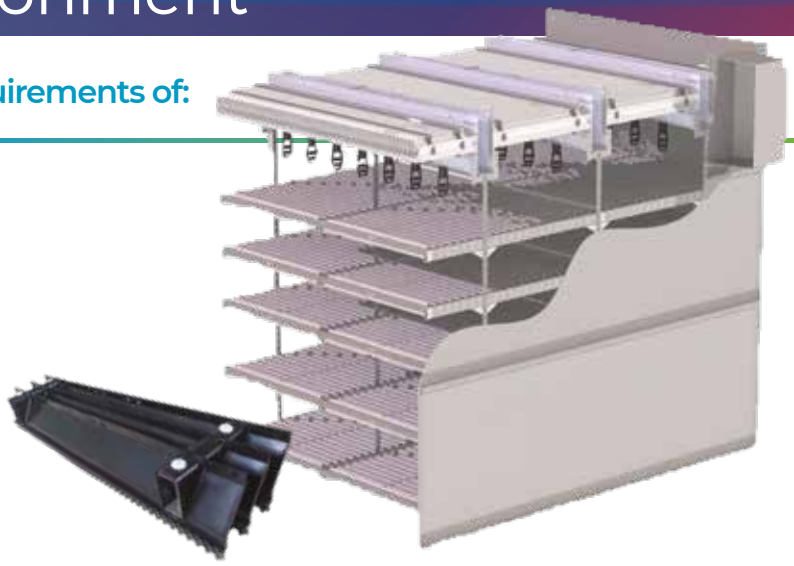
Cooling Towers
Adiabatic Coolers
Adiabatic Condensers

JACIR

Cooling for life

Our Strong Points
Technology & Environment

Exchange surfaces adapted to the requirements of: Industrial or HVAC applications



X-STEEL clean and resistant: 10 years warranty

Range of cooling towers aesthetically designed for ease of maintenance.

Design and material selection (X-STEEL stainless steel) ensures good performance, long life and safe, easy cleaning.

This new material is characterised by mechanical and chemical resistance to corrosion higher than those of 316 L stainless steel.
Its smooth surface slows bio film growth and avoids galvanisation's loss which is a pollutant once diluted in the water.

Low profile cooling towers

JACIR Patent

Plume abatement
Patented Glycol free, non freezing, plumeless coils: copper tubes and fins for efficiency and superior corrosion resistance.

Colour palette
Complete low profile range with wide selection of paint colours for full integration with architectural buildings.

Low Noise
Very low noise cooling towers are standard. Further sound attenuation is possible up to 35 dBA at 10 m for 1 dissipated MW.
These sound attenuation options can be retrofitted to existing standard towers: baffles, casing insulation...

Evolutive Cooling towers

All JACIR standard cooling towers can subsequently be equipped with options.

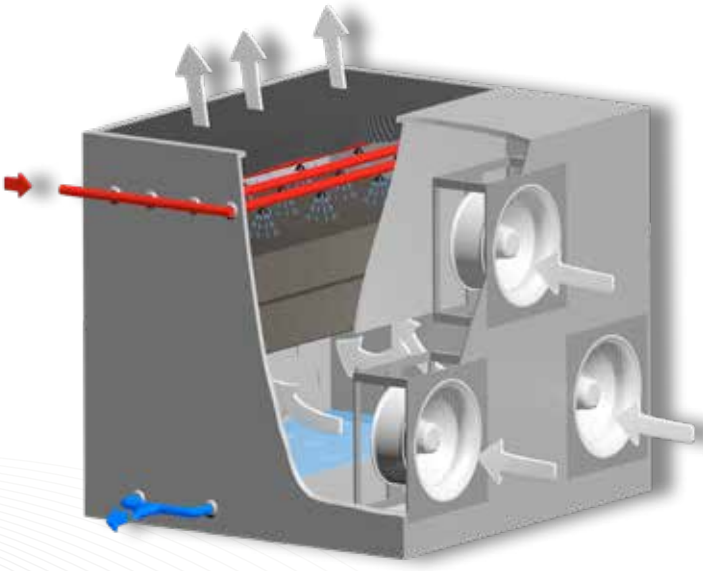
Open Circuit
Cooling Tower

Evaporative cooling remains the most ecological and economical of cooling technologies: high energy performance and low in processing cost.

The selection of a cooling tower is subject to an experienced and bespoke selection to ensure that the design meets the specific requirement of each application.

The exchange surfaces and tower casings are carefully chosen; according to application process, water quality and the operating conditions.

Axial induced or forced draft fans are selected for low power consumption and centrifugal forced draft for low noise.



AVAILABLE MATERIALS:

X-STEEL Stainless steel | SILVER-STEEL | Galvanized steel | Concrete | FRP

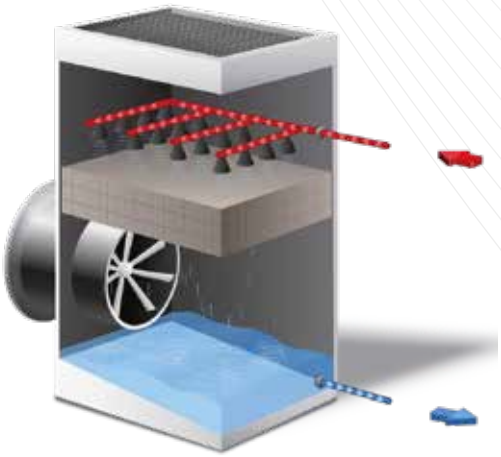
Clean water

JACIR participates in the ECP programme for cooling towers performances. Check ongoing validity of certificate: www.eurovent-certification.com

Metallic Centrifugal: S - ATM - KS - DTC

Metallic Axial: KH | FRP: VAP - TEC

PVC casing: RMP | Concrete: KBH



Dirty water

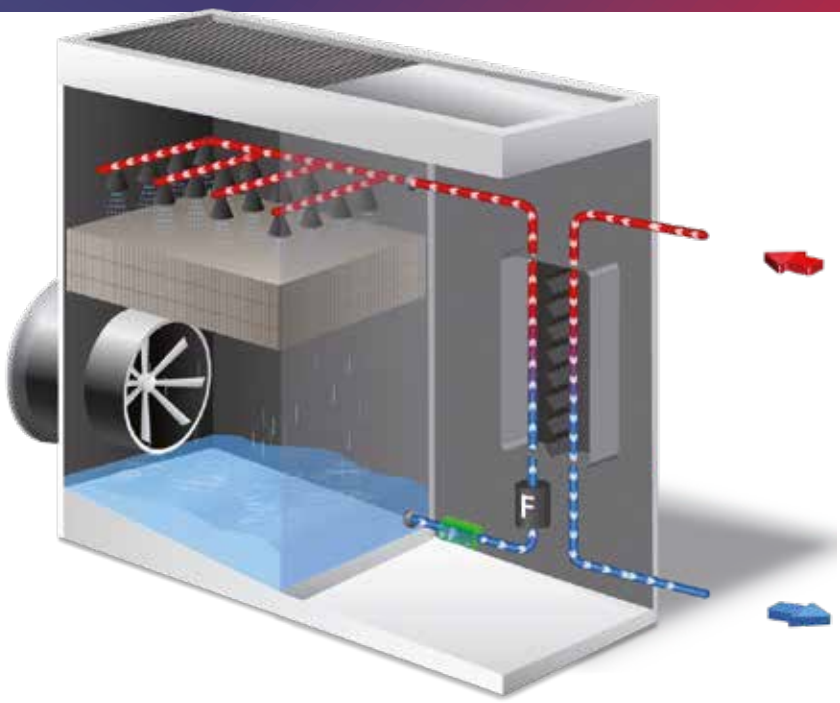
Metallic Centrifugal: RC | Metallic Axial: RH | Concrete: RBH

Closed Circuit
Cooling Tower

A closed circuit cooling tower can be used safely without glycol. Incorporating a Stainless Steel plate heat exchanger, it provides total desassembly for inspection and cleaning. This technology allows separation between the cooling tower's evaporative circuit and the primary's circuit.

It combines the excellent performance of the cooling tower infill, with the use of a plate heat exchanger keeping the circuits separate.

Both integral parts of the closed circuit are designed with easy access and inspection in mind.



AVAILABLE MATERIALS:

- X-STEEL Stainless steel
- SILVER STEEL
- Galvanized steel
- FRP

Metallic Centrifugal: SF - CRF - KSF

Metallic Axial: KHF

FRP: VAPF - RMPF

FRC Centrifugal Filter

Standard integration in our closed cooling towers' exchanger rooms , the FRC filter is a simple and efficient weapon against Legionella.

JACIR Patent

In addition to the natural fouling resistance of the exchanger (high water velocity), this equipment is designed to separate and then remove suspended solids in the water that may offer nourishment for bacteriological growth.

Automatic cleaning is effected during the blow-down by induction cycle or by timer, 100 % filtering of the water flow at 60 µm efficiency.

Power Efficiency

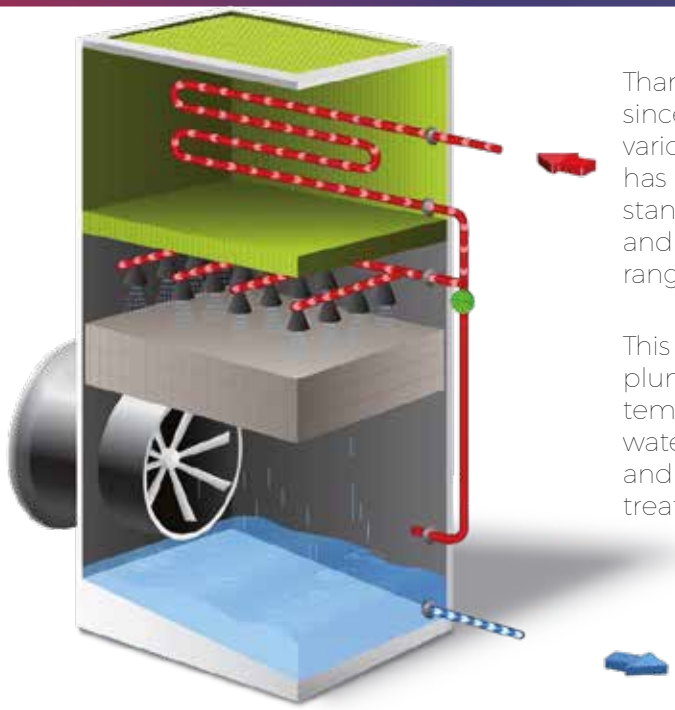
Energy savings

Power efficiency Inverter:
50 % energy saving on the annual consumption of the pump (optional).

An extensive range of closed cooling towers, not requiring glycol protection and removing the risk of freezing.

Indeed, in case of power failure or shut down, the secondary circuit water flows down into the basin.

Open Hybrid
Cooling Tower



Thanks to it's experience since 1973 and it's various patents, JACIR has developed and standardised a large open and closed hybrid cooler range.

This technology prevents plume, even during low temperatures and reduces water consumption and its associated water treatment.

Hybrid coolers with no plume, up to 80 % water savings thanks to dry/wet operation (duty totally dissipated in dry mode).

Water savings

AVAILABLE MATERIALS:

- X-STEEL Stainless steel
- SILVER -STEEL
- Galvanized steel

Metallic Centrifugal: SIM - ATIM - KSIM

Metallic Axial: KHIM

JACIR Patent

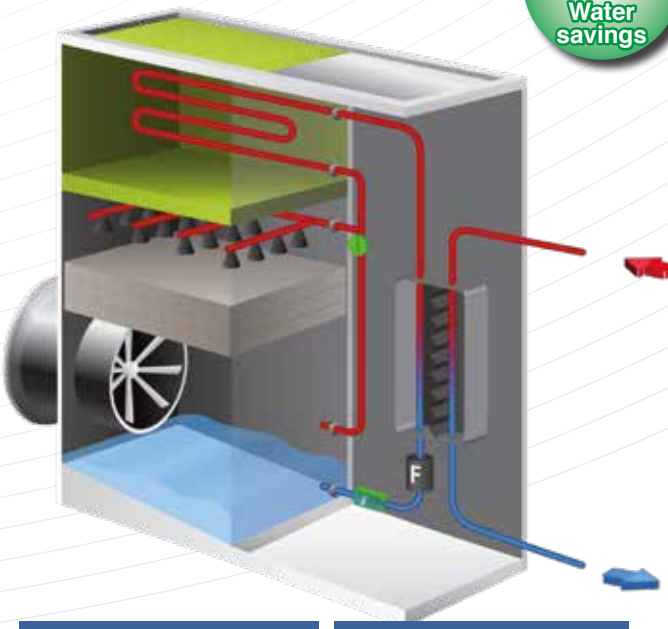
- Plumeless coils
- Water distribution is regulated through by-pass modulation

Closed Hybrid
Cooling Tower

Water savings

- Glycol free
- This regulation of the water distribution over the exchange surface is unique on the market and can also be installed on open and closed cooling towers.

Warming and drying of the air, combined with reduced air moisture content from the packing, lead to complete plume suppression, even in severe weather conditions (2°C ambient with 80 % RH).

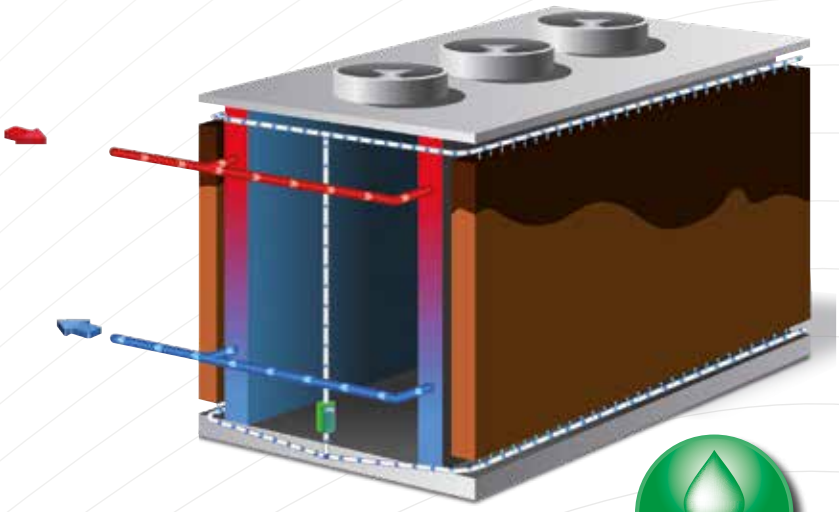


Metallic Centrifugal: SFIM - CRIM - KSFIM

Metallic Axial: KHFIM

Adiabatic Coolers & Condensers

Thermal performance certified coils



Water savings

TOPAZ NEO & ONYX technology delivers the following characteristics and benefits:

· Water consumption: 90 % savings compared with standard cooling towers

· No Legionella risk: no water spray in air flow, independently verified, JACIR certificated

· No water treatment required

· Easy maintenance: internal access by door

· Even lower water consumption with recycling pump

· Cooling and condensing at lower temperature than dry bulb temperature

AVAILABLE MATERIALS:

X-STEEL Stainless steel | Z-STEEL Stainless steel

TOPAZ NEO and ONYX ranges are available with single or double fans rows.
Coils are also available with a large casing material choice .

Heavy Duty

Cooling Towers Solutions

Heavy Duty

Excellent resistance to clogging
Very high mechanical resistance: 30kg/m2
Highly simplified access for cleaning and maintenance:
· Internal ladders with walkways
· Multiple and large access doors
· X-TRACT optional, JACIR patent.

APPLICATIONS :

· Steel Mills
· Sugar Mills
· Pulp and Paper
· Cement
· Distilleries
· Expanded polystyrene
· Food...

AVAILABLE MATERIALS:

X-STEEL Stainless steel | SILVER -STEEL | Galvanized steel | FRP | Concrete

JACIR Patent

Up to 400 ppm suspended solids: X-STREAM.

Ease of maintenance

Entirely cleanable cooling towers conforming with standards and requirements.

Fully appreciating our clients' needs and proactive in terms of changes in legislation, JACIR is continually improving the product range in order to ease operation and maintenance whilst providing costs savings.

Full access to all internals for complete removal and cleaning. Motor fan assembly is safely removable directly from the inside of the unit.

X-TRACT system

JACIR Patent

X-TRACT system has been specially designed to ease installation and maintenance operations.

In a single lift, the exchange surface, water distribution and drift eliminators are integrally removed, allowing for complete cleaning of the internals and casing. .

Other Services

POWER-FLOW access for complete basin cleaning

· Integrated water treatment

· Fan balancing on site

· Acoustic diagnosis

Cooling towers rental: available within 24 hours

Combining expertise aeraulics, thermal management and material selection, JACIR is recognised as a global leader in the design and manufacture in France of an extensive range of cooling towers, adiabatic coolers and condensers.

Our products comply with local environmental regulations, meet stringent sound requirements and are built with a variety of fan combinations, materials and exchange surfaces choice. They are designed for applications including HVAC, food, dairy, chemical, pul and paper...

Our dynamic and proactive R&D department ensures we provide innovations to new and existing installed equipment, combining performance improvement with reduced maintenance costs, water and energy savings, whilst complying with Health & Safety regulations.

We are committed to offering clients the best solutions to maintain reliability and optimise the performance of their cooling equipment.

Famous references :
ADP, Rolex, Nestlé, Louis Vuitton, CEA, Safe Host Data center...

JACIR
Cooling for life

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JACIR participates in cooling towers performances ECC Program.
Check ongoing validity of certificate:
www.eurovent-certification.com

Commercial and technical documentation of each cooling tower range is available on our web site

COOLING TOWERS
ADIABATIC COOLERS
ADIABATIC CONDENSERS

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CONTENT

JACIR
Cooling for life

TOPAZ NEO

Adiabatic Cooler

Certified coils performances

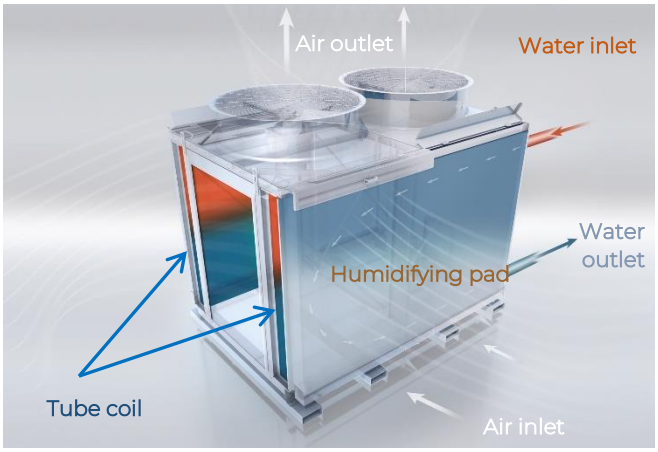
Commercial Documentation

GREEN TECH

- No water spray in the airflow
- No water treatment required
- Very low water consumption
- Easy maintenance: internal access through complete opening
- Optimized power consumption EC technology motors
- Cooling at lower temperature than dry bulb

FABRIQUE EN FRANCE
NF 38-424
La FRENCH FAB

Adiabatic Cooler: TOPAZ NEO range



Tube coil

In standard, the coils are made of copper and the aluminium fins are epoxy coated. Tubes are expanded through the fins to ensure both optimized mechanical resistance and thermal conductivity.
The coils have been tested for thermal performance, sealing and pressure according to PED.
The options of drainable coils by gravity and integrated automatic power and flow regulations in addition are also available.

Intelligent and safe access

The "H" orientation of the tube coils offers an ideal geometry for complete access to the motors, fans and the internal finned tube coils, over the whole height and width of the cooler. Accessibility is complete and safe for maintenance: a full safety switch accessibility door without doorstep offers an immediate and easy access to the motor fan set for maintenance. Indeed, motor fan set is removable and can be extracted from the inside of the cooler for safe maintenance. The floor of the inside of the equipment is made of non-slip aluminium tread plate, also removable for control under the unit as an option. This design avoids extra costs for lifting equipment, safety guards or outside walkways.

Motor fan sets

The motor fan sets draw air through the pads, then through the tube coils. Equipped with EC technology motors (Electronically Commutated) as a standard, especially designed to reduce power consumption with very low sound level: efficiency near IE4. EC motors are directly couple to a low-speed axial fan. This combination offers both power efficiency and optimized sound level.

The motor fan coupling is direct, and requires no maintenance. Technology in compliance with eco-conception (UE) 327/2011 concerning Directive 2009/125/CE application (ErP) for minimum efficiency thresholds after 2015/

Pre-cooling by evaporation

The evaporation section is used to pre-cool the ambient inlet air before it comes in contact with the tube coils: the cooling/humidifying pad covers the whole air inlet section, on both sides of the unit. Designed for easy cleaning, the water distribution channels and water recirculation system are made of Z-STEEL stainless-steel.
The water distribution channels are located above the pads, outside the air flow. The water recirculation pump is serviced externally by an access hatch provided for this purpose and this, remains accessible when the cooler is in operation. This complete system is factory pre-assembled.
The pre-cooling circuit is activated when the fluid outlet temperature is higher than the set point. This wet/dry set point is around 23°C in continental climate, with a fluid outlet temperature of 27°C. The collected water from the pads recirculates without bacteriological risk, and reduces drastically the water consumption: until 70% in wet mode.

Control panel with automaton

The TOPAZ NEO range is totally « Plug and Play »: the Schneider automaton equipped with HMI (Human Machine Interaction) as a standard, allows frequency drive and pre-cooling operation and EC motors controls in full safe maintenance.
Communication modes are optional: Ethernet, Modbus, BACnet as well as web or LonWorks.

Options

Drainable and non-freezing coils, telescopic pole especially designed for handles of cooling pads covers, POP-SCREEN filter, backup modes on the pump(s) and motor fan set, master-slave regulation for several unit's installation, maintenance table equipped with a telescopic foot especially designed to dissemble the motor-fan units from the inside of the device.

The TOPAZ NEO range is robust thanks to its designed and choice of materials, and especially developed for both urban and industrial environments.

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Cooling for life

TOPAZ NEO

Adiabatic cooler

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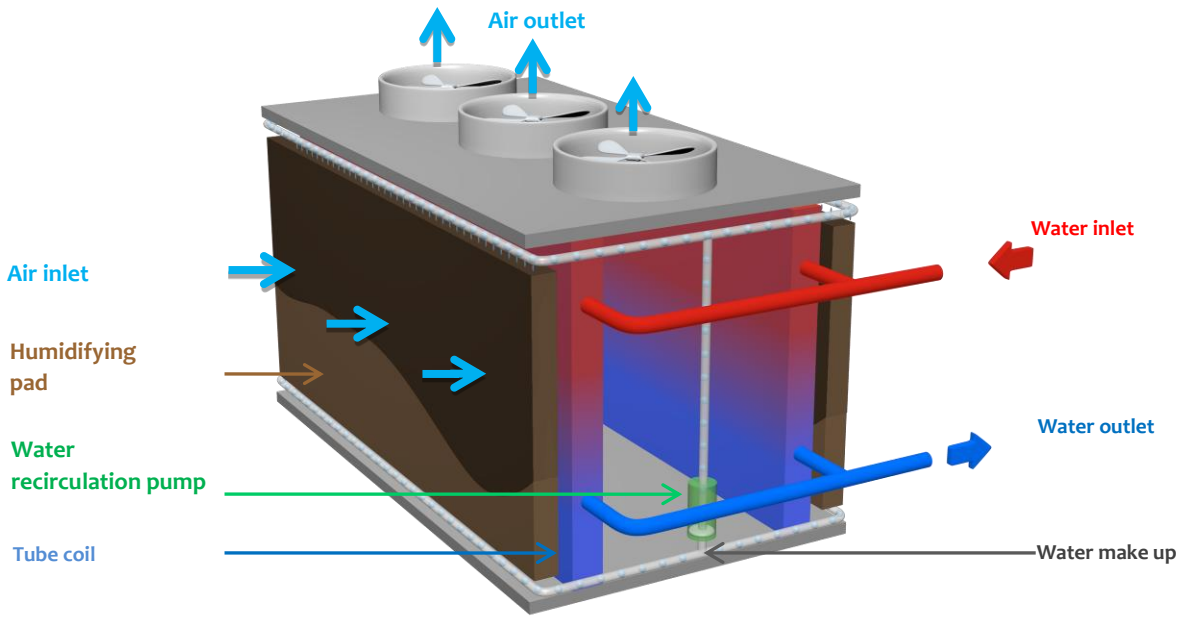
La FRENCH FAB

TOPAZ NEO principle and operation

The TOPAZ NEO adiabatic cooler is a heat exchanger; calories/heat are rejected to atmosphere. An adiabatic cooler is a combination of dry cooler with an adiabatic precooling section.

This precooling section lowers ambient air temperature by evaporating water which is passed over the cooling/humidifying pads especially designed for this purpose.

Adiabatic cooler operation



Dry mode operation:

- 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, it is without risk of Legionella.

TOPAZ NEO general description and benefits

Ranges

TOPAZ NEO is available in a range of 68 different duties composed by:

- Single motor fan set TM E09S
- Double row motor fan TM E09D
- High series double row motor fan set TH E09D
- Drainable double row motor fan set TMV E09D
- High drainable with double row of fans set THV E09D

General description

The TOPAZ NEO adiabatic cooler range includes:

- Two vertical heat exchanger tube coils,
- Two cooling/humidifying pads for precooling by evaporation,
- EC motors (Electronically Commutated): electronic Variation Speed Drive integrated to each motor,
- A low noise axial fan set.

The water distribution system for pre-cooling is follows:

- Water make-up electro/solenoid valve,
- Motorized bleed off valve,
- One or two water recirculation pump(s).

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 or Termokar, both participating to Eurovent Certita Certification COILS program (*www.eurovent-certification.com*),
- No external fouling of the tube coils: extended life expectancy,
- No thermal performance decrease,
- No water treatment required,
- Very low water consumption,
- Easy maintenance due to vertical “H” shape of the tube coils: full access through the central door,
- Low operating costs,
- Optimized power consumption 2009/125/CE application (ErP) for minimum efficiency thresholds after 2015,
- Design for container transport: TM single row,
- Made in France.

Tube coils

In standard configuration, the coils are made of copper tubes and aluminium fins epoxy coated.

Tubes are expanded through the fins to ensure both optimized mechanical resistance and thermal conductivity.

The tube thickness varies with the cooler size.

The coils are Eurovent certified by the manufacturers Friterm or Termokar, who are participating to the Eurovent Certita Certification program COILS (*www.eurovent-certification.com*). The coils are tested under pressure up to 20 bar according to PED.

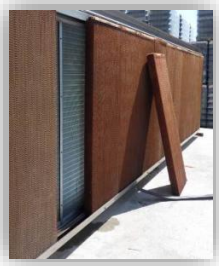
TMV and THV ranges are provided with totally drainable non-freezing coils. JACIR engineered tubes and coil arrangement enabling a complete drain under gravity (no compressed air injection needed). They are completed by an integrated automatic power and flow regulations

Pre-cooling by evaporation

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 media pads are not directional. It is easy to disassemble the cooling/humidifying pads, without tools or special access requirements. Optionally, a telescopic pole especially designed for handles of cooling pads cover, is proposed in order to ease the handling from the ground.

POP-SCREEN option allows to meet the environmental requirements of the site, an additional fixing frame is available as an option to fix a protection net on the medias (against insects, near forests, etc).

Water distribution

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.

The water distribution channels are entirely enclosed on the top in Z-STEEL stainless-steel and do not require any pressure to operate. They are located outside the airflow and distribute water evenly onto the pads, in full safety. Their “U” shape makes internal cleaning very easy, without any tools, handles are provided to aid removal.

Z-STEEL stainless-steel channels collect the water which has not been evaporated. Once filtered, the water is then returned to the basin and sucked in by the recirculation pump.

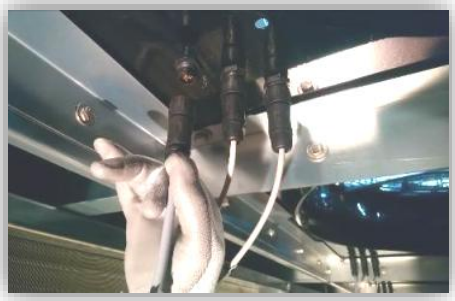
The water is then driven to a covered stainless-steel sump: a level switch and control of the water level is secured by one- or two-level detectors. The water recirculation pump is serviced externally by an access hatch provided for this purpose and thus remains accessible when the cooler is in operation.

The system includes a drain valve that automatically opens to dump the water from the sump if the cooling section has been used during the previous 24 hours.
A drying cycle is incorporated which will drain the sump completely and will dry the pads and other items which come into contact with water by running the fans at high speed. This function minimises bacteria growth potential and prolongs pad life.

Optionally, a backup mode on the pump(s) is also available, as well as a master-slave regulation common in the case of an installation of several units on the same hydraulic grid.

Motor fan sets

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-speed axial fans. This combination offers both power efficiency and optimized sound level. The blades are made of aluminium and are directly fitted to the motor rotor. The motor fan coupling is direct and requires no maintenance.
Fast electrical connectors allow easy and safe maintenance.



EC motors (Electronically commutated)

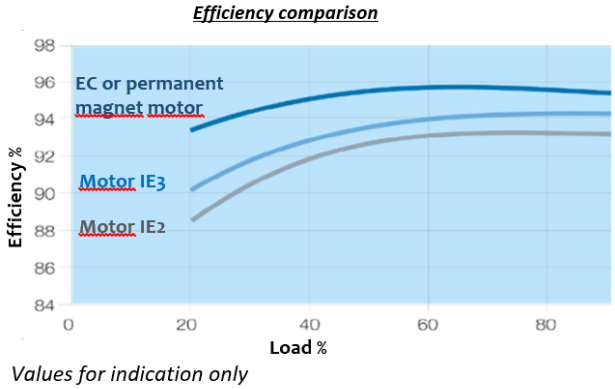
The TOPAZ NEO adiabatic cooler is a cutting-edge technology and shows exceptional performance (efficiency over the ErP 2015 directive IE3 and efficiency near IE4). They are IP 55 insulation class, 380/400 V, 50/60Hz. Technology in compliance with eco conception (UE) 327/2011 concerning Directive 2009/125/CE application (ErP) for minimum efficiency after 2015.

This efficiency places the TOPAZ NEO 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.

These motors have a low carbon footprint → power savings. 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.

Efficiency comparison



Frequency drive

Installed as a standard across the whole range, there is one frequency drive per motor.
EC motor directly coupled to its axial fan and regulated by the frequency drive allows to offer an exceptional efficiency and cos phi, even in case of low-speed variation.

Automaton

The TOPAZ NEO range is totally “Plug and Play”: the Schneider automaton, equipped with HMI (Human Machine Interaction), allows frequency drive and pre-cooling operation controls for full maintenance.

Here are some functions of the automaton:

- Digital monitoring including: pumps drain valve, water sump make-up valve, drain and dry pads mode control,
- Thermal load management,
- Automatic drain control of the adiabatic system,
- Analogue output for fan speed control with frequency drive,

- Analogue output for fan speed control,
- Management of recirculating water levels,
- Switching to dry/wet mode of one or two media sides (depending on model),
- Programming of the full draining (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

In case of drainable TOPAZ NEO range TMV parallel installed on a same circuit, connections to the automaton will be necessary for the drain information share between all the units (connections customer supply).

Communication modes are optional: Ethernet, Modbus, LonWorks, or BACnet.

Intelligent accessibility

The TOPAZ NEO adiabatic cooler has been designed with two main goals: thermal performance and ease of maintenance. Therefore, the following technical features are incorporated:

The “H” arrangement of the cooler provides an ideal geometry for complete access to the mechanical equipment and to internal sides of the coils over the entire height. Hinged access hatch also allows easy and immediate maintenance of the pumps and strainers directly from the outside even during dry operation of the cooler.

Equipped with a mechanical shutter and its safety sensor, giving full opening without threshold to the inside of the cooler, the motor-fan units are safety dismountable from inside, on a non-slip aluminium tread plate for a safe maintenance.

Accordingly, lifting equipment, safety guards or walkways are not necessary to carry out maintenance.

As an option, a maintenance table equipped with a telescopic foot especially designed for the TOPAZ NEO can be used to disassemble the motor-fan units from the inside of the device in complete safety. Without effort or additional lifting means this device with wheels makes it possible to get down the motor-fan units from the roof of the cooler to the floor, then to remove it easily.

An isolation plate is then proposed, also as an option, in place of motor fan set during its maintenance to keep safe the performance.

Also, easy handling of the humidifying pads is possible, without any lifting/handling tools.

Support and casing

Strong structure, the frame and the roof of the TOPAZ NEO range are made of SILVER STEEL, except for the parts in contact with water and both end points of the cooler (external sides: adiabatic pre-cooling section), made of Z-STEEL stainless steel for its perfect resistance to corrosion.

As an option, the floor made of non-slip aluminium tread plate safe maintenance may be removable for waterproof check.

TOPAZ NEO OPTIONS

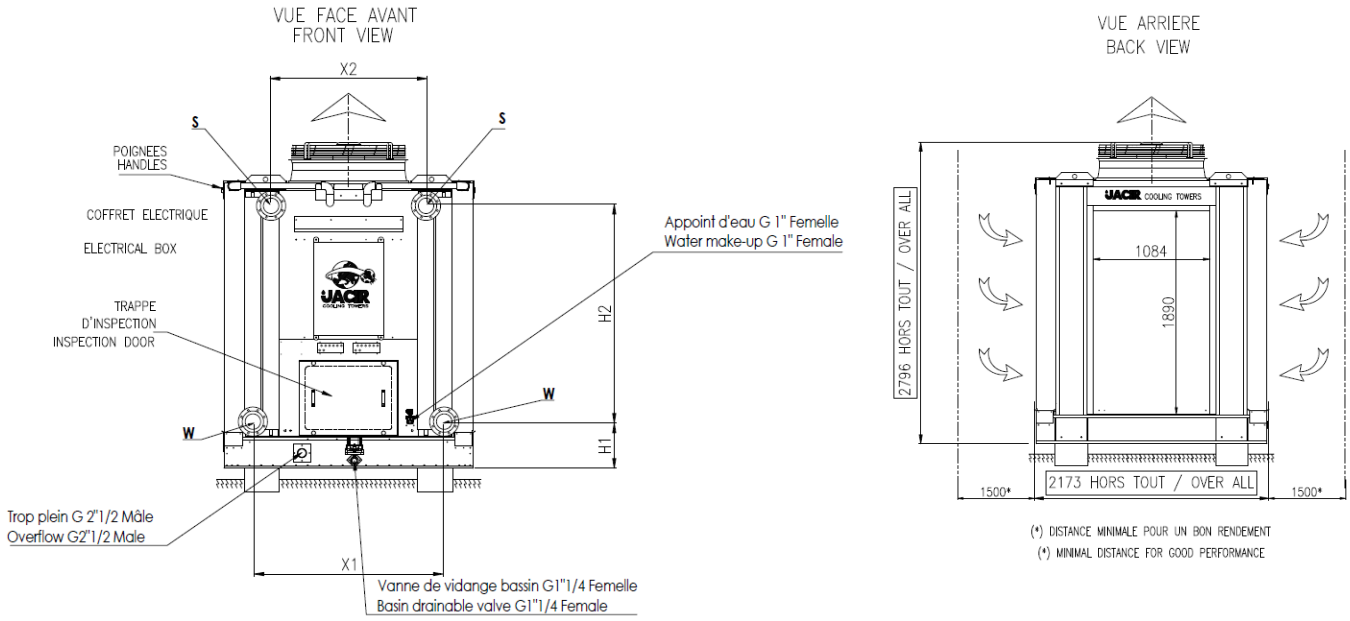
- Integrated drain protection system for drainable TOPAZ NEO ranges TMV and THV;
- Automated drain monitoring for drainable coils;
- Colour choice of the medias for a good integration in architecture site;
- POP-SCREEN: additional fixing frame to fix a protection on the medias (against insects, mear forests, etc);
- Telescopic pole especially designed for handles of cooling pads covers, is proposed in order to ease the handling from the ground;
- Backup mode on the pump(s);
- Backup mode on the motor fan set;
- Automaton communication gateway Ethernet, Modbus, LonWorks, or BACnet;
- Maintenance table equipped with a telescopic foot especially designed to disassemble the moto-fan units from the inside of the device in complete safety;
- Insulation plate in place of moto fan set during its maintenance to keep the performance;
- Removable floor made of non-slip aluminium tread plate for a safe maintenance for waterproof check;
- Master-slave regulation in case of an installation of several units on the same hydraulic grid.

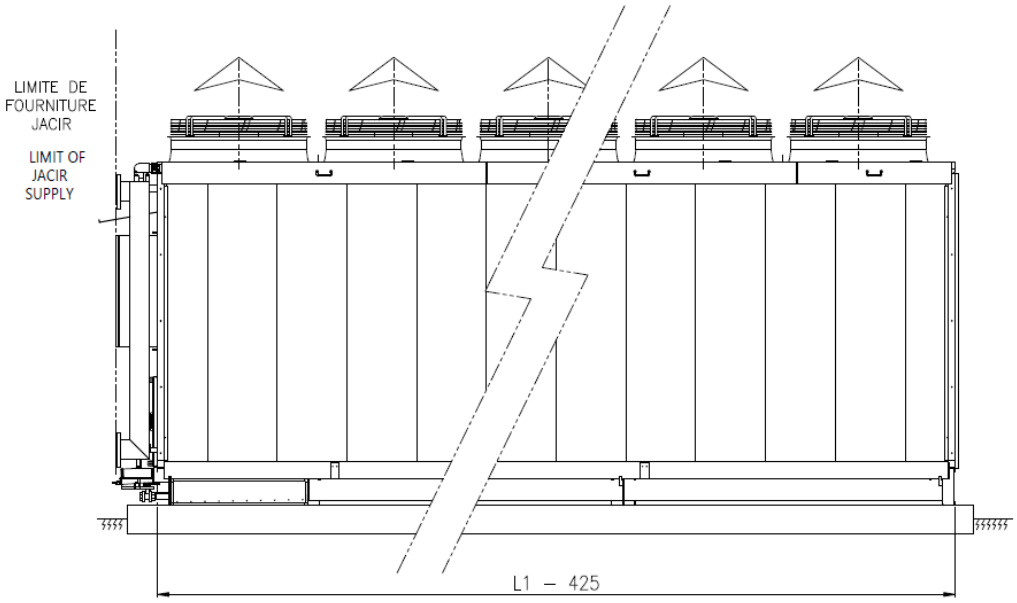
Technical features TOPAZ NEO TM E09 S

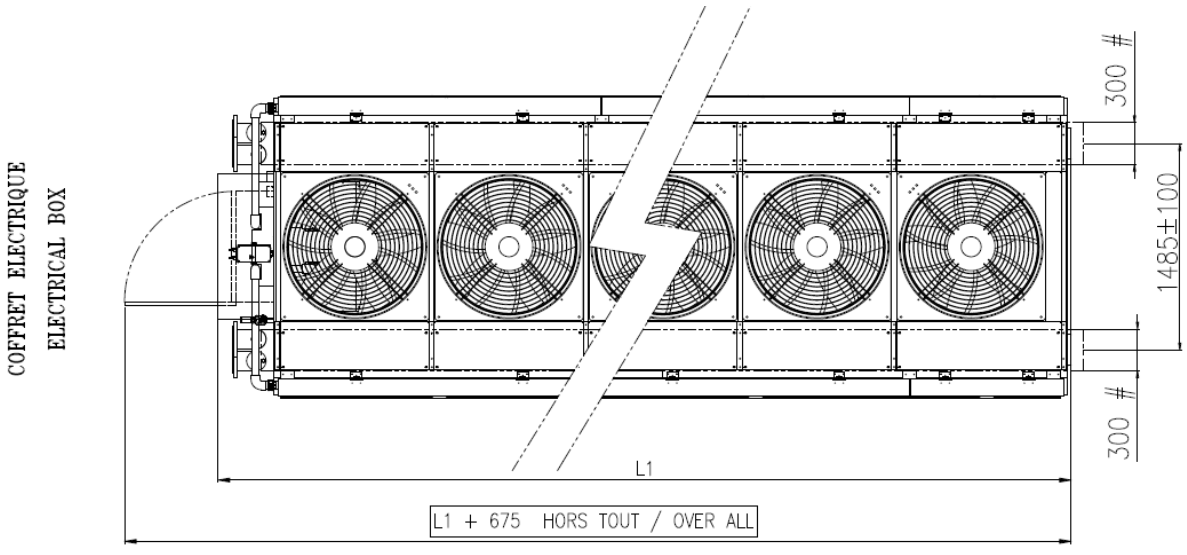
Série TOPAZ NEO		TM1 E09 S3 1722		TM2 E09 S3 2822		TM3 E09 S3 3922		TM4 E09 S3 5022		TM5 E09 S3 6122		TM6 E09 S3 7322	TM7 E09 S3 8422	TM8 E09 S3 9522	TM9 E09 S3 10622	TM10 E09 S3 11722	TM11 E09 S3 12822
		A	B	A	B	A	B	A	B	A	B	B	B	B	B	B	B
Nominal capacity max[1]	kW	89	104	180	204	271	307	356	417	453	514	623	695	805	915	1 024	1 134
Motor-fan	Qty / kW	1 x 3,2		2 x 3,2		3 x 3,2		4 x 3,2		5 x 3,2		6 x 3,2	7 x 3,2	8 x 3,2	9 x 3,2	10 x 3,2	11 x 3,2
Fan diameter	mm	910															
Motor absorbed power per unit	kW	4,7	4,8	7,4	7,6	10,2	10,5	12,9	13,3	15,7	16,1	19	21,8	24,6	27,5	30,3	33,2
Installed power per unit	kW	5,1	5,1	8,3	8,3	11,4	11,4	14,5	14,5	17,6	17,6	20,8	23,9	27	30,1	33,3	36,4
Inlet/outlet water connections (S/W)	DN	50		80		100				125							
Make-up water flow (max)	m3/h	0,4		0,5		0,7		0,9		1,15		1,3	1,5	1,6	1,7	1,8	1,9
Make-up water flow connection (threaded male)	inches (mm)	1" (26 x 34)															
Drain connection (threaded female)	inches (mm)	1" 1/4 (33 x 42)															
Overflow connection male (T)	inches (mm)	2" (50 x 60)										2" 1/2 (66 x 76)					
Weight empty	kg	650	750	1 150	1 300	1 650	1 850	2 100	2 450	2 600	3 000	3 600	4 150	4 700	5 300	5 850	6 450
Weight in operation	kg	1 100	1 200	1 700	1 900	2 300	2 600	2 900	3 350	3 500	4 050	4 750	5 500	6 200	6 900	7 600	8 350
Lenght overall (L1)	mm	1 705	1 705	2 815	2 815	3 925	3 925	5 035	5 035	6 145	6 145	7 255	8 365	9 475	10 585	11 695	12 805
Width overall	mm	2 173															
Height overall	mm	2 796															
Sound level[2]	dBA	58		61		61		63		64		64	65	65	66	66	66

(1): Based on condensing temperature of 35°C/30°C and design ambient 35°C/22°C (dry/wet bulb).
(2): Sound pressure level Lp at 15 metres in free field, in 5 directions at 100% of the ventilation (+/- 2 dBA).

Drawings and dimensions TOPAZ NEO TM E09 S







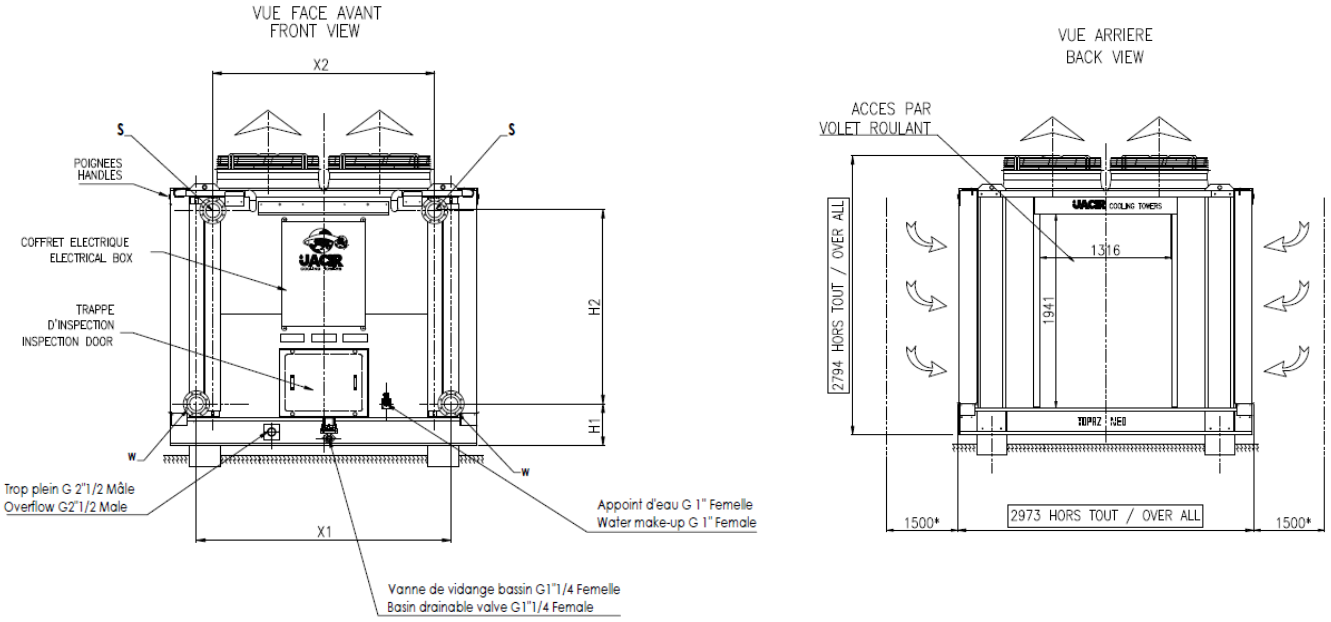
Beam width as an indication that can be reduced to 140mm

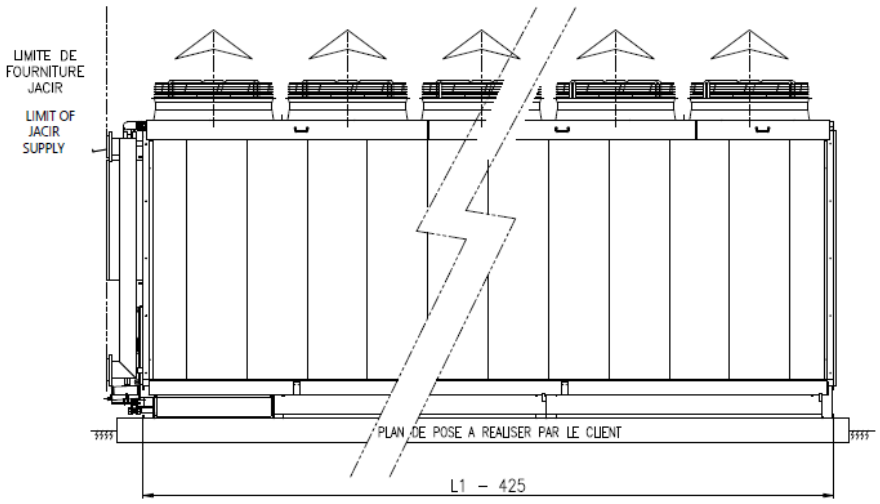
Technical characteristics TOPAZ NEO TM E09 D

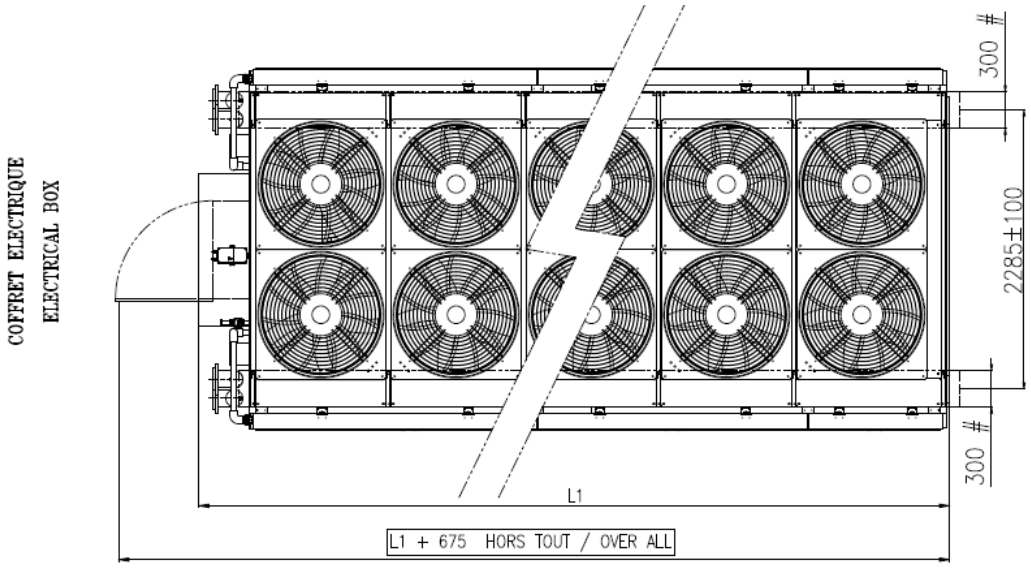
Série TOPAZ NEO		TM2 E09 D3 2830		TM3 E09 D3 3930		TM4 E09 D3 5030		TM5 E09 D3 6130	TM6 E09 D3 7330	TM7 E09 D3 8430	TM8 E09 D3 9530	TM9 E09 D3 10630	TM10 E09 D3 11730	TM11 E09 D3 12830
		A	B	A	B	A	B	B	B	B	B	B	B	B
Nominal capacity max[1]	**kW**	248	286	355	430	491	564	717	813	967	1 120	1 273	1 426	1 579
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												
Motor absorbed power per unit	**kW**	14,5	14,5	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						
Make-up water flow (max)	**m3/h**	0.7		0.8		1.2		1.6	1.8	2	1.2	2.6	2.7	1.9
Make-up water flow connection (threaded male)	**inches (mm)**	1" (26 x 34)												
Drain connection (threaded female)	**inches (mm)**						1" 1/4 (33 x 42)							
Overflow connection male (T)	**inches (mm)**	2" (50 x 60)							2" 1/2 (66 x 76)					
Weight empty	**kg**	1 350	1 500	1 900	2 150	2 450	2 800	3 450	4 100	4 700	5 320	6 000	6 650	7 300
Weight in operation	**kg**	2 050	2 250	2 750	3 050	3 400	3 850	4 650	5 450	6 250	7 050	7 850	8 650	9 450
Lenght overall (L1)	**mm**	2 815	2 815	3 925	3 925	5 035	5 035	6 145	7 255	8 365	9 475	10 585	11 695	12 805
Width overall	**mm**	2 973												
Height overall	**mm**	2 794												
Sound level[2]	**dBA**	64				65		66	67	67	68	68	69	69

(1): Based on condensing temperature of 35°C/30°C and design ambient 35°C/22°C (dry/wet bulb).
(2): Sound pressure level Lp at 15 metres in free field, in 5 directions at 100% of the ventilation (+/- 2 dBA).

Drawings and dimensions TOPAZ NEO TM E09 D







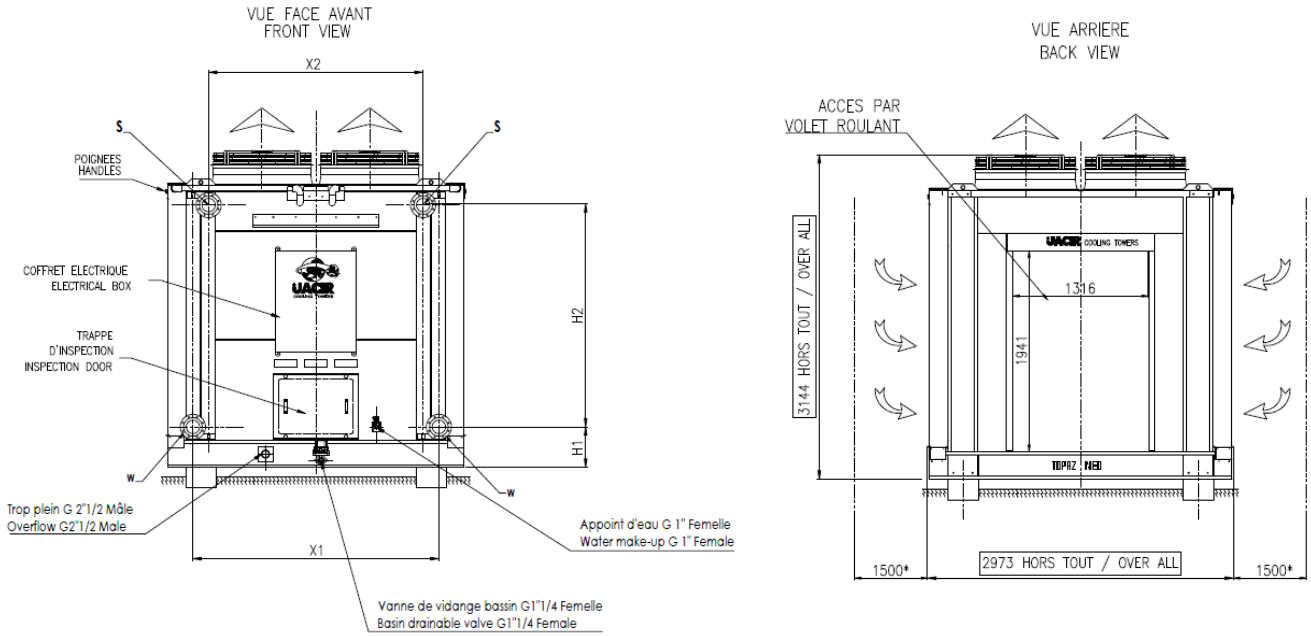
Beam width as an indication that can be reduced to 140mm

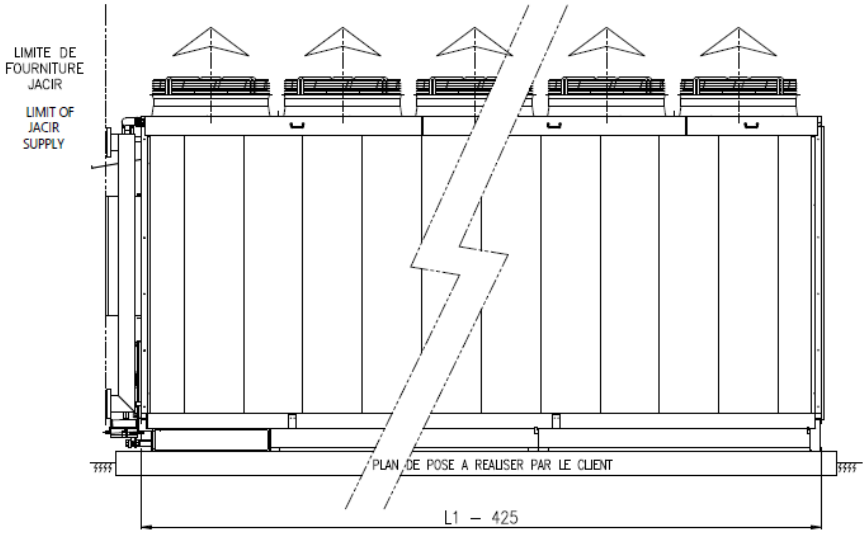
Technical features TOPAZ NEO TH E09 D

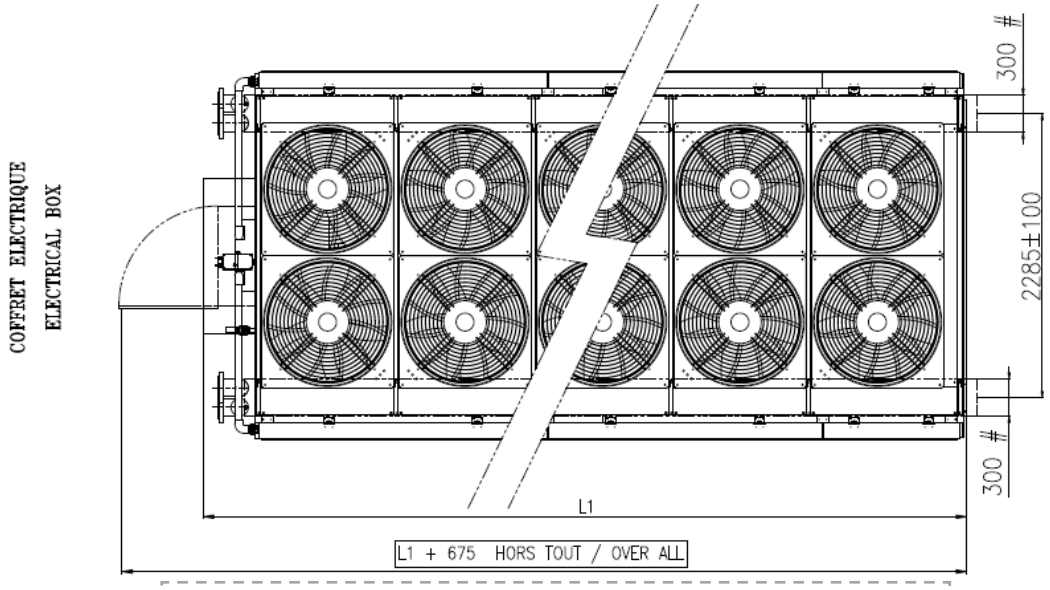
Série TOPAZ NEO		TH2 E09 D3 2830		TH3 E09 D3 3930		TH4 E09 D3 5030		TH5 E09 D3 6130	TH6 E09 D3 7330	TH7 E09 D3 8430	TH8 E09 D3 9530	TH9 E09 D3 10630	TH10 E09 D3 11730	TH11 E09 D3 12830
		A	B	A	B	A	B	B	B	B	B	B	B	B
Nominal capacity max[1]	**kW**	276	317	395	476	543	626	796	902	1 073	1 243	1 413	1 583	1 769
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												
Motor 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								
Make-up water flow (max)	**m3/h**	0.6		0.9		1.3		1.5	1.8	2	2.3	2.6	3	3.1
Make-up water flow connection (threaded male)	**inches (mm)**	1" (26 x 34)												
Drain connection (threaded female)	**inches (mm)**	1" 1/4 (33 x 42)												
Overflow connection male (T)	**inches (mm)**	2" (50 x 60)							2" 1/2 (66 x 76)					
Weight empty	**kg**	1 450	1 600	2 100	2 300	2 700	3 000	3 700	4 400	5 050	5 750	6 450	7 150	7 850
Weight in operation	**kg**	2 250	2 450	3 000	3 300	3 750	4 150	5 050	5 900	6 750	7 650	8 500	9 400	10 250
Lenght overall (L1)	**mm**	2 815	2 815	3 925	3 925	5 035	5 035	6 145	7 255	8 365	9 475	10 585	11 695	12 805
Width overall	**mm**	2 973												
Height overall	**mm**	3 144												
Sound level[2]	**dBA**	63		64		66		66	67	68	68	68	69	69

(1): Based on condensing temperature of 35°C/30°C and design ambient 35°C/22°C (dry/wet bulb).
(2): Sound pressure level Lp at 15 metres in free field, in 5 directions at 100% of the ventilation (+/- 2 dBA).

Drawings and dimensions TOPAZ NEO TH E09 D







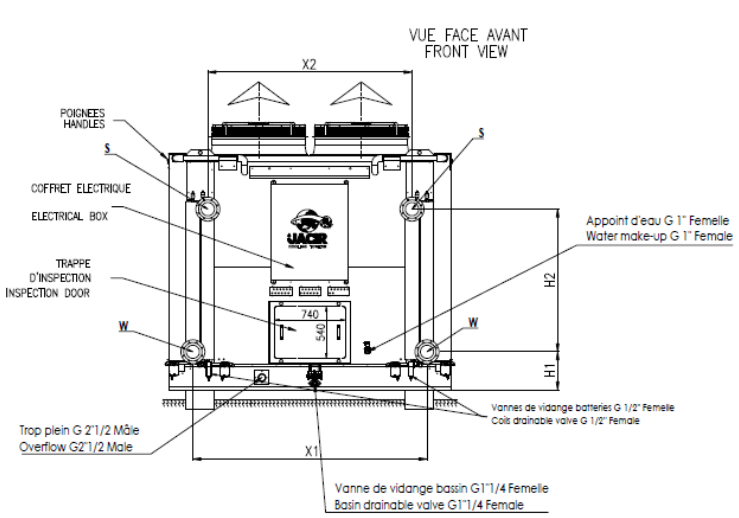
Beam width as an indication that can be reduced to 140mm

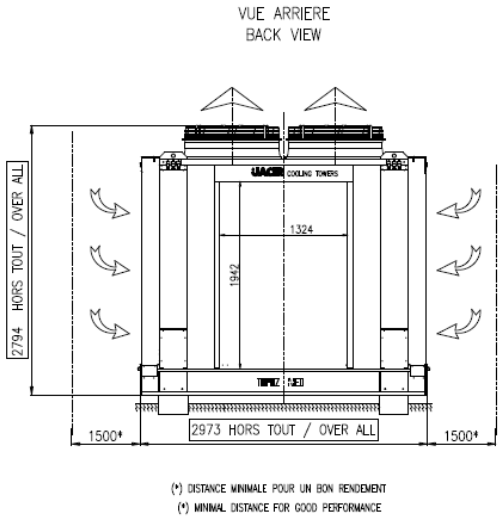
Technical characteristics TOPAZ NEO TMV E09 D

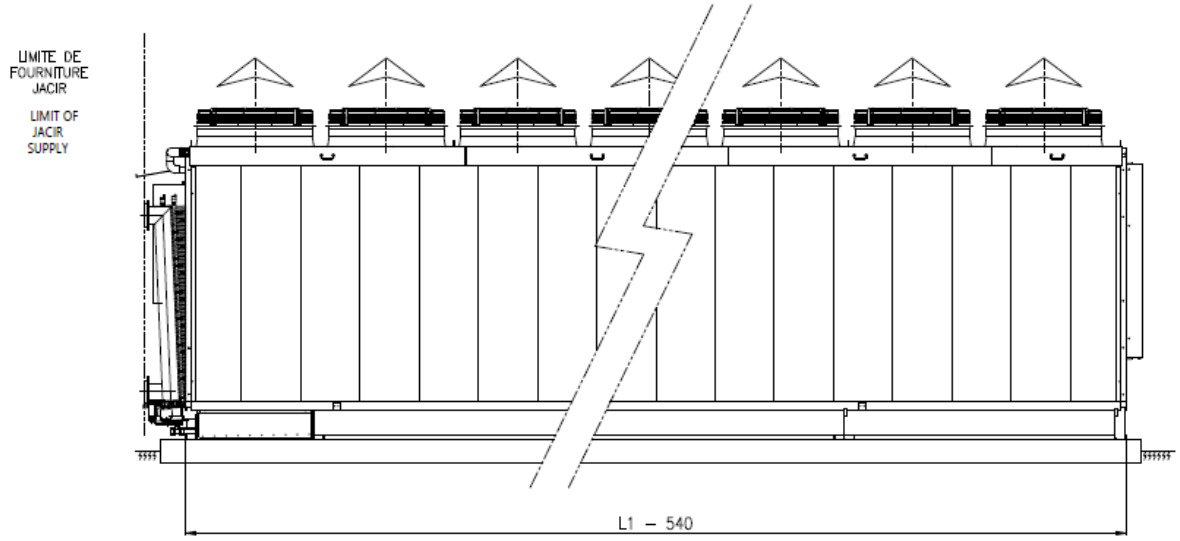
Série TOPAZ NEO		TMV2 E09 D3 2830		TMV3 E09 D3 3930		TMV4 E09 D3 5030		TMV5 E09 D3 6130	TMV6 E09 D3 7330	TMV7 E09 D3 8430	TMV8 E09 D3 9530	TMV9 E09 D3 10630	TMV10 E09 D3 11730	TMV11 E09 D3 12830
		A	B	A	B	A	B	B	B	B	B	B	B	B
Nominal capacity max[1]	kW	195	251	306	384	410	442	585	675	807	907	1 020	1 112	1 027
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												
Motor absorbed power per unit	kW	13	14,5	18	20	21.5	27	32	37	44	49	55	56	55
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						
Make-up water flow (max)	m3/h	0.8		0.9		1.3		1.7	1.8	2	2.2	2.6	2.7	2.8
Make-up water flow connection (threaded male)	inches (mm)	1" (26 x 34)												
Drain connection (threaded female)	inches (mm)						1" 1/4 (33 x 42)							
Overflow connection male (T)	inches (mm)	2" (50 x 60)							2" 1/2 (66 x 76)					
Weight empty	kg	1 350	1 500	1 900	2 150	2 450	2 800	3 435	4 100	4 700	5 320	6 000	6 650	7 300
Weight in operation	kg	2 050	2 250	2 750	3 050	3 400	3 850	4 650	5 450	6 250	7 050	7 850	8 650	9 450
Lenght overall (L1)	mm	2 930	2 930	4 040	4 040	5 150	5 150	6 260	7 370	8 480	9 590	10 700	11 810	12 920
Width overall	mm	2 973												
Height overall	mm	2 794												
Sound level[2]	dBA	64				65		66	67	67	68	68	69	69

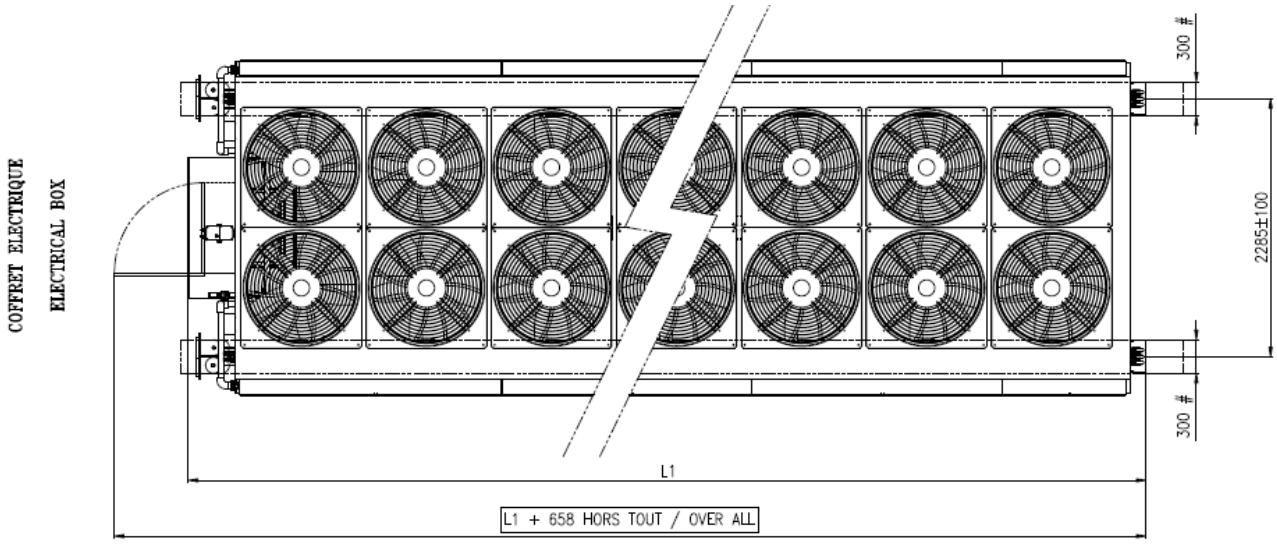
(1): Based on condensing temperature of 35°C/30°C and design ambient 35°C/22°C (dry/wet bulb).
(2): Sound pressure level Lp at 15 metres in free field, in 5 directions at 100% of the ventilation (+/- 2 dBA).

Drawings and dimensions TOPAZ NEO TMV E09 D









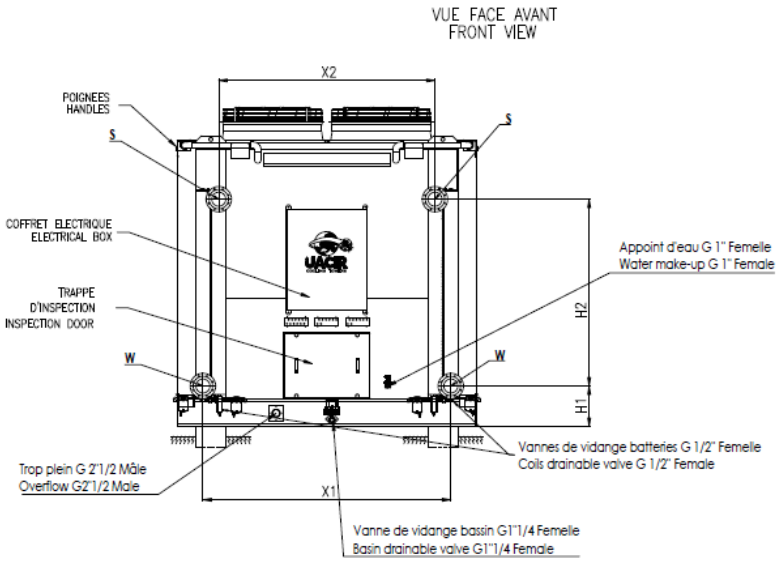
Beam width as an indication that can be reduced to 140mm

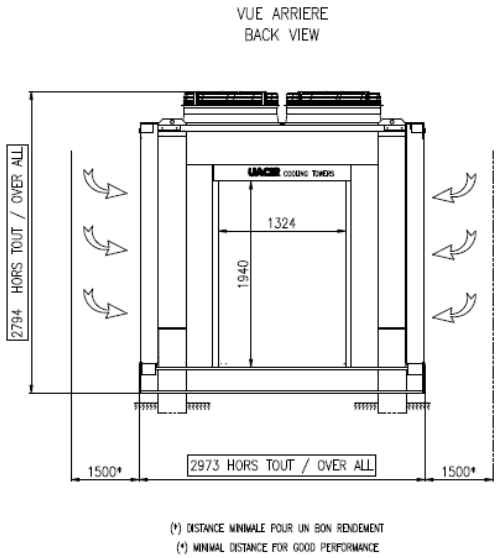
Technical characteristics TOPAZ NEO THV E09 D

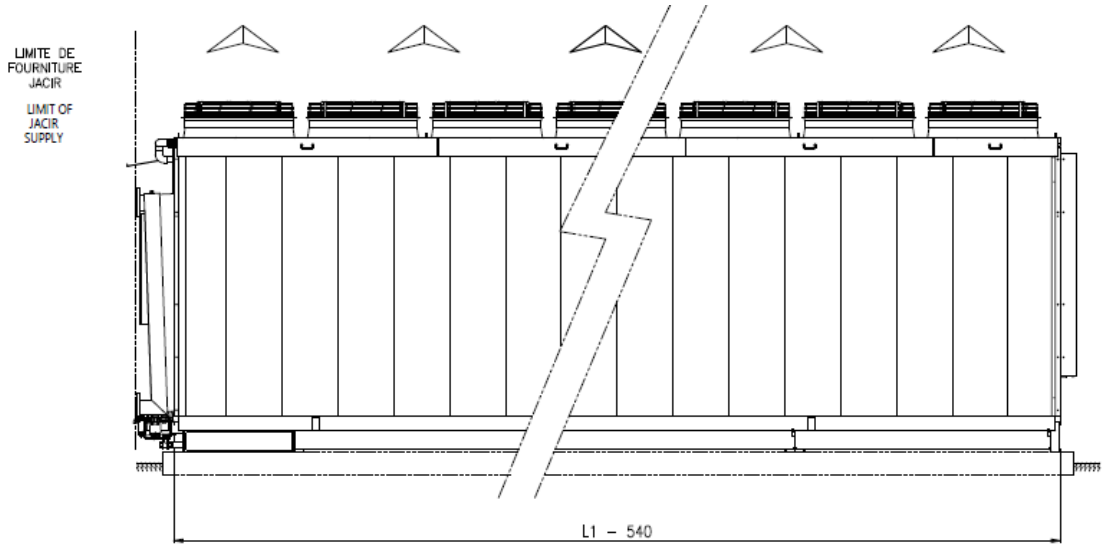
Série TOPAZ NEO		THV2 E09 D3 2830		THV3 E09 D3 3930		THV4 E09 D3 5030		THV5 E09 D3 6130	THV6 E09 D3 7330	THV7 E09 D3 8430	THV8 E09 D3 9530	THV9 E09 D3 10630	THV10 E09 D3 11730	THV11 E09 D3 12830
		A	B	A	B	A	B	B	B	B	B	B	B	B
Nominal capacity max[1]	kW	195	251	306	384	410	442	585	675	807	907	1 020	1 112	1 027
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												
Motor absorbed power per unit	kW	13	14,5	18	20	21.5	27	32	37	44	49	55	56	55
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						
Make-up water flow (max)	m3/h	0.8		0.9		1.3		1.7	1.8	2	2.2	2.6	2.7	2.8
Make-up water flow connection (threaded male)	inches (mm)	1" (26 x 34)												
Drain connection (threaded female)	inches (mm)						1" 1/4 (33 x 42)							
Overflow connection male (T)	inches (mm)	2" (50 x 60)							2" 1/2 (66 x 76)					
Weight empty	kg	1 450	1 600	2 100	2 300	2 700	3 000	3 700	4 400	5 050	5 750	6 450	7 150	7 850
Weight in operation	kg	1 600	2 450	3 000	3 300	3 750	4 150	5 050	5 900	6 750	7 650	8 500	9 400	10 250
Lenght overall (L1)	mm	2 930	2 930	4 040	4 040	5 150	5 150	6 260	7 370	8 838	9 590	10 700	11 810	12 920
Width overall	mm	2 973												
Height overall	mm	2 794												
Sound level[2]	dBA	64				65		66	67	67	68	68	69	69

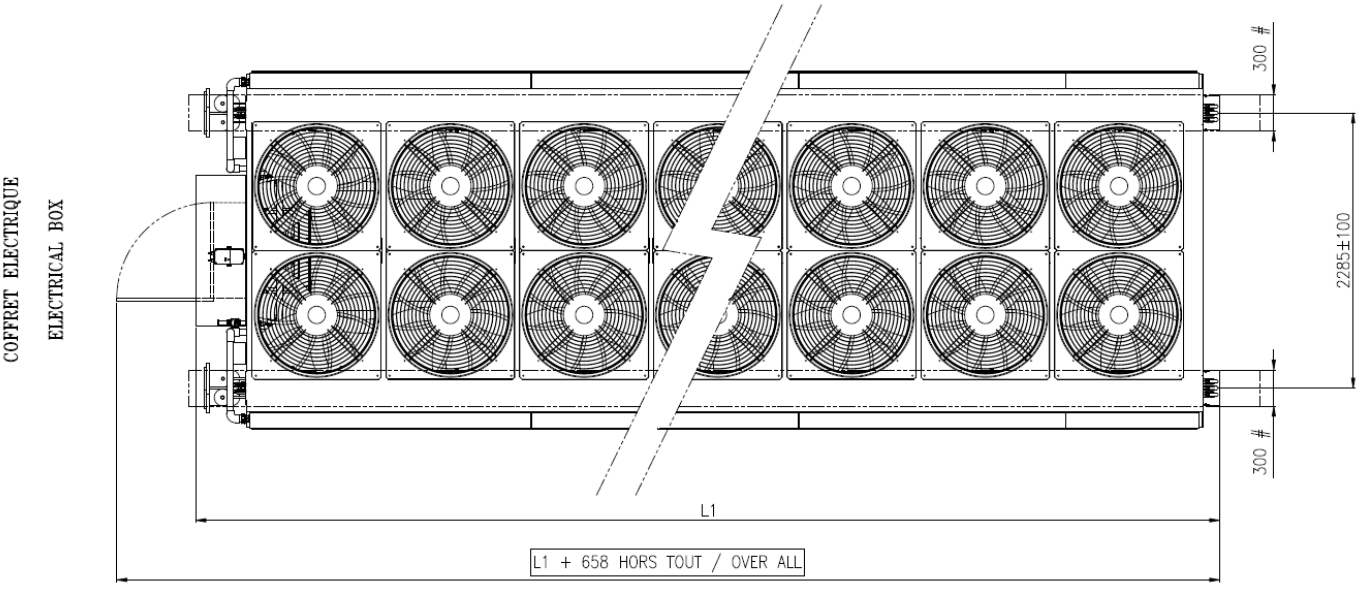
(1): Based on condensing temperature of 35°C/30°C and design ambient 35°C/22°C (dry/wet bulb).
(2): Sound pressure level Lp at 15 metres in free field, in 5 directions at 100% of the ventilation (+/- 2 dBA).

Drawings and dimensions TOPAZ NEO THV E09 D









Beam width as an indication that can be reduced to 140mm

In site layout TOPAZ NEO

In order to achieve optimum thermal performance, the TOPAZ NEO 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 TOPAZ working on the same site).
C- Air outputs must be cleared of any obstructions.

Minimum distances required:

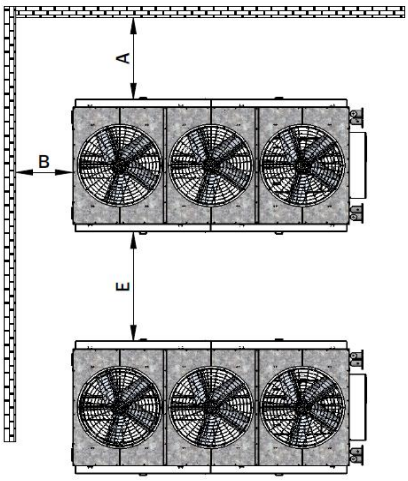
- A = minimum given by the graphic (unit are supposed to lay on the ground with no air movement under the unit).

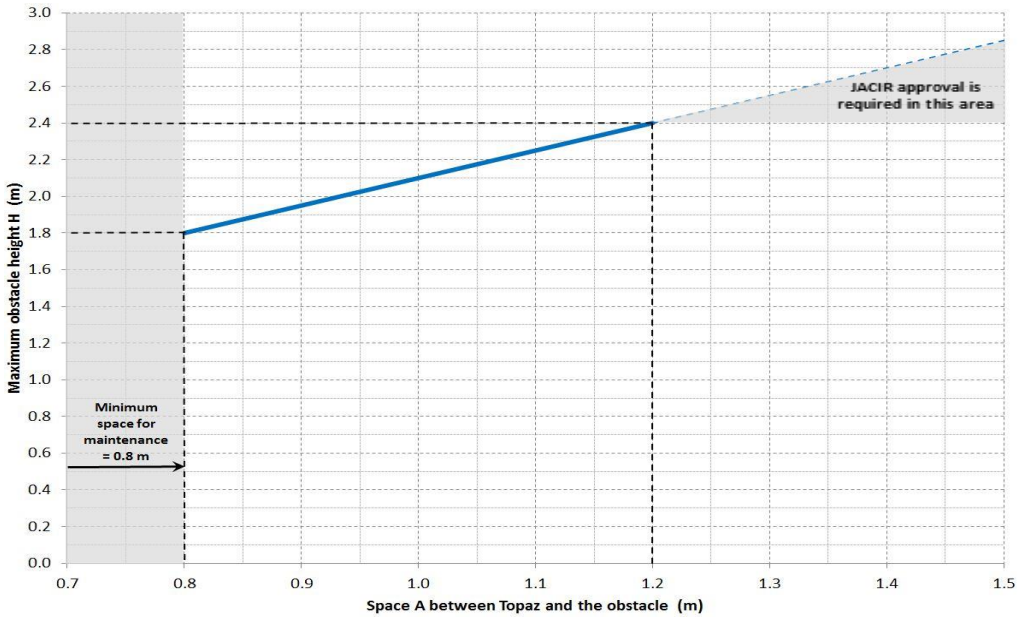
A= minimum 0.9 m from T4

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

Prescription TOPAZ NEO

Adiabatic cooler will be selected according the following data:

- Power to be dissipated: .....
- Ambient air temperature of ..... °C, and a wet bulb temperature of .....
- Temparature range from .....°C to ..... °C
- The sound pressure level will not be greater than ..... db(A) at 10 metres, average in 5 directions.

Adiabatic cooler data JACIR brand TOPAZ NEO type .....

Tube coils

- EUROVENT certified coils,
- The coils will be tested under pressure up to 20 bar and will have passed tests and certifications for thermal performance, sealing and pressure according to PED,
- The coils will be vertically installed, in “H” configuration, in order to allow full access to the internal sides of the coils and to the mechanics, without intermediate wall, through a service entrance over the whole width and height of the equipment,
- Tube coils will be made of copper tubing and aluminium fins with epoxy coated,
- The tubes thickness minimum will be provided according equipment size,
- Tubes will be seamless and expanded through the fins to secure a mechanical resistance and optimized thermal conductivity,
- Headers will be installed on a single side of the unit to make the internal access easier by a large service entrance on the opposite side.

Pre-cooling by evaporation

- The pads will be made of cellulose, chemically treated in order to avoid moisture and to improve its absorbing characteristics,
- The media pads are not directional, so that any side can be used,
- The cooling/humifying pads will cover the whole air inlet section, on the two sides of the unit,
- Removal of the pads is simple and does not require any tools of lifting equipment.

Water distribution

- The open water distribution channels will be designed for easy cleaning and will be made of Z-STEEL stainless-steel, without external pressure regulation,
- The open water distribution channels will be placed out of the air flow, easily accessible under the hood without help of any tools,
- In order to significantly reduce water consumption in adiabatic mode, the Z-STEEL stainless-steel header will collect the non-evaporated water. The water will be sent to a stainless-steel Z-STEEL sump. Water level regulation will be secured by one or two pumps,
- The system will include a drain valve, which will be automatically activated on a daily cycle,
- A full drain cycle, combined with full speed fan operation, will automatically dry parts in contact with the water.

Motor fan sets

- The moto fan sets will be aligned in a single or a double row at the top of the unit. They will draw the air through the pads and tube coils. It will be composed by one motor per fan,
- EC technology motors (Electronical Commutation) will be IP 55 insulation class, 380/400 V, 50/60 Hz, direct coupling requiring no maintenance, especially selected for a continuous running operation,
- Each motor will include its frequency drive automaton driven,
- The motor fan sets will be completely removable from inside the unit for maintenance avoiding high walkways or lifting tool needs for operating staff security.

Control panel with automaton

- Schneider automaton will control EC motor fan and will activate the pre-cooling mode,
- The TOPAZ NEO cooler will be delivered totally “Plug and Play”, with different communication languages as an option, and will de equipped with HMI (Human Machine Interface),
- As a standard, functions of the automaton will be as follows: general fault alarm, wet mode ad setting, drain valve position, water make-up valve for the sump control, analogue output for fan speed control with frequency drive,
- Communication modes will be provided as an option for TOPAZ remote monitoring.

Support frame and casing

- TOPAZ support and roof will be rigid and strong, made of SILVER-STEEL,
- The internal floor of the unit will be made of non-slip aluminium tread plate and will be removable in order to check easily the building terrace waterproof,
- All metallic parts in contact with water (adiabatic pre-cooling section) will be in Z-STEEL stainless-steel,
- Internal access for unit maintenance and motor fan set removal will be via a mechanical roller shutter door equipped with a safety switch, without any doorstep for ease of access to the whole height and width of the equipment,
- An access service door to the pump(s) and strainer will allow inspection and cleaning by the outside, without switch of the cooler.

Options

- Automated drain system: TOPAZ NEO drainable TMV-THV,
- POP-SCREEN: additional fixing frame to fix a protection on the medias (against insects, near forests, etc),
- Colour choice of the medias for a good integration on architecture site,
- Backup mode on the pump(s),
- Backup mode on the motor fan set,
- Automaton communication gateway Ethernet, Modbus, LonWorks, or BACnet,
- Telescopic pole especially designed for handles of cooling pads covers, is proposed in order to ease the handling from the ground,
- Maintenance table equipped with a telescopic foot specially designed to disassemble the motor-fan units from the inside of the device in complete safety,
- insulation plate in place of motor fan set during its maintenance to keep safe the performance,
- Removable floor made of non-slip aluminium tread plate for safe maintenance for waterproof check,
- Master-slave regulation in case of an installation of several units on the same hydraulic grid.

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Prescription TOPAZ NEO drainable TMV-THV

High performance adiabatic cooler, JACIR brand TOPAZ NEO ..... Series will be designed to operate with glycol content of ..... %.
Adiabatic cooler will be selected according the following data:

- Power to be dissipated: .....
- Ambient air temperature of ..... °C, and a wet bulb temperature of .....
- Temparature range from .....°C to ..... °C
- The sound pressure level will not be greater than ..... db(A) at 10 metres, average in 5 directions.

Drainable and non-freezing Adiabatic cooler data JACIR brand TOPAZ NEO type THV or TMV .....

Tube coils

- EUROVENT certified coils,
- The coils will be tested under pressure up to 20 bar and will have passed tests and certifications for thermal performance, sealing and pressure according to PED,
- The coils will be vertically installed, in “H” configuration, in order to allow full access to the internal sides of the coils and to the mechanics, without intermediate wall, through a service entrance over the whole width and height of the equipment,
- Tube coils will be made of copper tubing and aluminium fins with epoxy coated,
- The tubes thickness minimum will be provided according equipment size,
- Tubes will be seamless and expanded through the fins to secure a mechanical resistance and optimized thermal conductivity,
- Headers will be installed on a single side of the unit to make the internal access easier by a large service entrance on the opposite side.
- Geometrical configuration of drainable coils: engineered tubes and coil arrangement enabling a complete drain under gravity (no compressed air injection needed).
- An additional, integrated automatic drain will secure power and flow regulations (it excludes fluids collection tank). An electrical heat tracing and antifreeze protection will be necessary for process main piping until the electrical valve.

Pre-cooling by evaporation

- The pads will be made of cellulose, chemically treated in order to avoid moisture and to improve its absorbing characteristics,
- The media pads are not directional, so that any side can be used,
- The cooling/humifying pads will cover the whole air inlet section, on the two sides of the unit,
- Removal of the pads is simple and does not require any tools of lifting equipment.

Water distribution

- The open water distribution channels will be designed for easy cleaning and will be made of Z-STEEL stainless-steel, without external pressure regulation,
- The open water distribution channels will be placed out of the air flow, easily accessible under the hood without help of any tools,
- In order to significantly reduce water consumption in adiabatic mode, the Z-STEEL stainless-steel header will collect the non-evaporated water. The water will be sent to a stainless-steel Z-STEEL sump. Water level regulation will be secured by one or two pumps,
- The system will include a drain valve, which will be automatically activated on a daily cycle,
- A full drain cycle, combined with full speed fan operation, will automatically dry parts in contact with the water.

Motor fan sets

- The moto fan sets will be aligned in a single or a double row at the top of the unit. They will draw the air through the pads and tube coils. It will be composed by one motor per fan,
- EC technology motors (Electronical Commutation) will be IP 55 insulation class, 380/400 V, 50/60 Hz, direct coupling requiring no maintenance, especially selected for a continuous running operation,
- Each motor will include its frequency drive automaton driven,
- The motor fan sets will be completely removable from inside the unit for maintenance avoiding high walkways or lifting tool needs for operating staff security.

Control panel with automaton

- Schneider automaton will control EC motor fan and will activate the pre-cooling mode,
- The TOPAZ NEO cooler will be delivered totally “Plug and Play”, with different communication languages as an option, and will be equipped with HMI (Human Machine Interface),
- As a standard, functions of the automaton will be as follows: general fault alarm, wet mode ad setting, drain valve position, water make-up valve for the sump control, analogue output for fan speed control with frequency drive,
- Communication modes will be provided as an option for TOPAZ remote monitoring.

Support frame and casing

- TOPAZ support and roof will be rigid and strong, made of SILVER-STEEL,
- The internal floor of the unit will be made of non-slip aluminium tread plate and will be removable in order to check easily the building terrace waterproof,
- All metallic parts in contact with water (adiabatic pre-cooling section) will be in Z-STEEL stainless-steel,
- Internal access for unit maintenance and motor fan set removal will be via a mechanical roller shutter door equipped with a safety switch, without any doorstep for ease of access to the whole height and width of the equipment,
- An access service door to the pump(s) and strainer will allow inspection and cleaning by the outside, without switch of the cooler.

Options

- Automated drain system: TOPAZ NEO drainable TMV-THV,
- POP-SCREEN: additional fixing frame to fix a protection on the medias (against insects, near forests, etc),
- Colour choice of the medias for a good integration on architecture site,
- Backup mode on the pump(s),
- Backup mode on the motor fan set,
- Automaton communication gateway Ethernet, Modbus, LonWorks, or BACnet,
- Telescopic pole especially designed for handles of cooling pads covers, is proposed in order to ease the handling from the ground,
- Maintenance table equipped with a telescopic foot specially designed to disassemble the motor-fan units from the inside of the device in complete safety,
- Insulation plate in place of motor fan set during its maintenance to keep safe the performance,
- Removable floor made of non-slip aluminium tread plate for safe maintenance for waterproof check,
- Master-slave regulation in case of an installation of several units on the same hydraulic grid.

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Cooling for life

TOPAZ NEO

Fully Drainable & Non-Freezing

PRODUCT SUPPORT

In the absence of glycol and / or thermal load in the bundles, the coils may be exposed to freezing. The complete drain of the circuits is then unreliable, JACIR innovates and offers two additional options for the TOPAZ NEO range.

MADE IN FRANCE
FABRICATION FRANÇAISE
La FRENCH FAB

Drainable coils

This option is a JACIR engineered tubes and coil geometrical arrangement enabling a complete drain under gravity. The inclined cooling coil no need any compressed air injection.

Integrated drain protection

In addition to drainable coils option, JACIR offers automatic power and flow regulations (including valves, common headers…). An electrical heat tracing and antifreeze protection is necessary for process main piping until the electrical valve.

Benefits

∞ Simplified maintenance, fast and totally safe.

Applications

∞ All adiabatic coolers TOPAZ NEO range.

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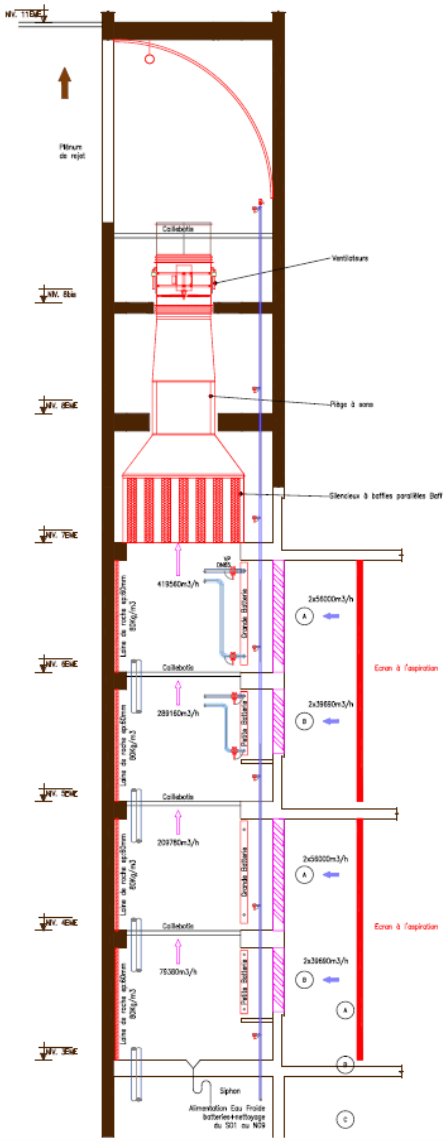
Cooling for life

ADIABATIC WALL

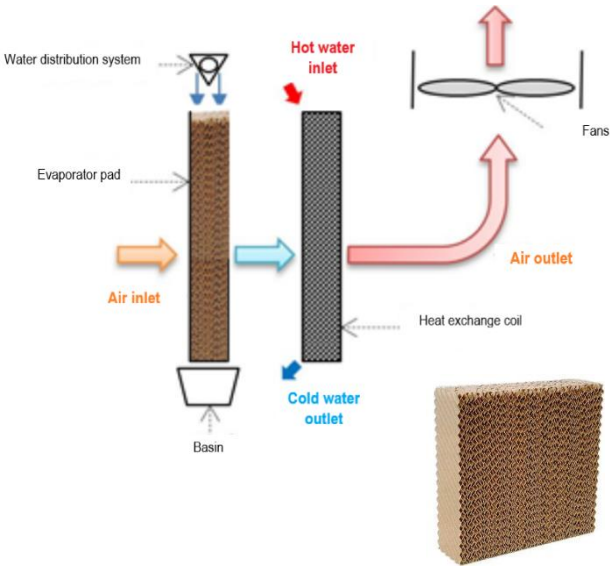


PRODUCT SUPPORT

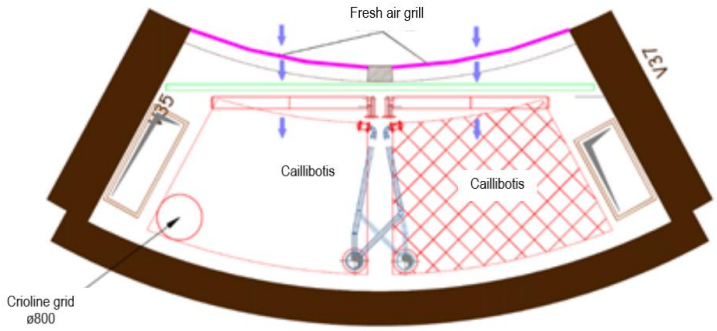
When the wall alone becomes a cooling unit ...

Adiabatic cooler principle:

Adiabatic cooling results from the association of a dry air cooler adiabatic pre-cooling section: this pre-cooling section is made to lower the ambient air temperature by water evaporation over a pad specially made for this use.
The adiabatic cooler uses water evaporation. Thus, this system makes it possible to get a cold-water temperature lower than the air one.



Example of configuration:



Characteristics:

- Water cooling at low temperatures allowing an increase in the outputs of cold groups
- Specific study for each building
- Possibility of free cooling
- No water treatment necessary
- Not subject to section 2921

Mutualizable applications:

- Cold groups cooling
- Generators cooling

Benefits:

- Elimination of machine installation constraints on the roof or in the basement
- Use of openings and hoppers in buildings to individually integrate evaporative cooling units

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ONYX

Adiabatic Condenser

Commercial Documentation

JACIR ONYX range combines latest technologies to achieve the expected and safe performance from an environmentally focused heat rejection system

- Condensing at lower temperature than ambient air
- No water spray in the airflow
- Optimized water consumption – no water treatment required
- Easy maintenance: full internal access to all components
- High efficient EC technology motors
- Energy saving Certificate compliance

La FRENCH FAB

ADIABATIC CONDENSER: ONYX

Operating principle

The ONYX system has been designed to guarantee to operate the best global performance of a cold chain installation, even under the most severe climatic conditions. The ONYX Series goes one step further greatly reducing fan input power for every tonne of heat discharged. Pressure loss optimisation and motor fan unit's regulation control enable both noise levels and power consumption reduction.

Low greenhouse effect fluid: although NH3 must be handled with care, due to the high Global Warming Potential (GWP) of most refrigerant fluids, JACIR's choice naturally went towards ammonia (NH3), considered to be less environmentally damaging: it does not deplete stratospheric ozone and has little impact on the greenhouse effect. In both ODP and GWP indexes, the environmental impact of NH3 is zero (source: 4th IPCC report). NH3 also has many other benefits: good heat transfer coefficient, easily leaks detection, low-flammability, and it is furthermore natural and biodegradable.

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Cold chain securing: while significantly reducing the water and electricity consumption, eliminating chemical treatment and reducing the demanding maintenance usually required for evaporative systems, the ONYX condenser offers minimal operating costs, fully controlled health risk, and a major step towards an ever more environmentally friendly technology.

Tube Coil

As standard, the coils are made of stainless steel. Tubes are expanded through the fins to ensure both mechanical physical strength and thermal conductivity. The coils have been tested for thermal performance, sealing and pressure in compliance with PED. ONYX is also available in HYBRID version allowing on the same equipment to discharge calories from the cooling water circuit and from the chiller compressor.

Intelligent and safe access

The « H » layout of the tube coils offers the ideal geometry allowing full access to the motors, fans and the inner internal surfaces of the finned tube coils, over both full height and width of the cooler. This full open access is safer for maintenance: a threshold-free opening flap equipped with safety sensor offers immediate and easy access to the motor/fan unit for maintenance. Indeed, motor fans unit enabling disassembling from within the inside of the cooler. This design avoids extra costs for lifting equipment, safety guards or exterior walkways

Motor fan units

The motor fan units draw air through the pads, then through the tube coils. Equipped with EC (Electronically Commutated) technology motors as standard, which are specially designed to reduce power consumption with very low noise level: efficiency is higher than IE4. EC motors are directly coupled to low-speed axial fan, this combination offers both power efficiency and an optimised sound level. The motor-fan coupling is direct, and requires no maintenance. Technology in compliance with Eco conception (UE) 327/2011 concerning Directive 2009/125/CE application (ErP) for minimum efficiency thresholds after 2015.

Pre-cooling by evaporation

The evaporation surface is used to pre-cool the incoming air before it circulates through the tube coils: the cooling / humidifying pads completely covers the whole air inlet surface, on both sides of the unit.
Designed for easy cleaning, the water distribution circuit and water recirculation systems are made of Z-STEEL stainless steel. The water distribution channels are located at the top of the unit, out of the air flow. The water recirculation pump is serviced externally by an access hatch provided for this purpose and thus remains accessible when the cooler is in operation. This complete system is factory pre-assembled.
The air precooling circuit is activated when the fluid outlet temperature is higher than the setpoint. This wet / dry switch point is around 23 °C under a continental climate, with an outlet fluid temperature of 27 °C. The recirculation water system from the pads avoids bacteriological risk, and drastically reduces water consumption: by up to 70% in wet mode.

PLC control panel

The ONYX adiabatic condenser is totally «Plug and Play»: the Schneider PLC is equipped with an HMI (Human Machine Interaction) as standard, which enables the EC motors and pre cooling function to be controlled in complete safety. Ethernet, Modbus, BACnet communication protocols, as well as web gateways or LonWorks are available as options.

ONYX SAFE® Jacir patent

Refrigerant containment and protection device
SafetyFrame: building containment sleeve for better condenser refrigerant management,
SafetyPulse: refrigerant abatement system in case of leak detection
SafetyDrain: safe recovery and evacuation network.

ONYX adiabatic condensers, as well as ONYX HYBRID version are eligible for energy savings certificates (ESC) in accordance with their rating for effective cooling condensation data. The impact on return on investment is further optimised.

ONYX

Adiabatic condenser

CONTENT

Technical Documentation

Principle and operation ONYX

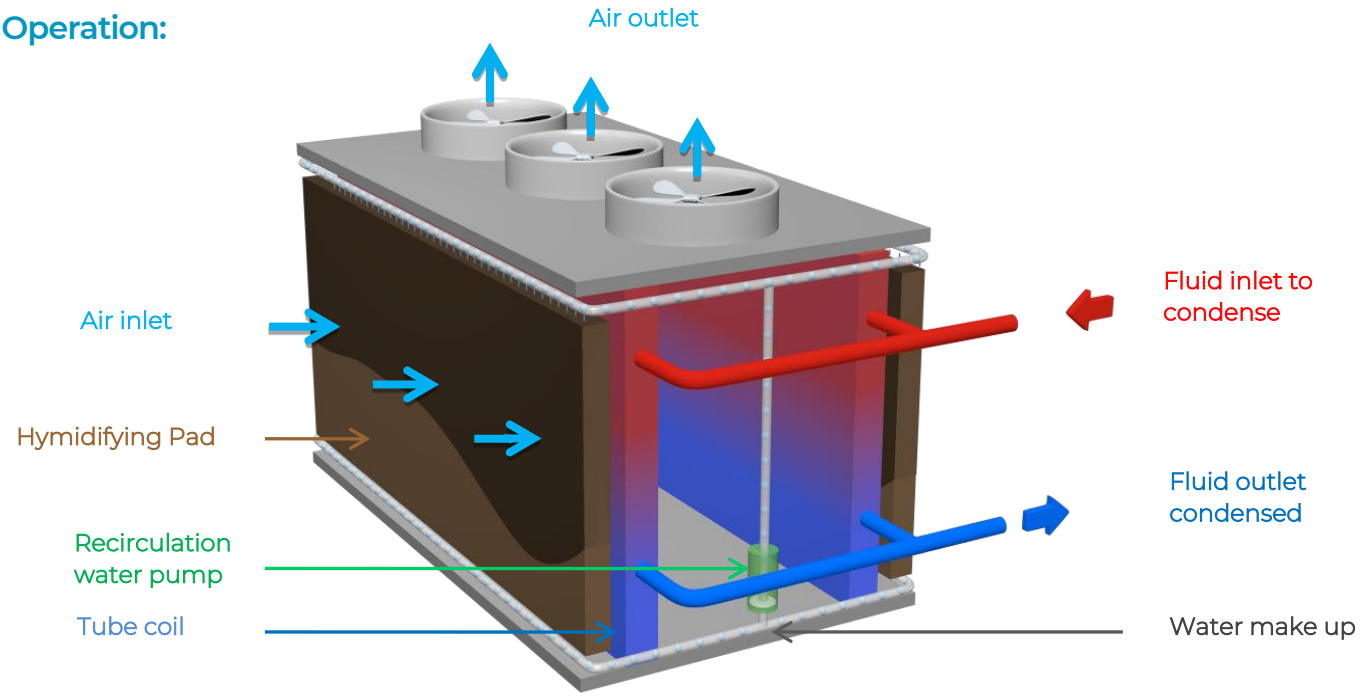
Principle

The ONYX adiabatic condenser is a heat exchanger designed for NH3 refrigerant fluid as standard. Calories are discharged into the atmosphere. When climatic conditions begin to change, this heat exchanger uses water evaporation. Indeed, in complete safety and without needing any water treatment, it discharges calories in order to condense the gas at a lower temperature than the ambient air.

The ONYX adiabatic condenser is the result of the combination of a dry condenser and an adiabatic pre-cooling section: this pre-cooling section lowers the ambient air temperature by evaporating water which passes through humidifying pads (Medias), specially designed for this purpose.

ONYX adiabatic condenser is also available in a hybrid version allowing the same equipment to discharge calories from the water-cooling circuit and the chiller compressor.

Operation:



Dry mode operation

- The fluid is cooled in the dry tube coil by ambient air flow. The ambient air is drawn in by the fans. The humidifying Medias located in front of the coils are dry.
- The fan speed is regulated according to the thermal load in order to maintain steady the outlet fluid pressure.
- The air is then evacuated upwards.

Adiabatic mode

- When cooling in dry mode is no longer effective, water is distributed over the Medias.
- The ambient air is then cooled by evaporation as it passes across the Medias.
- This precooled air then passes through the tube coils and condenses the fluid.
- The water in the Medias which has not been evaporated is collected and recycled back to the water make-up system. The water saving is then significant and without no risk of Legionella.

Range

The ONYX series offers a full range of 65 different adiabatic condensers:

- Single row motor-fan unit: ONYX M E09S
- Double row motor-fan unit: ONYX M E09D
- Double row motor-fan unit: ONYX HYM E09D Hybrid with integrated condenser and glycol water cooling

General description

ONYX adiabatic condensers are fitted with:

- Two vertical heat exchanger fine tube coils,
- Four vertical heat exchanger fine tube coils in the Hybrid version,
- One set of cooling/humidifying Medias for pre-cooling by evaporation,
- EC (Electronically Commutated) motors: electronic Variable Speed Drive installed in each motor,
- Low-noise axial fan unit,

The water distribution pre-cooling system includes:

- Water make-up solenoid valve,
- Motorised bleeder valve,
- One or two water recirculation pump(s).

Benefits

- Condensation temperature lower than outside temperature,
- Cooling of chiller compressor circuit on same equipment,
- No drift in the airflow,
- No water spraying system,
- Elimination of Legionella risk,
- The coils have been tested (sealing and pressure compliant with PED),
- No external fouling of the tube coils: extended lifespan,
- No thermal performance drifting,
- No water treatment,
- Very low water consumption,
- Easy maintenance due to vertical H shape of the tube coils: full access through a central door,
- Low operating costs,
- Optimised power consumption,
- Designed for container transport: ONYX single row range (up to ONYX M9 E09S model)
- Made in France.

ONYX: NH3 tube coil (condenser side)

As standard, the coils are designed to operate with NH3 refrigerant fluid and are made of stainless-steel with aluminium epoxy coated fins.
The surface area of the no-welded tubes is expanded through the fins to ensure both physical strength and thermal conductivity optimisation.
The coils are pressure-tested to 34 bar as standard and have been tested. Tube sealing and pressure specifications are compliant with PED.
Hydraulic connections are made with smooth stainless-steel tube which must be welded.

ONYX HYBRID: Glycol water thermal exchanger coil

A glycol water thermal exchanger coil is added to the condenser part. Made of copper tubes and aluminium epoxy coated fins.
The surface area of the no-welded tubes is expanded through the fins to ensure both physical strength and thermal conductivity optimisation.
The coils are Eurovent certified by the manufacturers Friterm or Termokar, who are participating in the Eurovent Certita Certification program “COILS” (www.eurovent-certification.com). The coils are pressure-tested to 20 bar and have undergone tests and certifications for thermal performance, sealing and pressure compliant with PED.
Hydraulic connections are made using block flanges.

Pre-cooling using evaporation

The evaporation surface is used to precool the incoming ambient air.
The cooling/humidifying Media completely covers the surfaces of the air inlet section, on both sides of the unit.

The design and choice of materials have been proven to give excellent performance and a long operating life, both in urban and industrial environments.
For better integration into the building’s architecture, the colour can be adapted upon request, according to need.

The cooling/humidifying Medias are made of special cellulose fibres, chemically treated to prevent mildew and improve their water absorbing qualities. Selected to simplify maintenance, the Medias have symmetrical channels and can be used in either direction (interior/exterior).

Removing the cooling/humidifying Medias is extremely easy, without needing tools or handling equipment.

Optionally, a telescopic pole especially designed for handles of cooling pads covers, is proposed in order to ease the handling from the ground.

POP-SCREEN: To meet the environmental requirements of an installation site, an additional fixing frame is available as an option consisting in a protective net covering the Medias (against insects, near forests, etc.)

Water distribution

The pre-cooling circuit is activated when the need for cooling is greater than the setpoint. This wet / dry set point is generally above 23°C under continental climate. Collected water can be re-circulated without any bacteriological risk (as its temperature is below the level for bacterial growth) and water consumption is divided by a factor of 3 during adiabatic mode operation.
The water distribution channels are made of Z-STEEL stainless-steel, fitted with covers with handles, and do not require any pressure to operate. They are located away from the airflow and distribute water evenly onto the Medias, in complete safety.
They are fully accessible internally for cleaning and require no tools for removal. Lower lateral Z-STEEL stainless-steel channels collect water which has not been evaporated and is then sent to the sump after filtering and sucked into the recirculation pump.

The water is then conducted to a fully covered stainless-steel sump where one or two pumps are installed, depending on ONYX model. The water level is regulated and secured by three level detectors. The water recirculation pump is serviced externally through a dedicated access hatch and thus remains accessible when the cooler is in operation.

The system includes a drain valve that automatically opens daily when the Medias are saturated. This full drainage, combined with forced ventilation, allows all components in contact with water to be cleaned automatically when the cooling section has been used during the previous 24 hours.
Optionally, a backup mode for the pump(s) is also available.
Optionally, a backup mode on the pump (s) is also available, as well as a master-slave regulation common in the case of an installation of several units on the same hydraulic grid.
An outlet water PH analyser to detect NH3 leaks from the sump or the water recirculation pipework must be fitted (customer supplied).

Motor-fan units

The motor-fan units draw the air through the Medias, then through the tube coils. Each EC motor (Electronically Commutated) is directly coupled to a low-speed axial fan. This combination offers both power efficiency and optimized sound level.
The blades made of aluminium are directly fitted to the motor rotor. The motor fan coupling is direct and requires no maintenance. Fast electrical connectors allow easy and safe maintenance.

EC motors (Electronically Commutated)

The ONYX adiabatic condenser is cutting-edge technology and provides exceptional performance (efficiency rating equivalent to IE4). They are IP 55 insulation class, 380/400V, 50/60Hz.

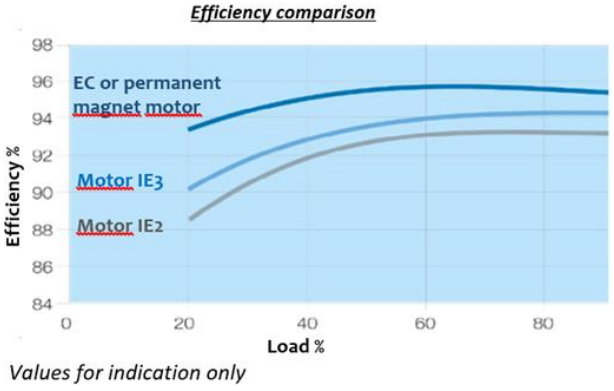
Technology in compliance with Eco conception (UE) 327/2011 concerning Directive 2009/125/CE application (ErP) for minimum efficiency thresholds after 2015.

This exceptional efficiency places the ONYX range at the peak of energy efficiency, especially as the motors operate at a variety of speeds which, in this range, is automatically monitored.

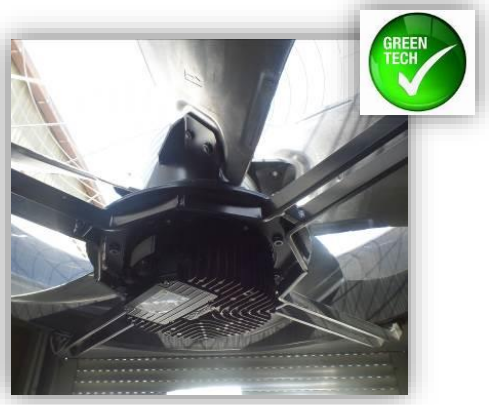
The motor runs cooler, is smaller and lighter compared to an asynchronous motor and has maintenance and handling benefits. Also, a lower temperature means long-lasting bearings (directly greased on the motor), and insulation materials.

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

These motors are environmentally-friendly and have a low carbon footprint = power savings.



Variable speeds



Installed as standard across the whole range, there is one variable speed drive per motor.

The combination of EC motor coupled directly to its axial fan and regulated by the variable drive allows it to offer exceptional efficiency and cos Φ, even at low speed.

PLC

The ONYX range is fully “Plug and Play”: the Schneider PLC is equipped with an HMI (Human Machine Interface) and allows both the motors and pre-cooling function to be monitored in complete safety.

Here are some PLC functions:

∞ Digital monitoring of pumps, drain valve, water sump make-up valve (for humidifying Medias)

∞ Thermal load management

∞ Automatic drain control of the water recirculation system, humidification of the Medias,

∞ Analog output for fan speed control,

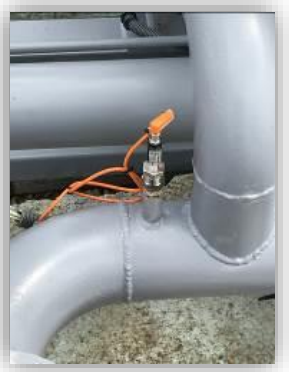
∞ Management of recirculation water levels,

∞ Switching to dry/wet mode of one or two Media sets (depending on model),

∞ Internal clock for optimising management of day and night noise 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,

Ethenet, Modbus and BACnet communications protocols and web gateways or LonWorks are available as options.

Option Maitre-Esclave

Dans le cas d'une installation de plusieurs ONYX sur le même réseau hydraulique il peut être nécessaire d'installer une régulation commune.
Dans ce cas un seul appareil sera en charge de la régulation de la vitesse de ventilation de toute l'installation.
Le seuil de déclenchement du mode humide reste quant à lui, propre à chaque appareil. Il pourra être différent d'une machine à l'autre permettant ainsi de réaliser un démarrage en cascade du mode humide.
En cas de perte de réseau de communication chaque condenseur adiabatique redevient automatiquement autonome avec son propre capteur de pression et PID de régulation.
Le signal du capteur de pression (fourniture client) devra être envoyé à chaque automate des condenseurs adiabatiques du réseau.
Les liaisons filaires entre les appareils sont à la charge du client.

Intelligent safe access

The ONYX adiabatic condenser has been designed with twin goals: thermal performance and ease of maintenance.
As a result, the following technical features were made:

The "H" arrangement of the cooler is the ideal geometry for providing complete access to the mechanical equipment and internal sides surfaces of the coils through the system's entire height.
A hinged access hatch also allows easy and quick maintenance of recirculation pump(s) and directly from the outside even during dry operation of the cooler.

The ONYX range is equipped with an easy-to-use mechanical shutter with safety sensor, giving full step-less access to the inside of the cooler. The motor-fan units can therefore be safely removed from the inside, without incurring extra costs for lifting equipment, walkways, external guard rails or safety ropes for work at height.

As an option, a maintenance table with pulleys (or hydraulic cylinders) specially designed for ONYX range can be used to disassemble the motor-fan units from the inside of the device in complete safety.

Requiring no effort or additional lifting equipment, this device on wheels makes it easy to remove the motor-fan unit(s) from the roof of the cooler, bring it to the floor and then removed.

An optional insulation plate can then be installed in place of the motor-fan unit during maintenance to avoid air recirculating during operation.

The humidifying Medias can also be serviced without lifting or handling equipment or tools.

Structure and casing

With their strong structure, the frame and roof of the ONYX range are made of SILVER STEEL, except for the parts in contact with water and both end-points of the cooler which are made of Z-STEEL stainless-steel for its perfect resistance to corrosion.

As standard, the internal floor is made of aluminium check plate.

ONYX-SAFE®:

Containment and refrigerant fluid recovery device in case of potential leaks (3 JACIR patent)

SafetyFrame

In order to facilitate containment in the building for the management of condenser fluid, Jacir can supply a containment sleeve directly pre-installed in the factory on the control cabinet side.

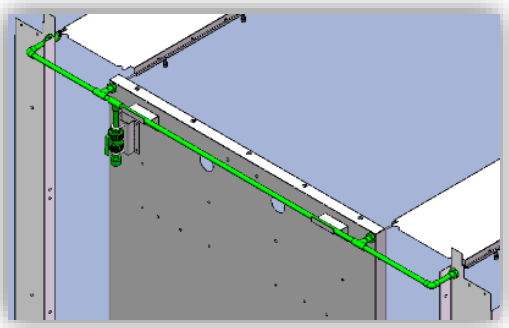
SafetySide

This option offers to regroup on a single side of the unit the complete equipment dedicated to the maintenance: the ONYX is then totally contained on the refrigerant's connection and regulation interface side. An additional access door also placed on this side allows an easy maintenance carrying out on the motor fan groups (only available on double row motor-fan unit).

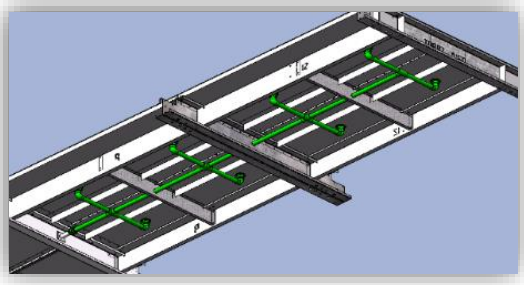
Consequently, with a complete access to both device sides, additional extra costs for lifting equipment, walkways, external guard rails or safety ropes for work at height are avoided for user's safety.

SafetyPulse & SafetyDrain

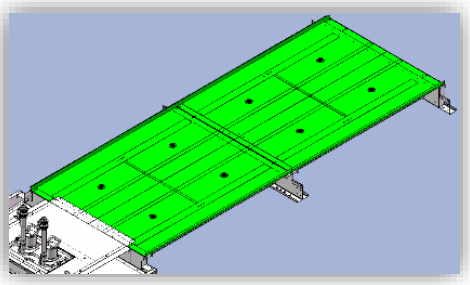
In case of refrigerant leak detection (sensor out of Jacir scope), the protection system can be activated. Two PVC water distribution pipes equipped with irrigation nozzles frame the coils over its whole length. The fluid is safely driven towards the bottom of the equipment.



In addition to the SafetyPulse option, the ONYX condenser offers a watertight bottom made of stainless-steel allowing to collect possible refrigerant leaks. This bottom is equipped with bungs connected by PVC piping, directly integrated into the equipment frame.
This piping is also connected to the basin in order to facilitate the safe evacuation of the alkali.



Bottom view



Top view

- POP-SCREEN: Additional fixing frame to attach a protective net over the Medias (against insects, near forests, etc.)
- Choice of colours for the Medias,
- Backup mode on the pump(s)
- Backup mode on the motor-fan unit
- PLC web gateways or LonWorks,
- Maintenance table with pulleys (or hydraulic cylinders) for simple and safe maintenance of motor-fan unit inside of the device.
- Insulation plate replacing the motor fan unit during maintenance.
- Containment sleeve in the building SafetyFrame (on double row motor-fan unit),
- Additional access door on containment sleeve side SafetyFrame,
- Refrigerant abatement system in case of leak detection SafetyPulse,
- Safe recovery and evacuation network of the alkalis thanks to watertight bottom of the equipment SafetyDrain.
- Removable floor made of non-slip aluminium tread plate for safe maintenance for waterproof check.
- Master-slave regulation in case of an installation of several units on the same hydraulic grid.

Technical characteristics ONYX M E09 S

ONYX S

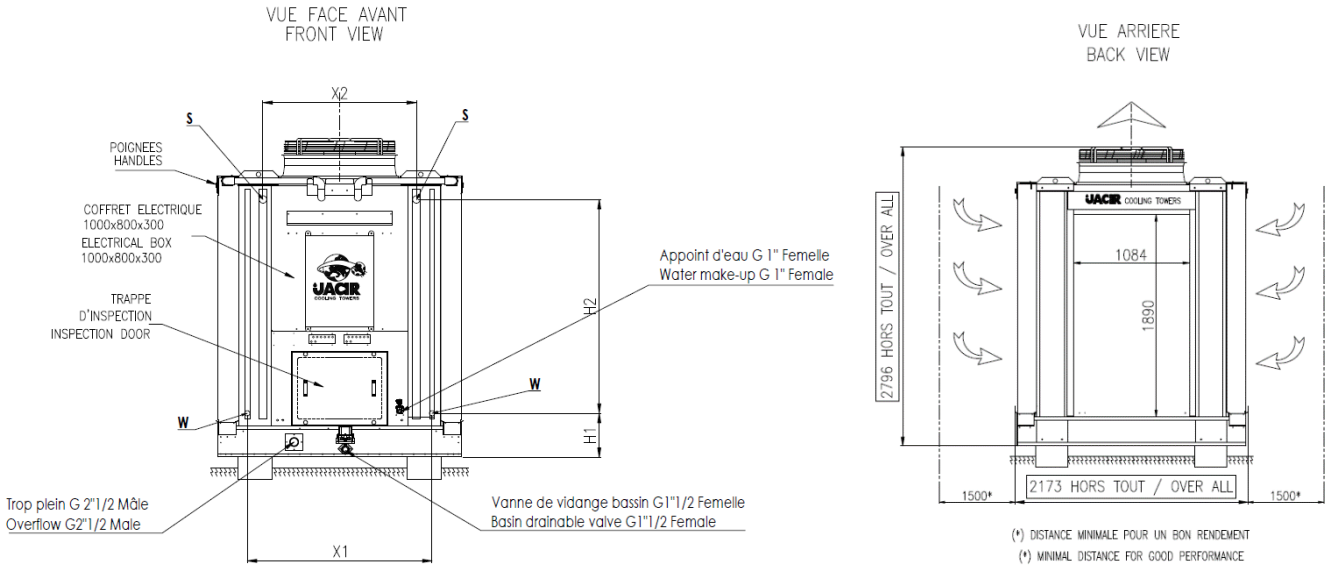
		ONYX M2 E09 S3 2822 A	ONYX M3 E09 S3 3922 A	ONYX M3 E09 S3 3922 B	ONYX M4 E09 S3 5022 A	ONYX M4 E09 S3 5022 B	ONYX M5 E09 S3 6122 A	ONYX M5 E09 S3 6122 B	ONYX M6 E09 S3 7322 A	ONYX M6 E09 S3 7322 B
L1	mm	2 815	3 925	3 925	5 035	5 035	6 145	6 145	7 255	7 255
Nominal capacity max [1]	kW	192	283	329	376	438	471	541	560	640
Evaporated water flow	m3/h	0.3	0.5	0.5	0.6	0.6	0.8	0.8	1	0.9
Motor-fan	Qty / kW	2 x 3.2	3 x 3.2	3 x 3.2	4 x 3.2	4 x 3.2	5 x 3.2	5 x 3.2	6 x 3.2	6 x 3.2
Fan diameter	mm					910				
Motor absorbed power per unit	kW	6.6	8.8	9.0	11.0	11.3	13.2	13.6	16.6	17.1
Installed power per unit	kW	8.7	11.95	11.95	15.2	15.2	18.45	18.45	22.9	22.9
Inlet fluid connection	DN	32	32	40	40	65	65	65	65	65
Outlet fluid connection	DN	20	25	25	32	32	32	32	32	40
Weight empty	kg	1 100	1 600	1 900	2 100	2 500	2 550	3 050	3 050	3 650
Weight in operation	kg	1 600	2 150	2 500	2 700	3 150	3 250	3 800	3 800	4 500
Sound level Lp in 5 directions at 15m -[2]	dB(A)	58	60	60	61	61	62	62	62	62

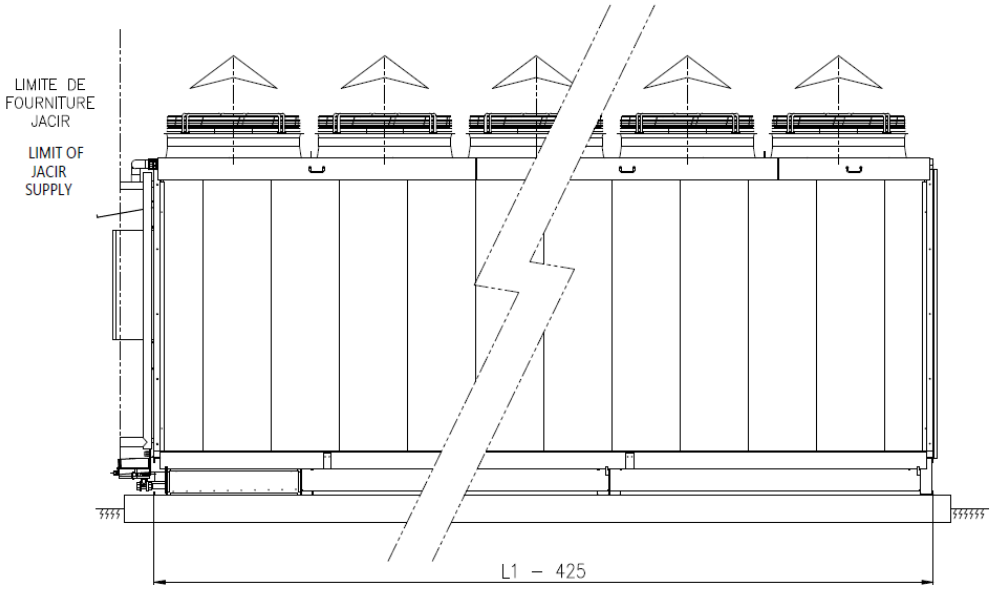
ONYX S

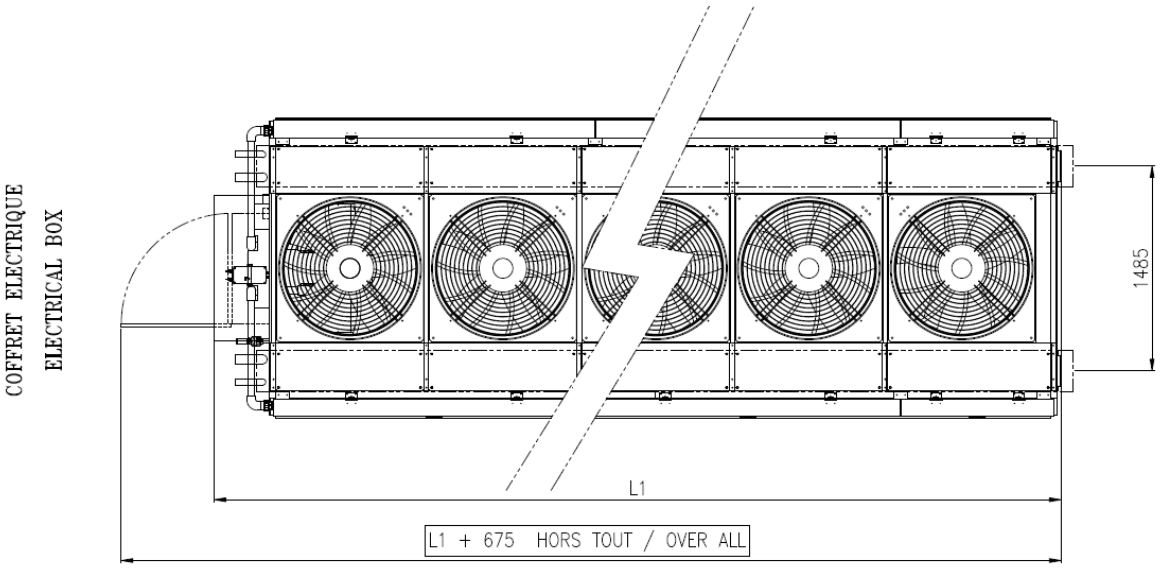
		ONYX M7 E09 S3 8422 A	ONYX M7 E09 S3 8422 B	ONYX M8 E09 S3 9522 A	ONYX M8 E09 S3 9522 B	ONYX M9 E09 S3 10622 A	ONYX M9 E09 S3 10622 B	ONYX M10 E09 S3 11722 A	ONYX M10 E09 S3 11722 B	ONYX M11 E09 S3 12822 A	ONYX M11 E09 S3 12822 B
L1	mm	8 365	8 365	9 475	9 475	10 585	10 585	11 695	11 695	12 805	12 805
Nominal capacity max 1	kW	654	762	742	868	840	972	934	1 075	1 027	1 176
Evaporated water flow	m3/h	1.1	1.1	1.3	1.3	1.5	1.4	1.6	1.6	1.8	1.7
Motor-fan	Qty / kW	7 x 3.2	7 x 3.2	8 x 3.2	8 x 3.2	9 x 3.2	9 x 3.2	10 x 3.2	10 x 3.2	11 x 3.2	11 x 3.2
Fan diameter	mm					910					
Motor absorbed power per unit	kW	18.8	19.3	21.0	21.6	23.2	23.9	25.5	26.2	27.7	28.5
Installed power per unit	kW	26.15	26.15	29.4	29.4	32.65	32.65	35.9	35.9	39.15	39.15
Inlet fluid connection	DN	65	65	65	65	65	65	65	65	65	80
Outlet fluid connection	DN	40	40	40	50	50	50	50	50	50	50
Weight empty	kg	3 500	4 200	4 000	4 800	4 500	5 400	4 950	5 950	5 450	6 550
Weight in operation	kg	4 350	5 150	4 850	5 800	5 400	6 500	5 950	7 150	6 500	78560
Sound level Lp in 5 directions at 15m -2	dB(A)	63	63	63	63	64	64	64	64	64	64

1. Based on NH3 – Inlet temp 80°C / cond temp 35°C – wet bulb temp 22°C / dry temp 35°C
2. Sound level Lp at 15 metres in free field, in 5 directions at 100% of ventilation fan operation (+/- 2 dBA).

Drawings and dimensions ONYX TM E09 S







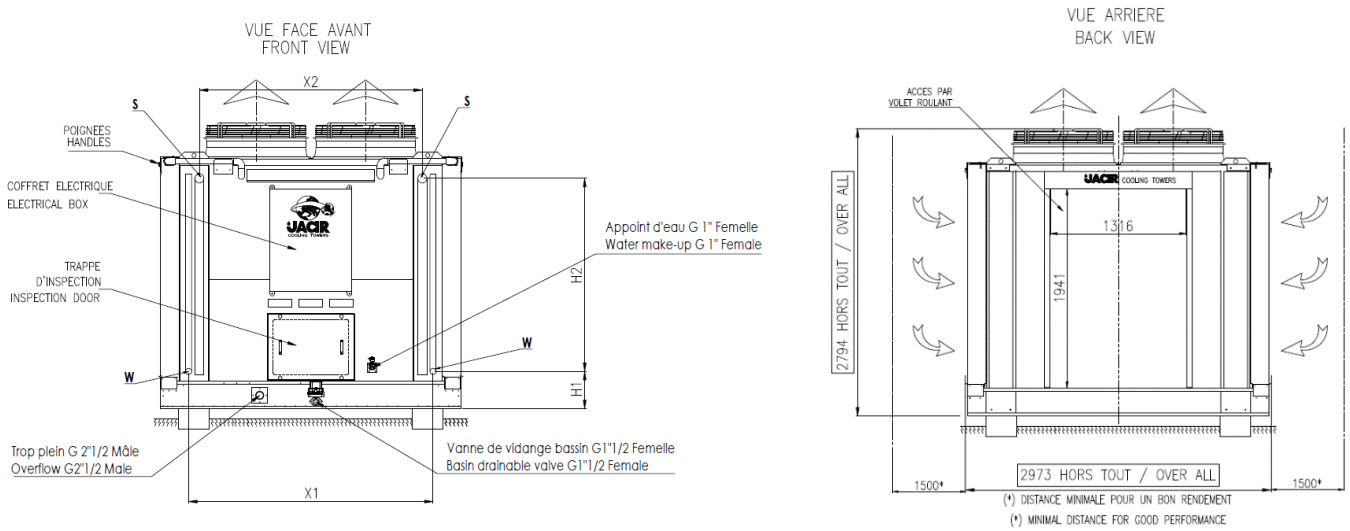
Technical characteristics ONYX TM E09 D

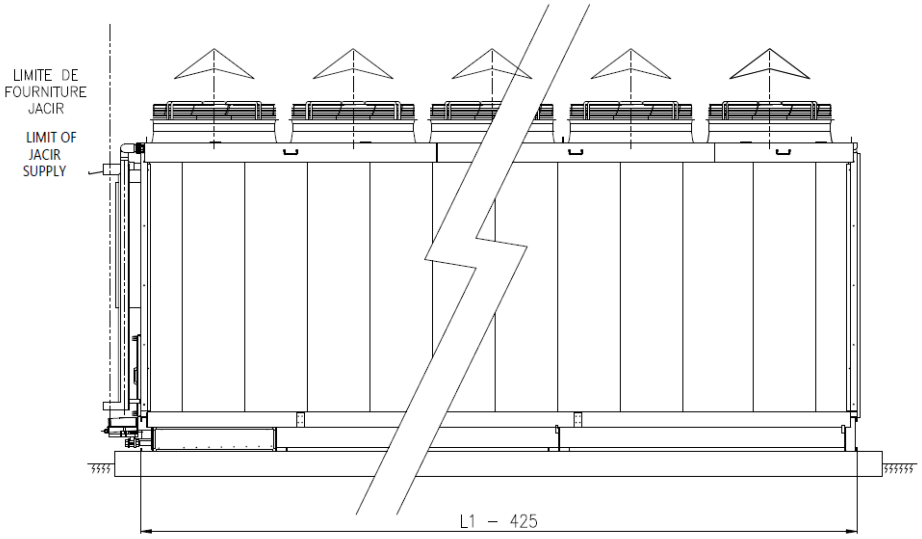
ONYX D		ONYX M2 E09 D3 2830 A	ONYX M3 E09 D3 3930 A	ONYX M3 E09 D3 3930 B	ONYX M4 E09 D3 5030 A	ONYX M4 E09 D3 5030 B	ONYX M5 E09 D3 6130 A	ONYX M5 E09 D3 6130 B	ONYX M6 E09 D3 7330 A	ONYX M6 E09 D3 7330 B
L1	mm	2 815	3 925	3 925	5 035	5 035	6 145	6 145	7 255	7 255
Nominal capacity max 1	kW	260	383	461	508	604	627	737	752	906
Evaporated water flow	m3/h	0.5	0.8	0.7	1	1	1.3	1.2	1.5	1.5
Motor-fan	Qty / kW	4 x 3.2	6 x 3.2	6 x 3.2	8 x 3.2	8 x 3.2	10 x 3.2	10 x 3.2	12 x 3.2	12 x 3.2
Fan diameter	mm					910				
Motor absorbed power per unit	kW	12.7	18.0	18.2	23.2	23.6	28.5	28.9	35.0	35.5
Installed power per unit	kW	15.2	21.7	21.7	28.2	28.2	34.7	34.7	42.4	42.4
Inlet fluid connection	DN	32	65	65	65	65	65	65	65	65
Outlet fluid connection	DN	25	32	32	32	40	40	40	40	50
Weight empty	kg	1 300	1 850	2 150	2 450	2 800	3 000	3 500	3 550	4 150
Weight in operation	kg	1 950	2 550	2 950	3 200	3 700	3 850	4 450	4 500	5 200
Sound level Lp in 5 directions at 15m -2	dB(A)	61	63	63	64	64	65	65	65	65

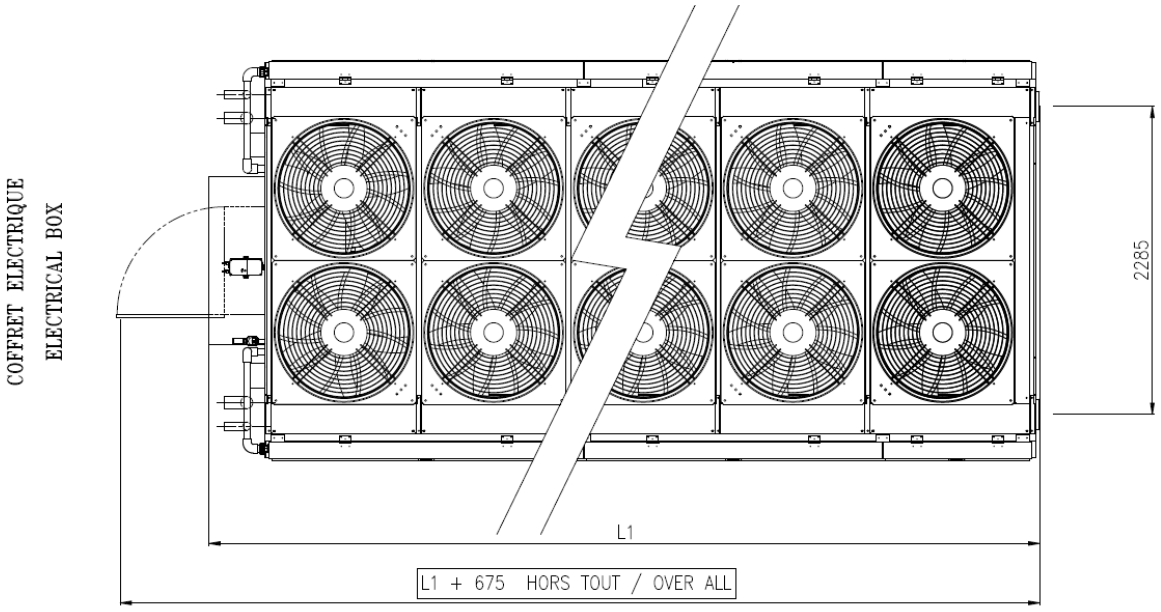
ONYX D		ONYX M7 E09 D3 8430 A	ONYX M7 E09 D3 8430 B	ONYX M8 E09 D3 9530 A	ONYX M8 E09 D3 9530 B	ONYX M9 E09 D3 10630 A	ONYX M9 E09 D3 10630 B	ONYX M10 E09 D3 11730 A	ONYX M10 E09 D3 11730 B	ONYX M11 E09 D3 12830 A
L1	mm	8 365	8 365	9 475	9 475	10 585	10 585	11 695	11 695	12 805
Nominal capacity max 1	kW	867	1 051	998	1 191	1 123	1 328	1 246	1 462	1 365
Evaporated water flow	m3/h	1.8	1.7	2.1	2	2.3	2.2	2.6	2.5	2.8
Motor-fan	Qty / kW	14 x 3.2	14 x 3.2	16 x 3.2	16 x 3.2	18 x 3.2	18 x 3.2	20 x 3.2	20 x 3.2	22 x 3.2
Fan diameter	mm					910				
Motor absorbed power per unit	kW	40.2	40.8	45.5	46.2	50.8	51.5	56.1	56.9	61.3
Installed power per unit	kW	48.9	48.9	55.4	55.4	61.9	61.9	68.4	68.4	74.9
Inlet fluid connection	DN	65	65	65	80	65	80	80	80	80
Outlet fluid connection	DN	50	50	50	50	50	50	50	65	65
Weight empty	kg	4 100	4 800	4 650	5 450	5 200	6 100	5 750	6 750	6 300
Weight in operation	kg	5 100	5 950	5 750	6 700	6 400	7 450	7 000	8 200	7 650
Sound level Lp in 5 directions at 15m -2	dB(A)	66	66	66	66	67	67	67	67	67

1. Based on NH3 – Inlet temp 80°C / cond temp 35°C – wet bulb temp 22°C / dry temp 35°C
2. Sound level Lp at 15 metres in free field, in 5 directions at 100% of ventilation fan operation (+/- 2 dBA).

Drawings and dimensions ONYX TM E09 D







Technical specifications: ONYX HYBRID HYM E09 D

ONYX HY D		ONYX HY M3.1 E09 D3 3930 AA	ONYX HY M4.1 E09 D3 5030 AA	ONYX HY M4.1 E09 D3 5030 BB	ONYX HY M5.1 E09 D3 6130 AA	ONYX HY M5.1 E09 D3 6130 BB	ONYX HY M6.1 E09 D3 7330 AA	ONYX HY M6.1 E09 D3 7330 BB	ONYX HY M7.1 E09 D3 8430 AA	ONYX HY M7.2 E09 D3 8430 AA
L1	mm	3 925	5 035	5 035	6 145	6 145	7 255	7 255	8 365	8 365
Nominal capacity max 1	kW	260	383	461	508	604	627	737	752	627
Nominal capacity max glycoled water Ref. 2	kW	195	195	225	195	225	195	225	195	431
Evaporated water flow	m3/h	0.8	1	1	1.3	1.2	1.5	1.5	1.8	1.8
Motor-fans	Qty / kW	6 x 3.2	8 x 3.2	8 x 3.2	10 x 3.2	10 x 3.2	12 x 3.2	12 x 3.2	14 x 3.2	14 x 3.2
Fan diameter	mm					910				
Power consumption per unit	kW	18.0	23.2	23.6	28.5	28.9	35.0	35.5	40.2	40.2
Installed power per unit	kW	21.7	28.2	28.2	34.7	34.7	42.4	42.4	48.9	48.9
NH3 inlet connection	DN	32	65	65	65	65	65	65	65	65
NH3 outlet connection	DN	25	32	32	32	40	40	40	40	40
Glycol water inlet connection	DN	80	80	80	80	80	80	80	80	100
Glycol water outlet connection	DN	80	80	80	80	80	80	80	80	100
Weight empty	kg	1 850	2 450	2 800	3 000	3 500	3 550	4 150	4 100	4 100
Weight in operation	kg	2 550	3 200	3 700	3 850	4 450	4 500	5 200	5 100	5 100
Sound level Lp 5D at 15m - 3	dB(A)	63	64	64	65	65	65	65	66	66

1. Based on NH3 – Inlet temp 80°C / cond temp 35°C – wet temp 22°C / dry temp 35°C
2. Based on 30% glycoled water inlet temp 45°C / cond temp 40°C – wet bulb 22°C / dry temp 35°C in humidification mode.
3. Sound level Lp at 15 m in free field, in 5 directions à 100% fan operation (+/- 2 dBA).

Technical specifications: ONYX HYBRID HYM E09 D

ONYX HYM D

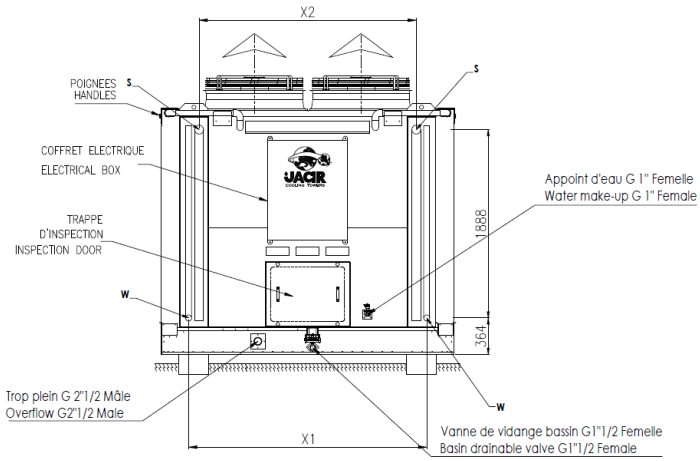
		ONYX HY M7.1 E09 D3 8422 BB	ONYX HY M7.2 E09 D3 8422 BB	ONYX HY M8.1 E09 D3 9522 AA	ONYX HY M8.2 E09 D3 9522 AA	ONYX HY M8.1 E09 D3 9522 BB	ONYX HY M8.2 E09 D3 9522 BB	ONYX HY M9.1 E09 D3 10622 AA	ONYX HY M9.2 E09 D3 10622 AA
L1	mm	8 365	8 365	9 475	9 475	9 475	9 475	10 585	10 585
Nominal capacity max 1	kW	906	737	867	752	1051	906	998	867
Nominal capacity max glycoled water Ref. 2	kW	225	506	195	431	225	506	195	431
Evaporated water flow	m3/h	1.7	1.7	2.1	2.1	2	2	2.3	2.3
Motor-fans	Qty / kW	14 x 3.2	14 x 3.2	16 x 3.2	16 x 3.2	16 x 3.2	16 x 3.2	18 x 3.2	18 x 3.2
Fan diameter	mm	910							
Power consumption per unit	kW	40.8	40.8	45.5	45.5	46.2	46.2	50.8	50.8
Installed power per unit	kW	48.9	48.9	55.4	55.4	55.4	55.4	61.9	61.9
NH3 inlet connection	DN	65	65	65	65	65	65	65	65
NH3 outlet connection	DN	50	40	50	40	50	50	50	50
Glycol water inlet connection	DN	80	100	80	100	80	100	80	100
Glycol water outlet connection	DN	80	100	80	100	80	100	80	100
Weight empty	kg	4 800	4 800	4 650	4 650	5 450	5 450	5 200	5 200
Weight in operation	kg	5 950	5 950	5 750	5 750	6 700	6 700	6 400	6 400
Sound level Lp 5D at 15m - 3	dB(A)	66	66	66	66	66	66	67	67

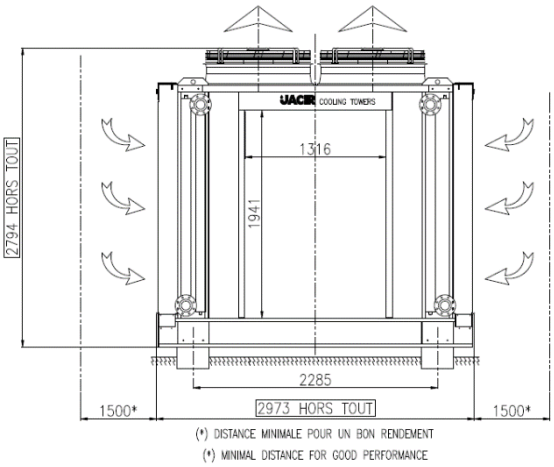
ONYX HY D

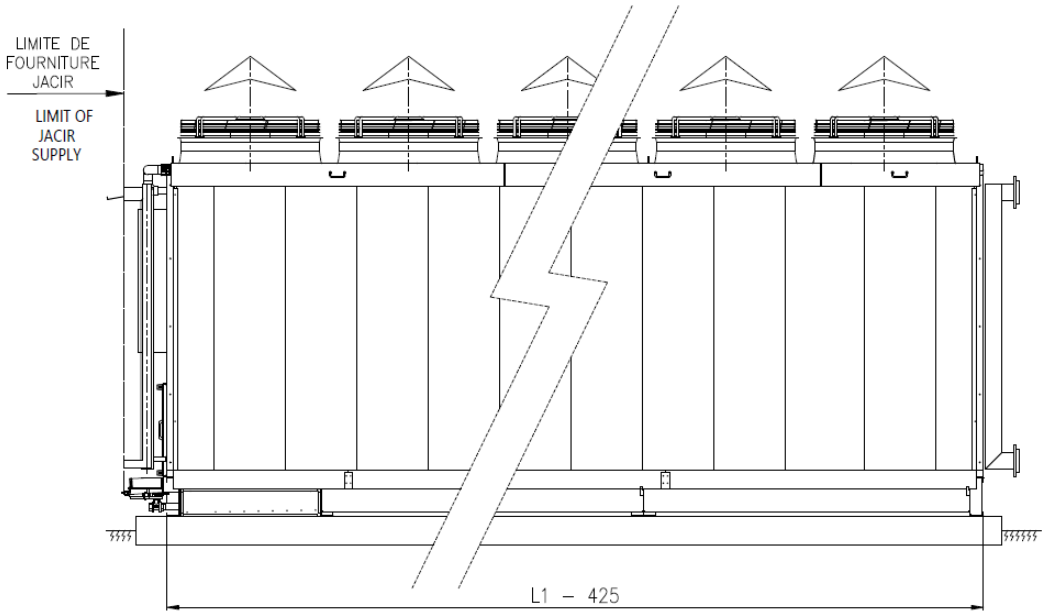
		ONYX HY M9.1 E09 D3 10622 BB	ONYX HY M9.2 E09 D3 10622 BB	ONYX HY M10.1 E09 D3 11722 AA	ONYX HY M10.2 E09 D3 11722 AA	ONYX HY M10.1 E09 D3 11722 BB	ONYX HY M10.2 E09 D3 11722 BB	ONYX HY M11.1 E09 D3 12822 AA	ONYX HY M11.2 E09 D3 12822 AA	ONYX HY M11.1 E09 D3 12822 BB	ONYX HY M11.2 E09 D3 12822 BB
L1	mm	10 585	10 585	11 695	11 695	11 695	11 695	12 805	12 805	12 805	12 805
Nominal capacity max 1	kW	1 191	1 051	1 123	998	1 328	1 191	1 246	1 123	1 462	1 328
Nominal capacity max glycoled water Ref. 2	kW	225	506	195	431	225	506	195	431	225	506
Evaporated water flow	m3/h	2.2	2.2	2.6	2.6	2.5	2.5	2.8	2.8	2.7	2.7
Motor-fans	Qty / kW	18 x 3.2	18 x 3.2	20 x 3.2	20 x 3.2	20 x 3.2	20 x 3.2	22 x 3.2	22 x 3.2	22 x 3.2	22 x 3.2
Fan diameter	mm	910									
Power consumption per unit	kW	51.5	51.5	56.1	56.1	56.9	56.9	61.3	61.3	62.2	62.2
Installed power per unit	kW	61.9	61.9	68.4	68.4	68.4	68.4	74.9	74.9	74.9	74.9
NH3 inlet connection	DN	80	65	65	65	80	80	80	65	80	80
NH3 outlet connection	DN	50	50	50	50	50	50	50	50	65	50
Glycol water inlet connection	DN	80	100	80	100	80	100	80	100	80	100
Glycol water outlet connection	DN	80	100	80	100	80	100	80	100	80	100
Weight empty	kg	6 100	6 100	5 750	5 750	6 750	6 750	6 300	6 300	7 400	7 400
Weight in operation	kg	7 450	7 450	7 000	7 000	8 200	8 200	7 650	7 650	8 950	8 950
Sound level Lp 5D at 15m - 3	dB(A)	67	67	67	67	67	67	67	67	67	67

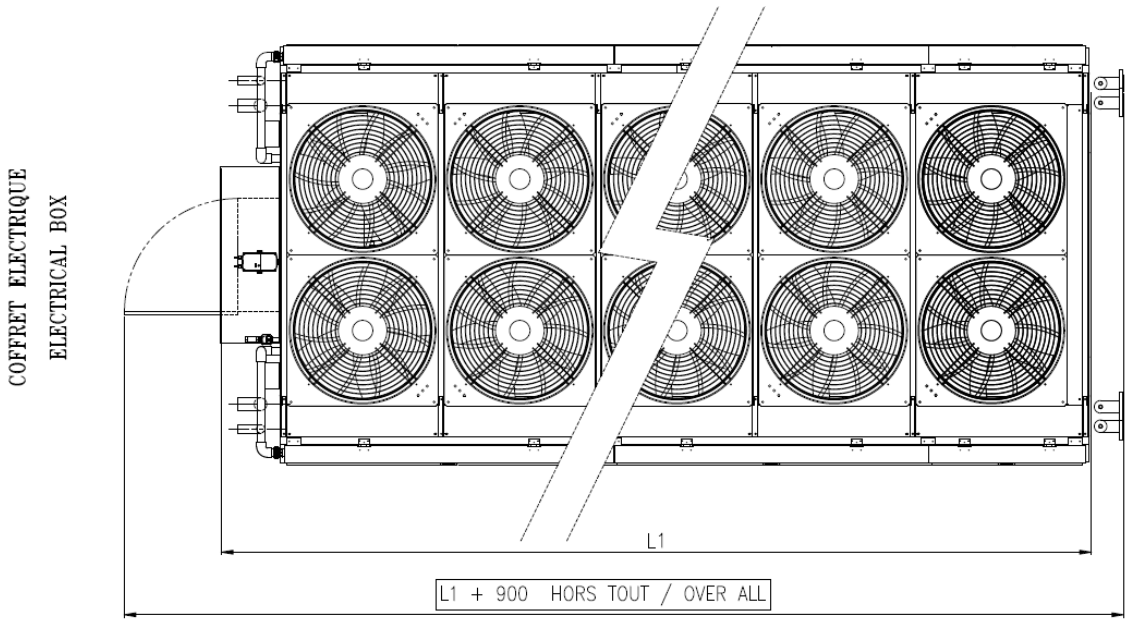
1. Based on NH3 – Inlet temp 80°C / cond temp 35°C – wet temp 22°C / dry temp 35°C
2. Based on 30% glycoled water inlet temp 45°C / cond temp 40°C – wet bulb 22°C / dry temp 35°C in humidification mode.
3. Sound level Lp at 15 m in free field, in 5 directions à 100% fan operation (+/- 2 dBA).

Drawings and dimensions ONYX HYBRID HYM E09 D









On site layout ONYX

In order to achieve optimum thermal performance, the ONYX adiabatic condenser must be installed according to the following criteria: the equipment location regarding to obstacles in the vicinity must be determined on the basis of the following instructions (for any special set-up, please contact JACIR):

∞ There must be sufficient open space along the two sides of the unit where air intakes are located (see below).

∞ The prevailing winds direction and obstacles in the vicinity must be taken into account to limit risks of cooling air being re-injected (this is particularly important if there are several Topaz on the same site).

∞ Air outputs must be cleared of any obstructions.

<u>Minimum distances required</u>

∞ 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 T(X)4

∞ A= minimum 1.2 from T(X)4 to T(X)7

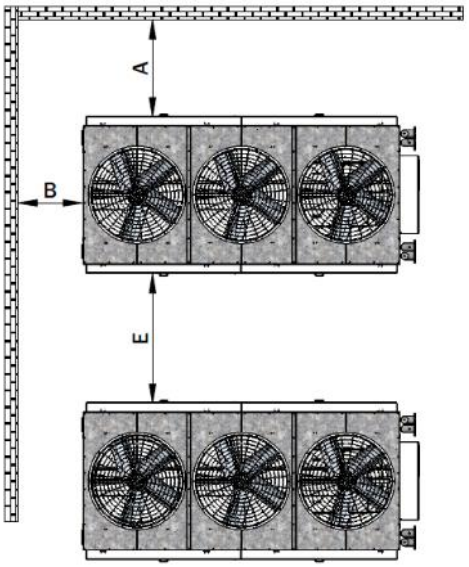
∞ A= minimum 1.3 from T(X)8 to T(X)11

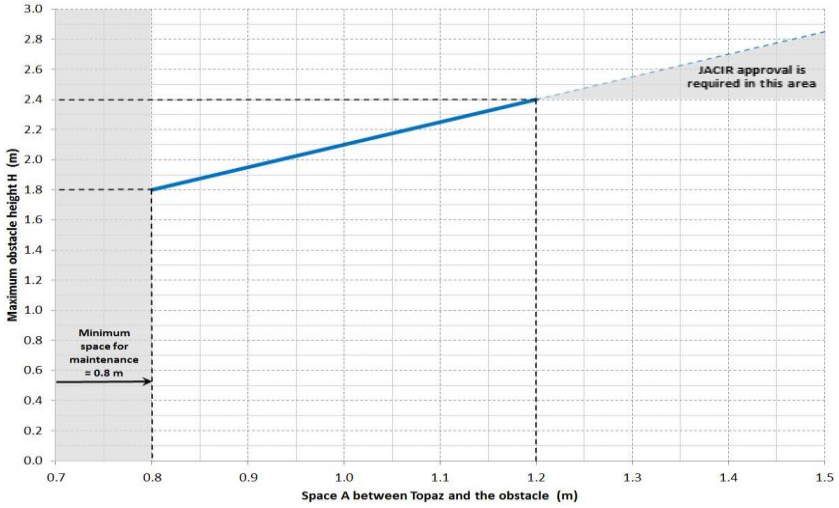
∞ B = minimum 1 m

∞ E = minimum 1,8 m (from (T(X)4 Fans)

∞ E = minimum 2.3 m (from T(X)4 to T(X)7 fans)

∞ E = minimum 2.6 m (from T(X)8 to T(X)11 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.

Prescription ONYX

The ONYX adiabatic condenser best suited to your need should be selected according to the following criteria:

- Fluid type to be cooled: .....
- Power to be dissipated through the cooler circuit: .....
- Condensation temperature: .....
- Gas inlet temperature: .....
- Ambient air conditions: dry mode: ..... °C – wet mode: .....°C
- Sound pressure level not be greater than .....dB(A) at 10 m average in all 5 directions.

Specifications per **JACIR** ONYX adiabatic condenser unit.....

Tube coils

- The coils will be installed vertically in an "H" configuration in order to allow full access to the internal surfaces of the coils and mechanical parts, through a service entrance stretching the entire width and height of the equipment: full step-less opening with mechanical shutter and safety switch
- The coils will be designed for condensing NH3 refrigerant fluid,
- Tube coils will be made of stainless-steel with aluminium epoxy coated fins,
- The coils will be pressure-tested to 34 bar as standard and will be tested for sealing and pressure in compliance with PED.
- The no-weld tubes will be expanded through the use of fins to ensure physical strength and optimised thermal conductivity,
- The header tanks will be installed on one side of the unit only,
- Hydraulic connections will be made using smooth stainless-steel tube which must be welded.

Pre-cooling Medias

- The Medias will be made of cellulose fibres, chemically treated to prevent mildew and improve their absorbent qualities,
- The Media channels will be symmetrical so they can be installed in either direction,
- Water distribution will be gravity-fed through non-pressurised water distribution channels
- Media removal is simple, requiring no tools or lifting equipments

Water distribution:

- The water distribution channels will be made of Z-STEEL stainless-steel, open at the top and fed without external pressure regulator,
- The water distribution channels will be placed away from the air flow and accessible by opening the cover (without tools needed),
- In order to further reduce water consumption in adiabatic mode, the Media water recirculation system will be made of Z-STEEL stainless-steel and will collect the non-evaporated water. This water will then be redirected to a stainless-steel Z-STEEL sump. Water level regulation will be ensured by three level sensors and one or two self-priming pumps,
- The system will include a drain valve, which will be automatically activated on a daily cycle,
- A full drain cycle, combined with full speed fan operation, will automatically dry the parts in contact with the water.

Motor-fan units

- The motor-fan units will be aligned in a single or double row at the top of the unit. They will draw the air through the Medias and then through the tube coils. They will be composed of one motor per fan,
- EC (electronically commutated) motors will be IP 55 insulation class, 380/400V, 50/60Hz
- Each motor will include its own variable speed drive controlled by PLC,
- The motor-fan units will be fully removable and left inside the cooler unit avoiding the need for high-level walkways or lifting equipment to ensure operator safety.

PLC Control

- The Schneider PLC will control the speed of the EC motors and manage the pre-cooling function,
- The ONYX adiabatic condenser will therefore be totally “plug and play”, with different communications protocols as options, and will be equipped with an HMI (Human Machine Interface),
- As standard, the following data will be available: general fault alarm, switch to wet mode, drain valve state, water make-up valve state for Media saturation, % load on variable speed drives, switch between wet/dry modes on one or both Media sets (depending on model) and thermal load control according to condenser type,
- An interface method will be offered as an option for remote control/monitoring.

Structure and casing

- The unit’s structure and roof will be constructed from SILVER-STEEL,
- The internal floor of the unit will be made of aluminium check plate for maximum safety,
- All metallic parts in contact with water (adiabatic pre-cooling section) will be in Z-STEEL stainless-steel,
- Internal access for unit maintenance and motor-fan unit removal for workshop maintenance will be via a step-less opening with mechanical shutter door equipped with a safety switch, stretching across the full height and width of the equipment,
- Access will also be provided for maintenance of the recirculation pump(s) and cleaning of the filters without having to stop the condenser.

Options

- POP-SCREEN: Additional fixing frame to attach a protective net over the Medias (against insects, near forests, etc.)
- Choice of colours for the Medias
- Backup mode on the pump(s)
- Backup mode on the motor-fan units
- PLC web gateways or LonWorks
- Maintenance table with pulleys (or hydraulic cylinders) for simple and safe maintenance of the motor-fan units
- Insulation plate to replace a motor-fan unit during maintenance
- Telescopic pole especially designed for handles of cooling pads covers, is proposed in order to ease the handling from the ground
- Master-slave regulation in case of an installation of several units on the same hydraulic grid

ONYX SAFE®:

- SafetyFrame, containment sleeve pre-installed on the control cabinet side
- SafetySide, additional access door on containment sleeve side SafetyFrame (on double row motor-fan unit)
- SafetyPulse, refrigerant abatement system in case of leak detection
- SafetyDrain, in addition to SafetyPulse option, watertight stainless-steel bottom, allowing a safe collection and evacuation of the alkalis.

The Hybrid adiabatic condenser best suited to your need should be selected according to the following conditions:

- Fluid type to be cooled: .....
- Power to be dissipated through cooler circuit: .....
- Cooling capacity of the chiller: .....
- Condensation temperature: .....
- Gas inlet temperature: .....
- Ambient air conditions: dry mode: ..... °C – wet mode: .....°C
- Sound pressure level not be greater than .....dB(A) at 10 m average in all 5 directions.

Specifications per **JACIR ONYX HYM adiabatic condenser model.....**

NH3 refrigerant tube coil

- The coils will be installed vertically in an "H" configuration in order to allow full access to the internal surfaces of the coils and mechanical parts, through a service entrance stretching the entire width and height of the equipment: full step-less opening with shutter and safety switch,
- The coils will be designed for condensing NH3 refrigerant fluid,
- Tube coils will be made of X-STEEL stainless-steel with aluminium epoxy coated fins,
- The coils will be pressure-tested to 34 bar as standard and will be tested for sealing and pressure in compliance with PED,
- The surface area of the no-weld tubes will be expanded through the use of fins to ensure both physical strength and optimised thermal conductivity,
- The header tanks will be installed on one side of the unit only.
- Hydraulic connections will be made using smooth stainless-steel tube which must be welded.

Glycol water thermal exchanger tube coils

- The coils will be Eurovent certified in advance and will be tested for sealing and pressure in compliance with PED.
- Two glycol water thermal exchanger tube coils will be added vertically in an "H" configuration in order to allow full access to the internal surfaces of the coils and mechanical parts, through a service entrance stretching the entire width and height of the equipment: full step-less opening with mechanical shutter and safety switch.
- The tube coils will be made of copper tubes with aluminium epoxy coated fins
- Coils will be pressure-tested to 20 bar
- The surface area of the no-weld tubes will be expanded through the use of fins to ensure both physical strength and optimised thermal conductivity,
- The header tanks will be installed on one side of the unit only on the opposite side to the NH3 coils (door side),
- Hydraulic connections will be made using block flanges.

Pre-cooling Medias

- The Medias will be made of cellulose fibres, chemically treated to prevent mildew and improve their absorbent qualities,
- The Media channels will be symmetrical, so they can be installed in either direction,
- Water distribution will be gravity-fed through non-pressurised water distribution channels
- Removal of the Medias will be extremely simple, without requiring any tools or lifting equipment.

Water distribution

- The water distribution channels will be made of Z-STEEL stainless-steel, open at the top and fed without external pressure regulator,
- The water distribution channels will be placed away from the air flow and accessible by opening the cover (without the need for tools),
- In order to further reduce water consumption in adiabatic mode, the Media water recirculation system will be made of Z-STEEL stainless-steel and will collect the non-evaporated water. This water will then be redirected to a stainless-steel Z-STEEL sump. Water level regulation will be ensured by three level sensors and one or two self-priming pumps,
- The system will include a drain valve which will open automatically on a daily cycle,
- A full drainage cycle, combined with forced ventilation, will automatically dry the components usually in contact with water.

Motor-fan units

- The motor-fan units will be aligned in a single or double row at the top of the unit. They will draw the air through the Medias and then through the tube coils. They will be composed of one motor per fan,
- EC (electronically commutated) motors will be IP 55 insulation class, 380/400 V, 50/60Hz
- Each motor will include its own variable speed drive controlled by PLC,
- The motor-fan units will be fully removable from inside the cooler unit avoiding the need for high-level walkways or lifting equipment to ensure operator safety.

PLC Control

- The Schneider PLC will control the speed of the EC motors and manage the pre-cooling function,
- The ONYX adiabatic condenser will therefore be totally “plug and play”, with different communications protocols as options, and will be equipped with an HMI (Human Machine Interface),
- As standard, the following data will be available: general fault alarm, switch to wet mode, drain valve state, water make-up valve state for Media saturation, % load on variable speed drivers, switch between wet/dry modes on one or both Media sets (depending on model) and thermal load control according to condenser type,
- An interface method will be offered as an option for remote control/monitoring.

Structure and casing

- The unit's structure and roof will be constructed from SILVER-STEEL,
- The internal floor of the unit will be made of aluminium check plate for maximum safety,
- All metallic parts in contact with water (adiabatic pre-cooling section) will be in Z-STEEL stainless-steel,
- Internal access for unit maintenance and motor-fan unit removal for workshop maintenance will be via a step-less opening with mechanical shutter door equipped with a safety switch, stretching the full height and width of the equipment,
- Access will also be provided for maintenance of the pump(s) and cleaning of the filters without having to stop the condenser.

Options

- POP-SCREEN: Additional fixing frame for attaching a protective net over the Medias (against insects, near forests, etc.)
- Choice of colours for the Medias
- Backup mode on the pump(s)
- Backup mode on the motor-fan units
- PLC web gateways or LonWorks
- Maintenance table with pulleys (or hydraulic cylinders) for simple and safe maintenance of the motor-fan units
- Insulation plate to replace a motor-fan unit during maintenance
- Telescopic pole especially designed for handles of cooling pads covers, is proposed in order to ease the handling from the ground
- Master-slave regulation in case of an installation of several units on the same hydraulic grid

ONYX SAFE®:

- SafetyFrame, containment sleeve pre-installed on the control cabinet side
- SafetySide, additional access door on containment sleeve side SafetyFrame (on double row motor-fan unit)
- SafetyPulse, refrigerant abatement system in case of leak detection
- SafetyDrain, in addition to SafetyPulse option, watertight stainless-steel bottom, allowing a safe collection and evacuation of the alkalis.

JACIR
Cooling for life

ONYX SAFE®

Refrigerant protection for ONYX Adiabatic Condenser

PRODUCT SUPPORT

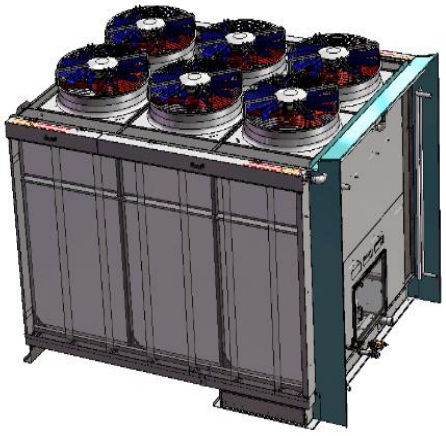
Containment and refrigerant fluid recovery device in case of potential leaks

Fully involved in the customer's needs, Jacir innovates to secure industrial refrigeration equipment and proposes 3 patented options for its ONYX adiabatic range.

Containment and refrigerant fluid recovery device in case of potential leaks

SafetyFrame

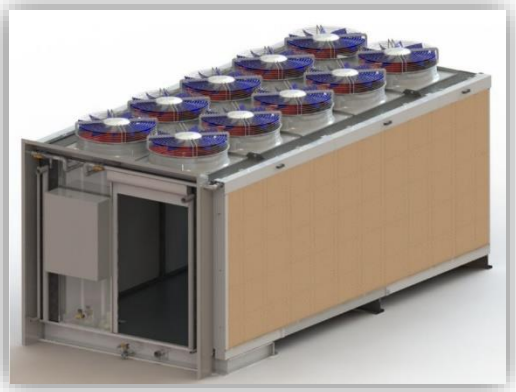
In order to facilitate containment in the building for the management of condenser fluid, Jacir can supply a containment sleeve factory pre-installed on the control cabinet side.



SafetySide

This option offers to regroup on a single side of the unit the complete equipment dedicated to the maintenance: the ONYX is then totally contained on the refrigerant's connection and regulation interface side. An additional access door also placed on this side allows an easy maintenance carrying out on the motor fan groups. (available option only for double raw motor fan groups ranges)

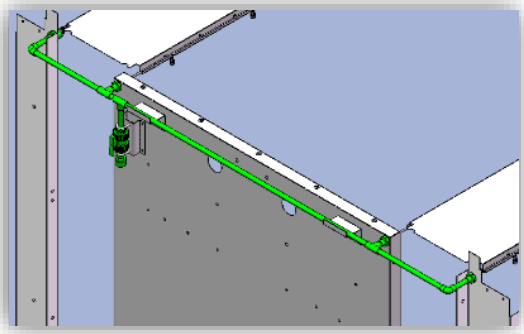
Consequently, with a complete access to both device sides, additional extra costs for lifting equipment, walkways, external guard rails or safety ropes for work at height are avoided for user's safety.



Containment and refrigerant fluid recovery device in case of potential leaks

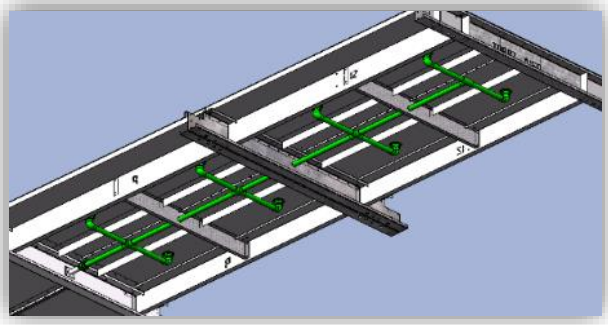
SafetyPulse

In case of refrigerant leak detection (sensor out of Jacir scope), the protection system can be activated. Two PVC water distribution pipes equipped with irrigation nozzles are installed over both coils on their whole length. The refrigerant is then safely driven towards the bottom of the equipment.

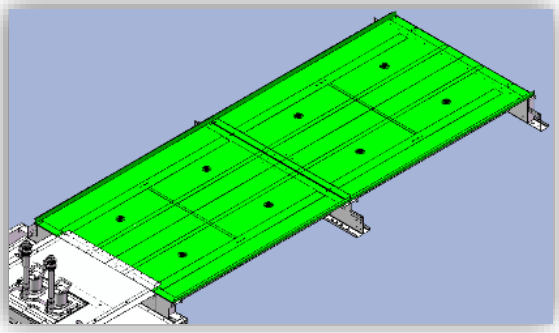


SafetyDrain

ONYX condenser is equipped with a watertight stainless-steel bottom, in addition to the SafetyPulse option, allowing to collect refrigerant leaks. This bottom is equipped with bungs linked by a collection refrigerant network integrated into the equipment frame. This PVC piping is also connected to the basin in order to facilitate safe evacuation of the alkali.



Bottom view



Top view

JACIR
Cooling for life

DTC

EUROVENT CERTIFIED PERFORMANCE
DTC range
17-07-003
www.eurovent-certification.com

Cooling tower

1200kW module

Commercial Documentation

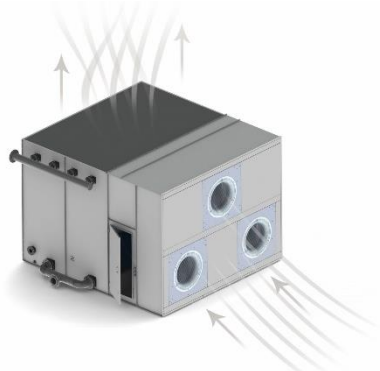
- Extremely quiet
- Highest energy efficiency
- Innovation boosting maintenance

La FRENCH FAB

COOLING TOWER: DTC RANGE

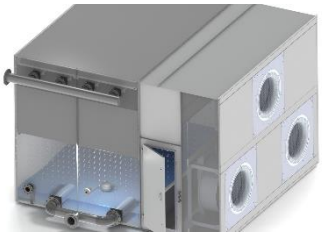
Operating principle

Innovative cooling tower compliant with latest European hygiene standard and EUROVENT-CTI thermal performance certified. Extremely quiet "Plug fans" centrifugal fans suck in air to cool the water optimally distributed over the exchange surface. Entirely designed to optimize its ease of maintenance thanks to its integrated technical room, the DTC is a concentrate of energy efficiency, even in case of space constraints with the possibility of installation in a corner.

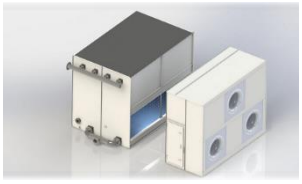


Hygienic design: compliant with European hygienic standard

Optimized accessibility: the technical room integrated into the tower offers total and immediate access to all the internal parts of the tower: drip eliminators, exchange bodies, water distribution ramps, basin with its accessories, motors and fans. Maintenance is simplified, even while DTC operating.



Casing: self-supporting panels casing have been twice or 4 times folded over the 4 sides (Jacir design) allowing additional sound attenuation casing if required. Thanks to this technology, we offer cooling towers with an extremely low sound level. Towers are assembled with waterproof stainless-steel rivets (uniform, high-capacity locking). There is no welding on assembled panels for the parts in contact with water. DTC range cooling towers is designed for an optimized transport and final assembly of its 2 modules.

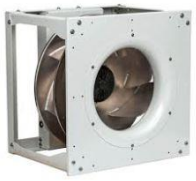


Basin: the bottom of the basin is inclined for complete draining and fully accessible through the integrated technical room with dedicated access door. It includes an easily adjustable float valve, an overflow, an anti-freeze resistance as well as an anti-cavitation stainless-steel + HDPE strainer.

Ultra silence

- ∞ 64dBA at 3m for 1,2MW
- ∞ Equivalent to a centrifugal forced draft cooling tower equipped with sound attenuations
- ⇨ Improved competitiveness and power consumption

"Plug fans" motor fan set



- ∞ First cooling towers equipped with single sided air inlet centrifugal jet fans,
- ∞ Efficiency of electronically commutated motors superior to IE4,
- ∞ Direct transmission: no mechanical maintenance,
- ∞ "Plug and Play": integrated wiring, connection and speed variation,
- ∞ High pressure drops available on the ai (for ducts and silencers).

Compliant with ecoconception (UE) 327/2011 concerning Directive 2009/125/CE application (ErP) for minimum efficiency thresholds after 2015.

Water distribution

PVC water distribution pipes feed the polypropylene nozzles (easily removable stainless-steel screws) equipped with internal turbulators for an optimal water distribution.

Infill: EFFI-PACK

Consisting of thermoformed and welded polypropylene sheets, the exchange surface is impact resistant and offers a maximum exchange surface with a large free surface area. Resistant up to 75°C as standard, its excellent thermal efficiency promotes energy savings

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DTC

Cooling for life

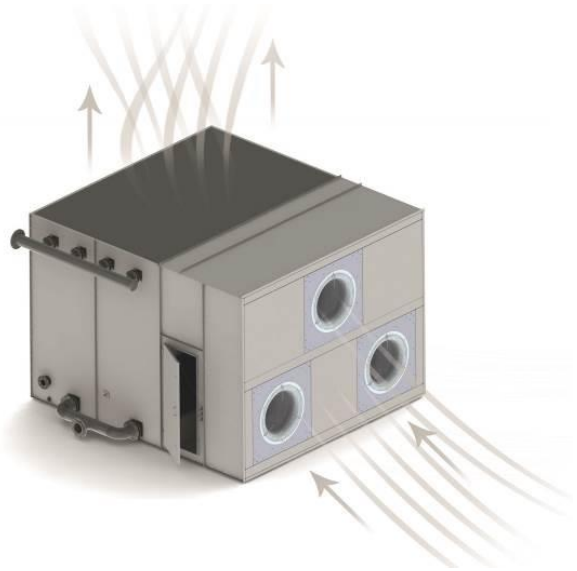
Open cooling towers

CONTENTS Page(s)

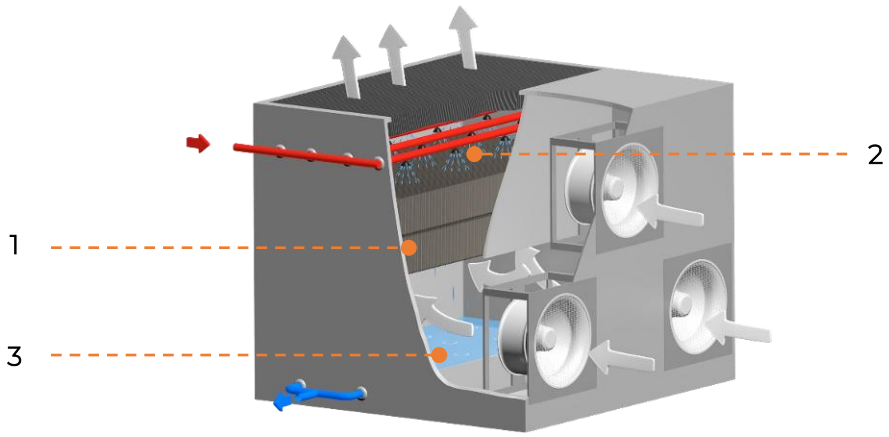
Technical Documentation

Operating principle

A water-cooling tower with an innovative design that complies with and is even ahead of December 2020 NF E 38-424 standard: the extremely quiet "Plug and Play" centrifugal fans suck in the air to cool the water distributed optimally over the exchange surface. Entirely designed to ease maintenance thanks to its integrated technical room, the DTC is a concentrate of energy efficiency, even in cases where space is limited: it can be installed in a corner.



Operation of an open wet air cooler



The hot water to be cooled is pumped to the top of the cooler through a pipe and then distributed over the heat exchange surface (1) by distribution nozzles (2).

Blown by the fans fresh air enters the lower section of the cooler and moves out through the upper section after heating up and saturation by passing through the heat exchange surface. Because of the superficial tension created by the exchange surface, the water evenly flows down along the whole height of the tower. The exchange surface is thus increased.

Cooled by forced ventilation, the water falls by gravity into the inclined basin (3) located at the bottom of the tower.

General description and benefits DTC range

General description

The DTC cooling tower is composed of 2 perfectly sealed, assembled casings:

- One casing dedicated to water circulation: water distribution, packing, basin and its accessories,
- One casing dedicated to airflow circulation, equipped with a maintenance corridor running along the entire width of the tower.

Each tower is equipped with:

- An ultra-quiet highly power efficient EC motors: 64 dBA at 3 meters for 1.2 MW,
- Centrifugal jet fans (world first),
- A hygienic basin whose sloping and flat bottom allows easy and total emptying thanks to Jacir POWER FLOW technology

Benefits of DTC serie

∞ SAFETY and HYGIENE	Tower design compliant with NF E 38-424 and VDI 2047-2 standards relating to hygienic risks (legionellosis)
∞ TIGHTNESS	Jacir jointing construction technology perfectly watertight.
∞ SILENCE	Ultra-quiet towers in standard version achieving exceptionally low sound levels.
∞ INFILL	Highly efficient, offering a wide exchange surface and temperature resistance
∞ ANTICORROSION PROTECTION	The tower casing is assembled without welding, made in galvanized steel, or X-STEEL stainless-steel as an option (corrosion resistance higher than that of 316L)
∞ EASY MAINTENANCE	Specially designed to ease maintenance: ∞ Direct motor/fan coupling ∞ An integrated access door leading to a technical room located between the wet section of the tower and the ventilation facilitates the maintenance operation, all at human height.
∞ ELECTRICAL CONSUMPTION	Optimized power consumption per EC motor. Technology in compliance with Eco conception (UE) 327/2011 concerning Directive 2009/125/CE application (ErP) for minimum efficiency thresholds after 2015.
∞ EVOLUTIVE TOWER	Possibility to upgrade the equipment to a closed-circuit and additional soundproofing
∞ MODULAR CONSTRUCTION	Easy transport and handling

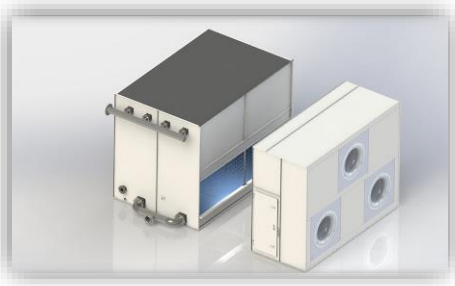
Manufacturing details - Options

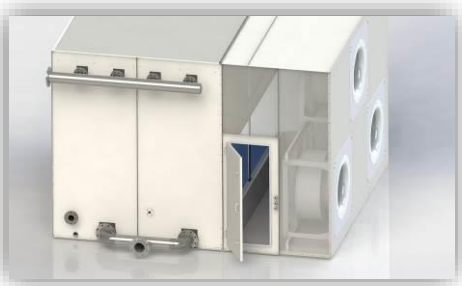
Tower casing

Self-supporting stiff panels, with double or quadruple folds on all four sides of the panel (Jacir design) allowing the body tower soundproofing if needed. Thanks to this technology we can offer towers with an extremely low sound level.

The tower is assembled with waterproof stainless-steel rivets (tightness and uniformity of clamping). Neither welding nor screws are used for panel's assembly for sections in contact with water; a specially designed seal provides the water tightness between panels.

DTC range cooling towers is designed for an optimized transport and final assembly of its 2 modules.





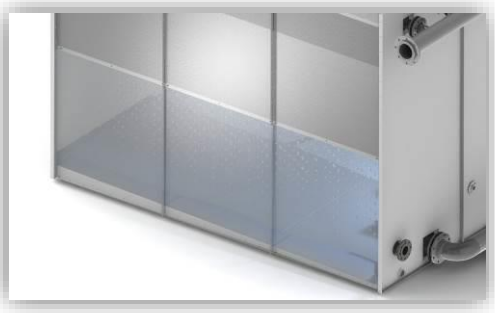
As standard, the panels are made of 2mm thick galvanised sheet, ZENDZIMIR process at 275 gr/m² (the protection of the galvanised sheets is ensured by formation of zinc oxidation on the surface).

As an option, X-STEEL stainless-steel (corrosion resistance superior to 316L) is proposed, either for airflow circulation casing, or for water circulation casing, or both casings.

Material for the hydraulic connections is similar to the one chosen for water circulation casing.

Inclined and flat bottom Basin

The large capacity basin's able to adapt the response time of the facility. Its sloping and flat bottom allows easy and total draining. Easily accessible through the integrated technical corridor with its dedicated access door.



The basin includes:

- An easily adjustable float valve,
- An overflow,
- An anti-freeze resistance, as an option: in 230V or 400V and waterproof thermostat with separate bulb,
- A drain opening and a POWER FLOW hatch below the low level of the basin to ease rapid removal of impurities during cleaning,
- A water outlet through removable strainer (stainless-steel or HDPE according to ND) with a large capacity flange witch suction design eliminates cavitation risk, and a filter,
- For the control of the resistor, proper contactors are necessary.

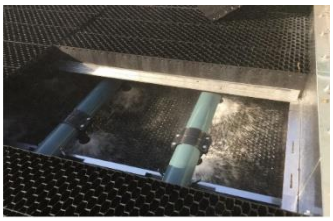
Heat exchange surface: EFFI-PACK

Made of thermoformed and welded polypropylene sheets, the EFFI-PACK exchange surface is shock-resistant and offers a maximum exchange surface with a large free surface area.

- good temperature resistance (75°C continuous),
- large surface area of high efficiency,
- ease of maintenance,
- high resistance to chemical agents,
- operating range up to 95°C on request (option)

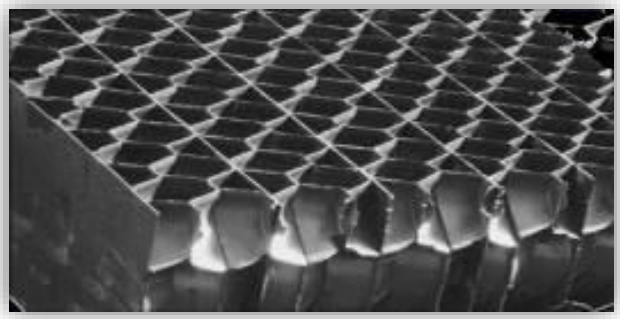
Water distribution

The water is distributed through PVC ramps equipped with highly efficient distributors distributing water in the form of a full jet cone. Screwed by wide clamps to distribution ramps, they can be easily dismantled while ensuring very good mechanical strength. An internal turbulator distributes the water evenly over the entire exchange surface.



Drift eliminators

Highly efficient, they prevent the water from being sprayed out of the tower. Ultraviolet rays resistant, they are easily removable from the top of the tower in order to access to the distributors and the exchange surface. The drift level is certified lower than 0.01% of the water flow.
Drifts efficiency is certified by an independent party (EUROVENT).



Tower design compliant with December 2020 NF E 38-424 and VDI 2047-2 standards relating to hygienic risks

Improved accessibility for maintenance: the technical room integrated into the tower offers total and immediate access to all its internal parts: drift eliminators, exchange surface, water distribution ramps, basin with its accessories, motors and fans: maintenance is simplified even in hydraulic operation.

« Plug fans » motor-fan set

Quiet, compact fans with EC motor integrated directly into the impeller. Extremely compact and silent jet fan units are equipped with EC motors directly integrated to the wheel with efficiency superior to IE4 class, without any use of rare-earths magnets. Fans are directly coupled to the motors.
EC motor with suction impeller on a single side permanently controlled by electronically commutation. The variation of the power electronics integrated in the EC motors is compatible with 380 à 480 V- IP 55.

Optional « Plug and Play » system for fan control.

The choice of this technology is in compliance with Eco conception (UE) 327/2011 concerning Directive 2009/125/CE application (ErP) for minimum efficiency thresholds after 2015.

Plume suppression coil (OPTION)

As standard, the battery consists of a steel manifold coated with a primary + epoxy paint. Two air vents ensure frost control. The tubes, arranged in a triangular pitch, are made of copper. As an option, they can be made of stainless-steel. The fins are made of copper or stainless-steel. The pitch is 3 mm as standard. A motorised valve which regulates the packing watering is coupled with the battery. Whenever weather conditions permit, this allows substantial water savings by evacuating heat thanks to the dry coil rather than by evaporation.

Automatic Inductive blow down (AiD)

Automatic Inductive blow down is available in option.

Sound attenuation (options)

IB sound attenuation

Sound trap in the fan box, between each fan, made of rock wool, glass veil and expanded metal in galvanized steel. An absorbent material will be deployed on the ceiling of the fan box.
Discharge sound trap made up of a soundproof cone making it possible to reduce the acoustic radiation surface.
Installed in the basin and on the opposite wall of the EFFI-SILENT system fan

ICV sound attenuation

Sound trap in the fan box, between each fan, made of rock wool, glass veil and expanded metal in galvanized steel. An absorbent material will be deployed on the ceiling of the fan box.
Discharge sound trap made up of a soundproof cone to reduce the surface area of acoustic radiation.

Installed in the basin and on the opposite wall of the EFFI-SILENT system fan. The casing, the fan box and the discharge box, consists of a box made of self-supporting rigid panels, double folded outwards on its 4 sides. The interior is lined with absorbent material and it contains sound traps with its acoustic baffles. The galvanized sheet baffles, made of high-density rock wool panels, are mounted on easily removable racks. On suction, the rock wool is protected by a glass veil. On delivery, the baffles receive protection reinforced by expanded metal in stainless-steel.

ICVK complete soundproofing with double tower body

The entire ICV version tower receives a lining made of high-density rock wool covered by an additional sheet: ICV-K.

OPTIONS

- Soundproofing: reinforced acoustics,
- EFFI-SILENT noise abatement for cooling towers basins,
- Plume suppression system,
- Exchanger room for closed circuit operation (DTCF range)
- X-STEEL stainless steel casing (higher corrosion resistance than 316L),
- Antifreeze heater with thermostat,
- Water supply by electric level control (with solenoid valve and filter),
- Automatic inductive blow down (see AID documentation),
- Air pressure available for duct connection,
- Material delivered in individual parts to be assembled,
- Assembly on site by our experienced technicians,
- Optional "Plug and Play" system: fan controls.

Technical characteristics DTC

DTC serie	Absorbed power [kW]*	Fans			Sound power without sound attenuation** [Lw]	Sound power with IB sound attenuation ** [Lw]	Sound power with ICV sound attenuation ** [Lw]
		Qty	Ø [mm]	Available power unit [kW]			
DTC-2315-PA-1-1000-64	470	1	1 000	6,4	89	81	74
DTC-2324-PA-2-1000-64	745	2	1 000	12,8	91	83	76
DTC-2336-PA-3-1000-64	1 115	3	1 000	19,2	92	85	77
DTC-2348-PA-4-1000-64	1 490	4	1 000	25,6	94	86	78
DTC-2360-PA-5-1000-64	1 860	5	1 000	32	95	87	79
DTC-2372-PA-6-1000-64	2 235	6	1 000	38,4	95	87	79
DTC-2384-PA-7-1000-64	2 600	7	1 000	44,8	96	88	80

* Data based on a thermal regime of 32/27/21°C
** +ou- 2dB(A)

Weights and dimensions DTC

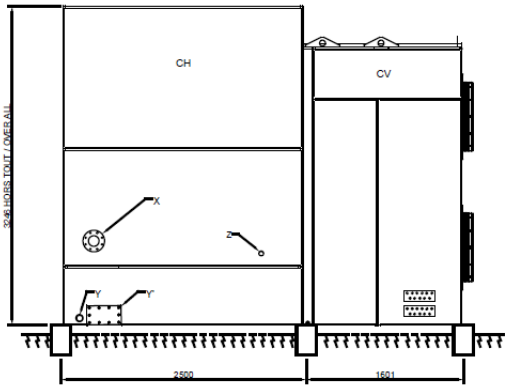
DTC without sound attenuation	Motor Fan set Qty	Dimensions			Weight empty [Kg]	Weight in operation [Kg]	Water inlet [DN]
		Lenght (overall)	Width (overall)	Height (overall)			
DTC-2315-PA-1-1000-64	1	1 975	4 186	3 246	1 325	3 300	125
DTC-2324-PA-2-1000-64	2	2 775	4 186	3 246	2 035	5 122	150
DTC-2336-PA-3-1000-64	3	4 075	4 186	3 246	2 796	7 376	200
DTC-2348-PA-4-1000-64	4	5 275	4 186	3 246	3 557	9 621	250
DTC-2360-PA-5-1000-64	5	6 475	4 186	3 246	4 339	11 885	250
DTC-2372-PA-6-1000-64	6	7 675	4 186	3 246	5 121	13 880	300
DTC-2384-PA-7-1000-64	7	8 875	4 186	3 246	5 903	16 098	300

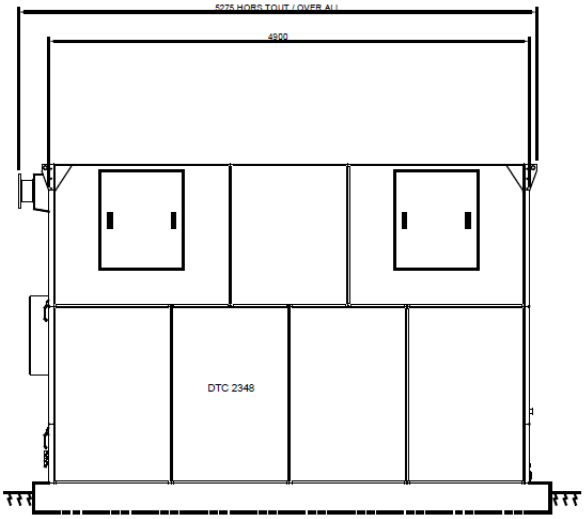
DTC IB serie	Motor Fan set Qty	Dimensions			Weight empty [Kg]	Weight in operation [Kg]	Water inlet [DN]
		Lenght (overall)	Width (overall)	Height (overall)			
DTC-2315-PA-1-1000-64	1	1 975	4 186	4 246	1 528	3 503	125
DTC-2324-PA-2-1000-64	2	2 775	4 186	4 246	2 399	5 486	150
DTC-2336-PA-3-1000-64	3	4 075	4 186	4 246	3 232	7 812	200
DTC-2348-PA-4-1000-64	4	5 275	4 186	4 246	4 171	10 235	250
DTC-2360-PA-5-1000-64	5	6 475	4 186	4 246	5 025	12 571	250
DTC-2372-PA-6-1000-64	6	7 675	4 186	4 246	5 986	14 745	300
DTC-2384-PA-7-1000-64	7	8 875	4 186	4 246	6 840	17 035	300

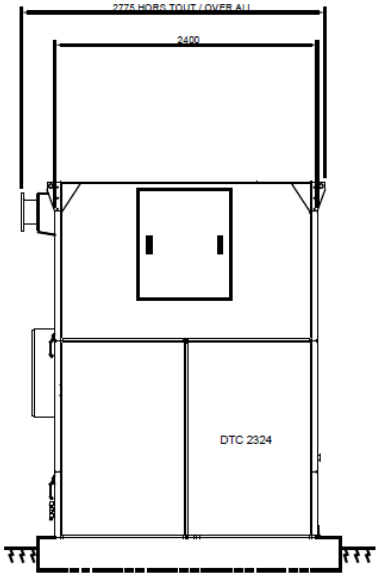
DTC ICV serie	Motor Fan set Qty	Dimensions			Weight empty [Kg]	Weight in operation [Kg]	Water inlet [DN]
		Lenght (overall)	Width (overall)	Height (overall)			
DTC-2315-PA-1-1000-64	1	1 975	4 950	4 746	1 874	3 849	125
DTC-2324-PA-2-1000-64	2	2 775	4 950	4 746	2 747	5 834	150
DTC-2336-PA-3-1000-64	3	4 075	4 950	4 746	3 726	8 306	200
DTC-2348-PA-4-1000-64	4	5 275	4 950	4 746	4 704	10 768	250
DTC-2360-PA-5-1000-64	5	6 475	4 950	4 746	5 703	13 249	250
DTC-2372-PA-6-1000-64	6	7 675	4 950	4 746	6 713	15 472	300
DTC-2384-PA-7-1000-64	7	8 875	4 950	4 746	7 713	17 908	300

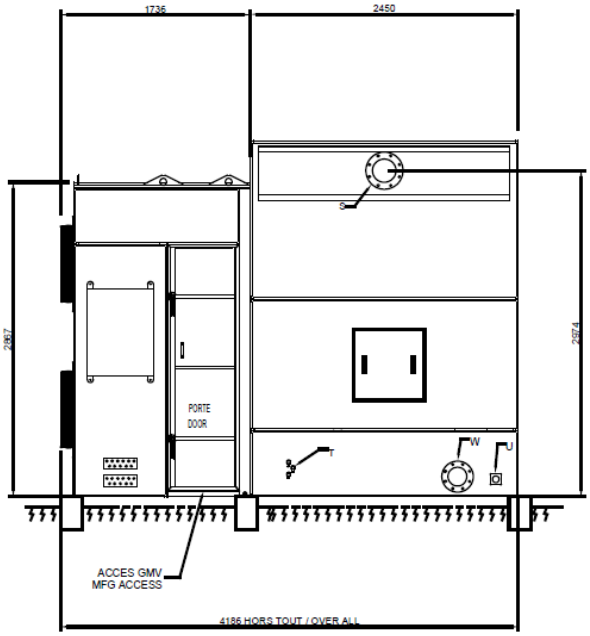
Drawings DTC without sound attenuation – 2/4/6 Motor-fan sets

CH: WET CASING
CV: VENTILATION CASING









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X: OVERFLOW ND100 TURNING FLANGE PP PN16
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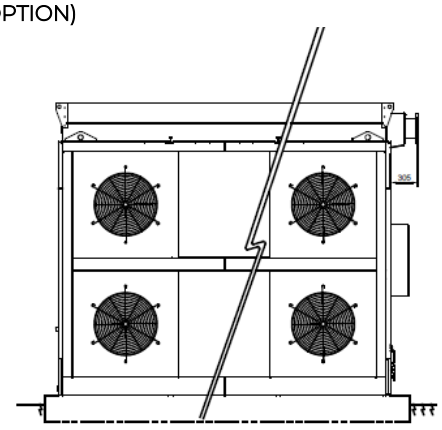
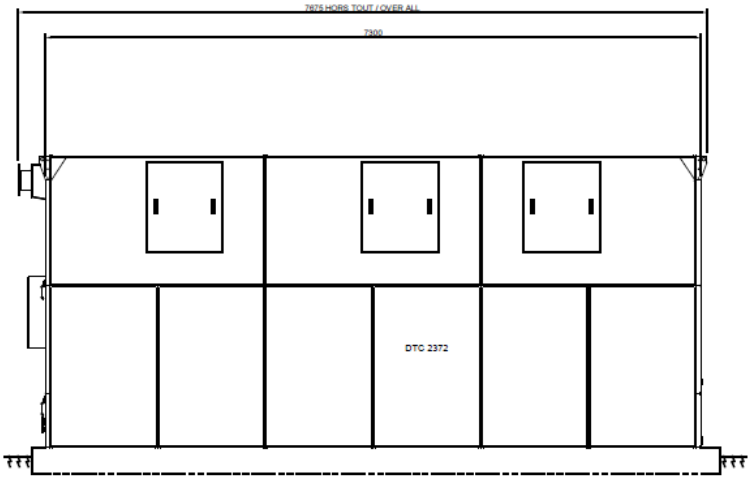
Z: WAKE UP WATER BY FLOATING TAP OR SOLENOID VALVE (OPTION)





Drawings DTC without sound attenuation – 1/3/5/7 Motor-fan sets

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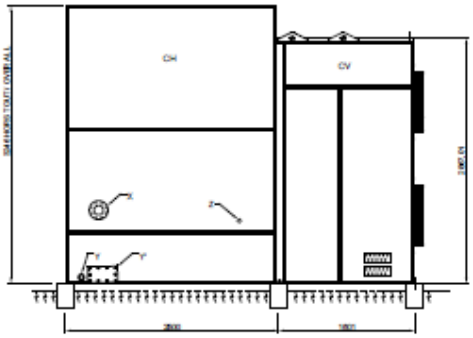

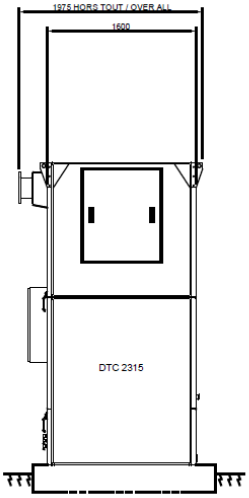

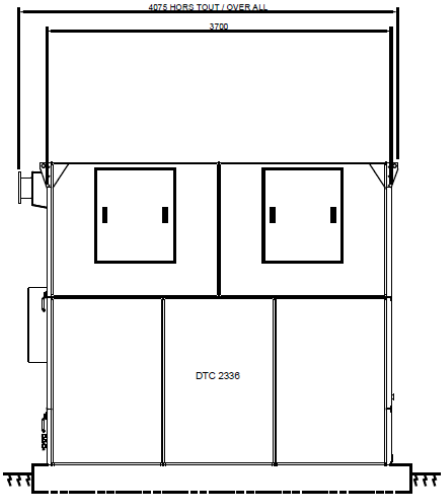

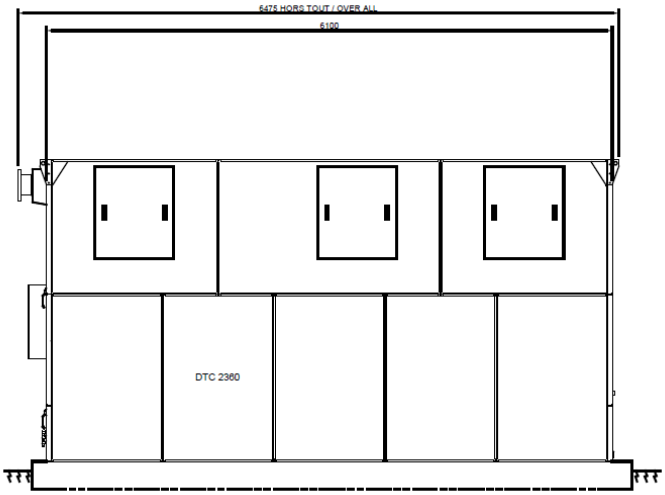

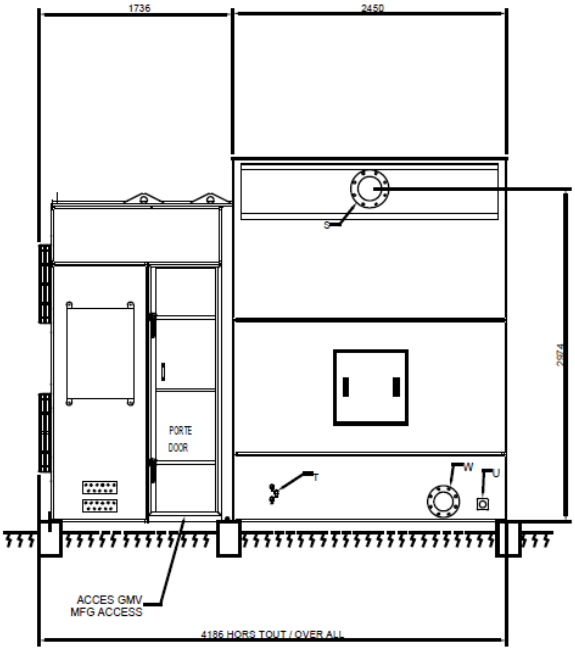

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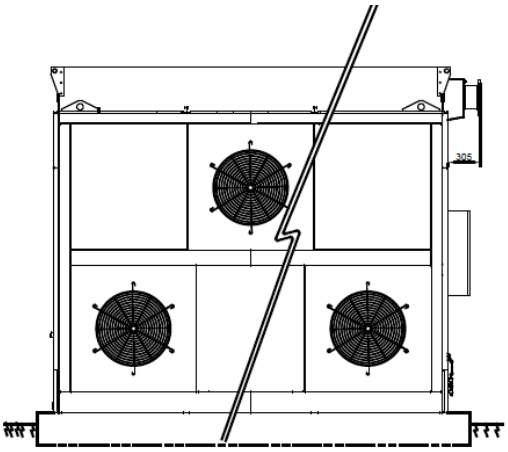

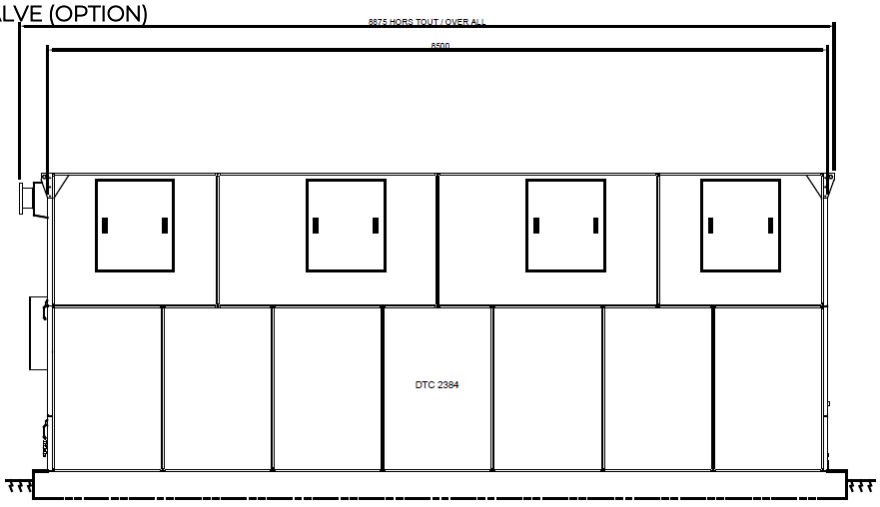

Drawings DTC IB sound attenuation – 2/4/6 Motor-fan sets

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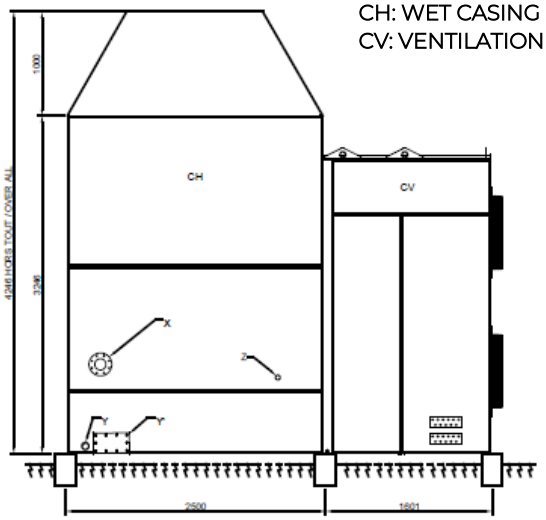

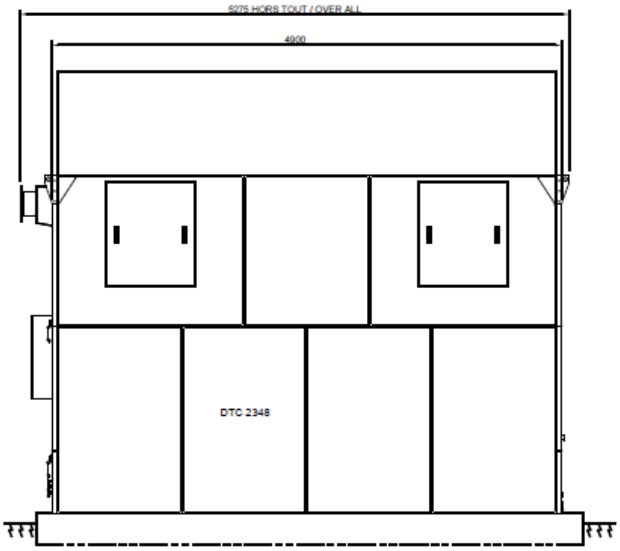

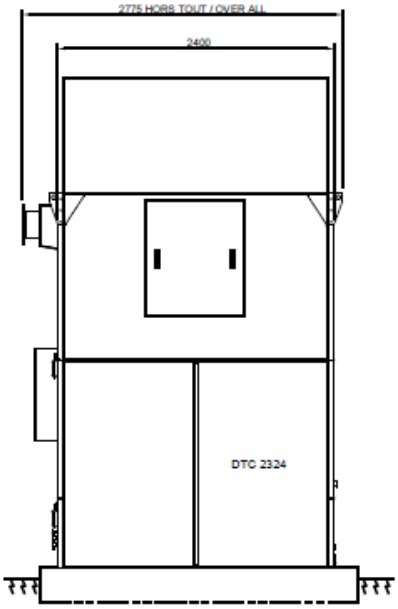

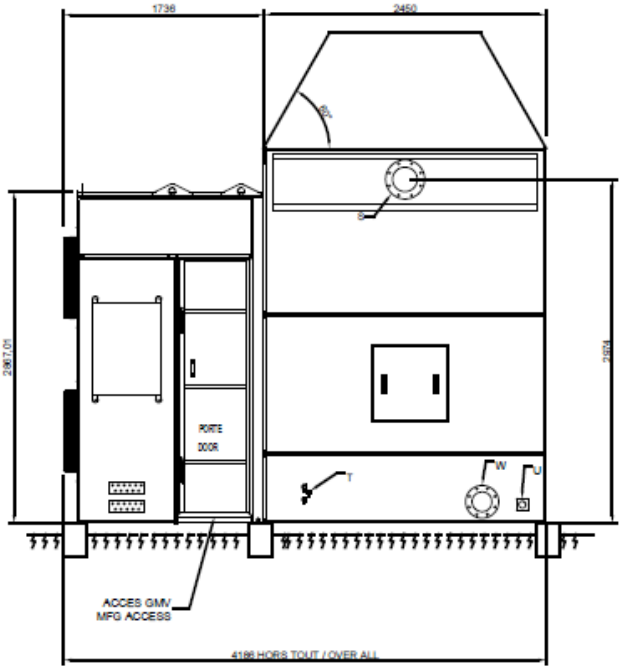

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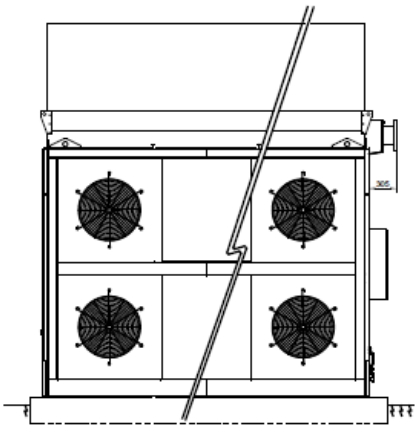
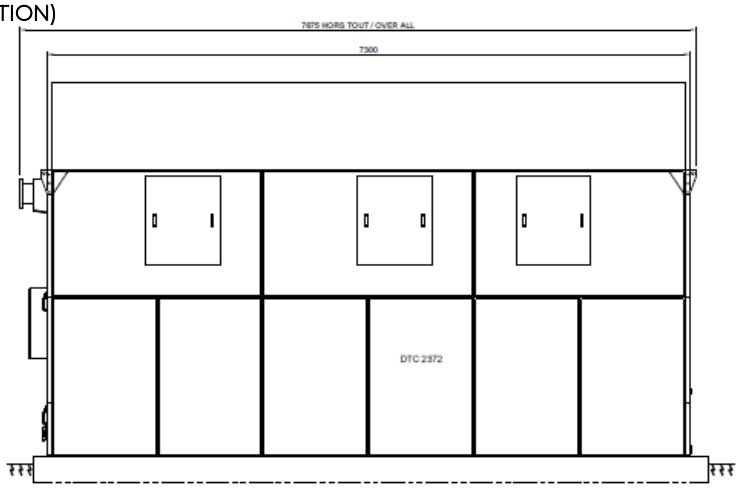
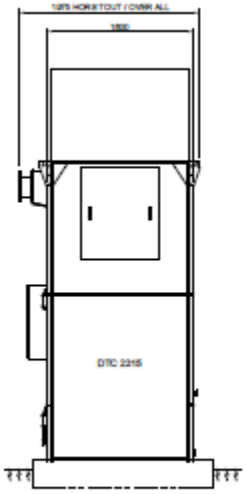
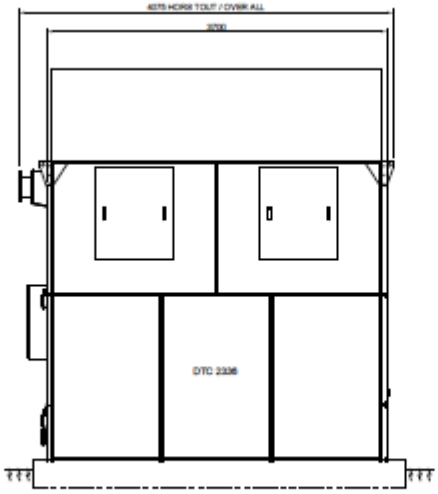
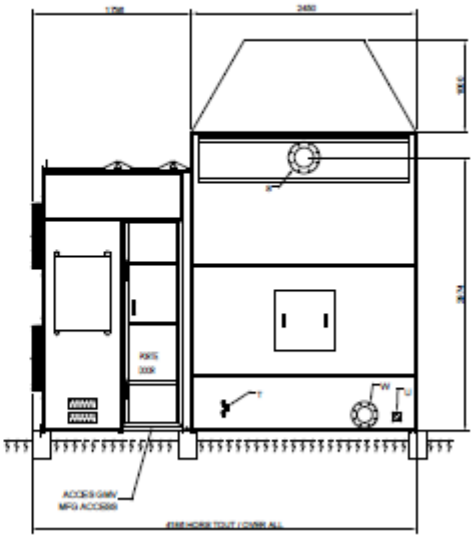


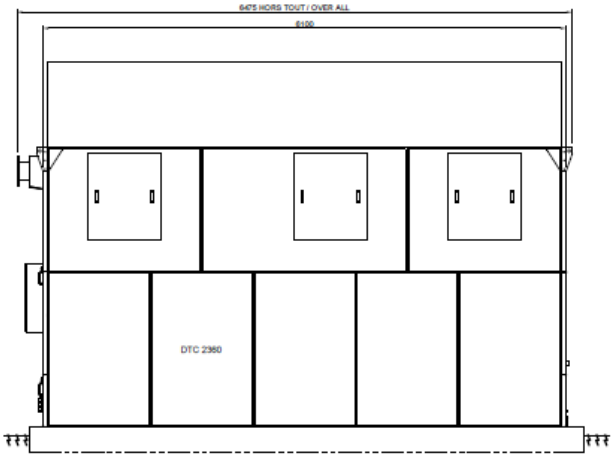


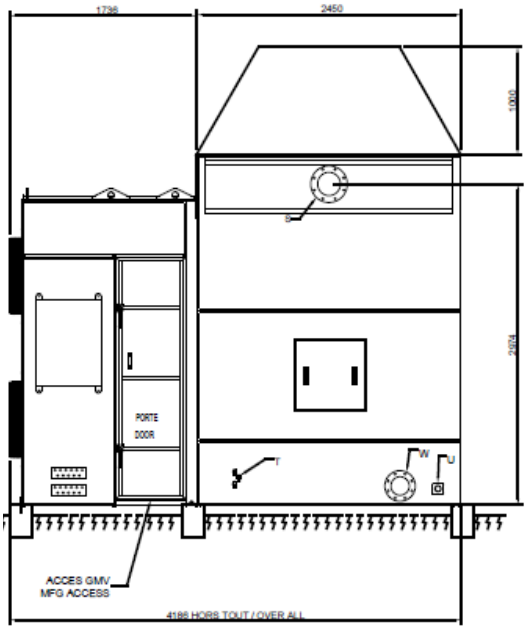
Drawings DTC IB sound attenuation – 1/3/5/7 Motor-fan sets











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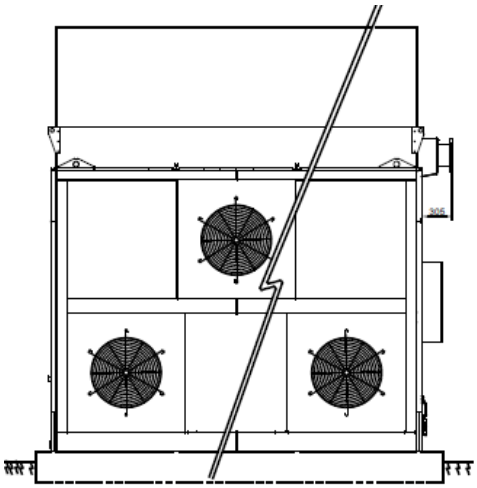

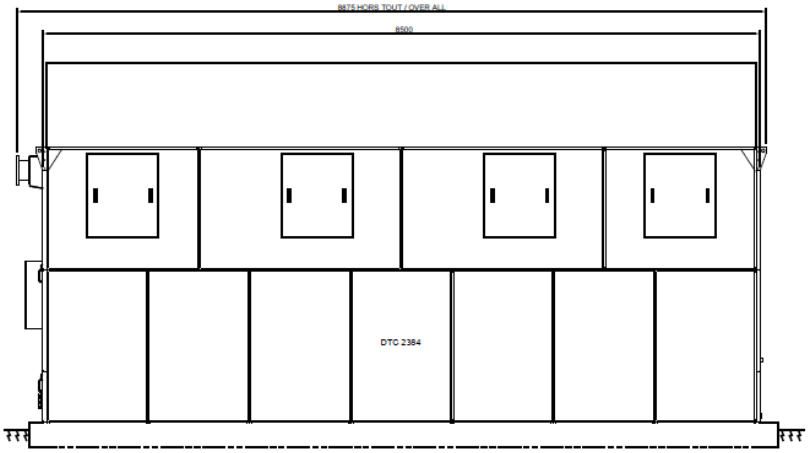

Drawings DTC ICV sound attenuation – 2/4/6 Motor-fan sets

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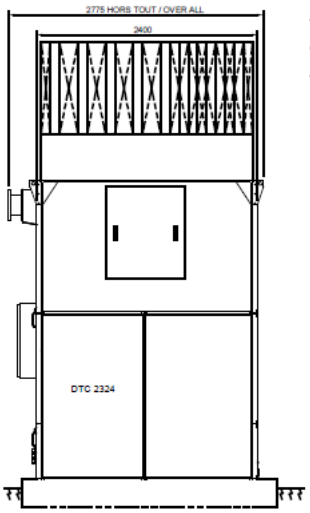
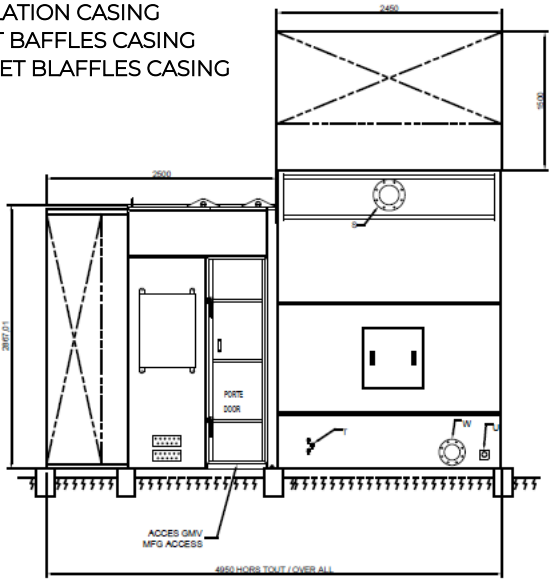
CBE: INLET BAFFLES CASING
CBS: OUTLET BLAFFLES CASING





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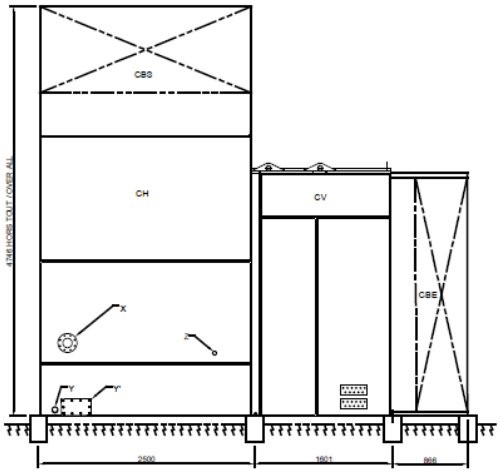

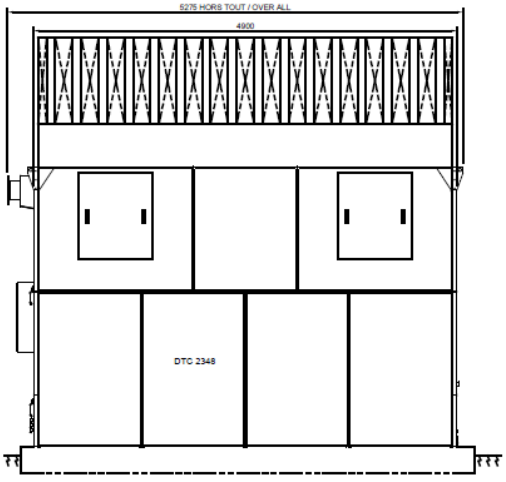

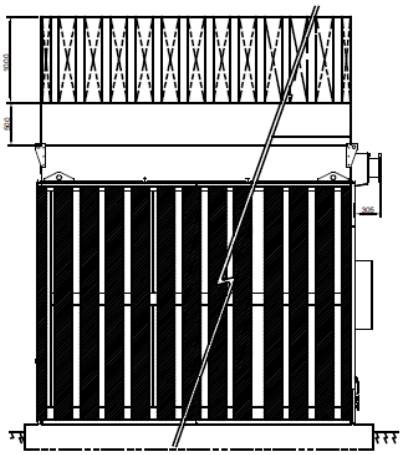

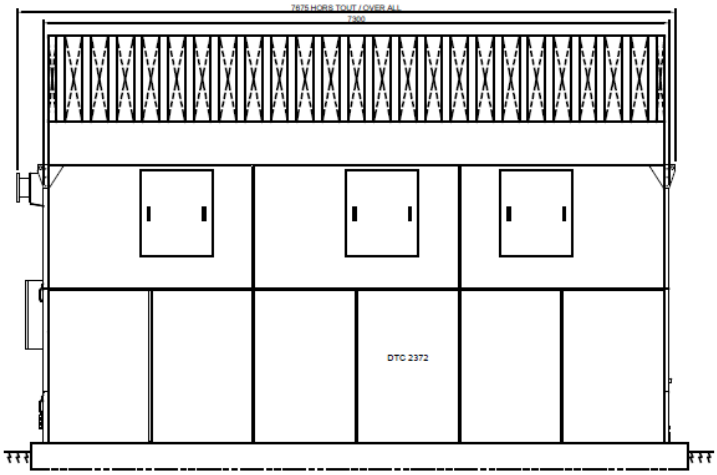

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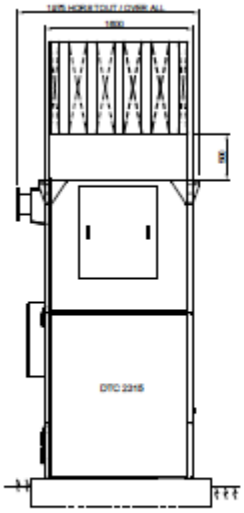

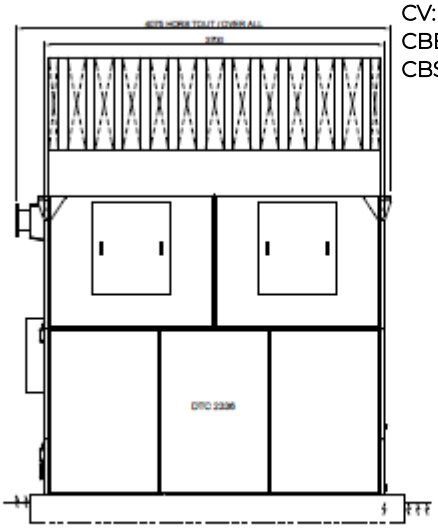

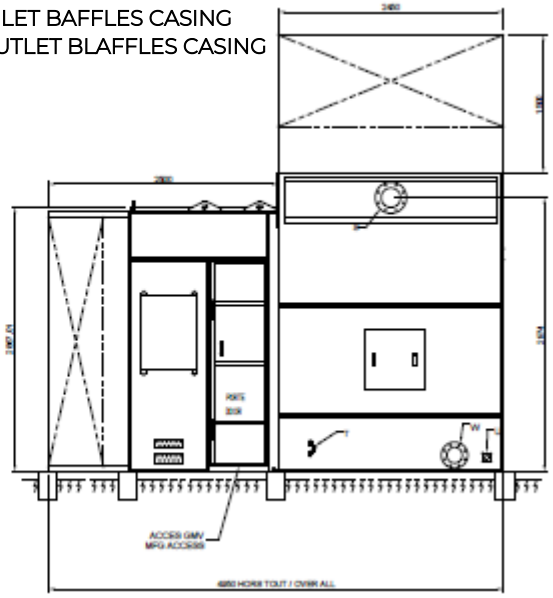

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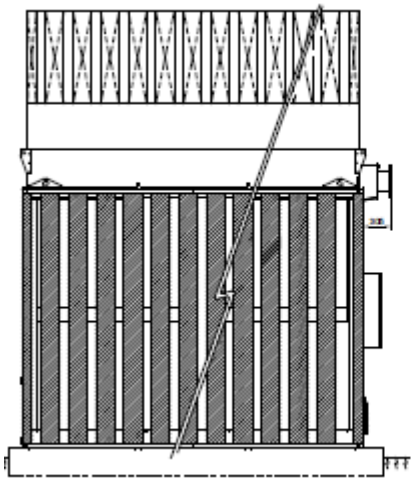
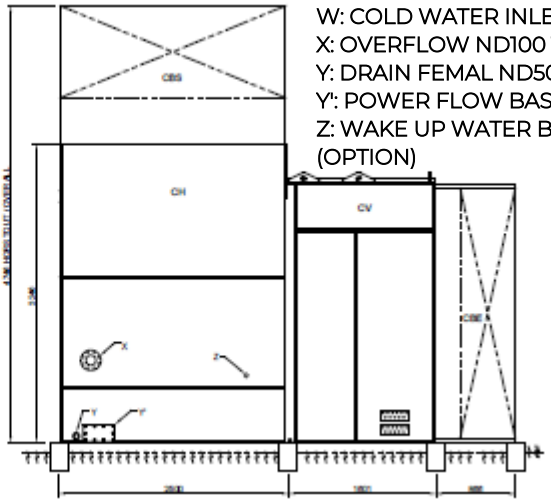
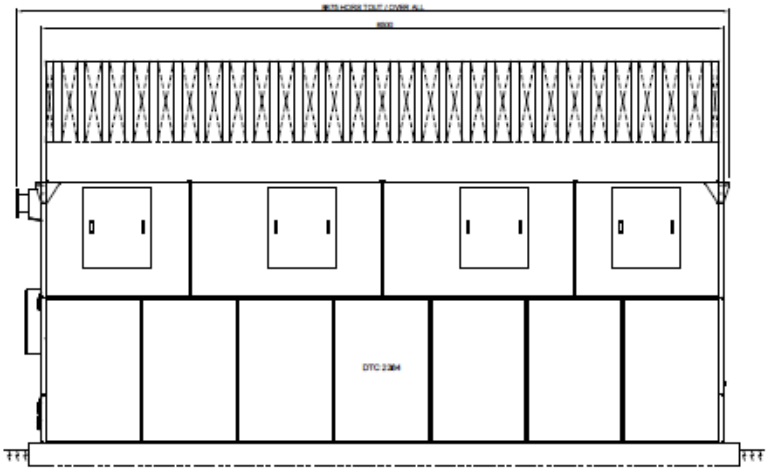
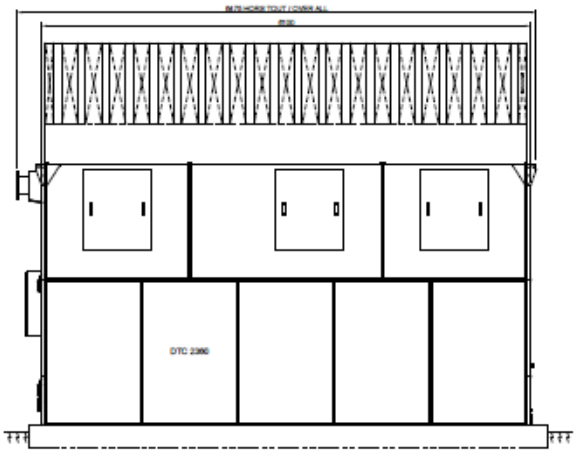




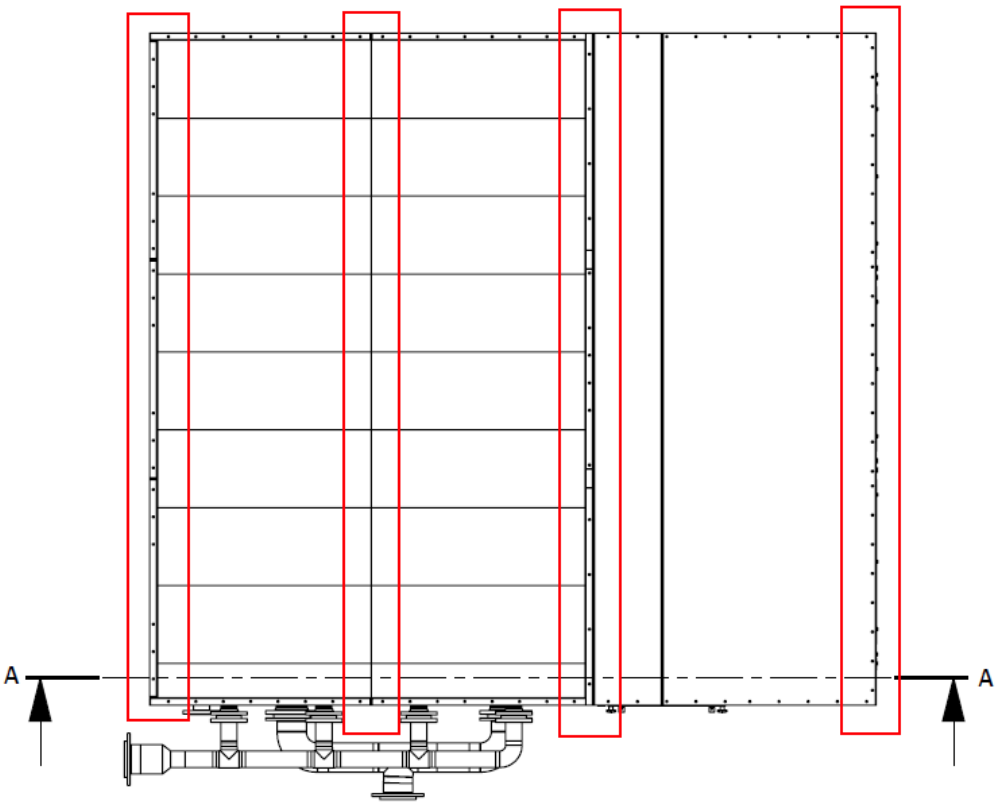




On site layout

Our cooling towers can stand on the ground or on a concrete floor base, but it is advisable to install them on concrete stringers or support irons (steel frame beams).
Make sure that the floor receiving the cooling tower can support the load during operation and that the floor or supports form a correct plane.

Number and position of concrete beams or support bars (customer supply)



Choice of implantation DTC

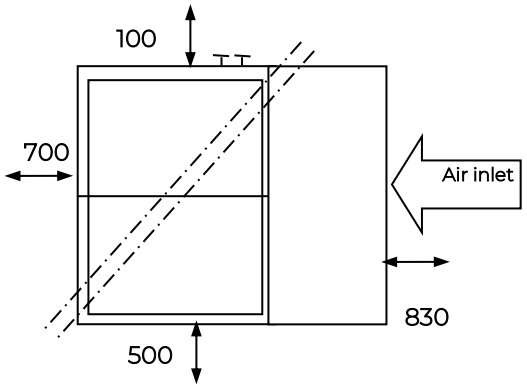
The cooling tower must not be surrounded on all sides by walls higher or equal to its height, and moreover without an opening, because a "short circuit" risk could occur. The air discharged at the tower exit (hot, moisture-saturated air) could then be recycled into the unit and consequently reduce the thermal output of the tower.

In any case, you must respect minimum clearances around all four sides of the tower to ensure a correct air supply for fans and sufficient access for assembly and maintenance.

Failure to observe these rules would inevitably lead to a malfunction of the cooling tower.

Recommended minimum spacings in mm: diagram from above

Tower without sound attenuation

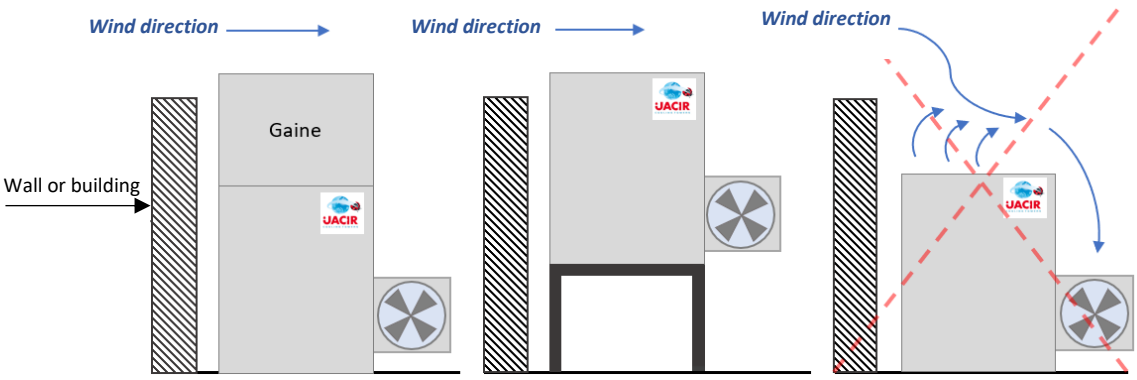


Please contact us for advice

Examples of implantation

The location choice for tower installation must follow these recommendations:

- The air intake area must always be kept free of any major obstruction.
  - ⇨ The obstacle-free distance to be kept around each air inlet is shown on the overall plan and is approximately 1 metre (unless otherwise stated)
- The air discharge must not be disturbed either by direct obstacles.
  - ⇨ He installation of acoustic baffles or ducts must be approved by JACIR's Technical Department.
- The risk of hot air being blown back (at tower outlet) to the air intake area must be prevented.
  - ⇨ The direction of the prevailing wind and the proximity of surrounding buildings (possibly generating risks of back-flow) are elements to be considered.



WATER EVAPORATION

Consumption by evaporation is approximately 1.7 kg/h per 1,000 kcal/h.

DECONCENTRATION

Due to evaporation and water recycling, there is a concentration of impurities or salts in the water. To prevent it from exceeding a limit value deconcentration purges must be carried out.
Without this purging considerable concentration rates (Tx) of 10, 100, or even 1000 would occur over time.
For the pre-sizing of galvanized steel equipment, consider drain value of twice the evaporation level (Tx=2). For operation connected with a monitored water treatment this value may decrease, especially if the cooling tower casing is made of stainless-steel (rates of 3 to 5 possible).

Depending on the situation three deconcentration solutions can be sorted:
1- Continues purges
Connect to the pump outlet just before the tower, if possible, at the sprayer booms, so that the pump is only vented when it is running.
The flow rate for bleeding can be calculated by the formula:[100 S / (M - S)] % of the make-up water flow rate with:
S : Salinity of the make-up water compensating evaporation.
M : Maximum permissible salinity in the circuits.

Example:
Salinity of the make-up water = TH 20°.
Maximum permissible salinity = TH 40°.
100 x 20 / (40 - 20) = 100 % of make-up water flow rate
So the continuous purge must be equal to the volume of water evaporated.
As a result, the actual make-up water flow rate is twice the theoretical evaporation flow rate.

2- Discontinuous purges

The water's conductivity in the circuit is checked and the system purged according to the value not to be exceeded.

3- Maintenance-free JACIR automated inductive deconcentration

Through conductivity measurement, it is possible to control a motorised valve which allows a flow to the sewer corresponding to the quantity of water necessary to maintain a correct concentration value (See separate document).

WATER TREATMENT

To ensure the proper functioning of a closed-circuit cooling system, it is essential to have good quality of water. If the water is contaminated with coarse impurities, it is recommended that 5-10% of the recirculated water flow should be filtered off in bypass. If the water contains encrusting salts or chemically aggressive elements, a make-up water treatment must be carried out to obtain a softer water close to chemical neutrality, capable of supplying the machines to be cooled without risk of damage.
In some cases, algae, mosses, fungi or shellfish may tend to grow in a cooling tower. There are products that, when added periodically to the circuit water, prevent the development of these organisms.

Water treatment should be entrusted to specialised companies.
LEGIONELLOSIS RISK PREVENTION: (see separate document).

Highly energy-efficient open-circuit evaporative water-cooling tower with EC motors integrated in jet centrifugal fans the JACIR DTC range.....

EC motor with suction impeller on a single side will be permanently controlled by electronically commutation. Its efficiency will be really superior to IE4 efficiency class, without any use of rare Earths magnets.
The variation of the power electronics integrated in the EC motors will be compatible with 380 à 480 V- IP 55
The system will be double exchange based with a direct counter current air-water exchange system.

The tower will be designed and delivered by the manufacturer in two parts to be assembled with its integrated technical room equipped with a wide service door giving access to all its components.

Thermal characteristics

The power output will be ... kW for a speed from ...°C to ...°C with a wet suction temperature of ...°C.
The tower will have been the subject of a EUROVENT thermal performance certification.

Acoustic characteristics

The equipment sound pressure level must not exceed ... dB (A) at ... metres in open air in all four directions; thus, the tower must be equipped with sound reinforcement if necessary.

DIRECT AIR-WATER EXCHANGE: TOWER CIRCUIT
Cooling Tower casing, sloped and plane bottom basin

The tower casing will consist of self-supporting steel panels twice or 4 times folded on the 4 sides. The side panels will be designed to receive later, if necessary, a doubling of the tower body. Stainless-steel rivets with high tightening capacity will be used for assembly. Concerning casing parts in contact with water they will be assembled without any bolting, welding or screwing and particular elastomer joints replacing jointing mastic will be of use for panel's watertight assembly.

The basin will include an easily adjustable float valve, an overflow, an anti-freeze resistance and an anti-cavitation filter strainer. The sloping bottom of the basin will allow an easy and total emptying: the lower location of the drain hole (POWER FLOW) below the low point of the basin's bottom. Access to power flow will be 260 x 100mm.

The large basin's capacity will increase inertia effect and system's water treatment efficiency.

Casing structure

The cooling tower panels structure will be made of:

- 2 mm thick galvanised sheet metal, Zendzimir process at 275 gr/m² or,
- X-STEEL stainless-steel for durability, water saving and cleanability.

Hydraulic connections material will be the same chosen for the water circulation casing.

Accessibility

As standard, a technical room integrated in the tower will offer total and immediate access to all internals: drip eliminators, exchange bodies, water distribution ramps, basin with its accessories, motors and fans providing simplicity for maintenance even under operation.

Motor-fan unit

Extremely compact and silent jet fan unit will be equipped with EC motors directly integrated to the wheel with efficiency superior to IE4 class. Fans will be directly coupled to the motors.
The choice of this technology will be in compliance with Eco conception (UE) 327/2011 concerning Directive 2009/125/CE application (ErP) for minimum efficiency thresholds after 2015.

Water distribution

The water distribution will be provided by PVC ramps, equipped with easily removable polypropylene dispersers, specially designed to distribute water in an optimal way i.e., covering the entire airflow section. These dispersers will operate at low pressure (0.8 mCE), thus reducing pump power and producing large droplets that are little sensitive to vesicular entrainment.

Exchange surface

The Effi-Pack exchange surface will be made of thermoformed and welded PP sheets.
Highly resistant to shocks and chemical agents and offering a maximized exchange surface, its free surface will be important. Resistant up to 75°C as standard, its excellent thermal efficiency will promote energy savings.

Drift eliminators

Highly efficient, they will strongly reduce water spraying out at the tower exit. Resistant to UV rays, they are easily removable from above to access the distributors and exchange surface if necessary. The drift will be 0.01% maximum of the recirculating water flow. They are certified by an independent body (EUROVENT).

Options

Water treatment can be integrated as an option, as well as Inductive Automatic Deconcentration installed in the room (see separate data sheet).
The different IB, ICV, ICVK soundproofing, or the EFFI-SILENT option will further optimize the sound level.

JACIR
Cooling for life

DTCF

Closed Circuit Cooling tower

Commercial Documentation

1200kW module

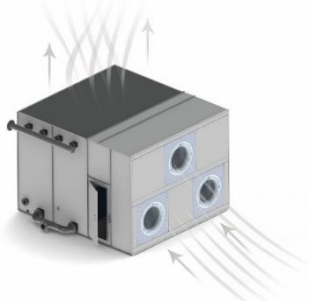
- Extremely quiet
- Highest energy efficiency
- Innovation boosting maintenance

La FRENCH FAB

COOLING TOWER: DTCF RANGE

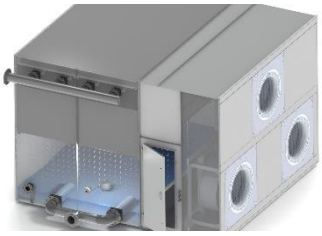
Operating principle

Innovative cooling tower compliant with latest European hygiene standard. Extremely quiet "Plug fans" centrifugal fans suck in air to cool the water optimally distributed over the exchange surface. Entirely designed to optimize its ease of maintenance thanks to its integrated technical room, the DTC is a concentrate of energy efficiency, even in case of space constraints with the possibility of installation in a corner.



Hygienic design: compliant with European hygienic standard

Optimized accessibility: the technical room integrated into the tower offers total and immediate access to all the internal parts of the tower: drip eliminators, exchange bodies, water distribution ramps, basin with its accessories, motors and fans. Maintenance is simplified, even while DTCF operating.



Casing: self-supporting panels casing have been twice or 4 times folded over the 4 sides (Jacir design) allowing additional sound attenuation casing if required. Thanks to this technology, we offer cooling towers with an extremely low sound level. Towers are assembled with waterproof stainless-steel rivets (uniform, high-capacity locking). There is no welding on assembled panels for the parts in contact with water. DTC range cooling towers is designed for an optimized transport and final assembly of its 2 modules.

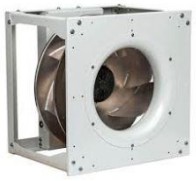
Non-freezing Plate Heat Exchanger room: Especially designed for an easy access and maintenance, the stainless-steel plate heat exchanger is totally protected from weather conditions thanks to its self-supporting stiff panels made of 15/10e galvanized steel (X-STEEL stainless-steel option), and equipped with lockers access door (2100 x 600mm). Customer connections is directly fixed outside the room to facilitate connections with primary circuit.

Basin: the bottom of the basin is inclined for complete draining and fully accessible through the integrated technical room with dedicated access door. It includes an easily adjustable float valve, an overflow, an anti-freeze resistance as well as an anti-cavitation stainless-steel + HDPE strainer.

Ultra silence

- ∞ 64dBA at 3m for 1,2MW
- ∞ Equivalent to a centrifugal forced draft cooling tower equipped with sound attenuations
- ⇨ Improved competitiveness and power consumption

"Plug fans" motor fan set



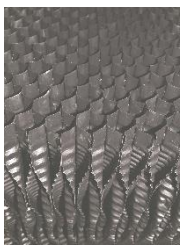
- ∞ First cooling towers equipped with single sided air inlet centrifugal jet fans,
- ∞ Efficiency of electronically commutated motors superior to IE4,
- ∞ Direct transmission: no mechanical maintenance,
- ∞ "Plug and Play": integrated wiring, connection and speed variation,
- ∞ High pressure drops available on the ai (for ducts and silencers).

Compliant with ecoconception (UE) 327/2011 concerning Directive 2009/125/CE application (ErP) for minimum efficiency thresholds after 2015.

Water distribution

PVC water distribution pipes feed the polypropylene nozzles (easily removable stainless-steel screws) equipped with internal turbulators for an optimal water distribution.

Infill: EFFI-PACK



Consisting of thermoformed and welded polypropylene sheets, the exchange surface is impact resistant and offers a maximum exchange surface with a large free surface area. Resistant up to 75°C as standard, its excellent thermal efficiency promotes energy savings.

DTCF

JACIR
Cooling for life

Closed cooling towers

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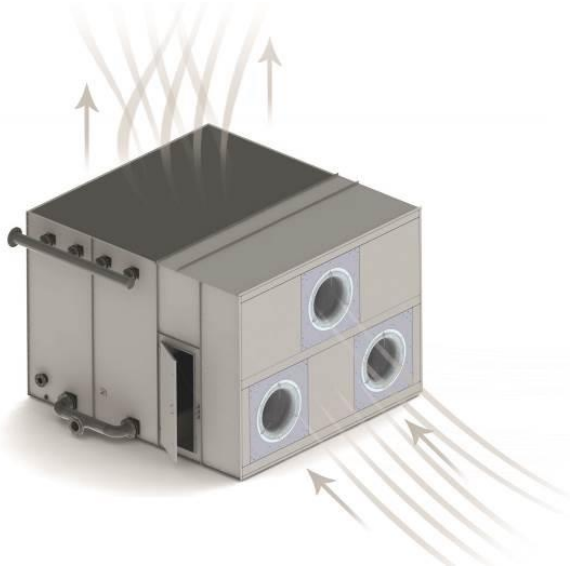
Technical Documentation

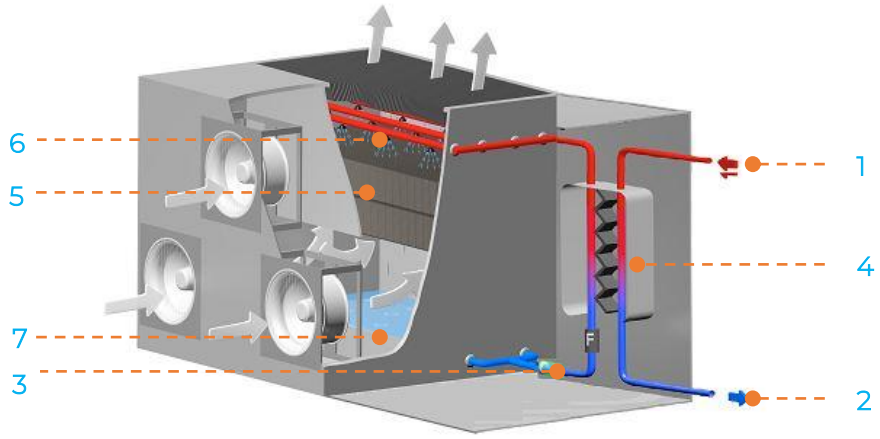
La FRENCH FAB

Operating principle

A water-cooling tower with an innovative design that complies with and is even ahead of December 2020 NF E 38-424 standard: the extremely quiet "Plug and Play" centrifugal fans suck in the air to cool the water distributed optimally over the exchange surface. Entirely designed to ease maintenance thanks to its integrated technical room, the DTC is a concentrate of energy efficiency, even in cases where space is limited: it can be installed in a corner.



Operation of a closed wet air cooler



Process (primary) side:

The water to be cooled (1) enters into the integrated plate heat exchanger and exits once cooled (2). Primary (user) circuit is closed and is not in contact with the air.

Cooling tower side (evaporation):

Water is sucked up by a pump (3), circulates through the plate heat exchanger (4) protected by 2 filters. The water leaving the exchanger is brought to the top of the device through a pipe. This water is fractionated and dispersed on the runoff surfaces (5) by dispersers (6).

The air forced by the fan enters through the lower part of the cell and escapes through the upper part after heating up and saturated with water, passing between the runoff surfaces.

Under the action of the surface tension due to the meshes of the runoff surfaces, the water spreads evenly, and runs down their entire height from both sides of the PVC mesh. The exchange surface is thus increased.

The water, cooled by forced ventilation, falls in free fall into the inclined basin (7) located at the bottom of the device.

General description and benefits DTC range

General description

The DTC cooling tower is composed of 2 perfectly sealed, assembled casings:

- One casing dedicated to water circulation: water distribution, packing, basin and its accessories,
- One casing dedicated to airflow circulation, equipped with a maintenance corridor running along the entire width of the tower.

Each tower is equipped with:

- An ultra-quiet highly power efficient EC motors: 64 dBA at 3 meters for 1.2 MW,
- Centrifugal jet fans (world first),
- A hygienic basin whose sloping and flat bottom allows easy and total emptying thanks to Jacir POWER FLOW technology

Benefits of DTCF serie

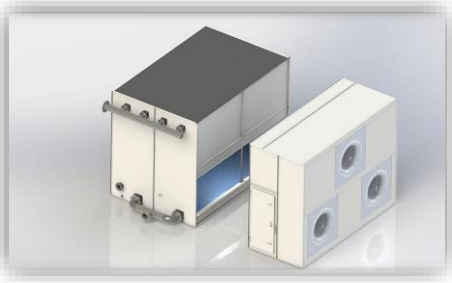
∞ SAFETY and HYGIENE	Tower design compliant with NF E 38-424 and VDI 2047-2 standards relating to hygienic risks (legionellosis)
∞ TIGHTNESS	Jacir jointing construction technology perfectly watertight.
∞ SILENCE	Ultra-quiet towers in standard version achieving exceptionally low sound levels.
∞ INFILL	Highly efficient, offering a wide exchange surface and temperature resistance
∞ ANTICORROSION PROTECTION	The tower casing is assembled without welding, made in galvanized steel, or X-STEEL stainless-steel as an option (corrosion resistance higher than that of 316L)
∞ EASY MAINTENANCE	Specially designed to ease maintenance: ∞ Direct motor/fan coupling ∞ An integrated access door leading to a technical room located between the wet section of the tower and the ventilation facilitates the maintenance operation, all at human height.
∞ ELECTRICAL CONSUMPTION	Optimized power consumption per EC motor. Technology in compliance with Eco conception (UE) 327/2011 concerning Directive 2009/125/CE application (ErP) for minimum efficiency thresholds after 2015.
∞ EVOLUTIVE TOWER	Possibility to upgrade the equipment to a closed-circuit and additional soundproofing
∞ MODULAR CONSTRUCTION	Easy transport and handling
∞ EXCHANGER ROOM	Galvanized steel construction (in standard), removable panels, all designed for easy access and maintenance.

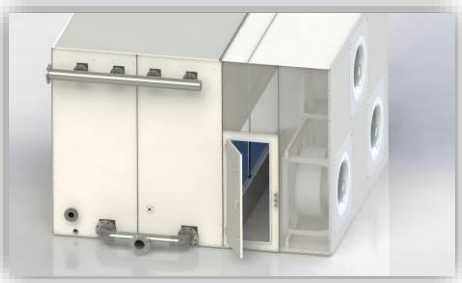
Tower casing

Self-supporting stiff panels, with double or quadruple folds on all four sides of the panel (Jacir design) allowing the body tower soundproofing if needed. Thanks to this technology we can offer towers with an extremely low sound level.

The tower is assembled with waterproof stainless-steel rivets (tightness and uniformity of clamping). Neither welding nor screws are used for panel's assembly for sections in contact with water; a specially designed seal provides the water tightness between panels.

DTC range cooling towers is designed for an optimized transport and final assembly of its 2 modules.





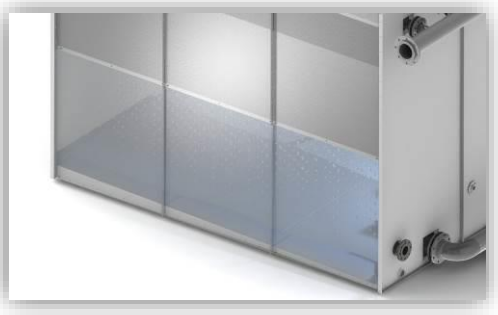
As standard, the panels are made of 2mm thick galvanised sheet, ZENDZIMIR process at 275 gr/m² (the protection of the galvanised sheets is ensured by formation of zinc oxidation on the surface).

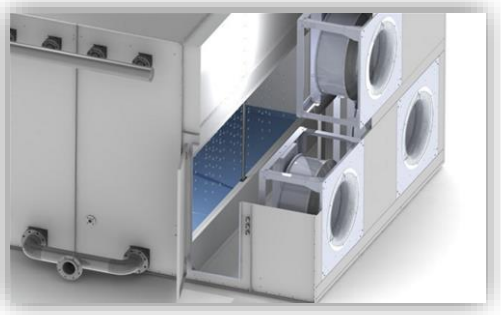
As an option, X-STEEL stainless-steel (corrosion resistance superior to 316L) is proposed, either for airflow circulation casing, or for water circulation casing, or both casings.

Material for the hydraulic connections is similar to the one chosen for water circulation casing.

Inclined and flat bottom basin

The large capacity basin's able to adapt the response time of the facility. Its sloping and flat bottom allows easy and total draining. Easily accessible through the integrated technical corridor with its dedicated access door.





The basin includes:

- An easily adjustable float valve,
- An overflow,
- An anti-freeze resistance, as an option: in 230V or 400V and waterproof thermostat with separate bulb,
- A drain opening and a POWER FLOW hatch below the low level of the basin to ease rapid removal of impurities during cleaning,
- A water outlet through removable strainer (stainless-steel or HDPE according to ND) with a large capacity flange witch suction design eliminates cavitation risk, and a filter,
- For the control of the resistor, proper contactors are necessary.

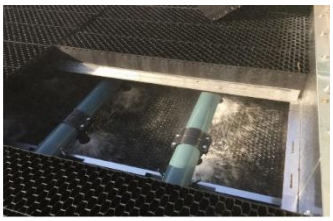
Heat exchange surface: EFFI-PACK

Made of thermoformed and welded polypropylene sheets, the EFFI-PACK exchange surface is shock-resistant and offers a maximum exchange surface with a large free surface area.

- good temperature resistance (75°C continuous),
- large surface area of high efficiency,
- ease of maintenance,
- high resistance to chemical agents,
- operating range up to 95°C on request (option)

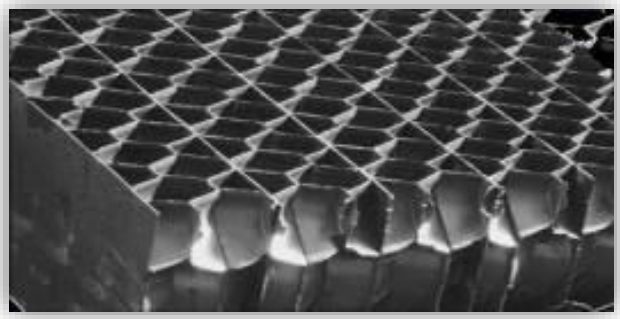
Water distribution

The water is distributed through PVC ramps equipped with highly efficient distributors distributing water in the form of a full jet cone. Screwed by wide clamps to distribution ramps, they can be easily dismantled while ensuring very good mechanical strength. An internal turbulator distributes the water evenly over the entire exchange surface.



Drift eliminators

Highly efficient, they prevent the water from being sprayed out of the tower. Ultraviolet rays resistant, they are easily removable from the top of the tower in order to access to the distributors and the exchange surface. The drift level is certified lower than 0.01% of the water flow.
Drifts efficiency is certified by an independent party (EUROVENT).



Tower design compliant with December 2020 NF E 38-424 and VDI 2047-2 standards relating to hygienic risks

Improved accessibility for maintenance: the technical room integrated into the tower offers total and immediate access to all its internal parts: drift eliminators, exchange surface, water distribution ramps, basin with its accessories, motors and fans: maintenance is simplified even in hydraulic operation.

« Plug fans » motor-fan set

Quiet, compact fans with EC motor integrated directly into the impeller. Extremely compact and silent jet fan units are equipped with EC motors directly integrated to the wheel with efficiency superior to IE4 class, without any use of rare-earths magnets. Fans are directly coupled to the motors.
EC motor with suction impeller on a single side permanently controlled by electronically commutation. The variation of the power electronics integrated in the EC motors is compatible with 380 à 480 V- IP 55.

Optional « Plug and Play » system for fan control.

The choice of this technology is in compliance with Eco conception (UE) 327/2011 concerning Directive 2009/125/CE application (ErP) for minimum efficiency thresholds after 2015.

Plume suppression coil (OPTION)

As standard, the battery consists of a steel manifold coated with a primary + epoxy paint. Two air vents ensure frost control. The tubes, arranged in a triangular pitch, are made of copper. As an option, they can be made of stainless-steel. The fins are made of copper or stainless-steel. The pitch is 3 mm as standard. A motorised valve which regulates the packing watering is coupled with the battery. Whenever weather conditions permit, this allows substantial water savings by evacuating heat thanks to the dry coil rather than by evaporation.

WATER-WATER EXCHANGE: USER CIRCUIT
Exchanger room integrated to the cooling tower

Made of galvanized steel in standard, self-supporting stiff panels equipped with an access door (2100 x 600 mm) with key lockers. The panels can be disassembled, and all components are designed for easy access and maintenance. As a standard, the exchanger room is equipped with automatic presence detection lightening.

Plate heat exchanger

It is protected from weather conditions inside its dedicated room. User's connection is directly fixed outside the room to facilitate connection with primary circuit, with only two connections: inlet and outlet located either in the cooling tower axe or perpendicularly. It does not require antifreeze protection: in case of electrical stop, the water-cooling tower circuit automatically drains by gravity down the basin, protecting by the way plates and gaskets of the plate heat exchanger. For easy re-assembly, Jacir selects with symmetrical plates and clipped gaskets.

Heat exchanger pump

Protected against freezing by a patented thermostatic valve: no electrical tracing need. A water level switch is included and a pump frequency drive is also proposed as an option.

Pressure meters

Protected against freezing by a patented thermostatic valve: no electrical tracing need. A water level switch is included and a pump frequency drive is also proposed as an option.

FRC centrifugal filter Jacir patent

Protected against freezing by a patented thermostatic valve: no electrical tracing need. A water level switch is included and a pump frequency drive is also proposed as an option. It offers the following characteristics:

- 100 % of the cooling tower flow is filtered continuously every minute: very high efficiency at 60 µm for all elements with density superior to 1,
- Automatic cleaning during the blow down of water circuit.

The evaporative circuit remains clean and avoids Legionella growth risk.

Automatic Inductive blow down (AiD)

Automatic Inductive blow down is available in option.

Sound attenuation (options)

IB sound attenuation

Sound trap in the fan box, between each fan, made of rock wool, glass veil and expanded metal in galvanized steel. An absorbent material will be deployed on the ceiling of the fan box.
Discharge sound trap made up of a soundproof cone making it possible to reduce the acoustic radiation surface.
Installed in the basin and on the opposite wall of the EFFI-SILENT system fan

ICV sound attenuation

Sound trap in the fan box, between each fan, made of rock wool, glass veil and expanded metal in galvanized steel. An absorbent material will be deployed on the ceiling of the fan box.
Discharge sound trap made up of a soundproof cone to reduce the surface area of acoustic radiation.

Installed in the basin and on the opposite wall of the EFFI-SILENT system fan. The casing, the fan box and the discharge box, consists of a box made of self-supporting rigid panels, double folded outwards on its 4 sides. The interior is lined with absorbent material and it contains sound traps with its acoustic baffles. The galvanized sheet baffles, made of high-density rock wool panels, are mounted on easily removable racks. On suction, the rock wool is protected by a glass veil. On delivery, the baffles receive protection reinforced by expanded metal in stainless-steel.

ICVK complete soundproofing with double tower body

The entire ICV version tower receives a lining made of high-density rock wool covered by an additional sheet: ICV-K.

OPTIONS

- Soundproofing: reinforced acoustics,
- EFFI-SILENT noise abatement for cooling towers basins,
- Plume suppression system,
- X-STEEL stainless steel casing (higher corrosion resistance than 316L),
- Antifreeze heater with thermostat,
- Water supply by electric level control (with solenoid valve and filter),
- Automatic inductive blow down (see AID documentation),
- Air pressure available for duct connection,
- Material delivered in individual parts to be assembled,
- Assembly on site by our experienced technicians,
- Optional "Plug and Play" system: fan controls.

Technical characteristics DTCF

DTCF serie	Absorbed power [kW]*	Fans			Sound power without sound attenuation** [Lw]	Sound power with IB sound attenuation ** [Lw]	Sound power with ICV sound attenuation ** [Lw]
		Qty	Ø [mm]	Available power [kW]			
DTCF-2315-PA-1-1000-64	400	1	1 000	6,4	89	81	74
DTCF-2324-PA-2-1000-64	630	2	1 000	12,8	91	83	76
DTCF-2336-PA-3-1000-64	950	3	1 000	19,2	92	85	77
DTCF-2348-PA-4-1000-64	1 270	4	1 000	25,6	94	86	78
DTCF-2360-PA-5-1000-64	1 580	5	1 000	32	95	87	79
DTCF-2372-PA-6-1000-64	1 900	6	1 000	38,4	95	87	79
DTCF-2384-PA-7-1000-64	2 200	7	1 000	44,8	96	88	80

* Data based on a thermal regime of 32/27/21°C
** +ou- 2dB(A)

Weights and Dimensions DTCF

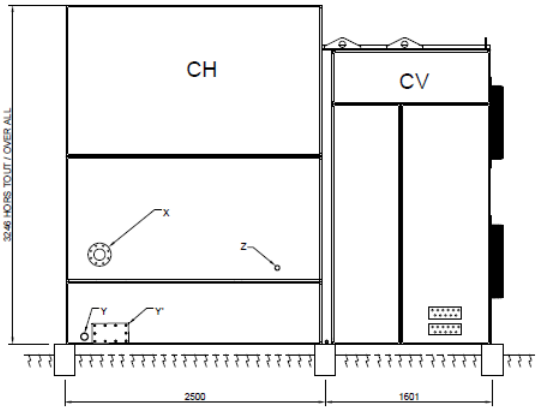
DTCF serie without sound attenuation	Motor Fan set Qty	Dimensions			Weight empty [Kg]	Weight in operation [Kg]	Water inlet [DN]
		Lenght (overall)	Width (overall)	Height (overall)			
DTCF-2315-PA-1-1000-64	1	3 440	4 186	3 246	3 375	6 050	100
DTCF-2324-PA-2-1000-64	2	4 240	4 186	3 246	4 085	7 872	100
DTCF-2336-PA-3-1000-64	3	5 540	4 186	3 246	4 846	10 126	100
DTCF-2348-PA-4-1000-64	4	6 740	4 186	3 246	5 607	12 371	100
DTCF-2360-PA-5-1000-64	5	7 940	4 186	3 246	6 389	14 635	150
DTCF-2372-PA-6-1000-64	6	9 140	4 186	3 246	7 171	16 630	150
DTCF-2384-PA-7-1000-64	7	10 340	4 186	3 246	7 953	18 848	150

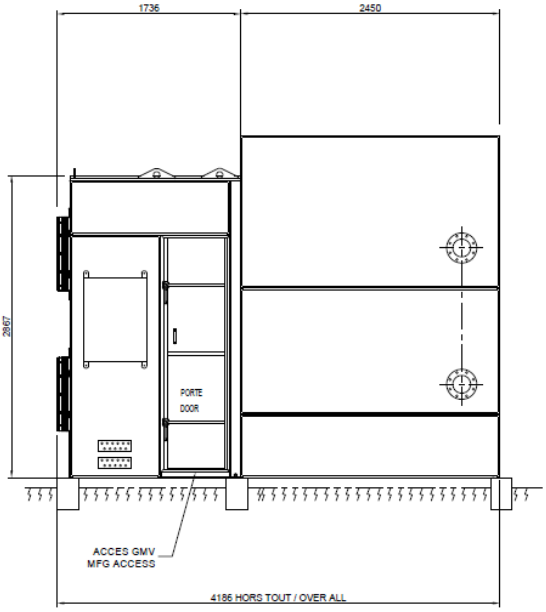
DTCF IB serie	Motor Fan set Qty	Dimensions			Weight empty [Kg]	Weight in operation [Kg]	Water inlet [DN]
		Lenght (overall)	Width (overall)	Height (overall)			
DTCF-2315-PA-1-1000-64	1	3 440	4 186	4 246	3 578	6 253	100
DTCF-2324-PA-2-1000-64	2	4 240	4 186	4 246	4 449	8 236	100
DTCF-2336-PA-3-1000-64	3	5 540	4 186	4 246	5 282	10 562	100
DTCF-2348-PA-4-1000-64	4	6 740	4 186	4 246	6 221	12 985	100
DTCF-2360-PA-5-1000-64	5	7 940	4 186	4 246	7 075	15 321	150
DTCF-2372-PA-6-1000-64	6	9 140	4 186	4 246	8 036	12 985	150
DTCF-2384-PA-7-1000-64	7	10 340	4 186	4 246	8 890	19 785	150

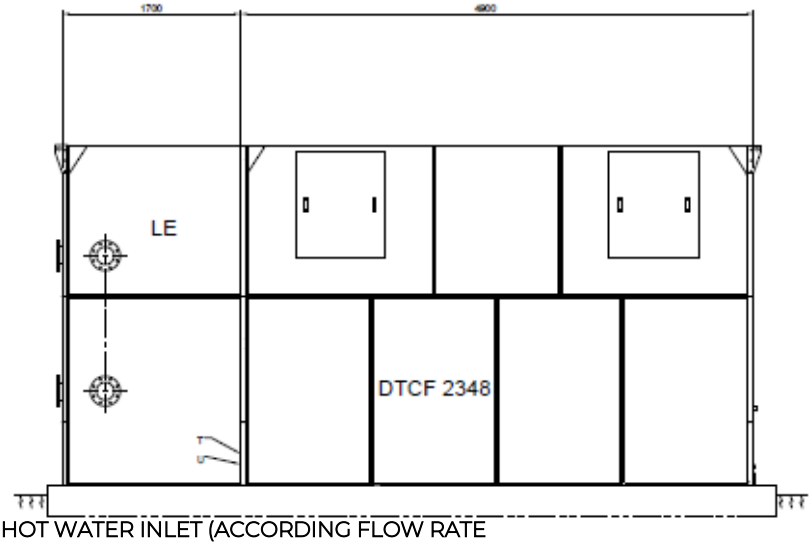
DTCF ICV serie	Motor Fan set Qty	Dimensions			Weight empty [Kg]	Weight in operation [Kg]	Water inlet [DN]
		Lenght (overall)	Width (overall)	Height (overall)			
DTCF-2315-PA-1-1000-64	1	3 440	4 950	4 746	3 924	6 599	100
DTCF-2324-PA-2-1000-64	2	4 240	4 950	4 746	4 797	8 584	100
DTCF-2336-PA-3-1000-64	3	5 540	4 950	4 746	5 776	11 056	100
DTCF-2348-PA-4-1000-64	4	6 740	4 950	4 746	6 754	13 518	100
DTCF-2360-PA-5-1000-64	5	7 940	4 950	4 746	7 753	15 999	150
DTCF-2372-PA-6-1000-64	6	9 140	4 950	4 746	8 763	18 222	150
DTCF-2384-PA-7-1000-64	7	10 340	4 950	4 746	9 763	20 658	150

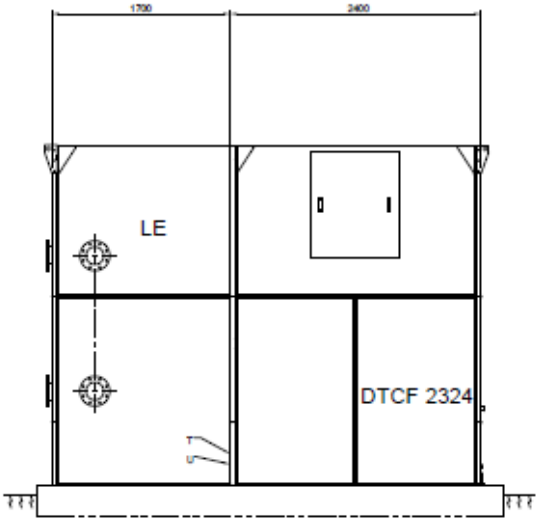
Drawings DTCF without sound attenuation – 2/4/6 Motor-fan sets

CH: WET CASING
CV: VENTILATION CASING
LE: EXCHANGER ROOM

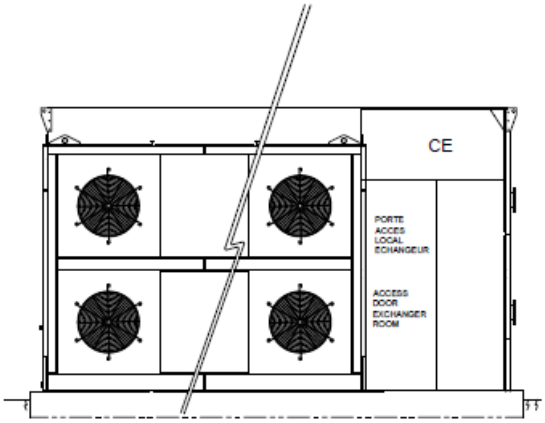


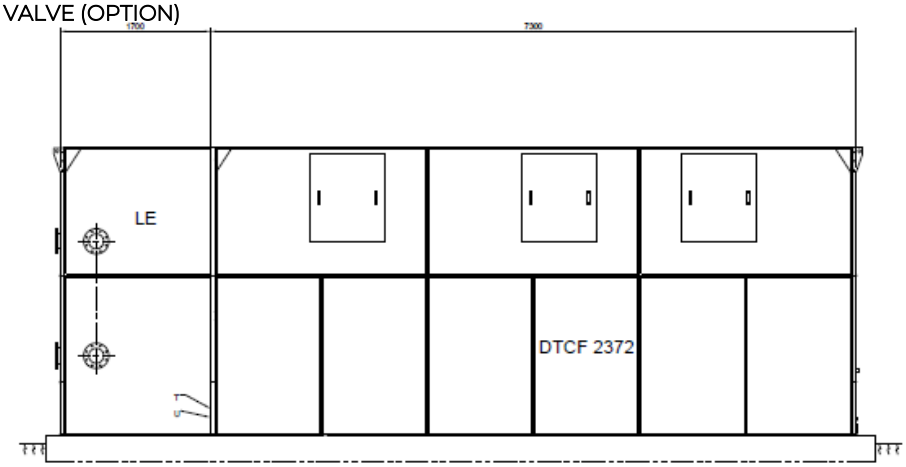






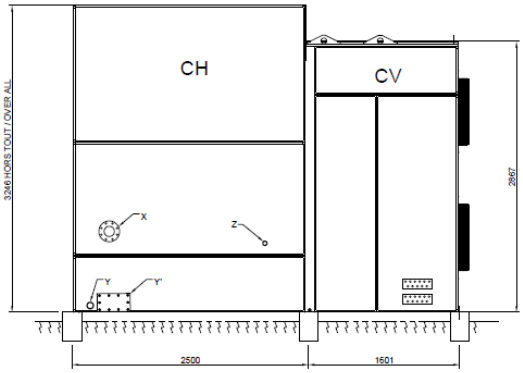
S: HOT WATER INLET (ACCORDING FLOW RATE
T: WATER LEVEL CONTACTORS (OPTION)
U: ANTI FREEZE RESISTOR (OPTION)
W: COLD WATER INLET ND150 (ACCORDING FLOW RATE)
X: OVERFLOW ND100 TURNING FLANGE PP PN16
Y: DRAIN FEMAL ND50
Y': POWER FLOW BASIN TRAP
Z: WAKE UP WATER BY FLOATING TAP OR SOLENOID VALVE (OPTION)

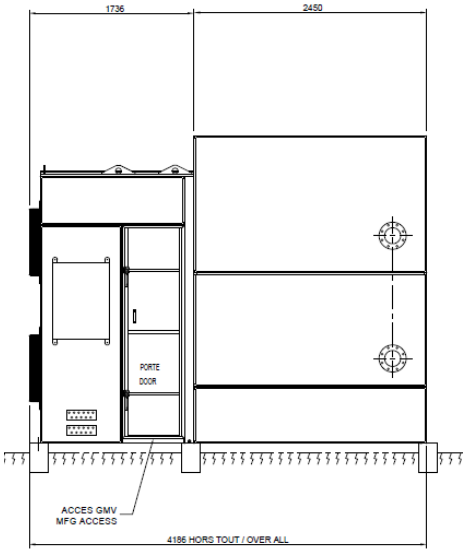


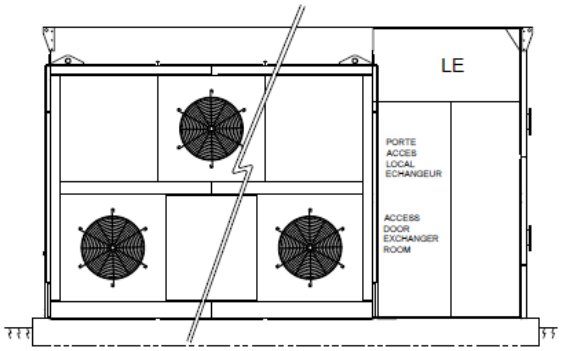


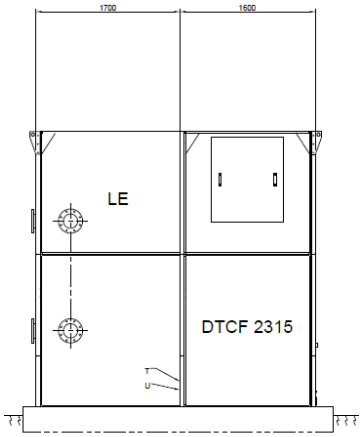
Drawings DTCF without sound attenuation – 1/3/5/7 motor-fan sets

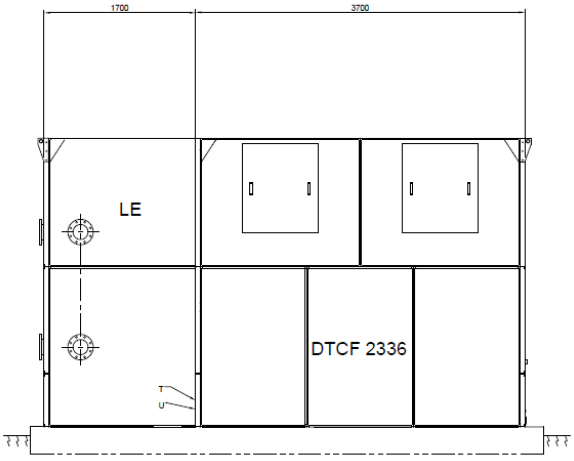
CH: WET CASING
CV: VENTILATION CASING
LE: EXCHANGER ROOM

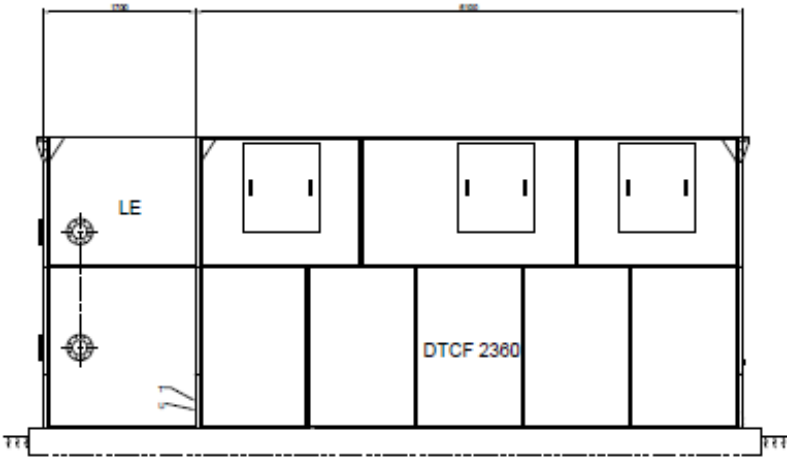


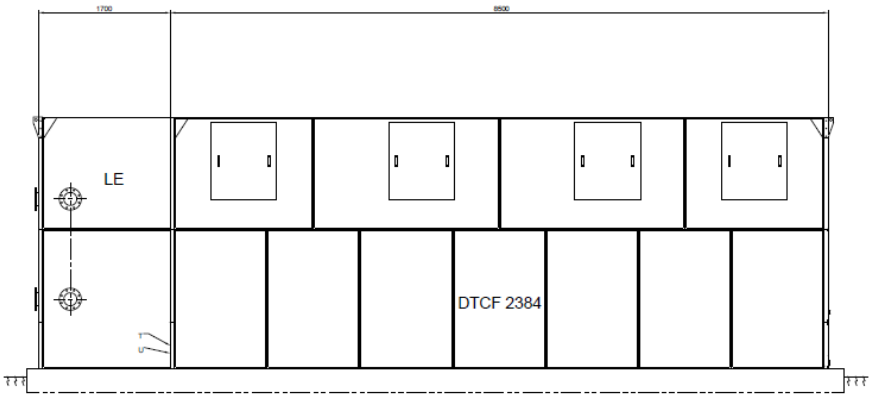






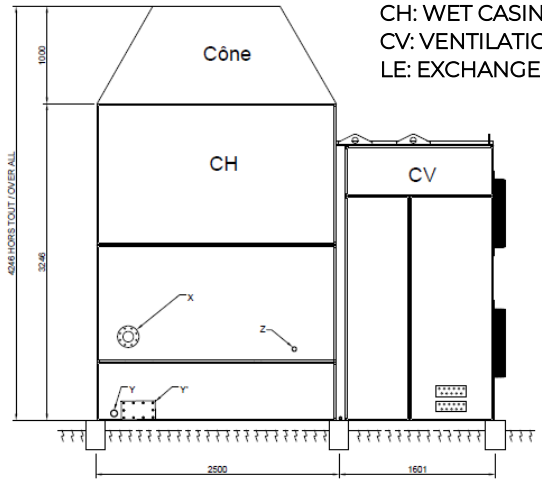


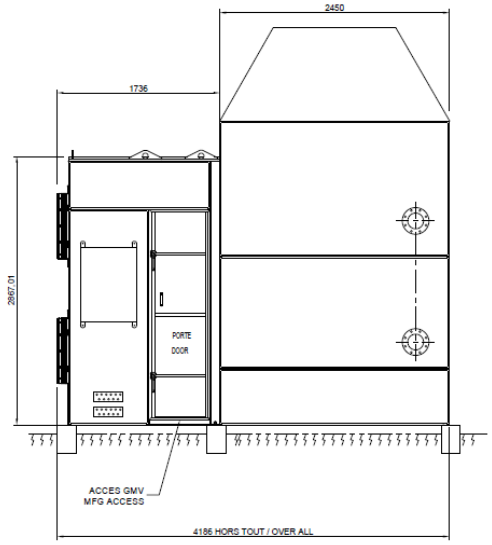


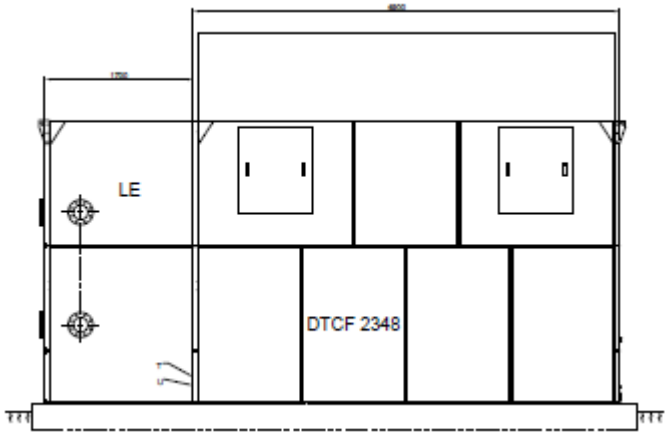


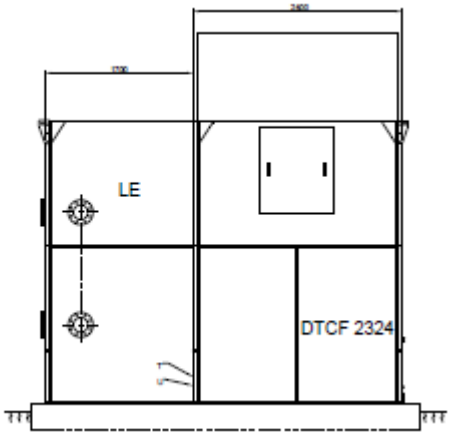
Drawings DTCF IB sound attenuation – 2/4/6 Motor-fan sets

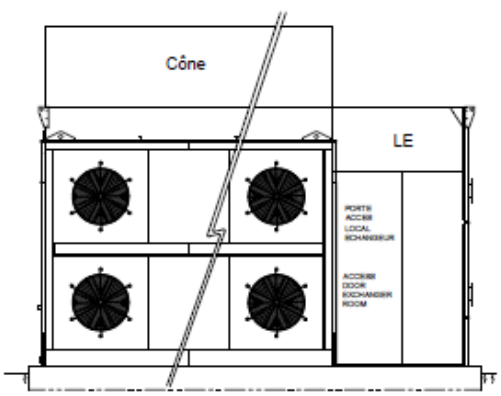
CH: WET CASING
CV: VENTILATION CASING
LE: EXCHANGER ROOM

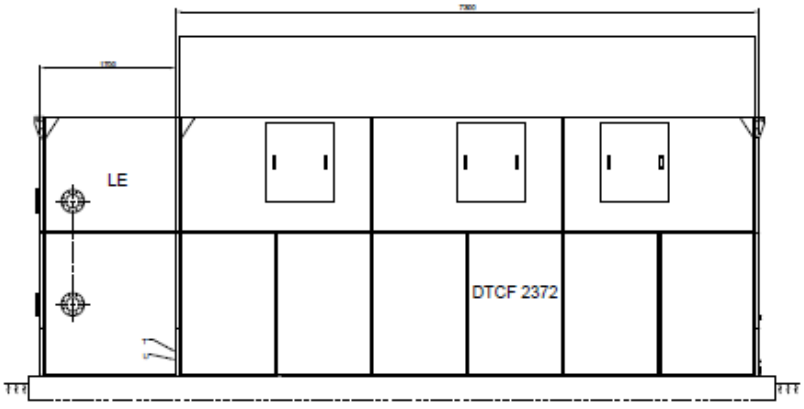






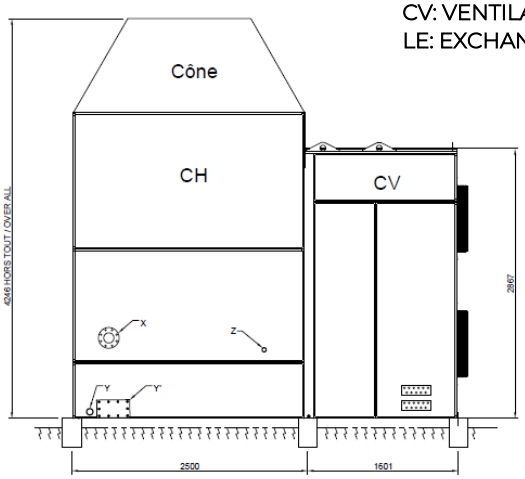


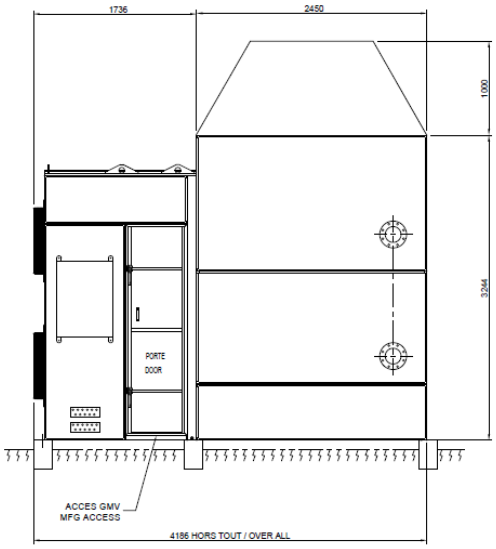


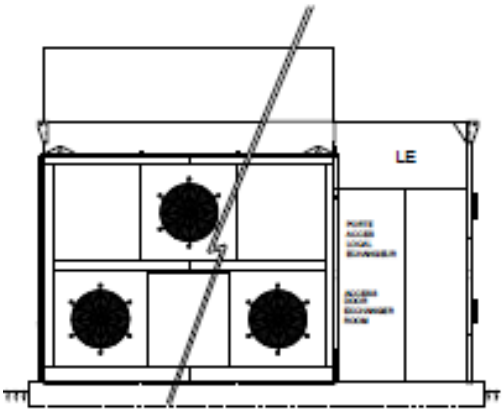


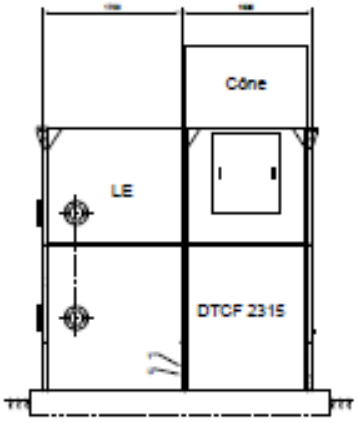
Drawings DTCF IB sound attenuation – 1/3/5/7 Motor-fan sets

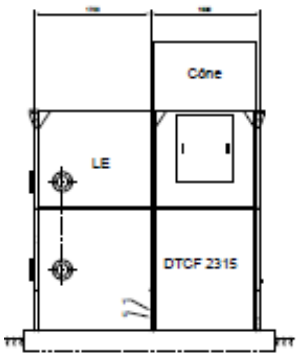
CH: WET CASING
CV: VENTILATION CASING
LE: EXCHANGER ROOM

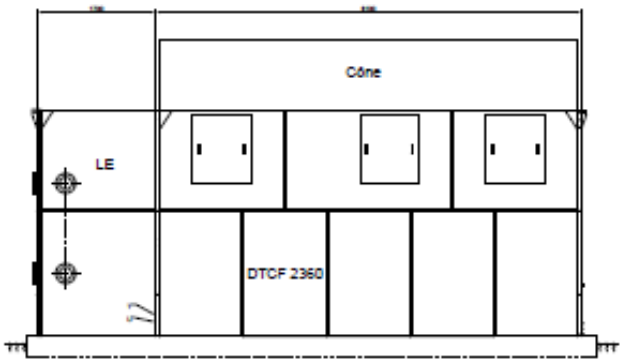


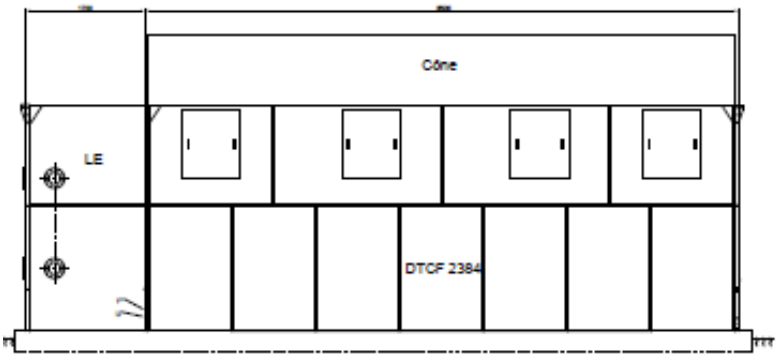






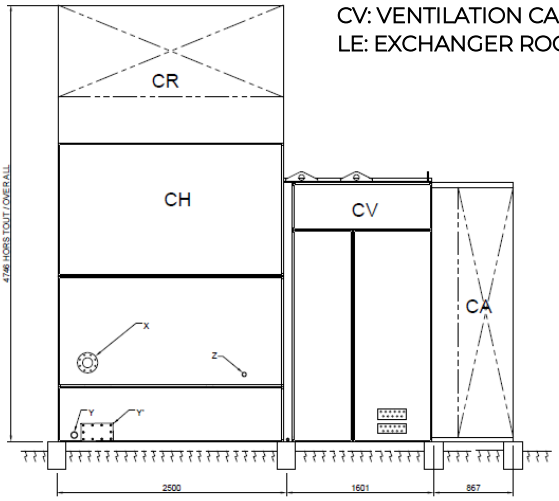


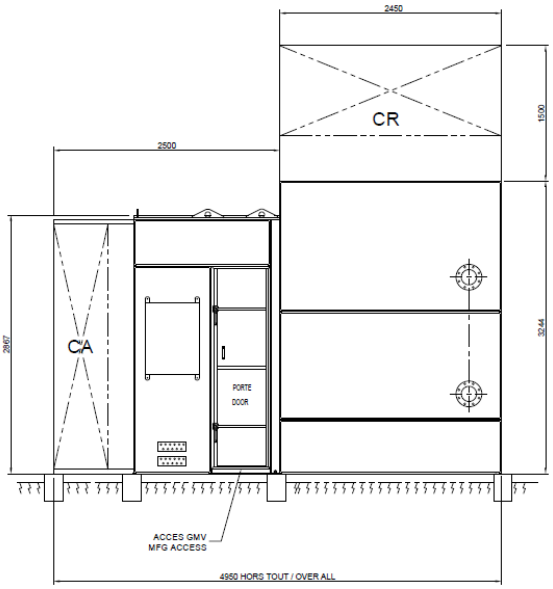


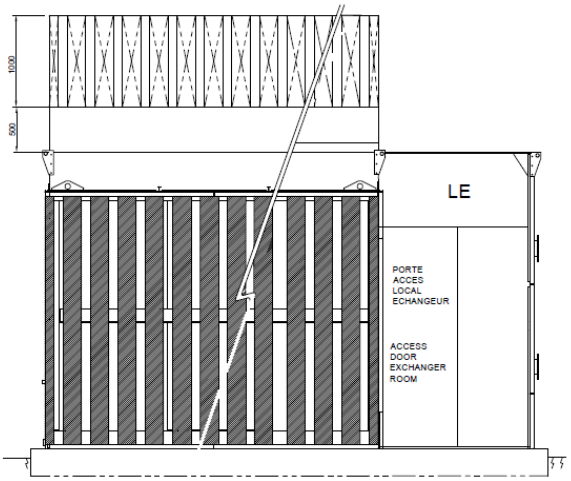


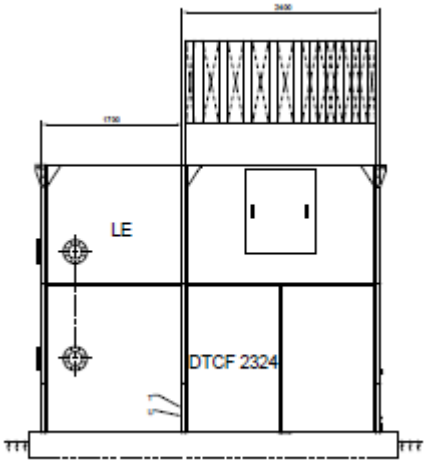
Drawings DTCF ICV sound attenuation – 2/4/6 Motor-fan sets

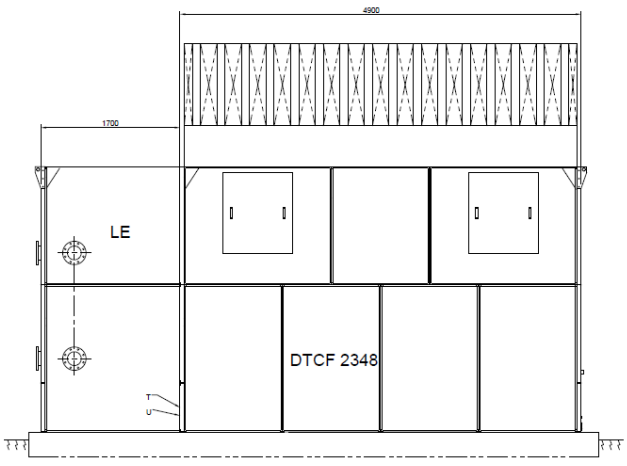
CH: WET CASING
CV: VENTILATION CASING
LE: EXCHANGER ROOM

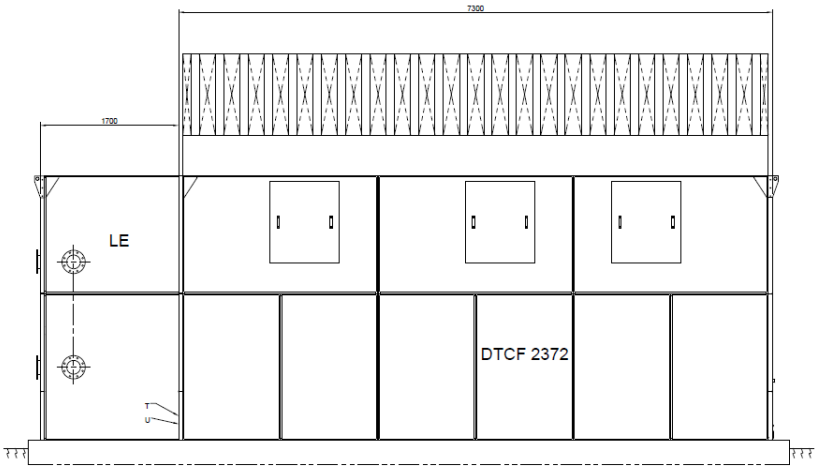






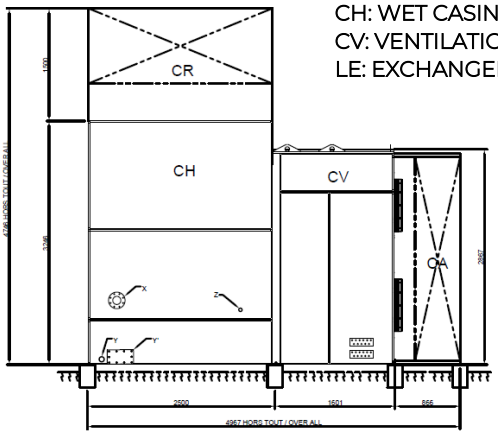


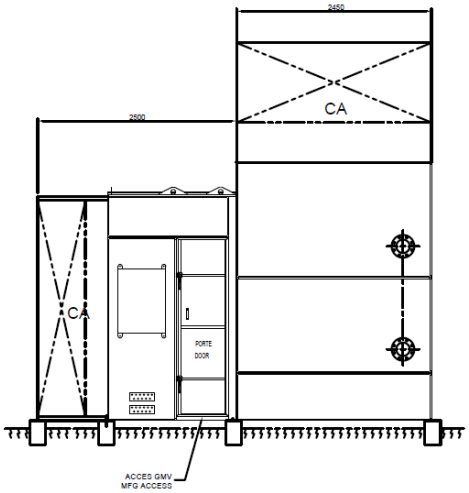


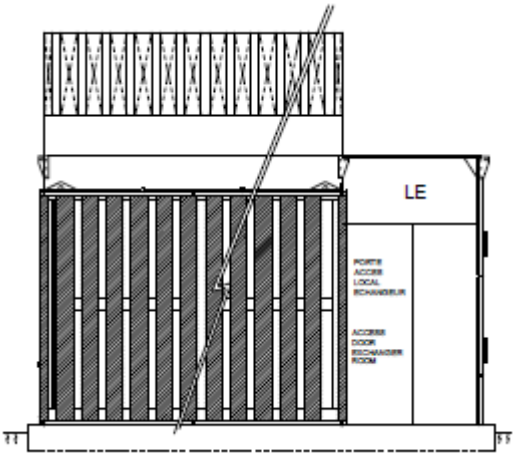


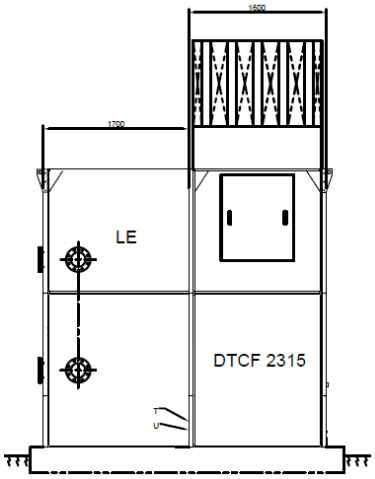
Drawings DTCF ICV sound attenuation – 1/3/5/7 Motor-fan sets

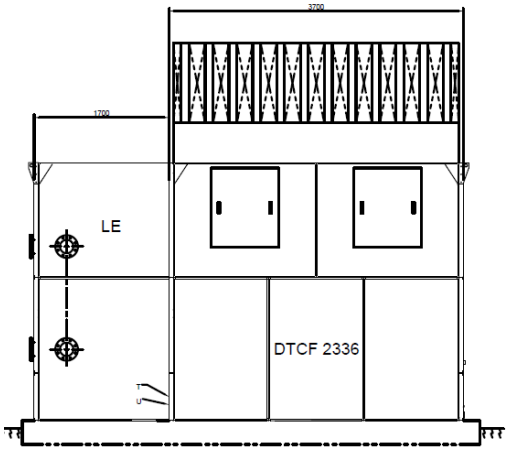
CH: WET CASING
CV: VENTILATION CASING
LE: EXCHANGER ROOM

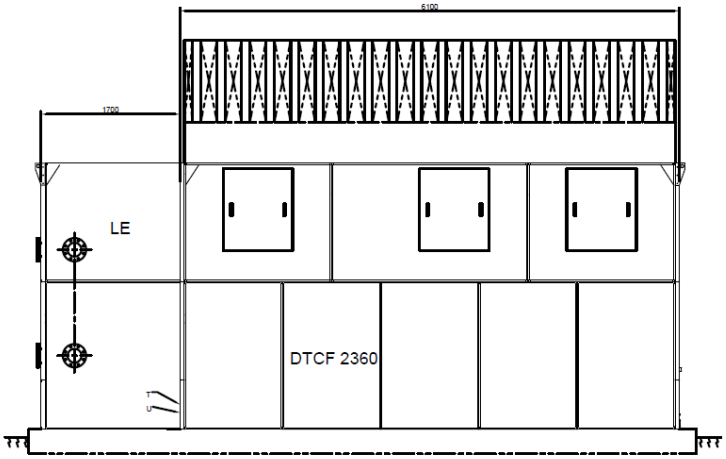


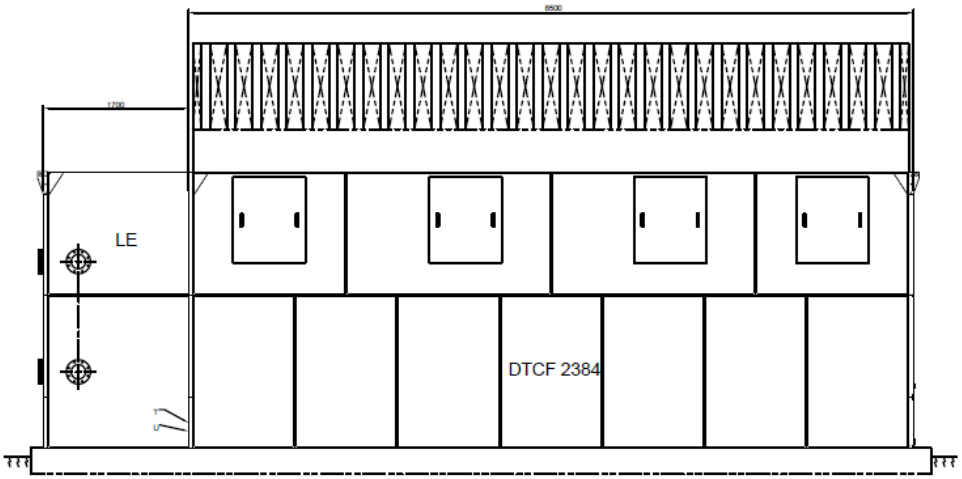








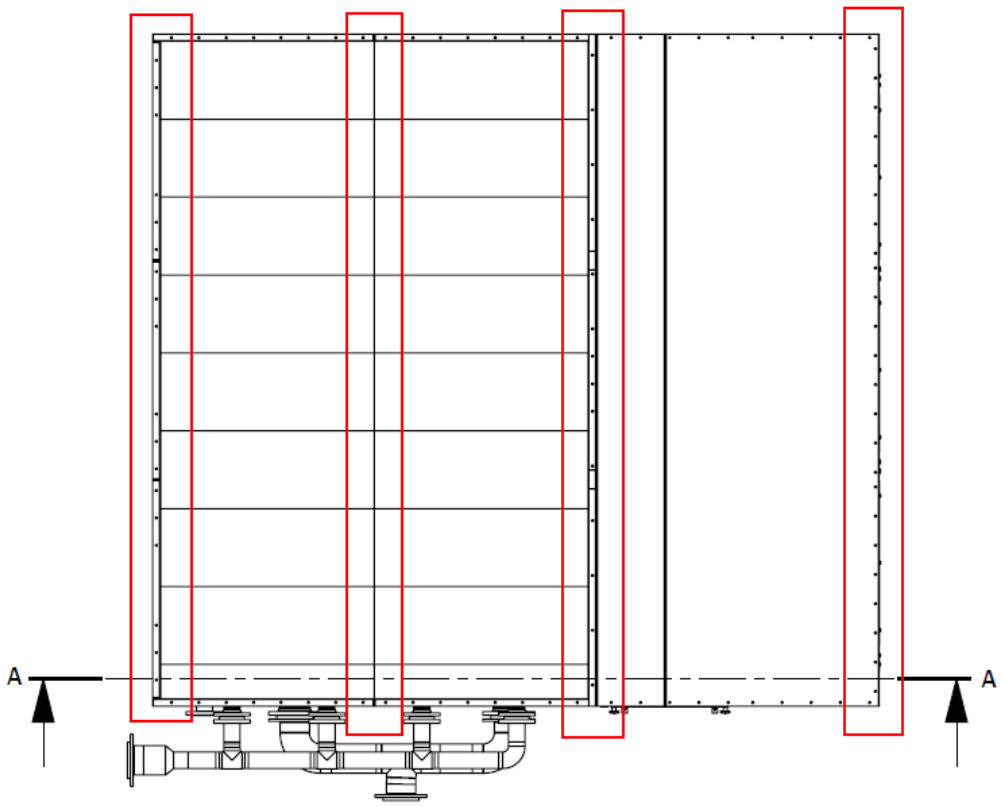




On site layout DTCF

Our cooling towers can stand on the ground or on a concrete floor base, but it is advisable to install them on concrete stringers or support irons (steel frame beams).
Make sure that the floor receiving the cooling tower can support the load during operation and that the floor or supports form a correct plane.

Number and position of concrete beams or support bars (customer supply)



Choice of location DTCF

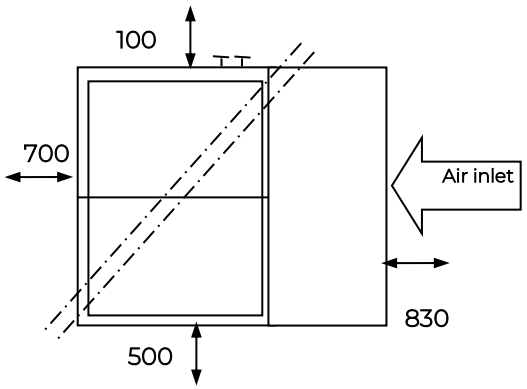
The cooling tower must not be surrounded on all sides by walls higher or equal to its height, and moreover without an opening, because a "short circuit" risk could occur. The air discharged at the tower exit (hot, moisture-saturated air) could then be recycled into the unit and consequently reduce the thermal output of the tower.

In any case, you must respect minimum clearances around all four sides of the tower to ensure a correct air supply for fans and sufficient access for assembly and maintenance.

Failure to observe these rules would inevitably lead to a malfunction of the cooling tower.

Recommended minimum spacings in mm: diagram from above

Tower without sound attenuation

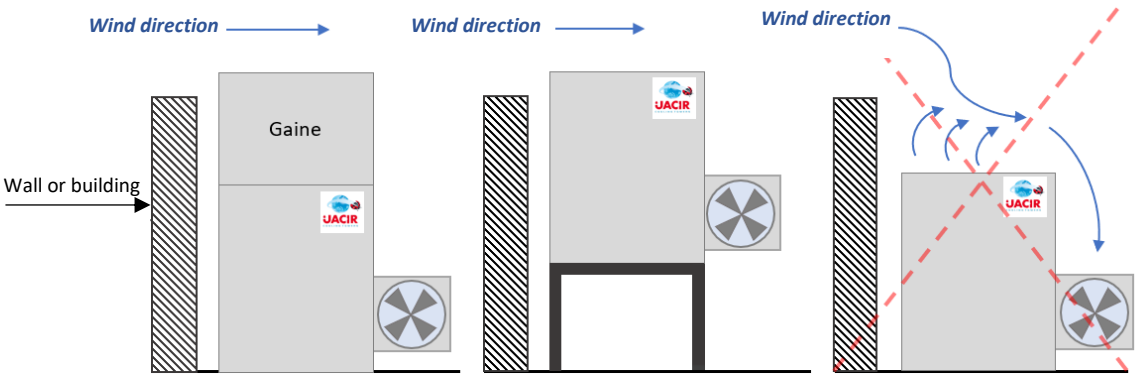


Please contact us for advice

Examples of implantation

The location choice for tower installation must follow these recommendations:

- ∞ The air intake area must always be kept free of any major obstruction.
  - ⇨ The obstacle-free distance to be kept around each air inlet is shown on the overall plan and is approximately 1 metre (unless otherwise stated)
- ∞ The air discharge must not be disturbed either by direct obstacles.
  - ⇨ He installation of acoustic baffles or ducts must be approved by JACIR's Technical Department.
- ∞ The risk of hot air being blown back (at tower outlet) to the air intake area must be prevented.
  - ⇨ The direction of the prevailing wind and the proximity of surrounding buildings (possibly generating risks of back-flow) are elements to be considered.



WATER EVAPORATION

Consumption by evaporation is approximately 1.7 kg/h per 1,000 kcal/h.

DECONCENTRATION

Due to evaporation and water recycling, there is a concentration of impurities or salts in the water. To prevent it from exceeding a limit value deconcentration purges must be carried out.
Without this purging considerable concentration rates (Tx) of 10, 100, or even 1000 would occur over time.
For the pre-sizing of galvanized steel equipment, consider drain value of twice the evaporation level (Tx=2). For operation connected with a monitored water treatment this value may decrease, especially if the cooling tower casing is made of stainless-steel (rates of 3 to 5 possible).

Depending on the situation three deconcentration solutions can be sorted:
1- Continues purges
Connect to the pump outlet just before the tower, if possible, at the sprayer booms, so that the pump is only vented when it is running.
The flow rate for bleeding can be calculated by the formula:[100 S / (M - S)] % of the make-up water flow rate with:
S : Salinity of the make-up water compensating evaporation.
M : Maximum permissible salinity in the circuits.

Example:
Salinity of the make-up water = TH 20°.
Maximum permissible salinity = TH 40°.
100 x 20 / (40 - 20) = 100 % of make-up water flow rate
So the continuous purge must be equal to the volume of water evaporated.
As a result, the actual make-up water flow rate is twice the theoretical evaporation flow rate.

2- Discontinuous purges

The water's conductivity in the circuit is checked and the system purged according to the value not to be exceeded.

3- Maintenance-free JACIR automated inductive deconcentration

Through conductivity measurement, it is possible to control a motorised valve which allows a flow to the sewer corresponding to the quantity of water necessary to maintain a correct concentration value (See separate document).

WATER TREATMENT

To ensure the proper functioning of a closed-circuit cooling system, it is essential to have good quality of water. If the water is contaminated with coarse impurities, it is recommended that 5-10% of the recirculated water flow should be filtered off in bypass. If the water contains encrusting salts or chemically aggressive elements, a make-up water treatment must be carried out to obtain a softer water close to chemical neutrality, capable of supplying the machines to be cooled without risk of damage.
In some cases, algae, mosses, fungi or shellfish may tend to grow in a cooling tower. There are products that, when added periodically to the circuit water, prevent the development of these organisms.

Water treatment should be entrusted to specialised companies.
LEGIONELLOSIS RISK PREVENTION: (see separate document)

Highly energy-efficient open-circuit evaporative water-cooling tower with EC motors integrated in jet centrifugal fans the JACIR DTCF range.....

EC motor with suction impeller on a single side will be permanently controlled by electronically commutation. Its efficiency will be really superior to IE4 efficiency class, without any use of rare Earth's magnets.
The variation of the power electronics integrated in the EC motors will be compatible with 380 à 480 V- IP 55
The system will be double exchange based with a direct counter current air-water exchange system.

The tower will be designed and delivered by the manufacturer in two parts to be assembled with its integrated technical Thermal characteristics

The power output will be ... kW for a speed from ...°C to ...°C with a wet suction temperature of ...°C.
The tower will have been the subject of a EUROVENT thermal performance certification.

Acoustic characteristics

The equipment sound pressure level must not exceed ... dB (A) at ... metres in open air in all four directions; thus, the tower must be equipped with sound reinforcement if necessary.

DIRECT AIR-WATER EXCHANGE: TOWER CIRCUIT
Cooling Tower casing, sloped and plane bottom basin

The tower casing will consist of self-supporting steel panels twice or 4 times folded on the 4 sides. The side panels will be designed to receive later, if necessary, a doubling of the tower body. Stainless-steel rivets with high tightening capacity will be used for assembly. Concerning casing parts in contact with water they will be assembled without any bolting, welding or screwing and particular elastomer joints replacing jointing mastic will be of use for panel's watertight assembly.

The basin will include an easily adjustable float valve, an overflow, an anti-freeze resistance and an anti-cavitation filter strainer. The sloping bottom of the basin will allow an easy and total emptying: the lower location of the drain hole (POWER FLOW) below the low point of the basin's bottom. Access to power flow will be 260 x 100mm.

The large basin's capacity will increase inertia effect and system's water treatment efficiency.

Casing structure

The cooling tower panels structure will be made of:
- 2 mm thick galvanised sheet metal, Zendzimir process at 275 gr/m² or,
- X-STEEL stainless-steel for durability, water saving and cleanability.

Hydraulic connections material will be the same chosen for the water circulation casing.

Accessibility

As standard, a technical room integrated in the tower will offer total and immediate access to all internals: drip eliminators, exchange bodies, water distribution ramps, basin with its accessories, motors and fans providing simplicity for maintenance even under operation.

Motor-fan unit

Extremely compact and silent jet fan unit will be equipped with EC motors directly integrated to the wheel with efficiency superior to IE4 class. Fans will be directly coupled to the motors.
The choice of this technology will be in compliance with Eco conception (UE) 327/2011 concerning Directive 2009/125/CE application (ErP) for minimum efficiency thresholds after 2015.

Water distribution

The water distribution will be provided by PVC ramps, equipped with easily removable polypropylene dispersers, specially designed to distribute water in an optimal way i.e., covering the entire airflow section. These dispersers will operate at low pressure (0.8 mCE), thus reducing pump power and producing large droplets that are little sensitive to vesicular entrainment.

Exchange surface

The EFFI-PACK exchange surface will be made of thermoformed and welded PP sheets.
Highly resistant to shocks and chemical agents and offering a maximized exchange surface, its free surface will be important. Resistant up to 75°C as standard, its excellent thermal efficiency will promote energy savings.

Drift eliminators

Highly efficient, they will strongly reduce water spraying out at the tower exit. Resistant to UV rays, they are easily removable from above to access the distributors and exchange surface if necessary. The drift will be 0.01% maximum of the recirculating water flow. They are certified by an independent body (EUROVENT).

WATER-WATER DIRECT EXCHANGE: TOWER CIRCUIT

Exchanger room

The stainless-steel plate heat exchanger must be protected from the elements by a galvanised body with primer paint as standard, self-supporting in at least 20/10ths, with a 2100 x 600mm inspection door and removable panels; all designed to facilitate maintenance. The connection of the exchanger will be provided outside the metal sheet by 2 flanges. The exchanger shall be provided with clip-on gaskets and symmetrical plates.

Filtration

Located at the basin outlet, a 5 mm filtration strainer is installed. A FRC centrifugal filter chosen in the same material as the piping (galvanized or 304 – 316L stainless-steel options) is located at the plate exchanger inlet.
It offers the following characteristics:

- 100 % of the cooling tower flow is filtered continuously every minute: very high efficiency,
- Automatic cleaning during the blow down of water circuit (DAi).

The evaporative circuit remains clean and avoids Legionella growth risk.

Connections

A stainless-steel strainer and a cleanable filter (on the large exchanger room only) will ensure the filtration of particles before the arrival in the plate exchanger. The water circulation in the system will be ensured by a one-piece pump pressurising the stainless-steel exchanger. This pump will be protected from freezing by a thermostatic valve.

All connection pipes will be made of galvanised steel, or optionally stainless-steel for optimised internal and external protection. As standard, a "low level" safety device will prevent the pump and possibly the antifreeze resistors from being started in the event of a "too low" water level.

Installed before and after the pump, and also before water distribution piping allowing permanent control of the circuit. A deconcentration orifice will be equipped with a control valve, with an optional solenoid valve.

The easement panels will include: an overflow device, a drain orifice and a water make-up.

Exchanger pump

Protected against freezing by a patented thermostatic valve: no electrical tracing need. A low water safety device will be included, to protect against cavitation.

Options

Water treatment can be integrated as an option, as well as Inductive Automatic Deconcentration installed in the room (see separate data sheet).
The different IB, ICV, ICVK soundproofing, or the EFFI-SILENT option will further optimize the sound level.

JACIR
Cooling for life

S

Open Circuit Cooling Tower

Water flow range from 11 to 190 m³/h

Capacity 20 to 4440 kW

- Silence
- Performance

Commercial Documentation

La FRENCH FAB

Low noise open cooling tower: S range

Casing

All the galvanized steel cooling tower panels casing have been twice or 4 times folded over the 4 sides, also proposed in X-STEEL stainless-steel as an option (corrosion resistance higher than 316L). The water tightness between the panels is ensured by a special designed high covering seal and stainless-steel rivets. The JACIR design gives extremely rigid panels once assembled, ensuring unique strength and waterproof cooling towers.

Basin

The basin has been thought to take into account the needs and inertia of the installation. In order to reduce bacteria growth, panel's assembly has been realized without any bolt or screw for the parts in contact with water. The sloped and flat basin is equipped with a drain and a POWER FLOW access, both located under the lower level of the basin, enabling a quick and complete drain of the sludge or other accumulated parts during cleaning maintenance. The basin is also equipped with integrated access door (540 x 390mm) to ease maintenance.

Water distribution

Water distribution is made with several PVC pipes which feed polypropylene nozzles and distribute water in the form of a full jet cone. These nozzles are screwed to the distribution pipes (stainless-steel screws and bolts), for an easy maintenance and a strong mechanical resistance, equipped with an internal turbulator so that a uniform water distribution reaches the exchange surface.

Exchange surface

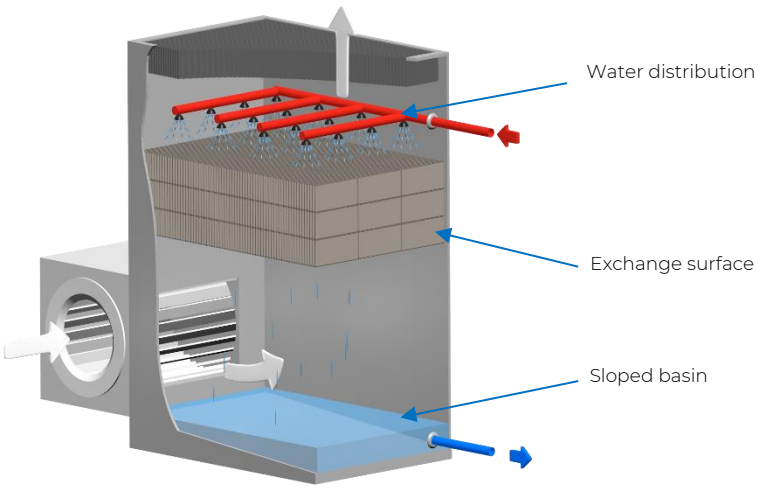
Made of highly resistant polypropylene sheets, the EFFI-PACK infill is not subject to crumbling and UV proof.

It provides a maximum exchange with free surface, avoiding fouling risks.

Accessibility

As a standard, a large access door made of the same material than the tower allows an easy removal and cleaning of the drift eliminators, sprayers, heat exchange surface and water distribution.

The « POWER FLOW » trapdoor, located under the low level of the slope basin makes the water drain and cleaning easy.



Motor fan set

The fans especially designed and manufactured by JACIR, have continuously been perfected over the years. The impeller is a double side air inlet type. Polyester air inlet ducts are profiled to optimise air suction and allow impeller removal.

All maintenance points, including the copper offset grease line, are placed in the dry airflow, out of the basin and at ground level for quick and easy access. The impeller is protected from corrosion by a baked epoxy coating. The elliptical scroll is made of X-STEEL stainless steel.

Silence

- IB sound attenuation without increase power consumption,
- ICV/ICVK or special* sound attenuation levels.

*Sound attenuation models are not ECC certified.

Options

Plume suppression coil*:

JACIR patent (hybrid SIM* series) plume suppression system: 30% to 50% water savings per year.

Automatic Inductive Blow down (Dai), frequency drive device, two speed motors, electro valve driven by level switch, all accessories in X-STEEL stainless-steel, on site erection and/or supervision, etc.

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JACIR
Cooling for life

S

Open Circuit Cooling Tower
Quiet Centrifugal Fans

CONTENT

Technical Documentation

La FRENCH FAB

JACIR

With more than 60 years' experience, our company:

- Has invested in detailed research and development in order to propose technical solutions in accordance with environmental protection through unequalled realizations and patents.
- Is today the European leader thanks to its technology beyond market requirements.

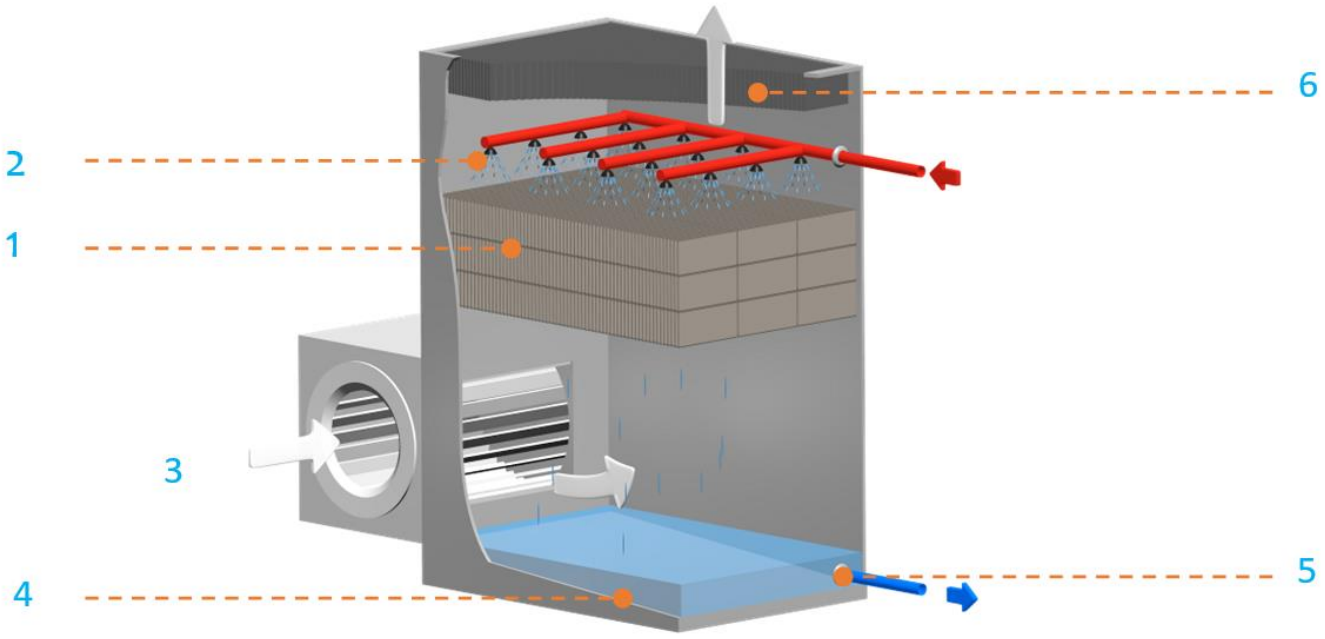
STRONG BENEFITS OF THE S

∞ SECURITY AND HYGIENE	Compliant with hygienic standards
∞ WATER PROOF	Thanks to our assembling technology, we guaranty no leak equipment.
∞ SILENCE	Very silent cooling towers in standard version, can be adapted according requirements.
∞ EXCHANGE SURFACE	EFFI-PACK: Highly efficient and easy to maintain, excellent resistance to temperature (75°C continuous) the infill may support use till 95°C as an option.
∞ ANTICORROSION COATING	Made of galvanized steel as a standard, the casing of the tower is assembled without any welding, also proposed in X-STEEL stainless steel (corrosion resistance superior to 316L).
∞ EASY MAINTENANCE	Large access doors, fan outside the tower and at man chest, inclined and plane basin for a complete drain.
∞ ELECTRICAL POWER	Fully optimized
∞ EVOLUTIVE TOWER	Possible to increase the exchanged power by addition of plates, to lower the sound level without increasing the motor power.
∞ MODULAR CONSTRUCTION	Easy handling and transport.

Open circuit cooling tower principle S

A cooling tower is a heat exchanger, which enables water to be cooled through direct contact with air, the heat transfer from the water to the air is carried out partly by sensible heat transfer, but mainly by latent heat transfer (evaporation of part of the water into the air), which makes it possible to reach cooling temperatures lower than ambient temperatures.

Operation



The hot water to be cooled is pumped to the top of the tower through pipes. This water is divided and distributed over the heat exchange surface (1) by low pressure water distribution nozzles (2).

Blown by the fan (3), the fresh air enters into the lower section of the unit and escapes through the upper section after being heated and saturated by passing through the wetted heat exchange surface.

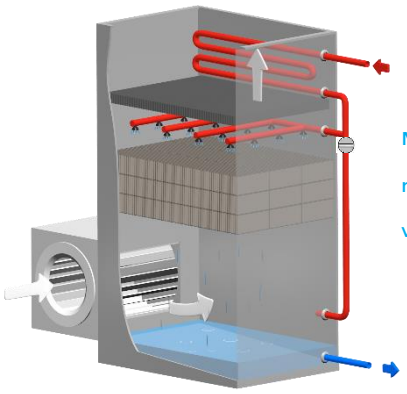
As a result of surface tension, due to exchange surface, the water spreads in uniform way, falls down the whole height. The exchange surface is then increased.

The water, cooled thanks to forced ventilation, falls into the inclined basin (4) at the bottom of the tower. Then the water is sucked through the strainer (5). Drift eliminators (6) located at air outlet reduces drifts losses.

Open Hybrid Cooling Tower principle and operation SIM

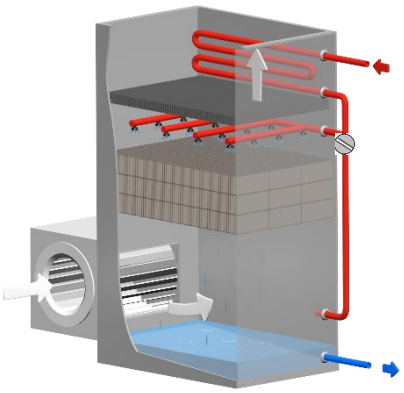
Standard S open circuit cooling tower ranges have originally been designed to receive the plume abatement coil option; these S ranges are then referred to as SIM open hybrid cooler range. Their efficiency is ensured by a finned tube coil combined with a valve for adjusting the water spray on the exchange surface (infill). This water flow regulation over the exchange surface is a market exclusivity (JACIR patent). Therefore, the combination of the air desaturation by air outlet warming up, and the reduction of the spray on the packing, ensures the complete plume suppression. Beyond the plume suppression itself, this system can provide significant water savings and is an ultimate obstacle to the drifts. This technology proposed by JACIR has been deeply researched in partnership with CETIAT for over 40 years, and has offered the opportunity to file innovating patents. Their design makes access and cleaning very easy and ensures performance durability.

Operation :



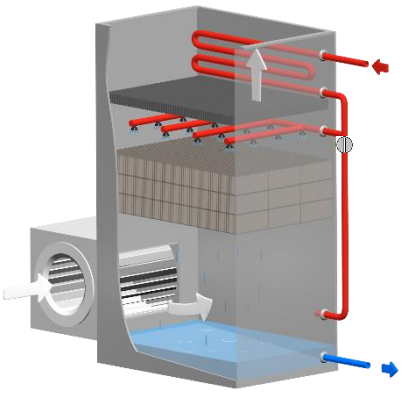
Dry operation: WINTER

The by-pass valve is totally open, so the whole water flow leaves directly the tube coil to the basin: there is no water spray on the infill, no water evaporation, so no water consumption. The whole power can be dissipated through the plume suppression coil.



Wet/dry operation: MID SEASON

When the dry cooling is not powerful enough part of the water flow goes to the spraying system thanks to the by-pass valve. A temperature probe (option) located in the water outlet send the information to the regulator monitoring the valve. So only the minimum water quantity is prayed on the infill. This cooling mode lowers the water/air exchange and optimize the power evacuated in the dry coil.



Wet operation: SUMMER

If necessary, the by-pass valve is totally closed: the water leaves the tube coil, and can be totally sprayed over the infill. This water is first cooled by sensitive heat, then by latent heat (evaporation on the exchange surface). In wet operation, 5 to 10% of the power is dissipated by the finned tube coil.

Casing

Self-supporting rigid panels, with 2 or 4 folds on the four sides, (JACIR design) allowing sound attenuation casing addition if required. Thanks to this technology, we can offer cooling towers with an extremely low sound level.

Towers are assembled with waterproof stainless-steel rivets (uniform, high-capacity locking). There is no welding on assembled panels for the parts in contact with water; a high-covering seal ensures the close fit between the panels. Folds and cutting plan are all outside oriented.

As standard model, the panels are in galvanized steel 2mm thick ZENDZIMIR process 275gr/m^2 (galvanized plates are protected by the zinc oxidation on the surface).

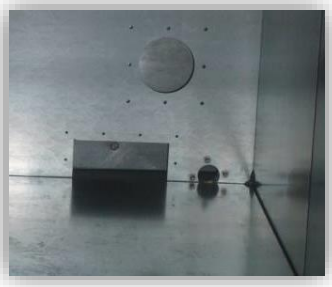
X-STEEL stainless-steel is optional: corrosion resistance higher than 316L stainless-steel

Basin

The sloped and plan basin allows a complete and easy drain.
On the utilities panels of the basin are located:

- Overflow,
- Drain below the lower level of the basin and POWER FLOW access (260 x 110mm) enabling to quickly and completely evacuate all sludge and other accumulated parts in the bottom of the casing using simple water spray,
- Make up water by float valve or electro valve as an option,
- Water outlet through a removable strainer in stainless-steel (or PEHD) with a flange, oversized to eliminate cavitation, with a perforated steel plate,
- An access door to the basin (540 x 390mm),
- Option: electrical heater of 230V or 400V and waterproof thermostat with separate bulb.

For automatic resistance control, suitable contactors must be provided.
Evaporative water circuit remains clean and decreases Legionella risks.



Exchange surface: EFFI-PACK infill

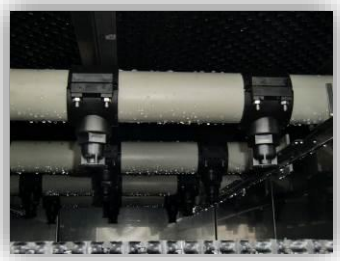
Made of thermoformed and welded Polypropylene sheets, this heat exchange surface is resistant to chocks and offers a large available surface. Resistant up to 75°C, its excellent thermal efficiency favours energy saving.

The EFFI-PACK infill is made of PP and offers a maximal heat exchange surface:

- High-temperature resistance (75 °C continuous),
- High-efficiency extended surface,
- Easy maintenance,
- High resistance to chemical agents,
- Range of operation up to 95°C (option).

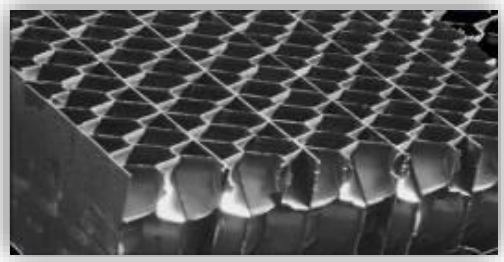
Water distribution

Water distribution is made of PVC pipes through highly efficient water distributors. The nozzles made of polypropylene distribute water in the shape of a full jet cone. Made of stainless-steel, these nozzles are bolted to the distribution pipes, for easy maintenance and strong mechanical resistance. An internal turbulator distributes the water so that a uniform water distribution reaches the exchange surface.



Drift eliminators

Highly efficient, drift eliminators are made of PP sheets and prevent the water from being sprayed out of the tower: the drift is 0.01% maximum of the recirculating water flow. This value has been EUROVENT certified.
Ultraviolet resistant, they are easy to remove from the top in order to access to the distributors and to the exchange surface.



Fans

The centrifugal fans are especially designed and manufactured by JACIR. The impeller is a double side air inlet type. The air inlet ducts are removable to access to the impeller, and are made of polyester. Their shape noticeably improves the performances of the fans.

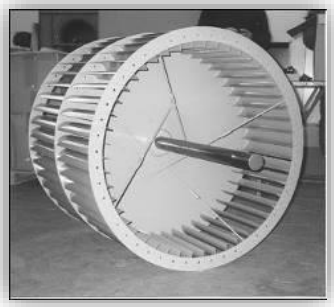
The bearings are self-aligning, lubricated in our factory and to be regularly lubricated thanks to a copper deported line lubrication as a standard for a simple and quick maintenance without any removal. Each shaft is supported by 2 bearings

The volutes side-plates are used to fix the motor support. This design prevents the belts from producing a slapping effect.

Trapezoidal pulleys and V-belts transmission are used. Tension is applied to the belts by tipping the motor seat, for easy adjustment.

The impeller is protected from corrosion by a baked coating. The elliptical scroll is made of X-STEEL stainless-steel.

Optionally, the impeller can be made of stainless-steel



Standard motors

- IE3 three-phase asynchronous motor, compatible with a frequency converter,
- 1500 rpm,
- 230/400 V up to 5.5 kW,
- 400/690 V above 5.5 kW,
- 50 Hz,
- IP 55 (outdoor operation possible),
- Class F / B,
- Direct connection to its terminal box,

Accessibility

As a standard, the basin is equipped with access door(s) sized 390 x 540 mm, and one POWER FLOW access sized 260x110 mm: located under the bottom level of the basin, it allows a fast complete drain and an easy cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

One large door sized 1290 x 640 mm in the same material as the cooling tower casing is also provided: allowing quickly removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

Plume suppression coil and modulating valve (Jacir patent) – SIM option

As a standard, the coil is made of carbon steel header coated with a primer paint.
Two air vents secure the freezing risk.

The tubes are assembled in a triangular pitch, made of copper (stainless-steel option)
The fins are in copper.

A monitored valve adjusting the water flow sprays over the infill, associated to the plume coil.

As soon as ambient conditions are met, this system makes it possible to operate significant water saving by cooling the water in the dry mode, rather than spraying and evaporating it.

Sound attenuations (options):

IB standard sound attenuation

Additional casing of the air inlet fan(s), made of self-supporting rigid steel panels covering, double folding on the 4 internal sides of the panels. Internal lagging is made of absorbent sound material. Complete access door is provided for a total accessibility maintenance in front door with 4 lockers, activated by key.
At the air outlet, an exhaust cone reduces the acoustic emission surface.

ICV complete sound attenuation

Additional casing of the air inlet fan(s), made of self-supporting rigid steel panels covering, double folding on the 4 internal sides of the panels. Internal lagging is made of absorbent sound material and contains sound acoustics baffles. These galvanized steel sound baffles, made of high-density rock wool panels, are easily removable.
At the air inlet, the rock wool is coated by a fibre glass layer.
At the air outlet, baffles receive a reinforced protection by a stainless-steel grid.

ICVK complete sound attenuation with double casing

The entire casing of ICV cooling tower is fitted with a double casing: high density rock wool covered by an additional steel sheet - ICVK.

Special sound attenuation

ICVK solution is adapted to reach required sound level, up to NR 30 at 10m.

OPTIONS

- Plume suppression coil system and modulating valve (SIM series),
- X-STEEL stainless-steel casing (resistance to corrosion superior to 316L),
- Non-freezing heater with thermostat,
- Two-speed motor (separate wiring or PAM – 1500/1000rpm),
- Fans frequency drive,
- Water level control with electric valve and input filter,
- Automatic Inductive Blow down (DAi),
- All accessories made of stainless steel (fan casing, wheel, plume suppression coil, etc),
- Discharge cone (increase of air outlet speed with lower sound radiation and recycling),
- EFFI-SILENT basin sound abatement,
- Available air pressure for connection to the duct,
- Equipment delivered in parts, ready to assembled,
- Assembly on site by our experimented technicians.

Technical characteristics S

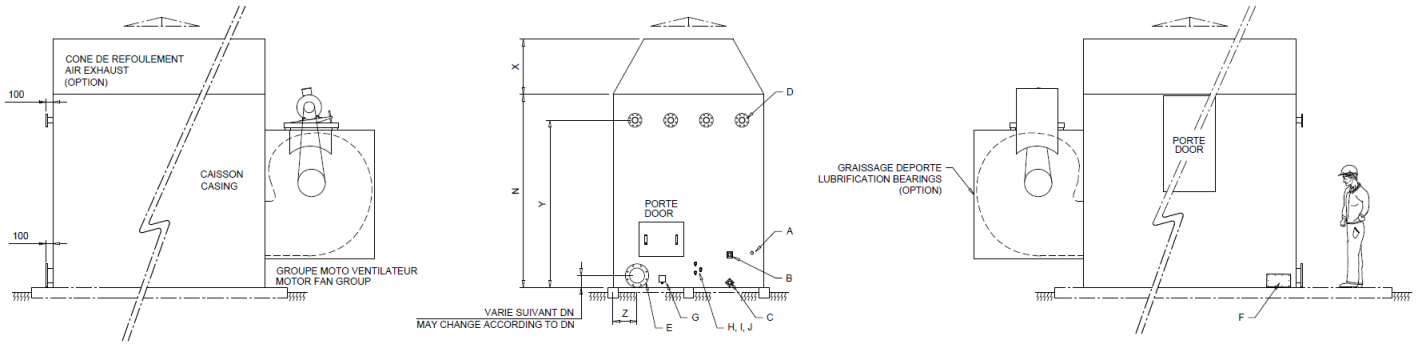
	OPEN COOLING TOWER WITHOUT SOUND ATTENUATION					
	Thermal power ref. average (1) [kW]	NDKL fans Qty	Total motor power [kW]	Sound level (2) at 20m [dB(A)]	Weight empty (without beams) [kg]	Operation weight (without beams) [kg]
S-1209-A-40	83	1	4	45	485	850
S-1812-A-90	165		9	47	695	1 435
S-2415-A-110	331		11	50	1 100	2 315
S-2415-A-150	503		15	52	1 100	2 315
S-2718-A-110	551		11	52	1 525	3 175
S-2718-A-150	639		15	53	1 525	3 175
S-2718-A-185	700		18.5	53	1 525	3 175
S-3021-A-150	744		15	53	1 750	3 880
S-3021-A-185	843		18.5	54	1 750	3 880
S-3021-A-220	896		22	54	1 750	3 880

(1) : Reference power is based on thermal data 32 / 27 / 21°C.
(2) : sound level : average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note : for higher power, towers can be added side by side.

	OPEN COOLING TOWER WITH SOUND ATTENUATION									
	NDKL fans Qty	Total motor power [kW]	Thermal power ref. average (1) [kM] **IB**	Sound level (2) at 20m [dB(A)] **IB**	Weight empty (without beams) [kg] **IB**	Operation weight (without beams) [kg] **IB**	Thermal power ref. average (1) [kW] **ICV**	Sound level (2) at 20m [dB(A)] **ICV**	Weight empty (without beams) [kg] **ICV**	Operation weight (without beams [kg] **ICV**
S-1209-A-40	1	4	161	41	715	1 085	-	-	-	-
S-1812-A-90		9	322	44	1 045	1 780	-	-	-	-
S-2415-A-110		11	490	46	1 530	2 745	459	39	2 830	4 045
S-2415-A-150		15	537	46	1 530	2 745	503	39	2 830	4 045
S-2415-A-185		-	-	-	-	-	534	39	2 830	4 045
S-2718-A-110		11	622	47	2 030	3 680	582	41	3 515	5 165
S-2718-A-150		15	681	47	2 030	3 680	638	41	3 515	5 165
S-2718-A-185		18.5	725	47	2 030	3 680	678	41	3 515	5 165
S-2718-A-220		22	-	-	-	-	714	41	3 515	5 165
S-3021-A-150		15	820	48	2 330	4 460	767	42	4 005	6 135
S-3021-A-185		18.5	872	48	2 330	4 460	816	42	4 005	6 135
S-3021-A-220		22	918	48	2 330	4 460	859	42	4 005	6 135
S-3021-A-300		30	-	-	-	-	941	42	4 005	6 135

(1) : Reference power is based on thermal data 32 / 27 / 21°C.
(2) : sound level : average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note : for higher power, towers can be added side by side.

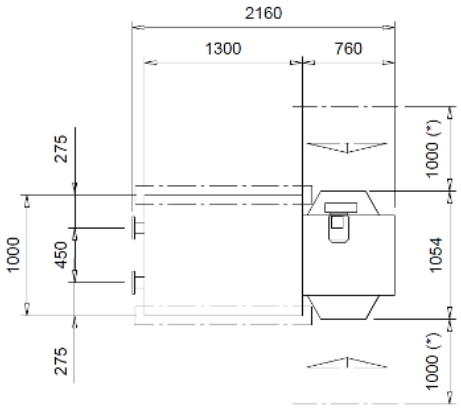
Drawings and dimensions S without sound attenuation



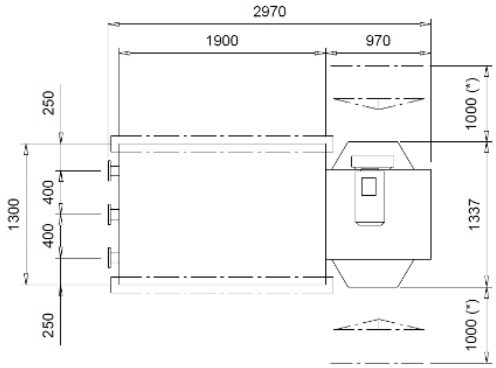
			S 1209 IB	S 1812 IB	S 2415 IB	S 2718 IB	S 3021 IB
	Height H with discharge cone (option)	mm	2 730	3 000	3 230	3 370	3 620
	Length L	mm	2 160	2 970	3 740	4 335	4 794
	Width l	mm	1 054	1 337	1 600	1 900	2 200
A	Float valve (male) Or electro valve (option)	DN DN	25 20	25 20	32 25	32 25	32 40
B	Over flow (female)	DN	50				
C	Drain (female)	DN	50				
D	Hot water inlet	DN	80				
	Height connection pipe	Qty	2	3	3	4	4
		mm	2 040	2 140	2 195	2 365	2 440
E	Water outlet	DN	According to the water flow				
F	Drain basin Power Flow	mm	260 x 110				
G	Non-freezing heater with integrated thermostat (option)	kW	3	3	3	6	6
H	Low level (option)						
I	High level (option)						
J	Water level switch (option)						

Drawings and dimensions S without sound attenuation

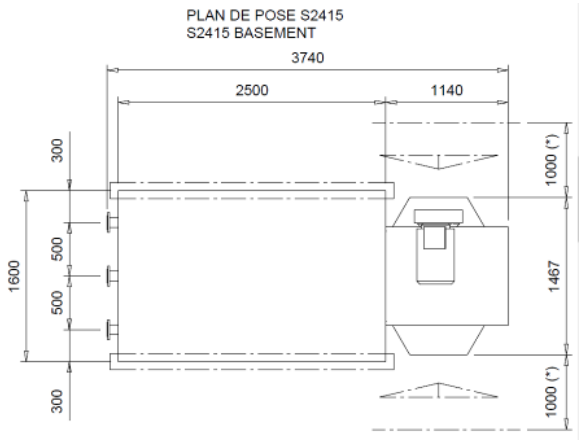
PLAN DE POSE S1209
S1209 BASEMENT



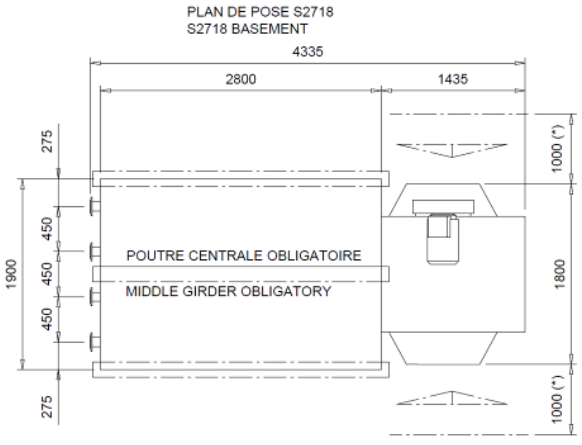
PLAN DE POSE S1812
S1812 BASEMENT



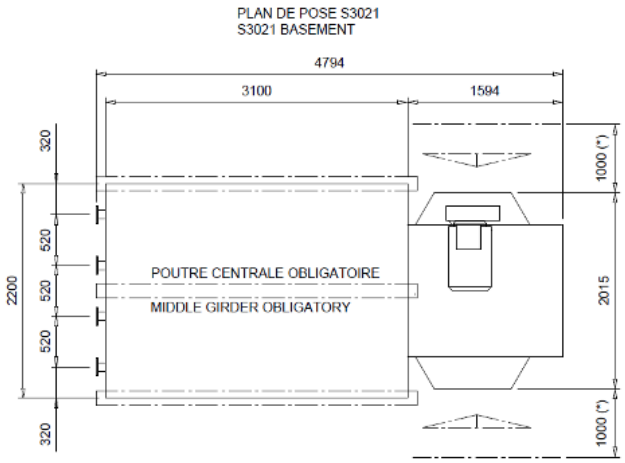
PLAN DE POSE S2415
S2415 BASEMENT



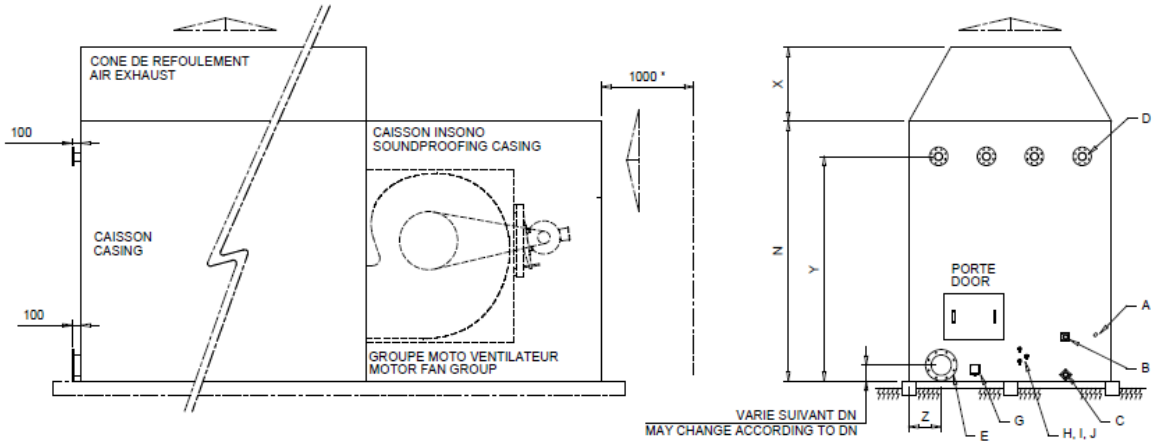
PLAN DE POSE S2718
S2718 BASEMENT

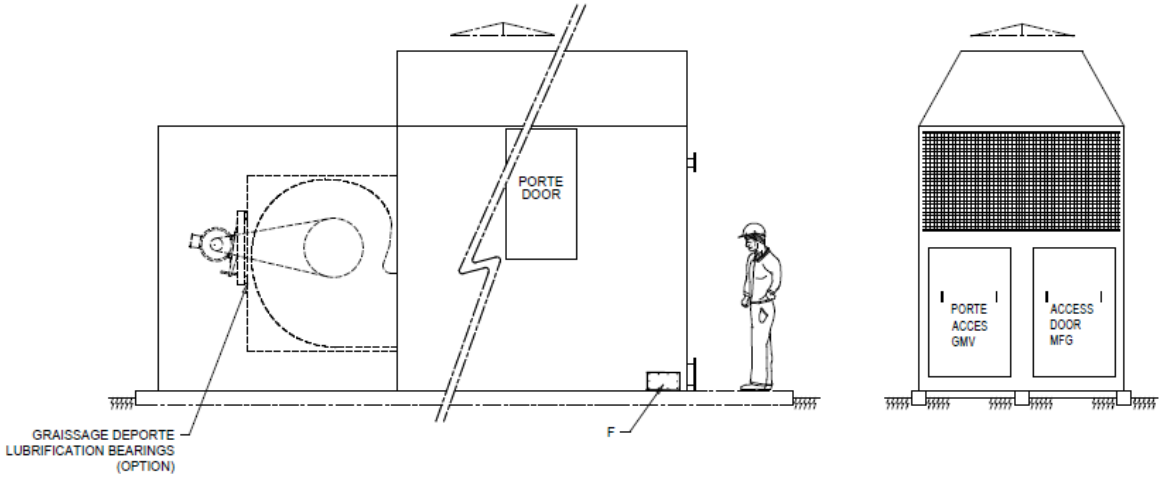


PLAN DE POSE S3021
S3021 BASEMENT



Drawings and dimensions IB sound attenuation

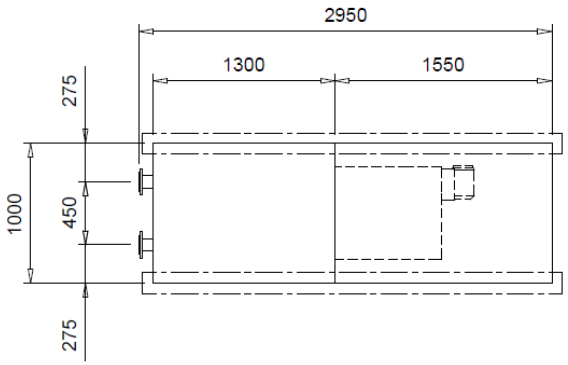




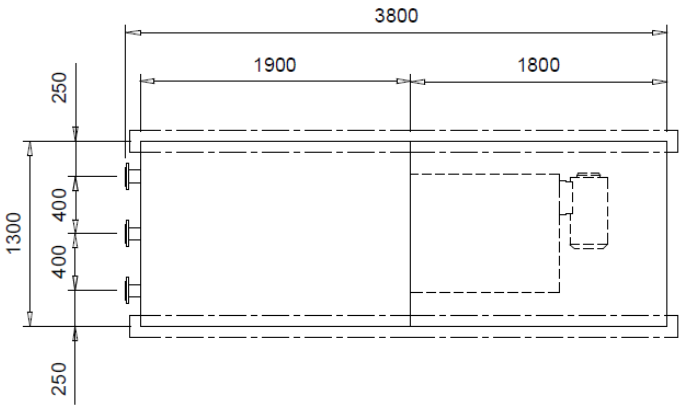
			S 1209 IB	S 1812 IB	S 2415 IB	S 2718 IB	S 3021 IB
	Height H with discharge cone (option)	mm	2 730	3 000	3 230	3 370	3 620
	Length L	mm	2 950	3 800	4 600	5 200	5 750
	Width l	mm	1 000	1 300	1 600	1 900	2 200
A	Float valve (male) Or electro valve (option)	DN DN	25 20	25 20	32 25	32 25	32 40
B	Over flow (female)	DN	50				
C	Drain (female)	DN	50				
D	Hot water inlet	DN	80				
	Height connection pipe	Qty	2	3	3	4	4
		mm	2 040	2 140	2 195	2 365	2 440
E	Water outlet	DN	According to the water flow				
F	Drain basin Power Flow	mm	260 x 110				
G	Non-freezing heater with integrated thermostat (option)	kW	3	3	3	6	6
H	Low level (option)						
I	High level (option)						
J	Water level switch (option)						

Drawings and dimensions IB sound attenuation

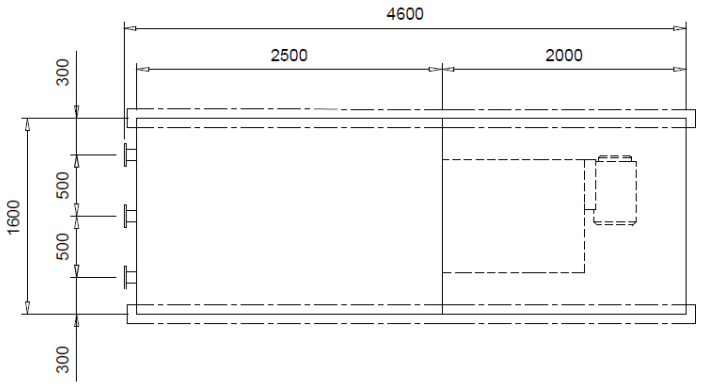
PLAN DE POSE S1209
S1209 BASEMENT



PLAN DE POSE S1812
S1812 BASEMENT



PLAN DE POSE S2415
S2415 BASEMENT



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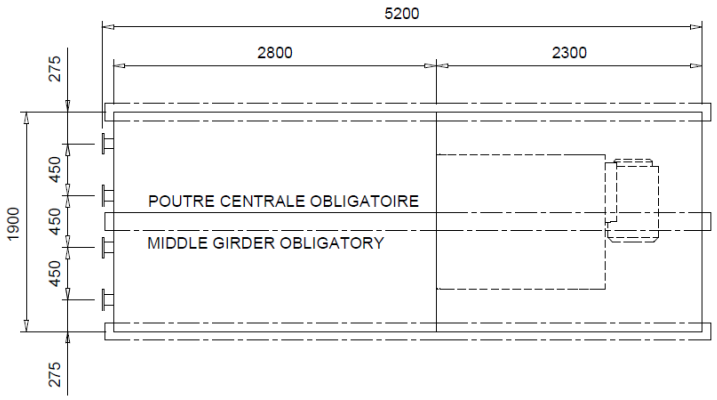
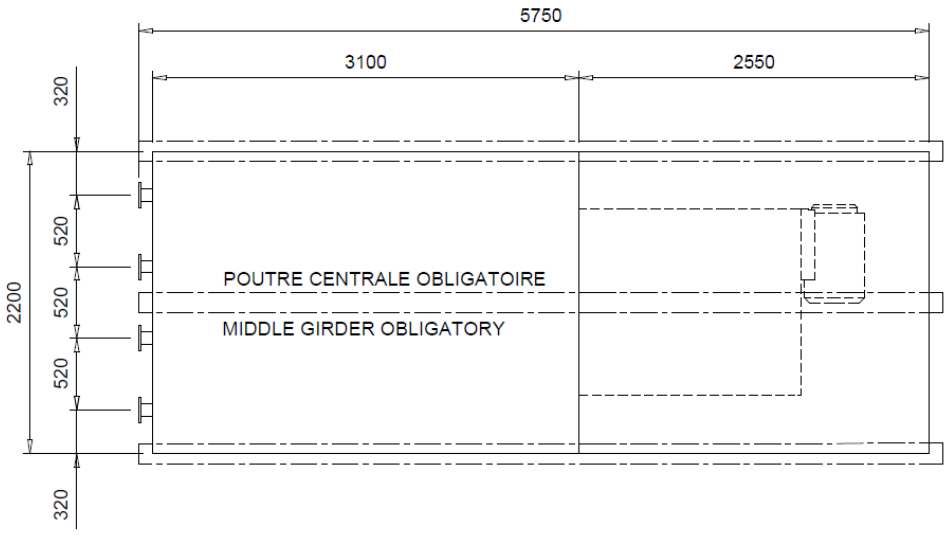
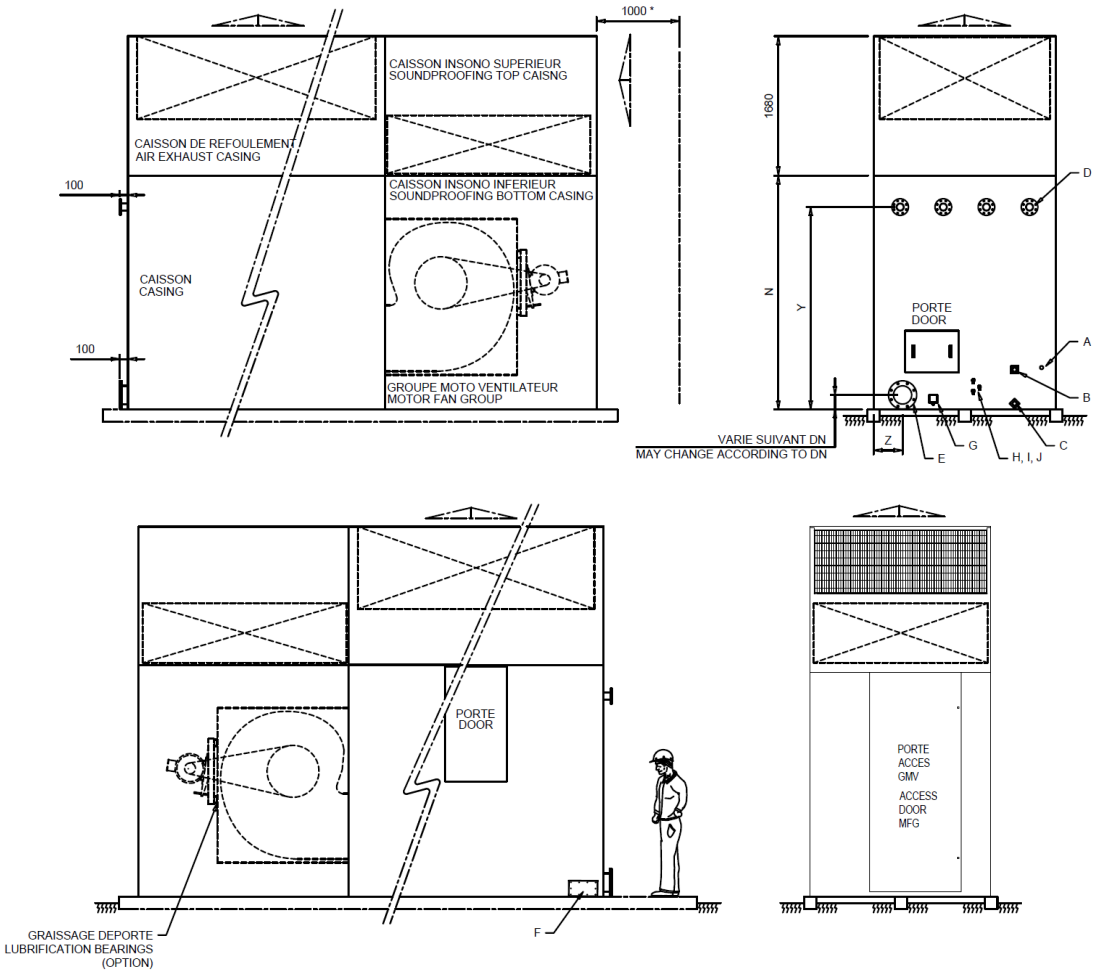
S2718 BASEMENT



PLAN DE POSE S3021
S3021 BASEMENT



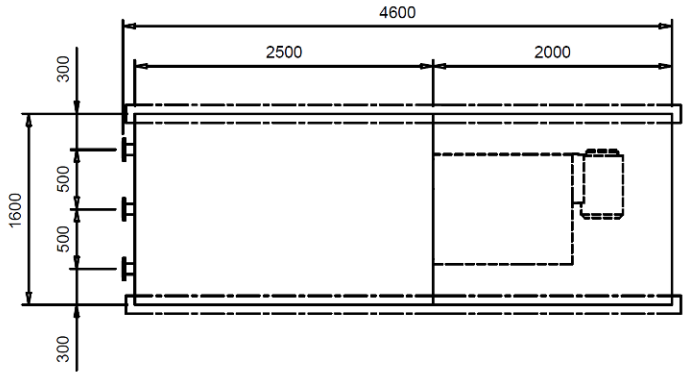
Drawings and dimensions ICV sound attenuation



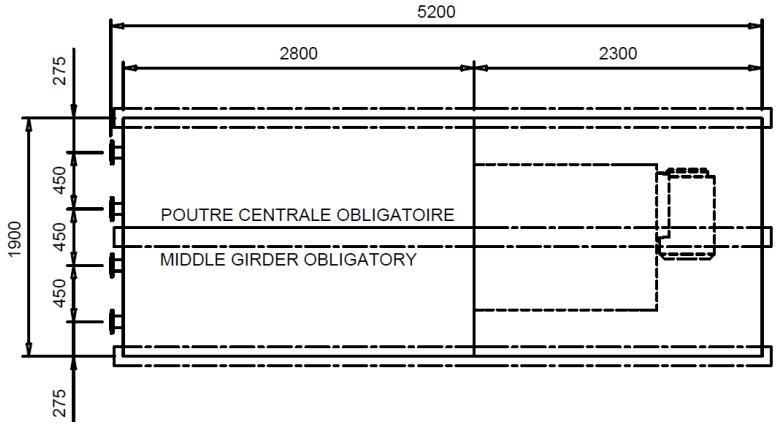
			S 2415 ICV	S 2718 ICV	S 3021 ICV
	Height H with discharge cone (option)	mm	4210	4350	4500
	Length L	mm	4600	5200	5750
	Width l	mm	1600	1900	2200
A	Float valve (male) Or electro valve (option)	DN DN	32 25	32 25	32 40
B	Over flow (female)	DN	50		
C	Drain (female)	DN	50		
D	Hot water inlet	DN	80		
		Qty	3	4	4
	Height connection pipe	mm	2195	2365	2440
E	Water outlet	DN	According to the water flow		
F	Drain basin Power Flow	mm	260 x 110		
G	Non-freezing heater with integrated thermostat (option)	kW	3	6	6
H	Low level (option)				
I	High level (option)				
J	Water level switch (option)				

Drawings and dimensions ICV sound attenuation

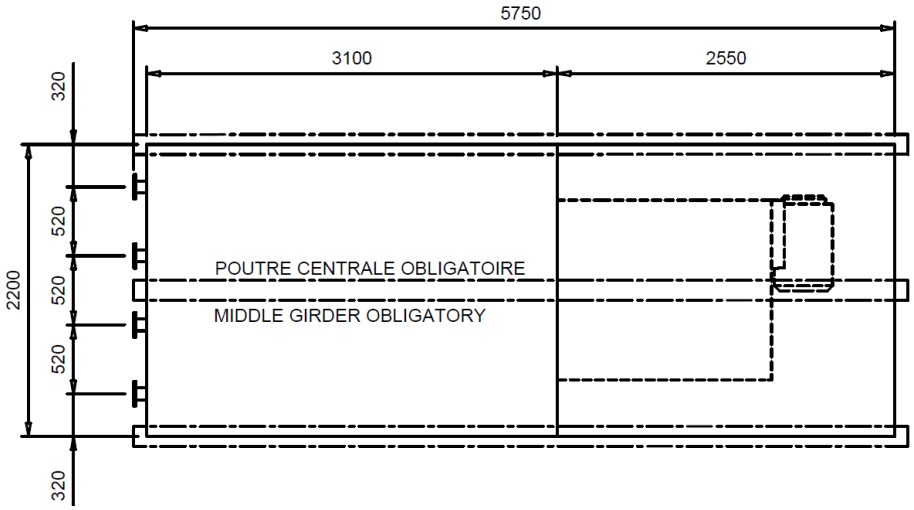
PLAN DE POSE S2415
S2415 BASEMENT



PLAN DE POSE S2718
S2718 BASEMENT



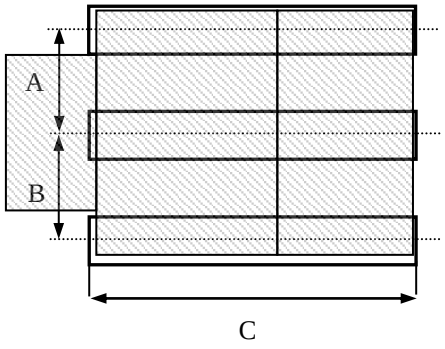
PLAN DE POSE S3021
S3021 BASEMENT



Support S

S cooling tower ranges can stand on a concrete base or on steel frame beams (customer supply).
Check that the ground can stand the operating load, and that surface or supports are flat and horizontal.

Quantity and position of concrete or metallic beams (customer supply) for cooling towers without sound attenuation



	Qty	Distance between beams under the basin A and B [mm]	Beams length under the basin C[mm]
S 1209	2	1000	1400
S 1812	2	1300	2000
S 2415	2	1600	2600
S 2718	3	1000	2900
S 3021	3	1100	3200

Quantity and position of concrete or metallic beams (customer supply) for cooling towers with IB sound attenuation

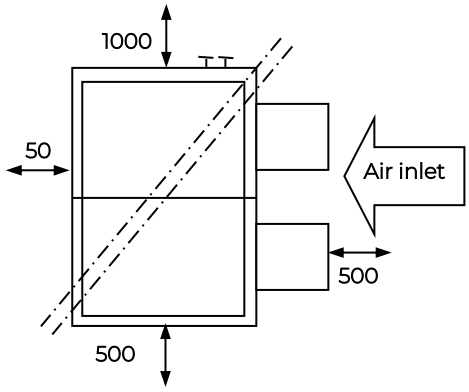
	Qty	Distance between beams under the basin A and B [mm]	Beams length under the basin C[mm]
S 1209 IB	2	1000	3000
S 1812 IB	2	1300	3900
S 2415 IB ou ICV	2	1600	4700
S 2718 IB ou ICV	3	950	5300
S 3021 IB ou ICV	3	1100	5850

On Site Layout S - SIM

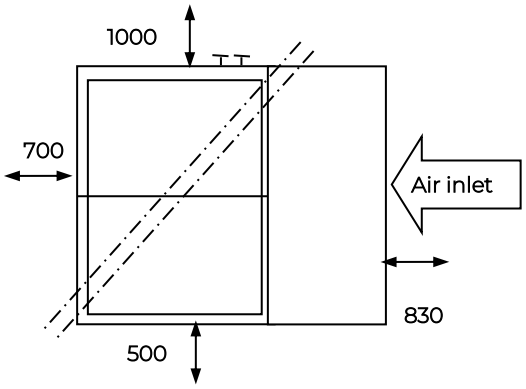
Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings. This could create a risk of a « re-circulation »; the air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower.
In any case, the free access on the four sides of the tower must be secured to ensure that the fans are supplied correctly with air and that there is proper access for installation and maintenance.
If these rules are not applied, it is inevitable that the cooling tower will not operate properly.

Recommended minimum free access (mm) for standard cooling towers: Top view

Tower without sound attenuation



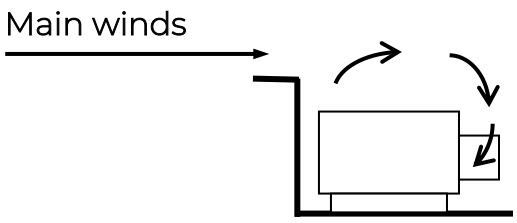
Tower with sound attenuation



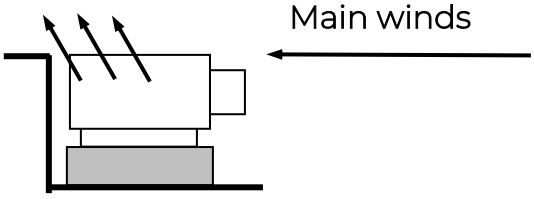
Do not hesitate to contact us for any advice

Layout examples:

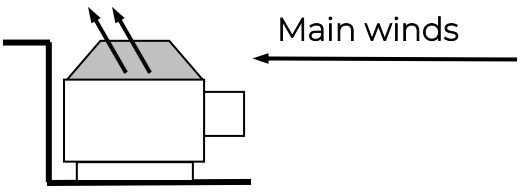
NOT TO DO:



TO DO:



Install a base in order to
up the cooling tower



Install a cone in order to
up the air outlet of the cooling tower

WATER EVAPORATION

Consumption by evaporation is approximately 1.7kg/h per 1 000kcal/h.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible).
There are three possibilities to choose according to the case:

1- Continuous blow down

Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.

The blow down flow rate can be calculated using the formula: [100 S / (M - S)] % of the make-up water in which:
S: Salinity of the make-up water compensating for evaporation.
M: Maximum acceptable salinity level of water in circuits.

Example:
Salinity of make-up water = HT 20 ° F
Maximum acceptable salinity = HT 40 ° F
100 x 20 / (40 - 20) = 100 % make-up water flow rate
Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).

Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous blow down

The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- JACIR Automated Inductive Blow down

Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level. See separate documentation.

WATER TREATMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly. If the water contains a significant amount of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10% of the recycled water flow.
If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.
In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to prevent these organisms from developing.

Water treatment should be undertaken by a specialized Company.
PREVENTS THE RISK OF LEGIONNAIRES' DISEASE: see separate documentation

Prescription S

Evaporative cooling tower, high efficiency open circuit with forced centrifugal fans, S ..... JACIR type.

Thermal characteristics

The dissipated power will be .....kW, with a temperature range from .....°C to .....°C, an ambient air temperature of.....°C, and a wet bulb temperature of .....°C.

Sound level characteristics

The sound pressure level will not exceed ..... dB (A) at ..... metres in free field over 4 directions. To ensure this, the tower has one of the following types of soundproofing devices:

1 – IB option with sound attenuators without baffles at air inlet, and outlet cone coated with acoustics foam,

2 –ICV / ICVK or special sound attenuation with parallel baffles both at air inlet and outlet, equipped with 50mm thick high density rock wool double casing, covered by 1.2mm thick steel sheet. NR30 at 10m may be reached.

Tower casing, sloped and plane bottom basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive if necessary, a double casing later on.
Stainless steel rivets with uniform and high-capacity locking will be used for assembly. The cooling tower casing will be assembled without any bolting or welding for the parts in contact with water; a special designed high covering seal ensure waterproofing between the panels.

The basin will be equipped with a rectangular access door (390 x 540mm), with a floating valve that can easily be adjusted, a drain, an overflow and an anti-cavitation strainer.
The sloped bottom of the basin will allow a complete and easy drain thanks to the (POWER FLOW) drain hole located under the lowest part of the basin in order to ease the cleaning. The size of this opening will be 260x110 mm. Height between basin bottom and the infill is 1400mm for easy access.

Casing structure

The cooling tower panels casing will be made of:

- As a standard, galvanized steel 2 mm thick ZENDZIMIR process 275gr/m² or;
- Option, X-STEEL stainless steel (corrosion resistance higher than 316L) for its long-lasting properties, water saving and easy cleaning.

.

Accessibility

As a standard, the basin will be delivered with access door(s) sized 390 x 540mm, and a POWER FLOW access 260 x 110mm allowing express draining and cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

A large door sized 1290 x 640mm in the same material as the cooling tower casing will also be provided, and will allow quick removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

Fans

The low-pressure centrifugal fan(s) with forward-inclined blades and double air admission will be placed outside the basin in dry airflow and at man chest to access without disassembly.
The polyester inlet duct(s) stand out to optimise air suction will be simple to disassemble for easy maintenance.
The impeller is protected from corrosion by a baked epoxy coating. The elliptical scroll is made of X-STEEL stainless steel.
Optionally, the impeller can be made of stainless-steel.
Each fan will be coupled with its own motor.

Electric motor and coupling

The IE3 asynchronous three-phase motor(s) will be closed type ventilated case(s) with a power of maximum kW....., rpm ....., IP55 protected, class F/B. Coupling will be made of trapezoidal belts selected for 150 % of nominal power.

Water distribution

Water distribution will be made of PVC pipes through highly efficient polypropylene water distributors: the nozzles will distribute the water uniformly on the whole exchange surface and will be easily removable.

Exchange surface

Made of thermoformed and welded polypropylene sheets, EFFI-PACK heat exchange surface will be resistant to chocks and will offer a large available surface. This system will ensure fouling risks reduction.

Drift eliminators

Highly efficient EUROVENT certified, the PP sheets drift eliminators will prevent the water from being sprayed out at the outlet tower. Ultraviolet resistant, they will be easy to remove from the top in order to access to the distributors and to the exchange surface if needed. The drift will be 0.01 % maximum of the re-circulating water flow.

Connections

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection.
The servitudes panels will include a high-level switch, a drain hole and water make up.

Options

An Automatic Inductive blown down (DAi) inside the exchanger room may be integrated, as an option (see separate documentation).
Will be available also as option: plume suppression coil system, fans frequency drive, water level control with electric valve, EFFI-SILENT basin sound attenuation, and all accessories made of stainless-steel (fan casing, wheel, plume suppression coil, etc). Equipment delivered in parts, ready to be assembled on site by our experimented technicians.

JACIR
Cooling for life

SF

Closed circuit cooling tower

Commercial Documentation

Range: water flow rates from 6 to 190 m³/h

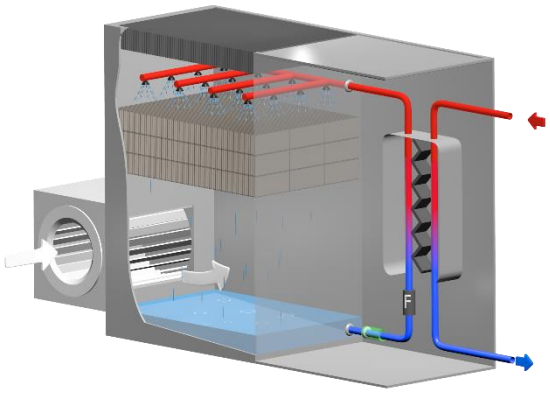
Power from 20 to 2 000 kW

- Lifetime guarantee
- Glycol-free
- Freezing safe

La FRENCH FAB

Operating principle

Water cooling tower, closed-type, centrifugal, forced-draft, designed for a glycol-free operating during winter.
The SF range is fully factory assembled on a single frame and composed of a dismountable and cleanable Plate Heat Exchanger, a pump and a filter with all technical accessories grouped together inside a closed room that is accessible through a large door for its maintenance.



Casing

As a standard, the rigid self-supporting panels are made of galvanized steel, 2 mm thick plates, folded twice or 4 times on the 4 sides of the panel (JACIR design) allowing a complete noise insulation of the tower's casing.
All the folds of the plates are outwards, and assembled by stainless steel sealed rivets (powerful and uniform tightening) and the panels are assembled without welding and without any bolt in contact with the water. X-STEEL stainless steel is available as an option (corrosion resistance superior to 316L).

Basin

The basin is sloped for a complete drain, with an access door. It includes an easily adjustable float valve, an overflow, a water heater and an anti-cavitation strainer made of stainless steel and PEHD. It is also equipped with a POWER FLOW trap door, enabling to quickly and completely evacuate all sludge and other accumulated parts in the bottom of the casing using simple water spray and also a centrifugal FRC filter (JACIR patent):

- 100 % of the tower's water volume is continuously filtered every 1.2 minutes, with a 60 µm efficiency,
- Automatic cleaning managed by the opening of the drain circuit (with DAI, inductive blow-down option).

Therefore, the entire evaporative loop remains clean and decreases the risk of legionella proliferation.

Heat exchange surface

The EFFI-PACK infill is made of PP sheets, is shock-proof and gives the highest heat exchange surface with a large free surface, and is resistant to fouling.

Water distribution

Several PVC material distribution pipes feed polypropylene sprayers. easy to remove (stainless steel bolts) they are equipped with an internal turbulator for an optimal and uniform distribution of the water.

Accessibility

As a standard, a large access door made of the same material than the tower allows an easy removal and cleaning of the drift eliminators, sprayers, heat exchange surface and water distribution.
The POWER FLOW trapdoor, located under the low level of the slope basin makes the water drain and cleaning easy.

Heat exchanger room

The stainless-steel Plate Heat Exchanger is fully protected from the outdoor conditions thanks to a galvanized, 1,5 mm thick self-supporting casing (X-STEEL as an option) with a large access door to ease the maintenance.
The connection to the Heat Exchanger is made through flanges located outside the room: there are only 2 connections: inlet and outlet, placed on the tower's length.

Motor fan set

The fans especially designed and manufactured by JACIR, have continuously been perfected over the years. The impeller is a double side air inlet type. Polyester air inlet ducts are profiled to optimise air suction and allow impeller removal.
All maintenance points, including the copper offset grease line, are placed in the dry airflow, out of the basin and at ground level for quick and easy access. The impeller is protected from corrosion by a baked epoxy coating. The elliptical scroll is made of X-STEEL stainless steel.

Silence

Acoustic attenuation levels are provided as an option:

- IB silencer,
- ICV, complete noise attenuation
- ICV(K), complete noise attenuation, with double casing
- Special, tailor-made solution on demand.

Options

Plume abatement coils (SFIM hybrid range), automatic inductive blow-down, 2-speed motor, extra support beams, electro-valve regulated by level sensors, explosion-proof motors, electrical cabinet, site erection, EFFI-SILENT sound abatement, etc.

SF et SFIM

Closed Circuit Cooling Tower

Closed Hybrid Cooler

Technical Documentation

CONTENT

JACIR

With more than 60 years' experience, our company:

- Has invested in detailed research and development in order to propose technical solutions in accordance with environmental protection through unequalled realizations and patents.
- Is today the European leader thanks to its technology beyond market requirements.

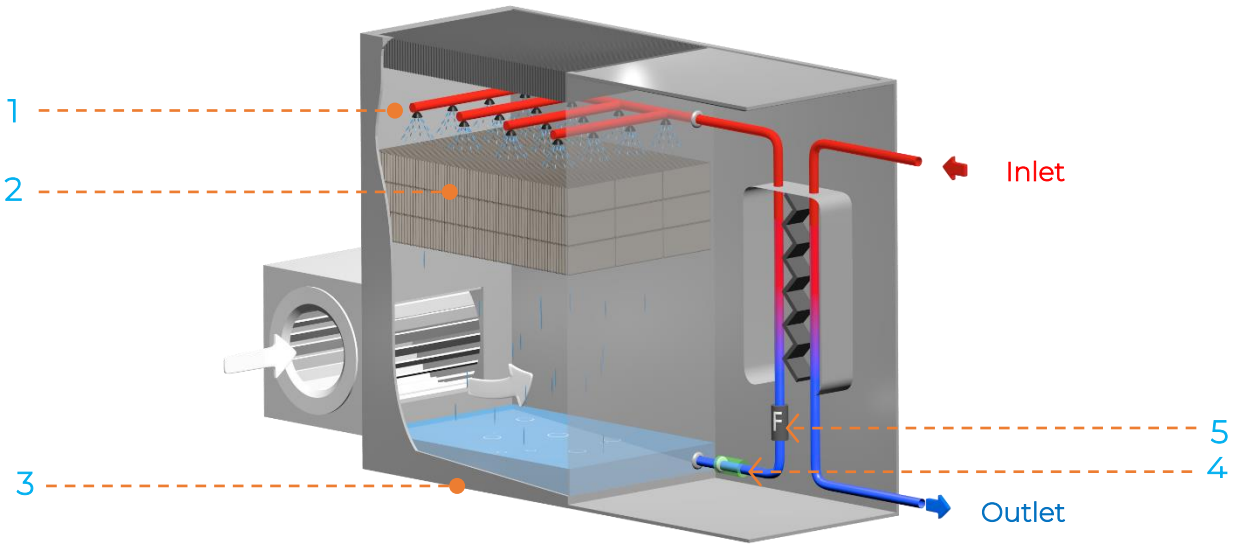
STRONG BENEFITS OF THE SF - SFIM

∞ SECURITY AND HYGIENE	Compliant with hygienic standards
∞ PLATE HEAT ECHANGER	Made of stainless steel, the plates are removable to ease the cleaning.
∞ NO FREEZING RISK	Glycol free Plate Heat Exchanger without winter freezing risks.
∞ WATER PROOF	Thanks to our assembling technology, we guaranty no leak equipment.
∞ SILENCE	Very silent cooling towers in standard version, can be adapted according requirements.
∞ EXCHANGE SURFACE	EFFI-PACK: Highly efficient and easy to maintain, excellent resistance to temperature (75°C continuous) the infill may support use till 95°C as an option.
∞ ANTICORROSION COATING	Made of galvanized steel as a standard, the casing of the tower is assembled without any welding, also proposed in X-STEEL stainless steel (corrosion resistance superior to 316L).
∞ EASY MAINTENANCE	Large access doors, fan outside the tower and at man chest, inclined and plane basin for a complete drain.
∞ EVOLUTIVE TOWER	Possible to increase the exchanged power by addition of plates, to lower the sound level without increasing the motor power.
∞ MODULAR CONSTRUCTION	Easy handling and transport.

Closed cooling tower principle and operation SF

A cooling tower is a heat exchanger, which enables water to be cooled through direct contact with air. The heat transfer from the water to the air is carried out partly by sensible heat transfer, but mainly by latent heat transfer (evaporation of part of the water into the air), which makes it possible to reach cooling temperatures lower than ambient temperatures.

Closed circuit cooling tower operation:



The fluid to be cooled flows through the primary circuit of a stainless-steel plate heat exchanger (inlet/outlet). The water from the secondary circuit, flows from the heat exchanger by pipes to the top of the cooling tower. This water is distributed on the exchange surface (2) through the nozzles (1).

The air is forced by the fan from the bottom to the top of the cooling tower. During the pass, it has been warmed up and saturated in water through the exchange surface.

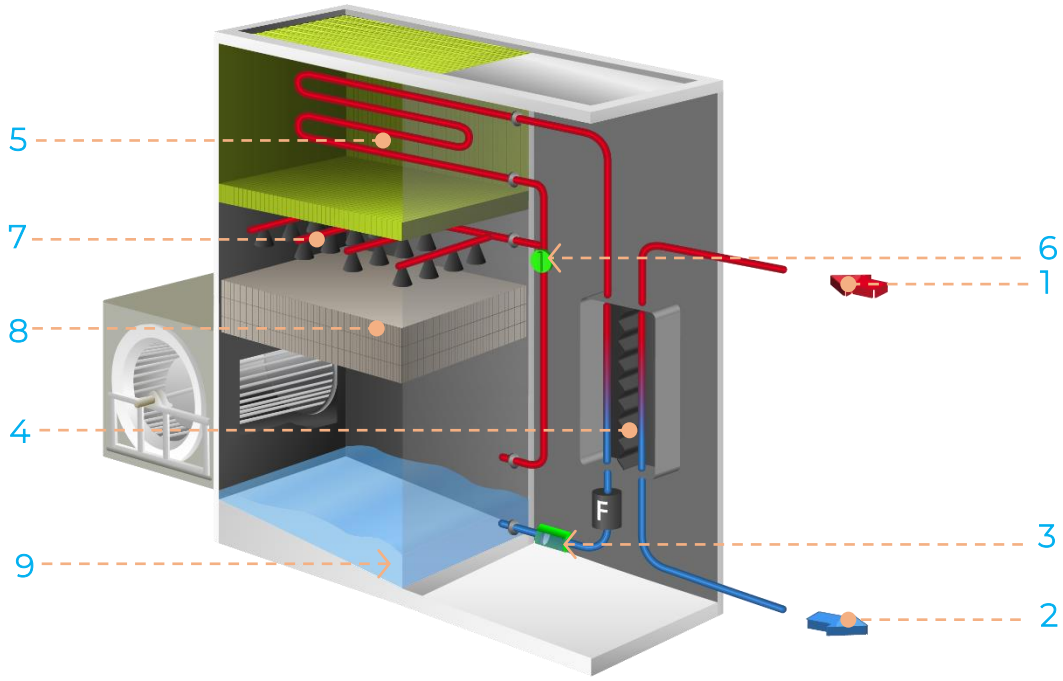
Because of the superficial tension created by the exchange surface, the water equally flows down along the whole height of the so extended exchange surface.
Cooled by the forced air, the water falls by gravity to the inclined basin (3) located on the bottom of the tower.

This water is recycled on the plate heat exchanger by the circulating pump (4) filtered by a strainer and then by a FRC centrifugal filter (5).

Closed Hybrid cooling tower principle and operation SFIM

Standard SF closed circuit cooling tower ranges have originally been designed to receive the plume abatement coil option; these SF ranges are then referred to as SFIM Closed Hybrid Cooler range. Their efficiency is ensured by a finned tube coil combined with a valve for adjusting the water spray on the
exchange surface (packing). This water flow regulation over the exchange surface is market exclusivity, (JACIR patent).
Therefore, the combination of the air desaturation by air outlet warming up, and the reduction of the water spray on the packing, ensures the complete plume suppression. Beyond the plume suppression itself, this system can provide water savings up to 80 % and is an ultimate obstacle to the drifts.
This technology proposed by JACIR has been deeply researched in partnership with the CETIAT for over 40 years, and has offered the opportunity to file innovating patents.
The closed-circuit hybrid towers are perfectly adapted for operating without glycol in winter. Their design makes access and cleaning very easy and ensures performance durability.

Operation:



Process (primary) Side:
The water to be cooled (1) enters into the integrated plate heat exchanger and exits once cooled (2). Primary (user) circuit is closed and is not in contact with the air.

Cooling tower side (evaporation):
Water is sucked up by a pump (3), circulates through the plate heat exchanger (4) filtered by a strainer and a FRC centrifugal filter, and enters into the non-freezing plume suppression coil (5) (JACIR patent); then, via a power-activated valve (6), water goes either to the water spraying system (7) to be distributed over the exchange surface (8), or directly to the basin if the ambient conditions are cold enough for a dry cooling. The water cooled thanks to the forced draft fan, falls into the bottom cooling tower sloped basin (9).

No freezing risk and easy maintenance:

This technology does not require glycol to avoid exchanger freezing risk. Designed for an easy cleaning or descaling of all the cooling tower components by a very simple operation maintenance.

I – AIR - WATER EXCHANGE: TOWER CIRCUIT

Casing structure

Self-supporting rigid panels, with 2 or 4 folds on the four sides, (JACIR design) allowing sound attenuation casing addition if required. Thanks to this technology, we can offer cooling towers with an extremely low sound level.
Towers are assembled with waterproof stainless-steel rivets (uniform, high-capacity locking).
There is no welding on assembled panels for the parts in contact with water; a high covering seal ensures the close fit between the panels. Folds and cutting plan are all outside oriented.
As standard model, the panels are in galvanised steel mm2 thick ZENDZIMIR process 275 gr / m² (galvanised plates are protected by the zinc oxidation on the surface).
Silver Steel or X-STEEL stainless steel (corrosion resistance superior to 316L one) are optional.

Sloped and flat basin

The sloped and plan basin allows a complete and easy drain.
On the utilities panels of the basin are located:

- Overflow,
- Drain below the lower level of the basin and POWER FLOW access enabling to quickly and completely evacuate all sludge and other accumulated parts in the bottom of the casing using simple water spray,
- FRC centrifugal filter (JACIR patented) (260 x 110 mm): 100 % of the cooling tower flow is filtered continuously every 1-2 minute at 60µm,
- Make-up water by float valve or electro valve as an option,
- Water outlet through a removable strainer (made of stainless steel or PEHD) with a flange, oversized to eliminate cavitation, with a perforated steel plate,
- Large doors to access the basin through a rectangular access (540x 390 mm).
- Option: electrical heater of V 230 or V 400 and waterproof thermostat with separate bulb and automatic cleaning generated by opening the purge circuit (with the DAi option).

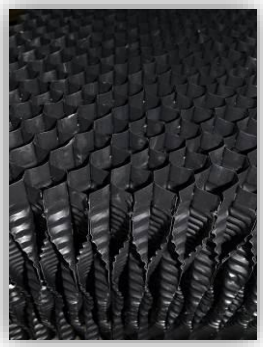
By the way, evaporation circuit stays clean and avoids Legionella's growth risk.

Exchange surface: EFFI-PACK

Made of thermoformed and welded Polypropylene sheets, this heat exchange surface is resistant to chocks and offers a large available surface. Resistant up to 75°C, its excellent thermal efficiency favours energy saving.

Also called infill, EFFI-PACK is made of PP and offers a maximal heat exchange surface:

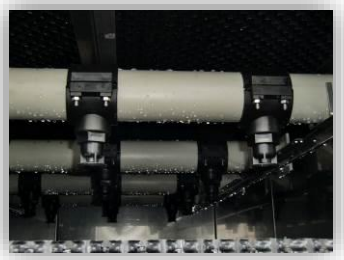
- High temperature resistance (75 °C continuous),
- High-efficiency, extended surface,
- Easy maintenance,
- High resistance to chemical agents,
- Range of operation up to 95°C (option).



Water distribution

Water distribution is made of PVC pipes through highly efficient water distributors. The nozzles made of polypropylene distribute the water in the shape of a full jet cone over the exchange surface.

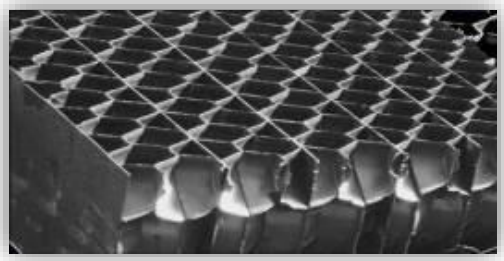
The nozzles are bolted (stainless steel screws) to the distribution pipes, for easy maintenance and strong mechanical resistance.
An internal turbulator distributes the water so that a uniform water distribution reaches the exchange surface.
The nozzles are selected according to distribution pressure and flow rate.



Drift eliminators

Highly efficient, drift eliminators are made of PP sheets and prevent the water from being sprayed out of the tower: the drift is 0.01 % maximum of the re-circulating water flow. This value has been Eurovent certified.

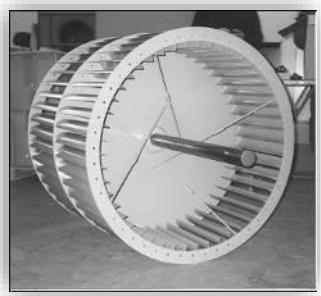
Ultraviolet resistant, they are easy to remove from the top in order to access to the distributors and to the exchange surface.



Fans

The centrifugal fans are specially designed and manufactured by JACIR. The impeller is a double side air inlet type. The air inlet ducts are removable to access to the impeller, and are made of polyester. Their shape noticeably improves the performances of the fans.

The bearings are self-aligning, lubricated in our factory and to be regularly lubricated thanks to a copper deported line lubrication as a standard for a simple and quick maintenance without any removal.
Each fan is associated with its own motor.



The volutes side-plates are used to fix the motor support. This design prevents the belts from producing a slapping effect.
Trapezoidal pulleys and V-belts transmission are used. Tension is applied to the belts by tipping the motor seat, for easy adjustment.

The impeller is protected from corrosion by a baked epoxy coating. The elliptical scroll is made of X-STEEL stainless steel.
Optionally, the impeller can be made of stainless-steel.

Motors

- IE3 asynchronous three-phases motor, Frequency drive compliant,
- 1500 rpm,
- 230/400 V up to 5.5 kW,
- 400/690 V above 5.5 kW,
- Hz 50,
- IP55 (possible open sky operating),
- F/B Class,
- Direct connection to terminal box,

Accessibility

As a standard, the basin is equipped with access door(s) sized 390 x 540 mm, and one POWER FLOW access sized 260x110 mm: located under the bottom level of the basin, it allows a fast complete drain and an easy cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

One large door sized 1290 x 640 mm in the same material as the cooling tower casing is also provided: allowing quickly removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

Non-freezing plume suppression coil (JACIR patent) – SFIM option

As a standard, the coil is made of X-STEEL stainless steel.
Two air vents secure the freezing risk. This “cover” type configuration protects the coil from accidental damage related to possible freeze-over.

The tubes are assembled in a triangular pitch, made of copper (stainless-steel option)
The fins are in copper.

A monitored valve adjusting the water flow sprays over the infill, associated to the plume coil.
As soon as ambient conditions are met, this system makes it possible to operate significant water saving by cooling the water in the dry mode, rather than spraying and evaporating it.

II – WATER-WATER EXCHANGE: PROCESS CIRCUIT
Integrated exchanger room to the cooling tower

Made of galvanized steel in standard (X-STEEL sainless steel option), self-supporting stiff panels equipped with an access door (2100 x 600 mm) with key lockers. The panels can be disassembled, and all components are designed for easy access and maintenance.
As a standard, the exchanger room is equipped with automatic presence detection lightening. Electrical heater is available as an option.

Plate Heat Exchanger

It is protected from weather conditions inside its dedicated room.
User's connection is directly fixed outside the room to facilitate connection with primary circuit, with only two connections: inlet and outlet located either in the cooling tower axe or perpendicularly. It does not require antifreeze protection: in case of electrical stop, the water-cooling tower circuit automatically drains by gravity down the basin, protecting by the way plates and gaskets of the plate heat exchanger. For easy re-assembly, JACIR selects with symmetrical plates and clipped gaskets.

Heat exchanger pump

Protected against freezing by a patented thermostatic valve: no electrical tracing need. A water level switch is included and a pump frequency drive is also proposed as an option.

Pressure meters

Installed before and after the pump, and also before water distribution piping.

FRC Centrifugal filter

Located at the basin outlet, a 5 mm filtration strainer is installed.
A FRC centrifugal filter chosen in the same material as the piping (galvanized or 304 – 316L stainless steel options) is located at the plate exchanger inlet.
It offers the following characteristics:

- 100 % of the cooling tower flow is filtered continuously every minute: very high efficiency,
- High efficiency at 60µm for all elements with density superior to 1,
- Automatic cleaning during the blow down of the water circuit = JACIR patented system option.

The evaporative water circuit remains clean, thus reducing the risk of legionella proliferation.

Automatic Inductive blow down (AiD)

Automatic Inductive blow down is available in option.

III – SOUND ATTENUATION (options):

IB standard sound attenuation

Additional casing of the air inlet fan(s), made of self-supporting rigid steel panels covering, double folding on the 4 internal sides of the panels. Internal lagging is made of absorbent sound material. Complete access door is provided for a total accessibility maintenance in front door with 4 lockers, activated by key.
At the air outlet, an exhaust cone reduces the acoustic emission surface.

ICV complete sound attenuation

Additional casing of the air inlet fan(s), made of self-supporting rigid steel panels covering, double folding on the 4 internal sides of the panels. Internal lagging is made of absorbent sound material and contains sound acoustics baffles. These galvanized steel sound baffles, made of high-density rock wool panels, are easily removable.
At the air inlet, the rock wool is coated by a fibre glass layer.
At the air outlet, baffles receive a reinforced protection by a stainless-steel grid.

ICVK complete sound attenuation with double casing

The entire casing of ICV cooling tower is fitted with a double casing: high density rock wool covered by an additional steel sheet - ICVK.

Special sound attenuation

ICVK solution is adapted to reach required sound level, up to NR 30 at 10m.

OPTIONS

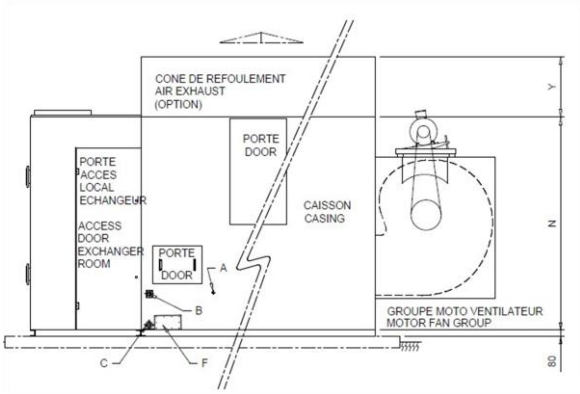
- Pump frequency drive,
- X-STEEL stainless-steel plate heat exchanger room,
- Non-freezing plume suppression coil system (SFIM),
- SILVER STEEL casing option,
- X-STEEL stainless-steel casing (resistance to corrosion superior to 316L),
- Non-freezing heater with thermostat,
- Electrical convector for plate heat exchanger room heating,
- 2 speeds motor (separate wiring or PAM – 1500/1000 rpm),
- Fans frequency drive,
- Water level control with electric-valve and input filter,
- Automatic Inductive Deconcentration (see AiD documentation),
- All accessories made of stainless steel (fan casing, wheel, plume suppression coil, etc.),
- Discharge cone (air outlet speed increased with lower sound radiation and recycling),
- EFFI-SILENT basin sound abatement,
- Available air pressure for connection to the duct,
- Equipment delivered in parts, to be assembled on site,
- Assembly on site by our experimented technicians.

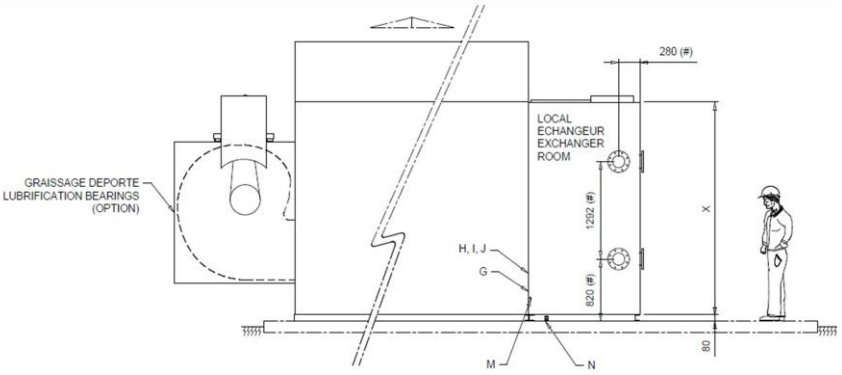
Technical characteristics SF

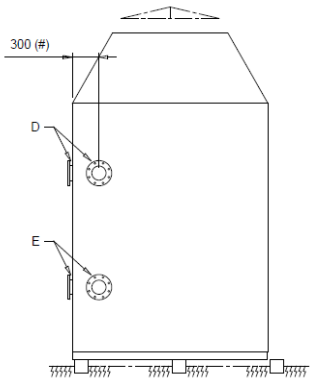
	Heat power ref. average (1) [kW]	Fans Qty	Outlet air flow rate [m3/h]	Water Heater power [kW]	Motor power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty (without beams) [kg]	Weight full (without beams) [kg]	Overall dimensions (with exhaust cone option) [mm]
CLOSED COOLING TOWER WITHOUT SOUND ATTENUATION									
SF-1812	260	1	28 000	3	9	50	1 885	2 980	H = 2 630 L = 4 395 l = 1 600
SF-2415	430		47 000	3	15	52	2 300	3 915	H = 2 700 L = 5 165 l = 1 600
SF-2718	590		64 000	6	18.5	53	2 795	4 890	H = 2 900 L = 5 710 l = 1 900
SF-3021	770		82 000	6	22	54	3 890	6 700	H = 3 050 L = 6 170 l = 2 200
	Heat power ref. average (1) [kW]	Fans Qty	Outlet air flow rate [m3/h]	Water Heater power [kW]	Motor power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty (without beams) [kg]	Weight full (without beams) [kg]	Overall dimensions (with exhaust cone option) [mm]
CLOSED COOLING TOWER IB SOUND ATTENUATION									
SF-1812 IB	250	1	28 000	3	9	44	2 235	3 325	H = 2 630 L = 6 195 l = 1 600
SF-2415 IB	420		47 000	3	15	46	2 735	4 345	H = 2 700 L = 7 165 l = 1 600
SF-2718 IB	570		64 000	6	18.5	47	3 300	5 395	H = 2 900 L = 8 010 l = 1 900
SF-3021 IB	750		82 000	6	30	48	4 475	7 280	H = 3 050 L = 8 720 l = 2 200
	Heat power ref. average (1) [kW]	Fans Qty	Outlet air flow rate [m3/h]	Water Heater power [kW]	Motor power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty (without beams) [kg]	Weight full (without beams) [kg]	Overall dimensions (with exhaust cone option) [mm]
CLOSED COOLING TOWER ICV – ICVK - Special SOUND ATTENUATIONS									
SF-2415 ICV	410	1	47 000	3	18.5	39	4 035	5 645	H = 4 440 L = 7 165 l = 1 600
SF-2415 ICVK						36	4 545	6 160	
SF-2415 Special						On demand	4 750	6 365	
SF-2718 ICV	560		64 000	6	22	40	4 785	6 880	H = 4 440 L = 8 010 l = 1 900
SF-2718 ICVK						37	5 385	7 480	
SF-2718 Special						On demand	5 625	7 720	
SF3021 ICV	730		82 000	6	30	41	6 145	8 950	H = 4 720 L = 8 720 l = 2 200
SF3021 ICVK						38	6 860	9 660	
SF3021 Special						On demand	7 145	9 945	

(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): Sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side.

Drawings and dimensions SF without sound attenuation





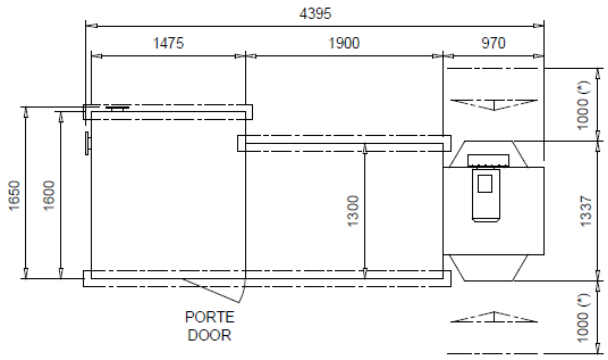


			SF 1812	SF 2415	SF 2718	SF 3021
Dimensions N (mm)			2 400	2 530	2 670	2 820
Dimensions X (mm)			2 420	2 420	2 670	2 820
Dimensions Y (mm)			600	700	700	800
A	Electro vanne Float valve (male)	Ø*	3/4''	1''	1''	1''1/2
		Ø*	1''	1''1/4	1''1/4	1''1/4
	Water make up	X	1 100	1 650	1 950	2 200
		Y	585	585	585	585
B	Overflow	DN	50	50	50	50
		X	1 800	2 400	2 700	3 000
		Y	560	560	560	560
C	Drain (female)	DN	50	50	50	50
		X	1 800	2 400	2 700	3 000
		Y	150	150	150	150
D	Hot water inlet	DN	150	150	150	150
		X	**	**	**	**
		Y	**	**	**	**
E	Cold water outlet	DN	150	150	150	150
		X	**	**	**	**
		Y	**	**	**	**
F	Drain basin POWER FLOW					
G	Non-freezing heater with integrated thermostat (option)					
H – I	Water level switch (option)					
J	Safety water level (low/high) (option)					
M	Outlet blow down (option)					
N	Outlet Exogel and drain pump					

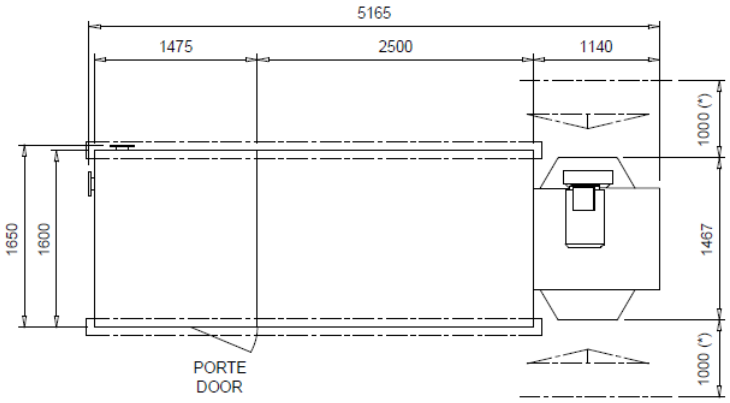
* : According to thermal data
** : According selected servitudes

Drawings and dimensions SF without sound attenuation

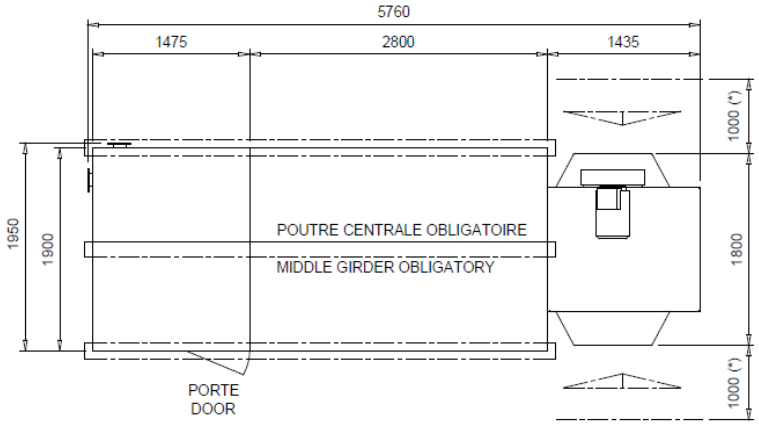
PLAN DE POSE SF1812
SF1812 BASEMENT



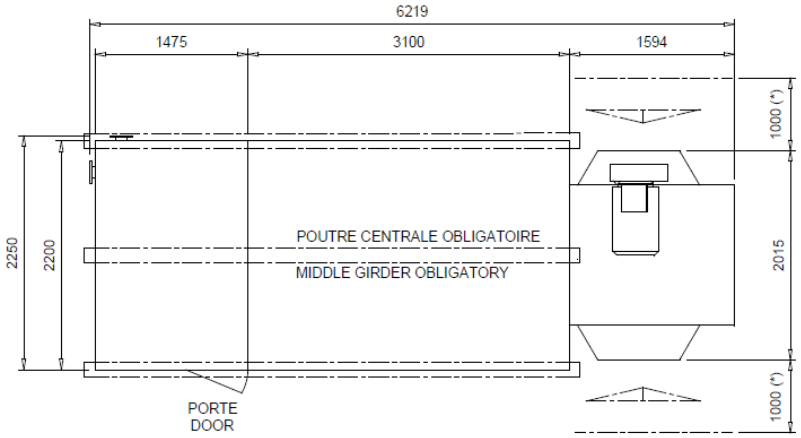
PLAN DE POSE SF2415
SF2415 BASEMENT



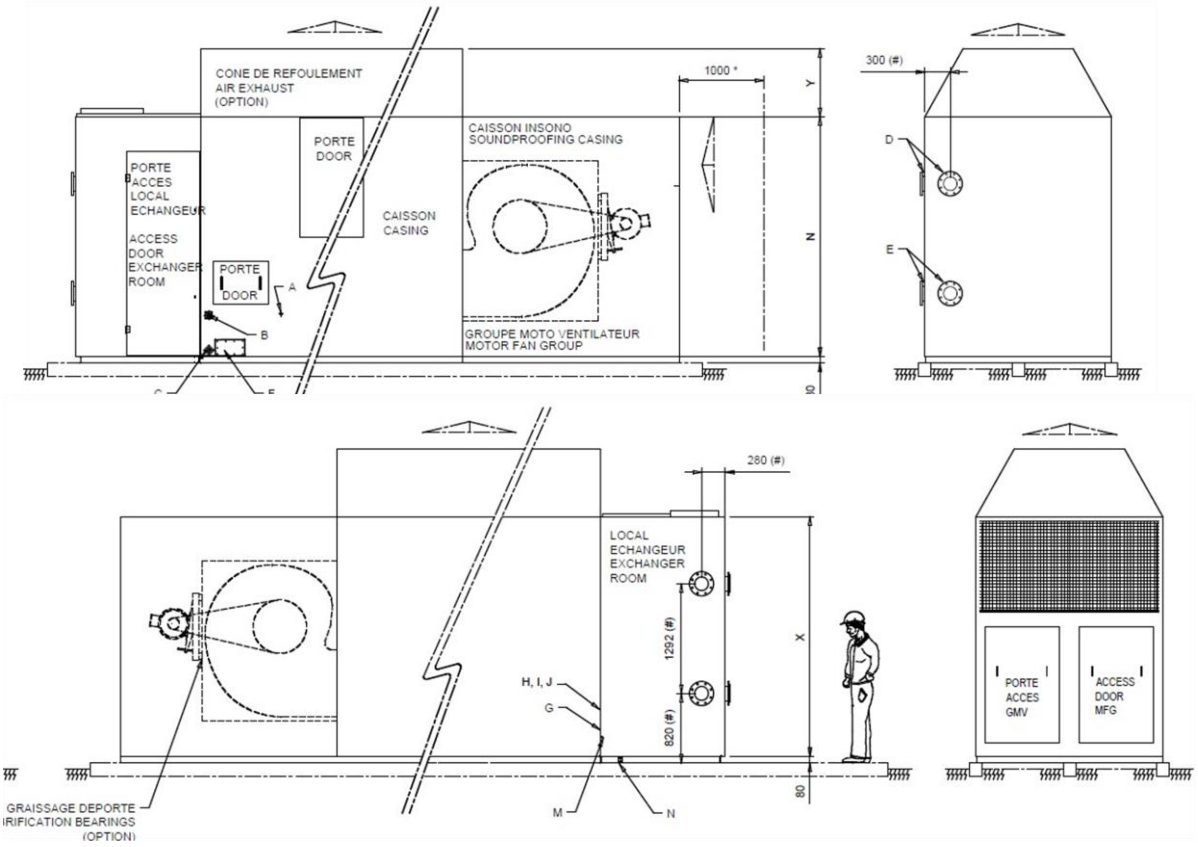
PLAN DE POSE SF2718
SF2718 BASEMENT



PLAN DE POSE SF3021
SF3021 BASEMENT



Drawings and dimensions SF with IB sound attenuation

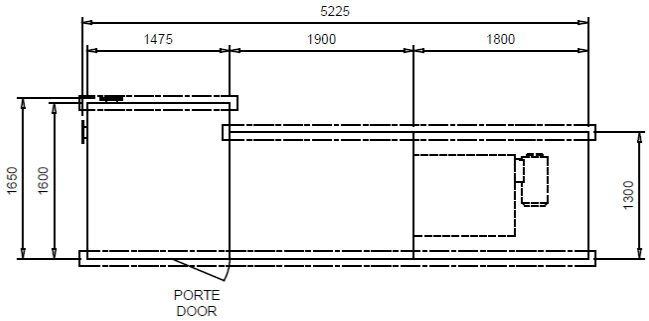


			SF 1812 IB	SF 2415 IB	SF 2718 IB	SF 3021 IB
Dimensions N (mm)			2 400	2 530	2 670	2 820
Dimensions X (mm)			2 420	2 420	2 670	2 820
Dimensions Y (mm)			600	700	700	800
A	Electro vanne Float valve (male)	Ø*	3/4''	1''	1''	1''1/2
		Ø*	1''	1''1/4	1''1/4	1''1/4
	Water make up	X	1 100	1 650	1 950	2 200
		Y	585	585	585	585
B	Overflow	DN	50	50	50	50
		X	1 800	2 400	2 700	3 000
		Y	560	560	560	560
C	Drain (female)	DN	50	50	50	50
		X	1 800	2 400	2 700	3 000
		Y	150	150	150	150
D	Hot water inlet	DN	100	100	100	150
		X	**	**	**	**
		Y	**	**	**	**
E	Cold water outlet	DN	100	100	100	150
		X	**	**	**	**
		Y	**	**	**	**
F	Drain basin POWER FLOW					
G	Non-freezing heater with integrated thermostat (option)					
H – I	Water level switch (option)					
J	Safety water level (low/high) (option)					
M	Outlet blow down (option)					
N	Outlet Exogel and drain pump					

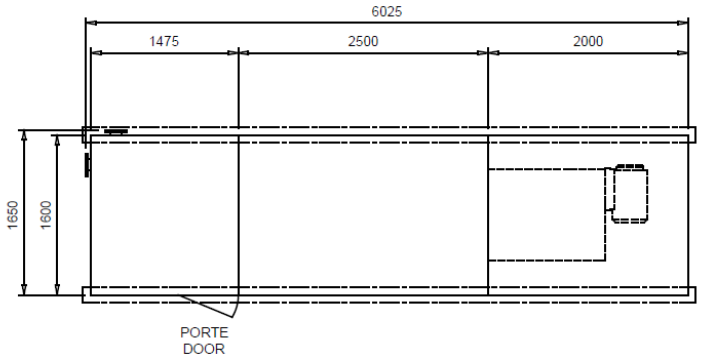
* : According to thermal data
** : According selected servitudes

Drawings and dimensions SF with IB sound attenuation

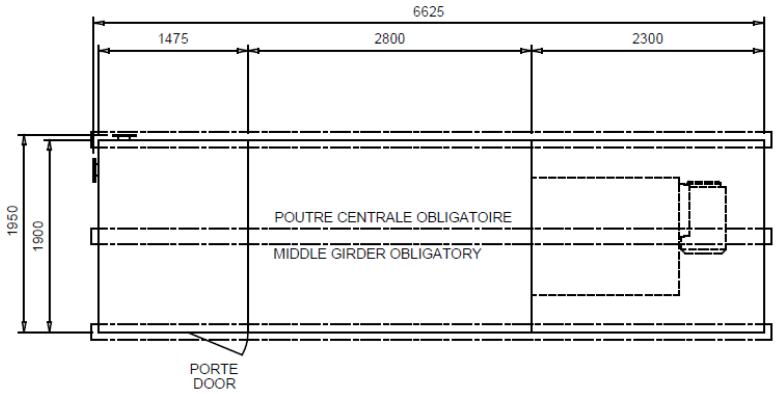
PLAN DE POSE SF1812
SF1812 BASEMENT



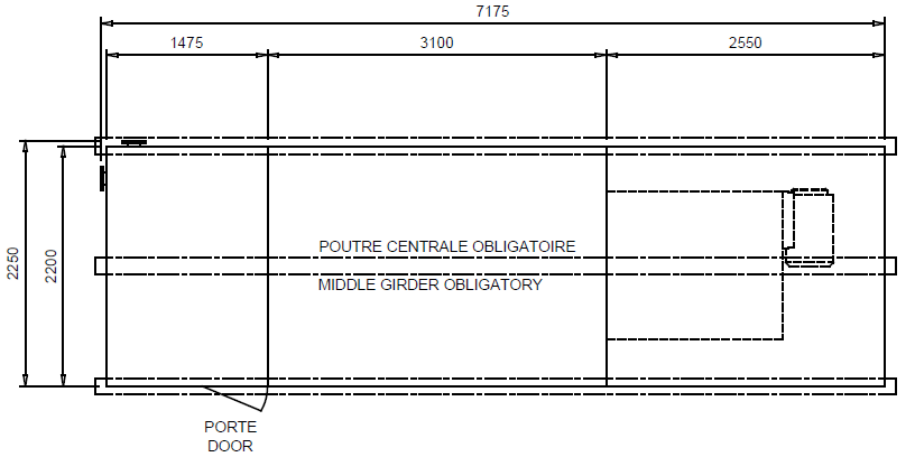
PLAN DE POSE SF2415
SF2415 BASEMENT



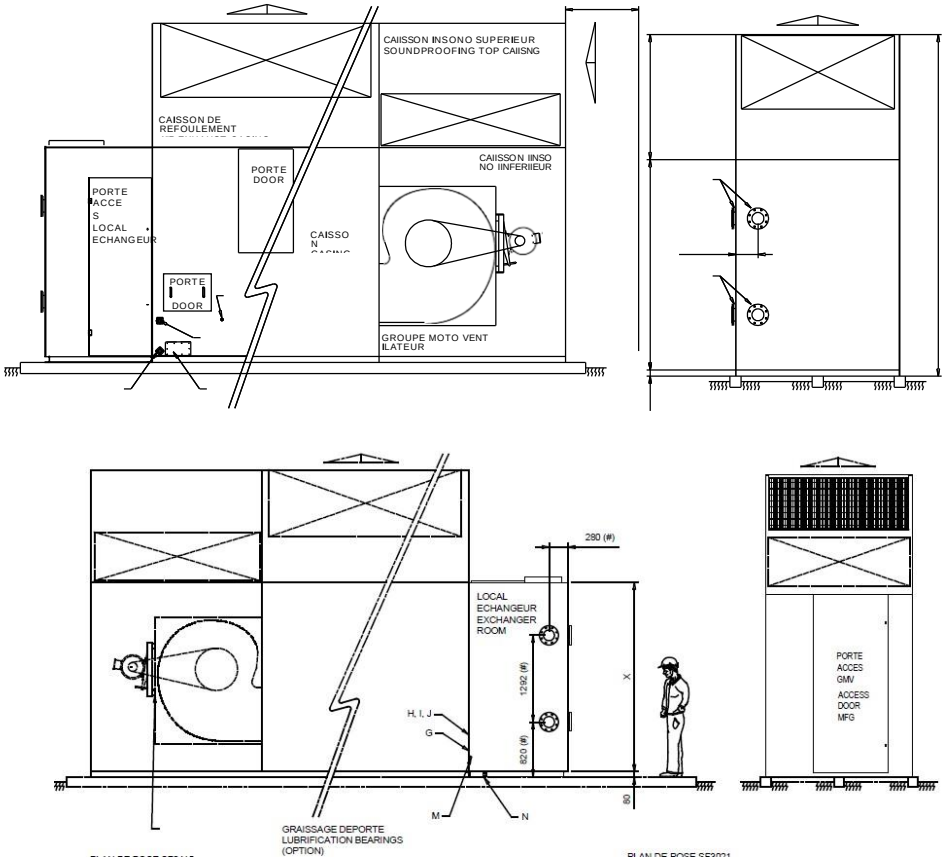
PLAN DE POSE SF2718
SF2718 BASEMENT



PLAN DE POSE SF3021
SF3021 BASEMENT



Drawings and dimensions SF with ICV sound attenuation

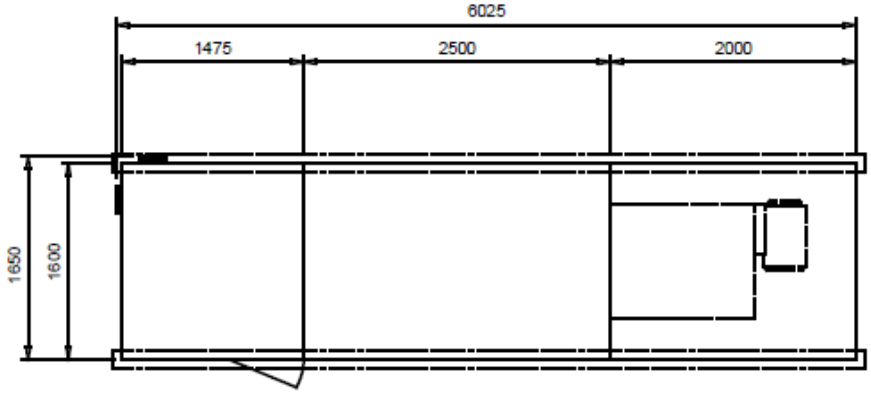


			SF 2415 ICV	SF 2718 ICV	SF 3021 ICV
Dimensions N (mm)			2 530	2 670	2 820
Dimensions X (mm)			2 420	2 670	2 820
Dimensions Y (mm)			4 290	4 430	4 580
A	Electro valve	Ø*	1''	1''	1''1/2
	Float valve (male)	Ø*	1''1/4	1''1/4	1''1/4
	Water make up	X	1 650	1 950	2 200
		Y	585	585	585
B	Overflow	DN	50	50	50
		X	2 400	2 700	3 000
		Y	560	560	560
C	Drain (female)	DN	50	50	50
		X	2 400	2 700	3 000
		Y	150	150	150
D	Hot water inlet	DN	100	100	150
		X	**	**	**
		Y	**	**	**
E	Cold water outlet	DN	100	100	150
		X	**	**	**
		Y	**	**	**
F	Drain basin POWER FLOW				
G	Non-freezing heater with integrated thermostat (option)				
H-I	Water level switch (option)				
J	Safety water level (low/high) (option)				
M	Outlet blow down (option)				
N	Outlet Exogel and drain pump				

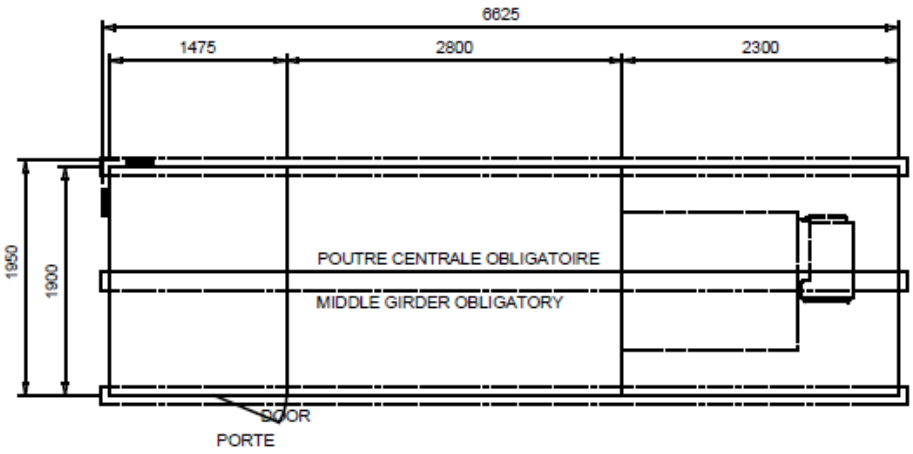
* : According to thermal data
** : According selected servitudes

Drawings and dimensions SF with ICV sound attenuation

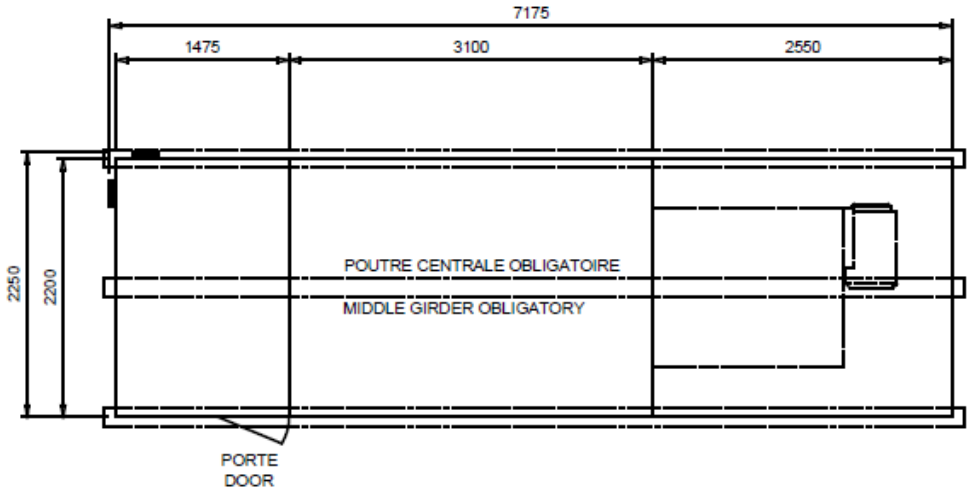
PLAN DE POSE SF2415
SF2415 BASEMENT



PLAN DE POSE SF2718
SF2718 BASEMENT



PLAN DE POSE SF3021
SF3021 BASEMENT



Technical characteristics SFIM

HYBRID CLOSED COOLING TOWER WITHOUT SOUND ATTENUATION

	Heat power ref. average (1) [kW]	Fans Qty	Outlet air flow rate [m3/h]	Water Heater power [kW]	Motor power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty (without beams) [kg]	Weight full (without beams) [kg]	Overall dimensions (with exhaust cone option) [mm]
SFIM-1812	260	1	27 000	3	9	50	2 055	3 255	H = 3 090 L = 4 345 l = 1 920
SFIM-2415	430		45 600	3	15	52	2 570	4 330	H = 3 270 L = 5 165 l = 2 220
SFIM-2718	590		62 000	6	18,5	53	3 145	5 435	H = 3 400 L = 5 705 l = 2 600
SFIM-3021	770		80 000	6	22	54	4 340	7 365	H = 3 550 L = 6 165 l = 2 815

HYBRID COOLING TOWER IB SOUND ATTENUATION

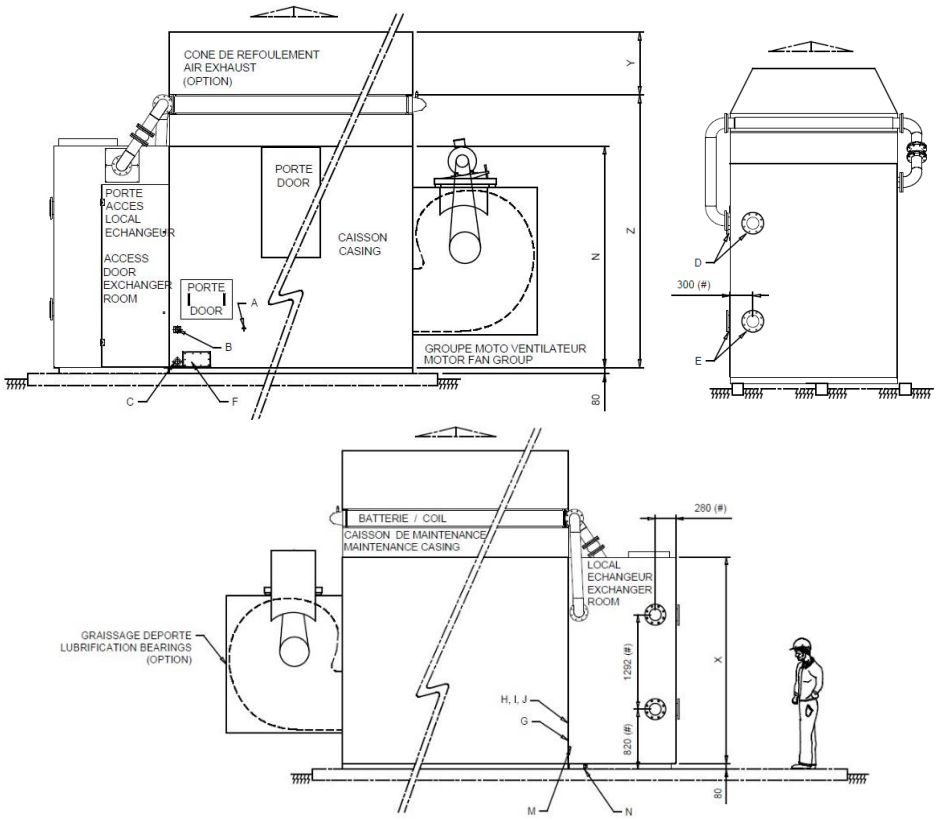
	Heat power ref. average (1) [kW]	Fans Qty	Outlet air flow rate [m3/h]	Water Heater power [kW]	Motor power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty (without beams) [kg]	Weight full (without beams) [kg]	Overall dimensions (with exhaust cone option) [mm]
SFIM-1812 IB	250	1	27 000	3	9	44	2 405	3 600	H = 3 790 L = 5 175 l = 1 920
SFIM-2415 IB	420		45 600	3	15	46	3 000	4 760	H = 3 970 L = 5 975 l = 2 220
SFIM-2718 IB	570		62 000	6	18,5	47	3 650	5 940	H = 4 100 L = 6 575 l = 2 600
SFIM-3021 IB	750		80 000	6	22	48	4 920	7 950	H = 4 250 L = 7 125 l = 2 815

CLOSED HYBRID COOLING TOWER ICV – ICVK – SPECIAL SOUND ATTENUATIONS

	Heat power ref. average (1) [kW]	Fans Qty	Outlet air flow rate [m3/h]	Water Heater power [kW]	Motor power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty (without beams) [kg]	Weight full (without beams) [kg]	Overall dimensions (with exhaust cone option) [mm]
SFIM-2415 ICV	410	1	45 600	3	18.5	39	4 300	6 060	H = 5 650 L = 5 975 l = 2 220
SFIM-2415 ICVK						36	4 815	6 570	
SFIM-2415 Special						On demand	5 020	6 675	
SFIM-2718 ICV	560		62 000	6	22	41	5 135	7 425	H = 5 780 L = 6 575 l = 2 600
SFIM-2718 ICVK						38	5 735	8 025	
SFIM-2718 Special						On demand	5 975	8 265	
SFIM-3021 ICV	730		80 000	6	30	42	6 590	9 620	H = 5 930 L = 7 125 l = 2 815
SFIM-3021 ICVK						39	7 300	10 330	
SFIM3021 Special						On demand	7 585	10 615	

(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side.

Drawings and dimensions SFIM without attenuation

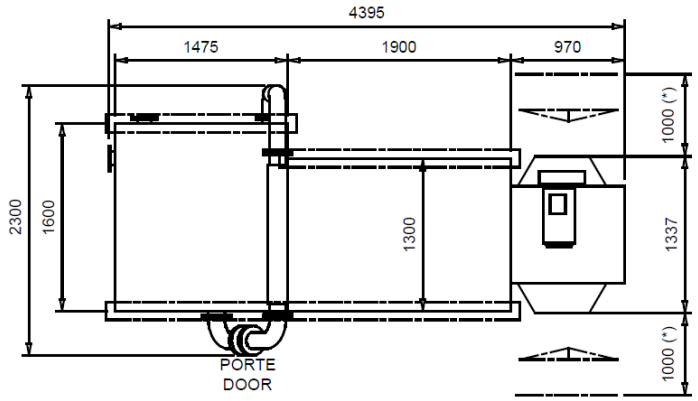


			SFIM 1812	SFIM 2415	SFIM 2718	SFIM 3021
Dimensions N (mm)			2 400	2 530	2 670	2 820
Dimensions X (mm)			2 420	2 420	2 670	2 820
Dimensions Y (mm)			600	700	700	800
Dimensions Z (mm)			3 130	3 260	3 400	3 550
A	Electro vanne Float valve (male)	Ø*	3/4''	1''	1''	1''1/2
		Ø*	1''	1''1/4	1''1/4	1''1/4
	Water make up	X	1 100	1 650	1 950	2 200
		Y	585	585	585	585
B	Overflow	DN	50	50	50	50
		X	1 800	2 400	2 700	3 000
		Y	560	560	560	560
C	Drain (female)	DN	50	50	50	50
		X	1 800	2 400	2 700	3 000
		Y	150	150	150	150
D	Hot water inlet	DN	100	100	100	150
		X	**	**	**	**
		Y	**	**	**	**
E	Cold water outlet	DN	100	100	100	150
		X	**	**	**	**
		Y	**	**	**	**
F	Drain basin POWER FLOW					
G	Non-freezing heater with integrated thermostat (option)					
H – I	Water level switch (option)					
J	Safety water level (low/high) (option)					
M	Outlet blow down (option)					
N	Outlet Exogel and drain pump					

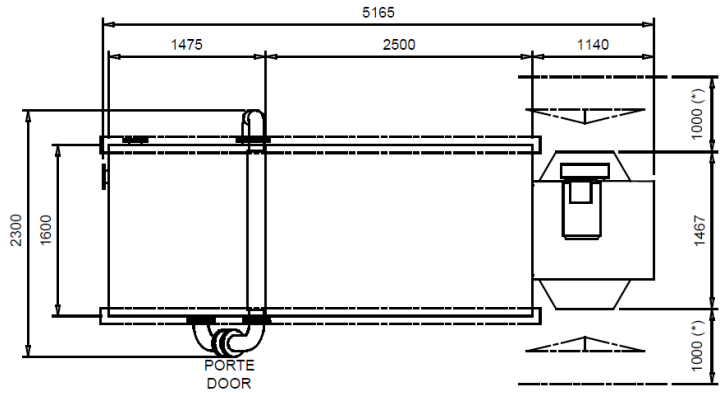
* : According to thermal data
** : According selected servitudes

Drawings and dimensions SFIM without attenuation

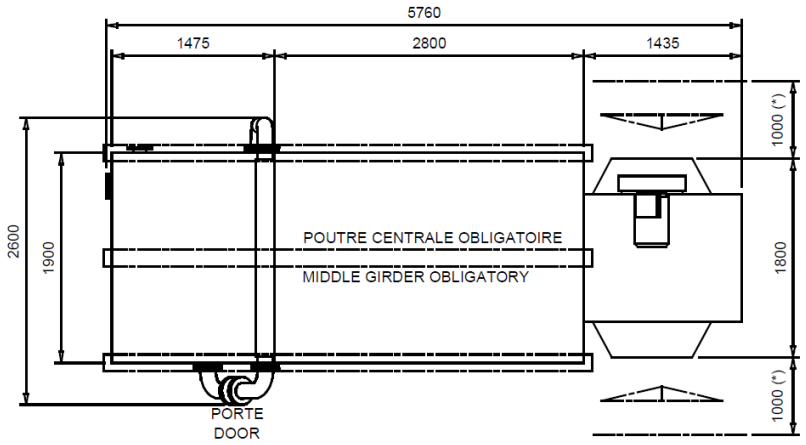
PLAN DE POSE SFIM1812
SFIM1812 BASEMENT



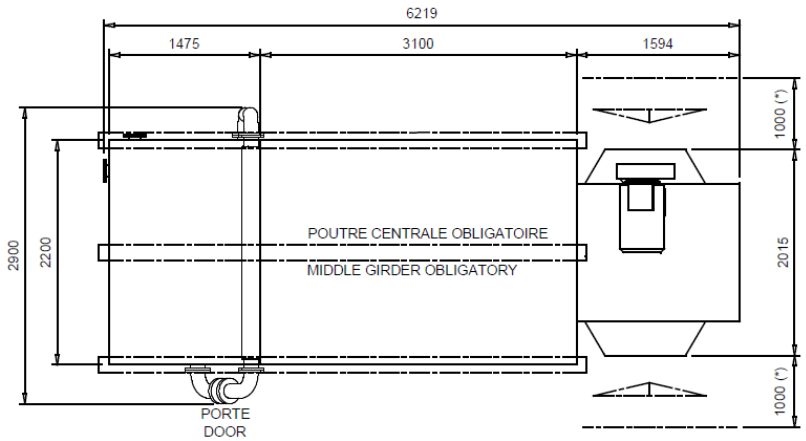
PLAN DE POSE SFIM2415
SFIM2415 BASEMENT



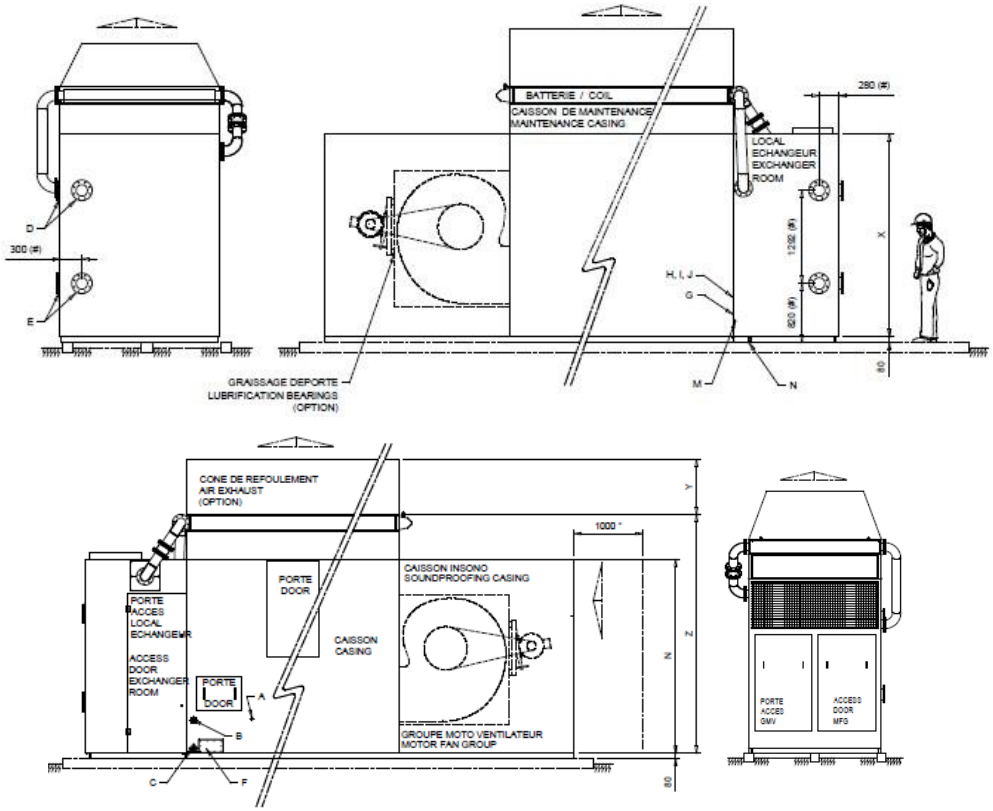
PLAN DE POSE SFIM2718
SFIM2718 BASEMENT



PLAN DE POSE SFIM3021
SFIM3021 BASEMENT



Drawings and dimensions SFIM with IB sound attenuation

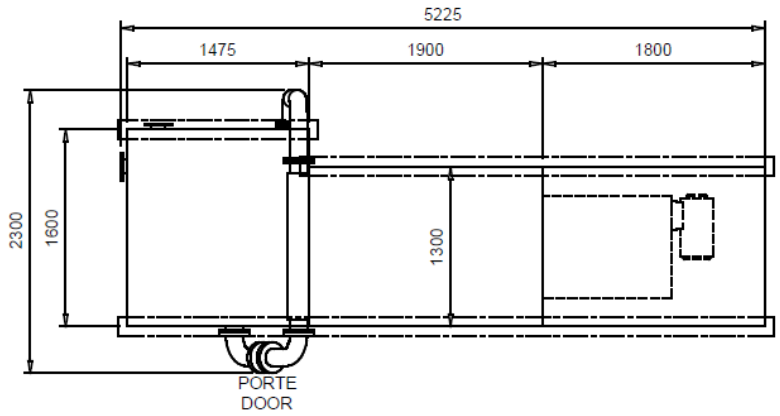


			SFIM 1812 IB	SFIM 2415 IB	SFIM 2718 IB	SFIM 3021 IB
Dimensions N (mm)			2 400	2 530	2 670	2 820
Dimensions X (mm)			2 420	2 420	2 670	2 820
Dimensions Y (mm)			600	700	700	800
Dimensions Z (mm)			3 130	3 260	3 400	3 550
A	Electro vanne Float valve (male)	Ø*	3/4''	1''	1''	1''1/2
		Ø*	1''	1''1/4	1''1/4	1''1/4
	Water make up	X	1 100	1 650	1 950	2 200
		Y	585	585	585	585
B	Overflow	DN	50	50	50	50
		X	1 800	2 400	2 700	3 000
		Y	560	560	560	560
C	Drain (female)	DN	50	50	50	50
		X	1 800	2 400	2 700	3 000
		Y	150	150	150	150
D	Hot water inlet	DN	100	100	100	150
		X	**	**	**	**
		Y	**	**	**	**
E	Cold water outlet	DN	100	100	100	150
		X	**	**	**	**
		Y	**	**	**	**
F	Drain basin POWER FLOW					
G	Non-freezing heater with integrated thermostat (option)					
H – I	Water level switch (option)					
J	Safety water level (low/high) (option)					
M	Outlet blow down (option)					
N	Outlet Exogel and drain pump					

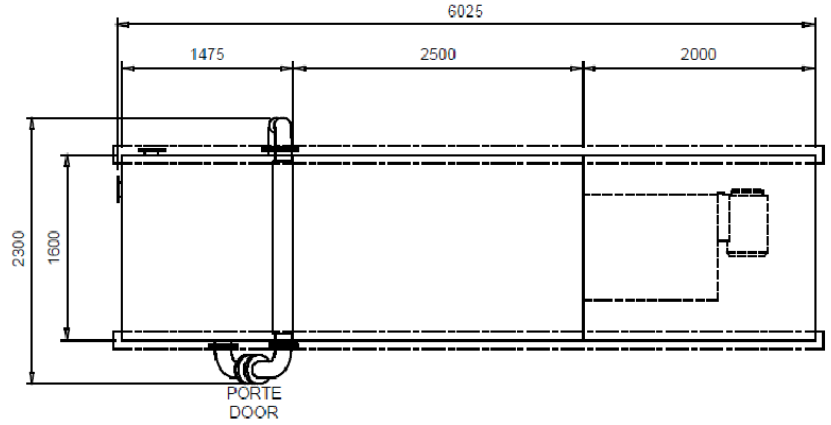
*: According to thermal data
**: According selected servitudes

Drawings and dimensions SFIM with IB sound attenuation

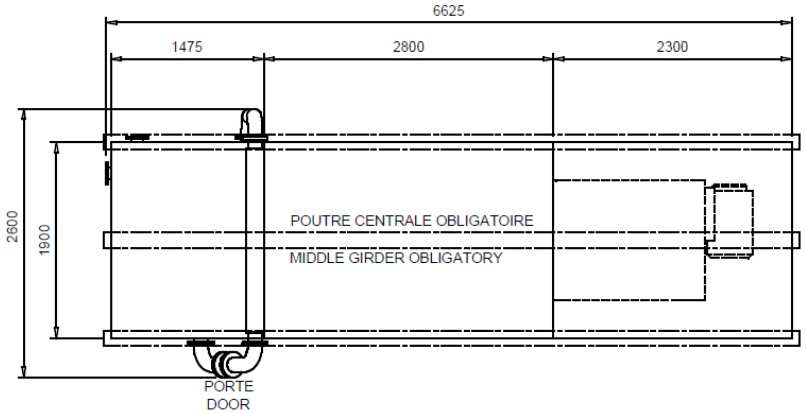
PLAN DE POSE SFIM1812
SFIM1812 BASEMENT



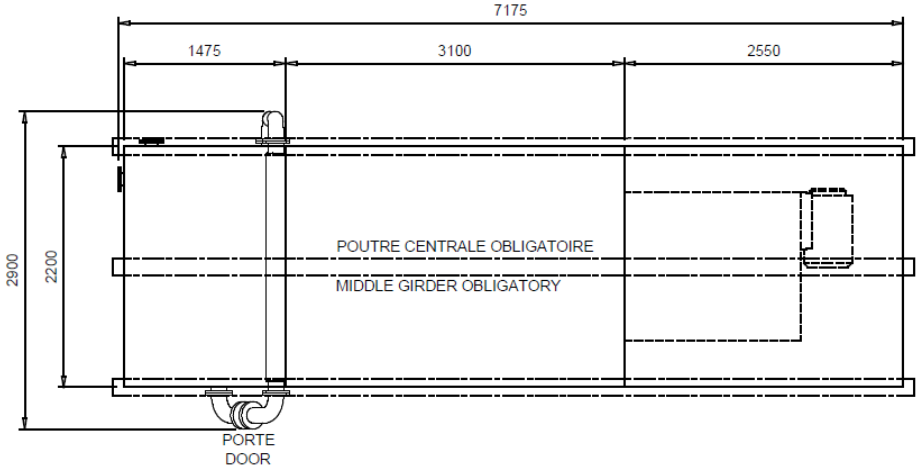
PLAN DE POSE SFIM2415
SFIM2415 BASEMENT



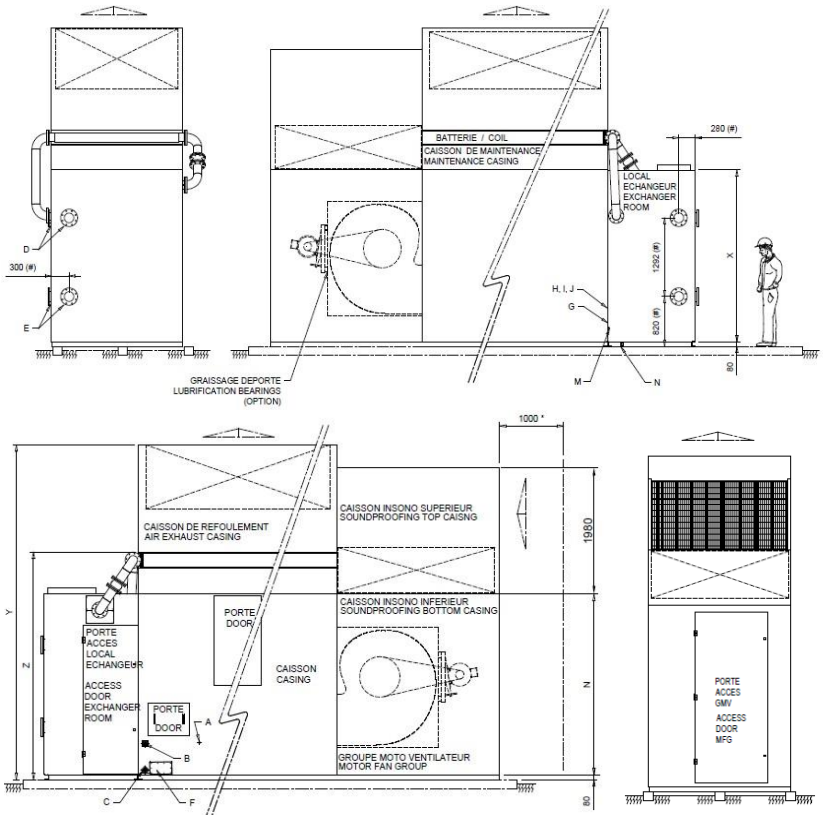
PLAN DE POSE SFIM2718
SFIM2718 BASEMENT



PLAN DE POSE SFIM3021
SFIM3021 BASEMENT



Drawings and dimensions SFIM with ICV – ICVK - Special sound attenuation

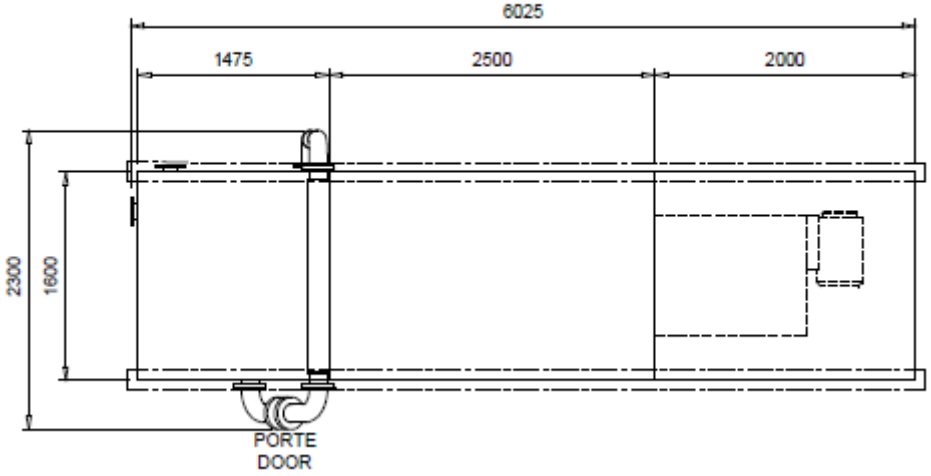


			SFIM 2415 ICV	SFIM 2718 ICV	SFIM 3021 ICV
Dimensions N (mm)			2 530	2 670	2 820
Dimensions X (mm)			2 420	2 670	2 820
Dimensions Y (mm)			4 940	4 080	4 230
Dimensions Z (mm)			3 180	3 320	4 370
A	Electro valve	Ø*	1''	1''	1''1/2
	Float valve (male)	Ø*	1''1/4	1''1/4	1''1/4
	Water make up	X	1 650	1 950	2 200
		Y	585	585	585
B	Overflow	DN	50	50	50
		X	2 400	2 700	3 000
		Y	560	560	560
C	Drain (female)	DN	50	50	50
		X	2 400	2 700	3 000
		Y	150	150	150
D	Hot water inlet	DN	100	100	150
		X	**	**	**
		Y	**	**	**
E	Cold water outlet	DN	100	100	150
		X	**	**	**
		Y	**	**	**
F	Drain basin POWER FLOW				
G	Non-freezing heater with integrated thermostat (option)				
H-I	Water level switch (option)				
J	Safety water level (low/high) (option)				
M	Outlet blow down (option)				
N	Outlet Exogel and drain pump				

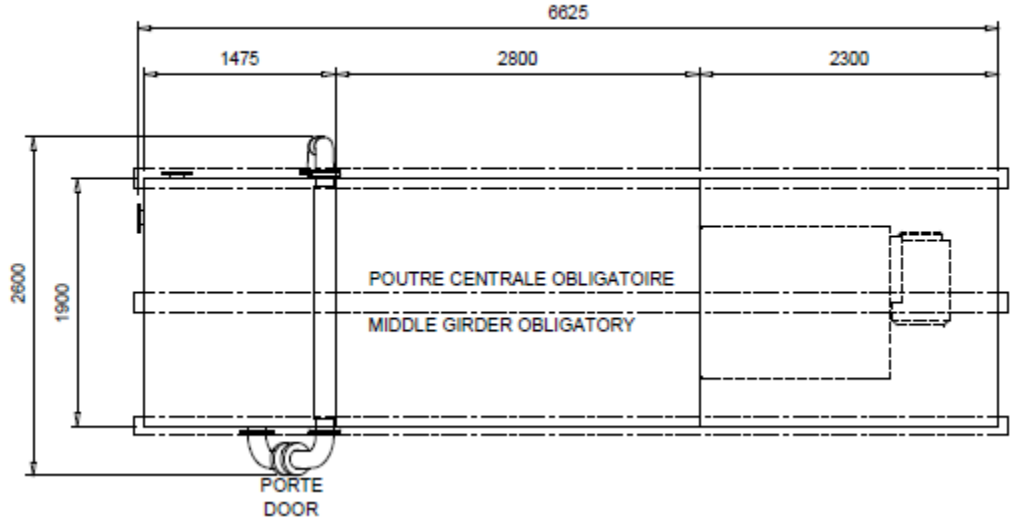
* : According to thermal data
** : According selected servitudes

Drawings and dimensions SFIM with ICV – ICVK - Special sound attenuation

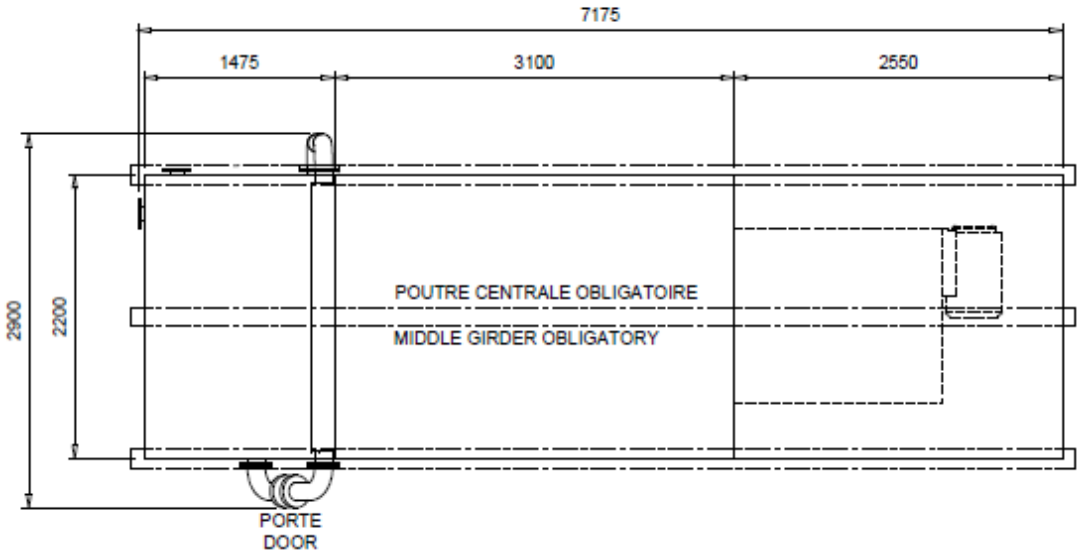
PLAN DE POSE SFIM2415
SFIM2415 BASEMENT



PLAN DE POSE SFIM2718
SFIM2718 BASEMENT



PLAN DE POSE SFIM3021
SFIM3021 BASEMENT

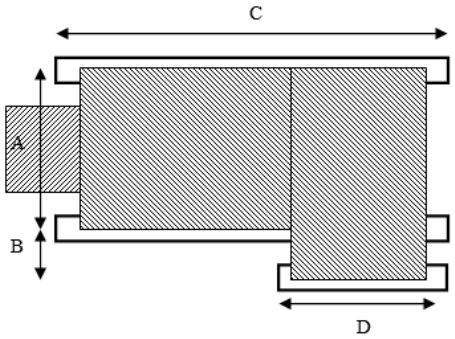


Support SF

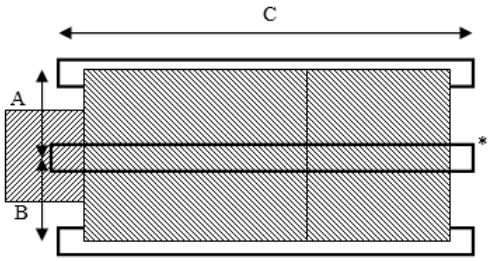
SF cooling tower ranges can stand on a concrete base or on steel frame beams (customer supply). Check that the ground can stand the operating load, and that surface or supports are flat and horizontal.

Quantity and position of concrete or metallic beams (customer supply) for cooling towers without sound attenuation

SF 1812



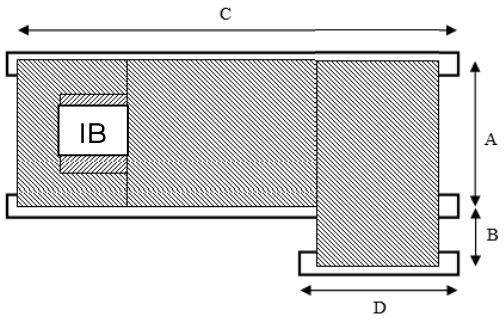
Others SF



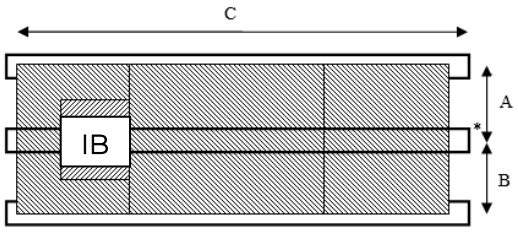
	Qty	Distance between beams under the basin A [mm]	Distance between beams under the basin B [mm]	Length superior to C [mm]	Length superior to D [mm]
SF 1812	3	1 330	295	3 500	1 600
SF 2415	2	1 630		4 200	
SF 2718	3	926,5	926,5	4 500	
SF 3021	3	1 115	1 115	4 800	

Quantity and position of concrete or metallic beams (customer supply) for cooling towers with IB sound attenuation

SF 1812



Others SF



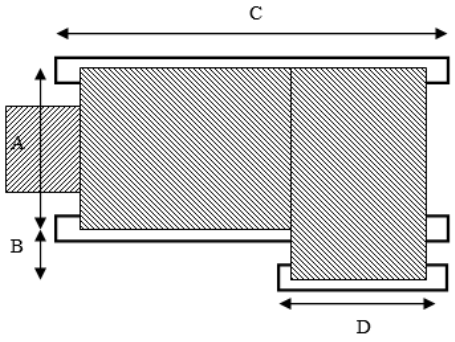
	Qty	Distance between beams under the basin A [mm]	Distance between beams under the basin B [mm]	Length superior to C [mm]	Length superior to D [mm]
SF 1812	3	1 330	295	5 300	1 600
SF 2415	2	1 630		6 200	
SF 2718	3	926,5	926,5	6 800	
SF 3021	3	1 115	1 115	7 350	

Support SFIM

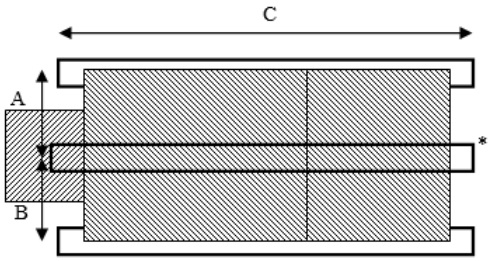
SFIM cooling tower ranges can stand on a concrete base or on steel frame beams (customer supply).
Check that the ground can stand the operating load, and that surface or supports are flat and horizontal.

Quantity and position of concrete or metallic beams (customer supply) for cooling towers without sound attenuation

SFIM 1812



Others SFIM



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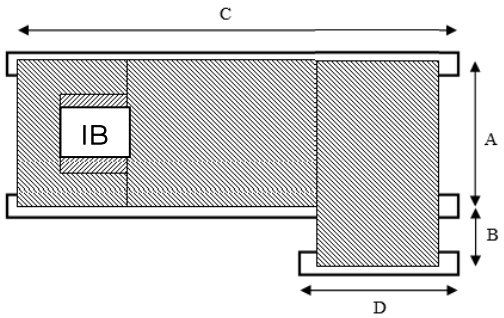
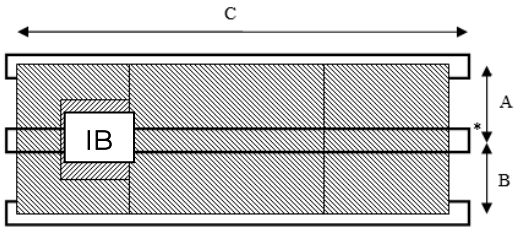
SFIM 2415	2	1 630		4 200	
SFIM 2718	3	926,5	926,5	4 500	
SFIM 3021	3	1 115	1 115	4 800	

Quantity and position of concrete or metallic beams (customer supply) for cooling towers with IB sound attenuation

SF 1812



Autre SF



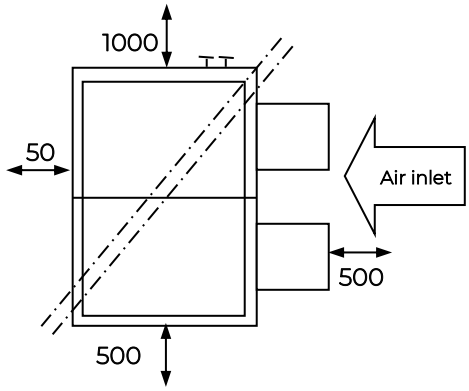
	Qty	Distance between beams under the basin A [mm]	Distance between beams under the basin B [mm]	Length superior to C [mm]	Length superior to D [mm]
SFIM 1812	3	1 330	295	5 300	1 600
SFIM 2415	2	1 630		6 200	
SFIM 2718	3	926,5	926,5	6 800	
SFIM 3021	3	1 115	1 115	7 350	

On site Layout SF - SFIM

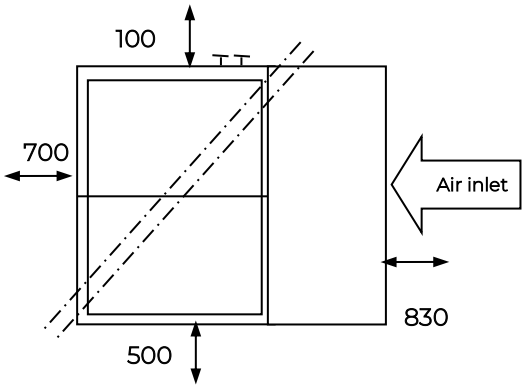
Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings. This could create a risk of a « re-circulation »; the air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower.
In any case, the free access on the four sides of the tower must be secured to ensure that the fans are supplied correctly with air and that there is proper access for installation and maintenance.
If these rules are not applied, it is inevitable that the cooling tower will not operate properly.

Recommended minimum free access (mm) for standard cooling towers: Top view

Cooling tower without sound attenuation



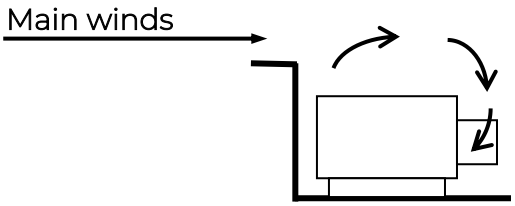
Sound attenuated cooling tower



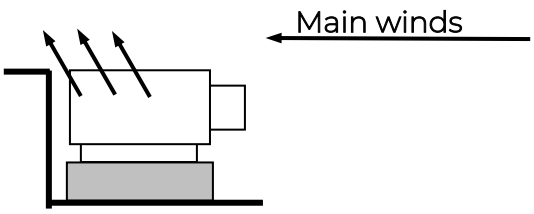
Do not hesitate to contact us for any advice

Layout examples:

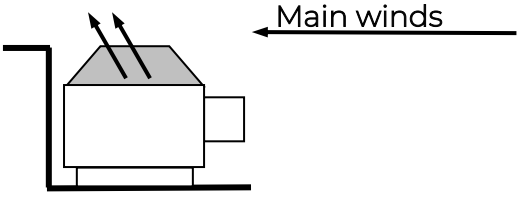
NO



YES



Install a base in order to
up the cooling tower



Install a cone in order to
up the air outlet of the cooling tower

WATER EVAPORATION

Consumption by evaporation is approximately 1.7 kg/h per 1 000 kcal/h.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible).
There are three possibilities to choose according to the case:

1- Continuous blow down

Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.

The blow down flow rate can be calculated using the formula: *100 S / (M - S)* % of the make-up water in which:
S: Salinity of the make-up water compensating for evaporation.
M: Maximum acceptable salinity level of water in circuits.

Example:
Salinity of make-up water = HT 20 ° F
Maximum acceptable salinity = HT 40 ° F
100 x 20 / (40 - 20) = 100 % make-up water flow rate
Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).

Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous blow down

The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- JACIR Automated Inductive Blow down

Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level. See separate documentation.

WATER TREATMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly. If the water contains a significant amount of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10 % of the recycled water flow.
If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.
In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to prevent these organisms from developing.

Water treatment should be undertaken by a specialized Company.
PREVENTS THE RISK OF LEGIONNAIRES' DISEASE: See separate documentation.

Prescription SF

Evaporative cooling tower, high efficiency closed circuit with forced centrifugal fans, SF ..... JACIR type, designed for a glycol free operation during freezing period.

The system will be with a double exchange: a direct exchange air/ water, and an exchange water/ water, both counter flow types.

The cooling tower will be designed and delivered by the supplier, totally assembled on frame, exchanger, pump and technical accessories gathered in a same technical area with large access door.

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Sound level characteristics

The sound pressure level will not exceed.... dB (A) at ..... meters in free field over 4 directions. To ensure this, the tower has one of the following types of soundproofing devices:

1 – IB option with sound attenuators without baffles at air inlet, and outlet cone coated with acoustic foam.

2 – ICV – ICVK or Special sound attenuation with parallel baffles both at air inlet and outlet, equipped with 50mm thick high density rock wool double casing, covered by 1.2 mm thick steel sheet. NR30 at 10m may be reached.

I – WATER – AIR EXCHANGE: COOLING TOWER CIRCUIT
Tower casing, sloped and plane bottom basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive if necessary, a double casing later on.
Stainless steel rivets with uniform and high-capacity locking will be used for assembly.

The cooling tower casing will be assembled without any bolting or welding for the parts in contact with water; a special designed high covering seal ensure waterproofing between the panels.

The basin will be equipped with a rectangular access door (390 x 540 mm), with a floating valve that can easily be adjusted, a drain, an overflow and an anti-cavitation strainer.
The sloped bottom of the basin will allow a complete and easy drain thanks to the (POWER FLOW) drain hole located under the lowest part of the basin in order to ease the cleaning. The size of this opening will be 260x110 mm. Height between basin bottom and the infill is 1400 mm for easy access.

Casing structure

The cooling tower panels casing will be made of:

- As a standard, galvanized steel 2 mm thick ZENDZIMIR process 275 gr/m² or;
- Option, X-STEEL stainless steel (corrosion resistance higher than 316L) for its long-lasting properties, water saving and easy cleaning.

Accessibility

As a standard, the basin will be delivered with access door(s) sized 390 x 540 mm, and a POWER FLOW access 260 x 110 mm allowing express draining and cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

A large door sized 1290 x 640 mm in the same material as the cooling tower casing will also be provided, and will allow quick removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

Filtration

Located at the outlet of the basin, a 5 mm strainer will be installed and a FRC centrifugal filter made of the same material as the piping (galvanized steel, or 304-316L options) will be provided before the plate heat exchanger.

The centrifugal FRC filter will offer the following characteristics:

- 100 % of the cooling tower flow will be filtered continuously every 1.2 minute: very high efficiency
- High efficiency at 60 µm for all elements with density superior to 1,
- Automatic cleaning during the blow down of water circuit.

The evaporative circuit will remain clean to avoid Legionella growth risk.

Fans

The low-pressure centrifugal fan(s) with forward-inclined blades and double air admission will be placed outside the basin in dry airflow and at man chest to access without disassembly.
The polyester inlet duct(s) stand out to optimise air suction will be simple to disassemble for easy maintenance.
The impeller is protected from corrosion by a baked epoxy coating. The elliptical scroll is made of X-STEEL stainless steel.
Optionally, the impeller can be made of stainless-steel.

Electric motor and coupling

The IE3 asynchronous three-phase motor(s) will be closed type ventilated case(s) with a power of maximum kW....., rpm ....., IP55 protected, class F/B. Coupling will be made of trapezoidal belts selected for 150 % of nominal power.

Water distribution

Water distribution will be made of PVC pipes through highly efficient polypropylene water distributors: the nozzles will distribute the water uniformly on the whole exchange surface and will be easily removable.

Exchange surface

Made of thermoformed and welded Polypropylene sheets, EFFI-PACK heat exchange surface will be resistant to chocks and will offer a large available surface. This system will ensure fouling risks reduction.

Drift eliminators

Highly efficient Eurovent certified, the PP sheets drift eliminators will prevent the water from being sprayed out at the outlet tower. Ultraviolet resistant, they will be easy to remove from the top in order to access to the distributors and to the exchange surface if needed. The drift will be 0.01 % maximum of the re-circulating water flow.

II – WATER – WATER EXCHANGE: USER CIRCUIT
Integrated exchanger room

The stainless-steel plate heat exchanger will be imperatively protected from conditions weather in its dedicated room: self-supporting galvanized structure (20/10e minimum) paint coating as a standard. This integrated exchanger room with removable panels for easy maintenance will be equipped with a large access door sized 2400 x 850 mm as a standard.
The plate heat exchanger connection will be provided outside the room by 2 flanges.
The plate heat exchanger will be equipped with gaskets and symmetric plates.
Life freezing damage free guarantee, even with the use of non-glycol water.

Connections

A stainless-steel strainer and a cleanable filter (on large size exchanger room only) will secure the proper water filtration before the inlet to the plate heat exchanger. The water circulation inside the system will be secured by a pump. This pump will be protected against freeze by a thermostatic valve.

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection. As standard, a low-level switch will avoid the start of the pump and will protect the water heaters in case of “too low” water level.

Pressure meters for control will be located before and after the pump, and before the water distribution header. They will secure a constant control of the system. A blow down hole with setting valve will be provided, and an electro valve as an option.

The servitudes panels will include a high-level switch, a drain hole and water make up.

Exchanger pump

Protected from freezing thanks to a patented thermostatic valve, the pump will not need any electrical tracing. A safety level switch will be provided to protect from cavitation.

Options

A water treatment may be integrated, as an option, as well as an integrated blow down (AID) inside in the exchanger room (see separate documentation).

Prescription SFIM

Evaporative cooling tower, high efficiency closed circuit with forced centrifugal fans, SFIM ..... JACIR type, designed for a glycol free operation during freezing period.
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The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

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The evaporative circuit will remain clean to avoid Legionella growth risk.

Fans

The low-pressure centrifugal fan(s) with forward-inclined blades and double air admission will be placed outside the basin in dry airflow and at man chest to access without disassembly.
The polyester inlet duct(s) stand out to optimise air suction will be simple to disassemble for easy maintenance.
The impeller will be protected from corrosion by a baked epoxy coating. The elliptical scroll will be made of X-STEEL stainless steel.

Electric motor and coupling

The IE3 asynchronous three-phase motor(s) will be closed type ventilated case(s) with a power of maximum kW....., rpm ....., IP55 protected, class F/B. Coupling will be made of trapezoidal belts selected for 150 % of nominal power.

Water distribution

Water distribution will be made of PVC pipes through highly efficient polypropylene water distributors: the nozzles will distribute the water uniformly on the whole exchange surface and will be easily removable.

Exchange surface

Made of thermoformed and welded Polypropylene sheets, EFFI-PACK heat exchange surface will be resistant to chocks and will offer a large available surface. This system will ensure fouling risks reduction. The Infill will have an excellent high temperature and chemical agents' resistance, and easy maintenance.

Drift eliminators

Highly efficient Eurovent certified, the PP sheets drift eliminators will prevent the water from being sprayed out at the outlet tower. Ultraviolet resistant, they will be easy to remove from the top in order to access to the distributors and to the exchange surface if needed. The drift will be 0.01 % maximum of the re-circulating water flow.

Non-freezing plume suppression coil and modulating valve (JACIR patent)

As a standard model, the stainless-steel headers will be totally removable for access and complete cleaning. This “cover” type configuration will protect the coil from accidental damage related to possible freeze-over. Two air vents will secure the freezing risk. The tubes will be assembled in a triangular pitch, in copper outside diameter 12 mm, and 0.5 mm thick. The fins will be in copper.
A monitored valve adjusting the water flow sprays over the infill, will be associated to the plume coil.

II – WATER – WATER EXCHANGE: USER CIRCUIT

Integrated exchanger room

The stainless-steel plate heat exchanger will be imperatively protected from conditions weather in its dedicated room: self-supporting galvanized structure (20/10e minimum) paint coating as a standard. This integrated exchanger room with removable panels for easy maintenance will be equipped with a large access door sized 2400 x 850 mm as a standard.
The plate heat exchanger connection will be provided outside the room by 2 flanges.
The plate heat exchanger will be equipped with gaskets and symmetric plates.
Life freezing damage free guarantee, even with the use of non-glycol water.

Connections

A stainless-steel strainer and a cleanable filter (on large size exchanger room only) will secure the proper water filtration before the inlet to the plate heat exchanger. The water circulation inside the system will be secured by a pump. This pump will be protected against freeze by a thermostatic valve.
All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection. As standard, a low-level switch will avoid the start of the pump and will protect the water heaters in case of “too low” water level.
Pressure meters for control will be located before and after the pump, and before the water distribution header. They will secure a constant control of the system. A blow down hole with setting valve will be provided, and an electro valve as an option.
The servitudes panels will include a high-level switch, a drain hole and water make up.

Exchanger pump

Protected from freezing thanks to a patented thermostatic valve, the pump will not need any electrical tracing. A safety level switch will be provided to protect from cavitation.

Options

A water treatment may be integrated, as an option, as well as an integrated blow down inside in the exchanger room (see separate documentation).

JACIR
Cooling for life

KS

Open silent centrifugal cooling tower

Commercial Documentation

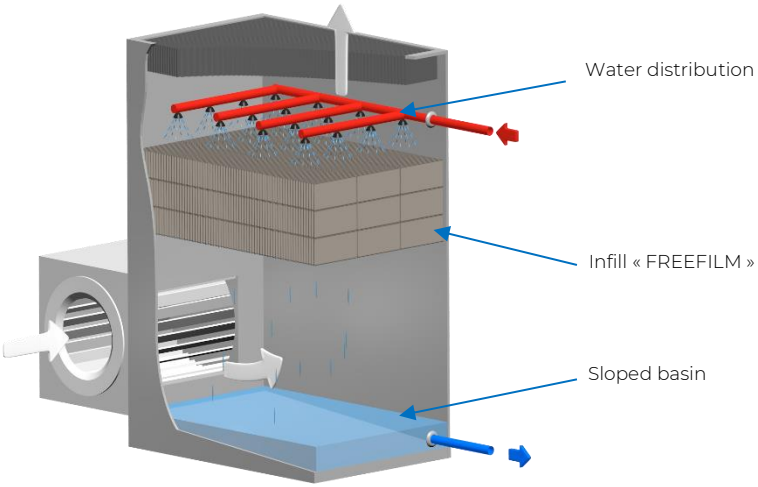
Water ranges from 74 to 766m³/h

Capacity: 1100 to 3300kW

- FREEFILM : industrial infill
- Mechanical resistance
- Hygiene compliance
- Easy maintenance
- Reliability

La FRENCH FAB

OPEN SILENT CENTRIFUGAL COOLING TOWER: KS



Casing structure

All the galvanized steel cooling tower panels casing have been twice or 4 times folded over the 4 sides, also proposed in X-STEEL stainless steel as an option (corrosion resistance higher than 316L). The water tightness between the panels is ensured by a special designed high covering seal and stainless-steel rivets (uniform and high-capacity locking), located on external side of the casing. Panels' assembly is made without any bolting or welding for the parts in contact with water: unique strength and waterproof JACIR design.

As a standard, two large doors in the same material as the cooling tower are provided on bottom and upper casings to allow quickly access or removal of the drift eliminators, nozzles, exchange surface and water distribution pipes.

Basin

The basin has been thought to take into account the needs and inertia of the installation. In order to reduce bacteria growth, panel's assembly has been realised without any bolts or screws for the parts in contact with water. The sloped and flat basin is equipped with a drain and a POWER FLOW access, both located under the lower level of the basin, enabling a quick and complete drain of all sludge or other accumulated parts during cleaning maintenance. The basin is also equipped with access doors to ease maintenance.

Water distribution

The water distribution is made of PP pipes through highly efficient water distributors. These nozzles are made of polypropylene and distribute water under low pressure (8kPA) uniformly over the whole exchange surface. This low pressure reduces drifts (0.8m WC) and bacteriological contamination risk. Indeed, low pressure creates heavier droplets, so less drifts out of the cooling tower. Furthermore, water nozzles are widely sized to avoid any clogging, even in the case of high suspended solids contents.

Exchange surface: FREEFILM

Made of vacuum pressed PVC sheets for a standard use up to 55 °C as a standard; and up to 80 °C as option with PP or ABS material. Thanks to its large vertical channels of 20mm, the FREEFILM is highly resistant to fouling and shows a very low pressure drop characteristics.

Motor fan set

The fans specially designed and manufactured by JACIR, have continuously been perfected over the years. Polyester air inlet ducts are profiled to optimise air suction, allowing low pressure and slow rotation speeds. This leads to a very low power consumption of the fan motors. Located in the dry air flow and outside the tower basin, motor fan set is protected from corrosion by a baked epoxy coating. The elliptical scroll is made of X-STEEL stainless steel.

Silence

- IB sound attenuation without increase power consumption,
- ICV/ICVK or special* sound attenuation levels.

*Sound attenuation models are not ECC certified.

Options

Automatic Inductive Blow down (Dai), frequency drive device, two speed motors, electro valve driven by level switch, all accessories in X-STEEL stainless-steel, on site erection and/or supervision, etc

KS and KSIM

Open circuit centrifugal cooling tower

Open hybrid cooling tower

JACIR
Cooling for life

Technical Documentation

CONTENTS

La FRENCH FAB

JACIR

With more than 60 years' experience, our company:

∞ Has invested in detailed research and development in order to propose technical solutions in accordance with environmental protection through unequalled realizations and patents.
∞ Is today the European leader in a technology that is ahead of market requirements.

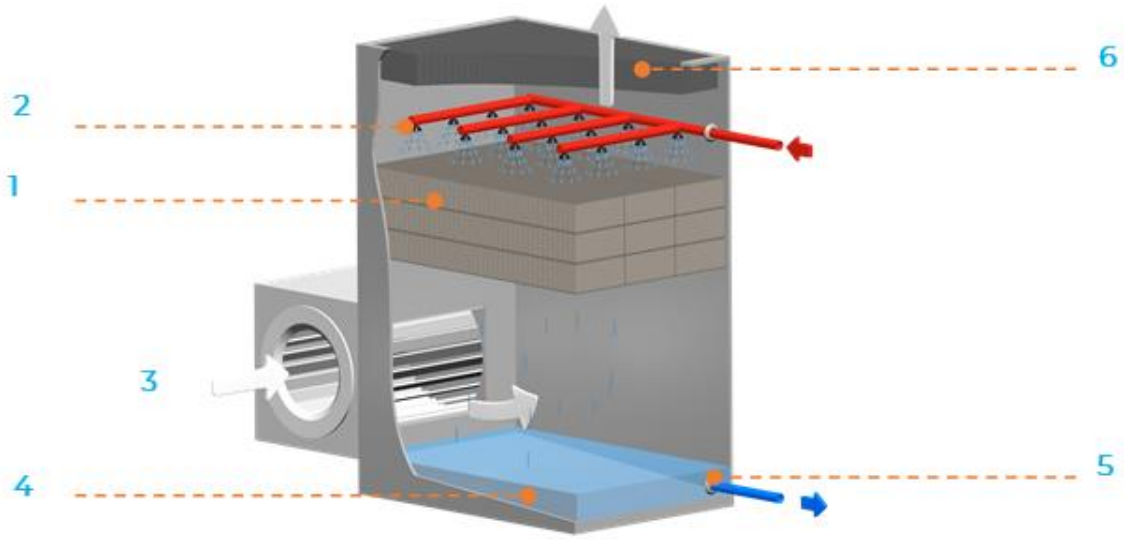
STRONG BENEFITS OF THE KS – KSIM SERIES

∞ SAFE & HYGIENIC	Compliant with hygienic design standards.
∞ SILENCE	Very silent cooling towers in standard version, which can achieve exceptionally low sound levels according requirements.
∞ EXCHANGE SURFACE	High efficiency, with low fouling and low pressure drop characteristics thanks to vertical channels.
∞ ANTICORROSION COATING	Galvanised steel casing of the tower is assembled without any welding, also proposed in X-STEEL stainless-steel
∞ EASY MAINTENANCE	Large inspection hatches, fan outside the tower and at man's height level, basin with inclined bottom, fully drainable and cleanable.
∞ ELECTRICAL POWER	Large access doors, fan outside the tower and at man chest, inclined and plane basin for a complete drain.
∞ EVOLUTIVE TOWER	Possibility to increase the exchanged power by addition of plates (KSF range), Possibility to add a plume suppression coil further on (KSIM or KSFIM ranges) Possibility of reducing the noise level thanks to silencers, without necessarily increasing the installed electrical power.
∞ MODULAR CONSTRUCTION	Easy handling & transport

Open cooling tower principle & operation KS

A cooling tower is a heat exchanger, which enables water to be cooled through direct contact with air. The heat transfer from the water to the air is carried out partly by sensible heat transfer, but mainly by latent heat transfer (evaporation of part of the water into the air), which makes possible reaching cooling temperatures lower than ambient temperatures.

Open wet cooling tower operation:



The hot water to be cooled is pumped to the top of the tower through pipes. This water is divided and distributed over the heat exchange surface (1) by low pressure water distribution nozzles (2).

Blown by the fan (3), the fresh air enters into the lower section of the unit and escapes through the upper section after being heated and saturated by passing through the wetted heat exchange surface.

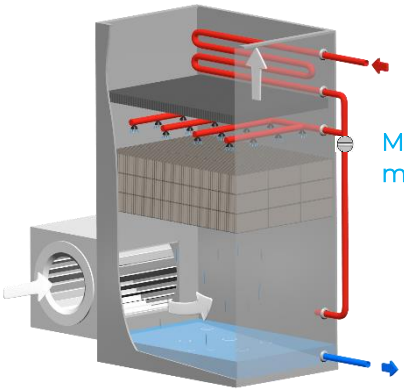
As a result of surface tension, due to the exchange surface, the water spreads in uniformly, falling down the whole height. The exchange surface is then increased.

The water, cooled thanks to forced ventilation, falls into the inclined basin (4) at the bottom of the tower to be sucked through the strainer (5). Drift eliminators (6) located at air outlet reduces drifts losses.

Open hybrid cooling tower principle & operation KSIM

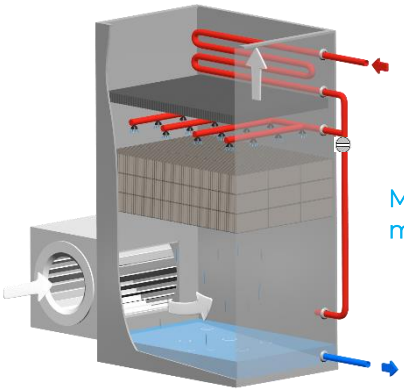
Standard KS open circuit cooling tower ranges have originally been designed to receive the plume abatement coil option; these KS ranges are now referred to as KSIM open hybrid Cooler range.
Their efficiency is ensured by a finned tube coil combined with a valve to adjust water spray on the exchange surface (packing). This water flow regulation over exchange surface is a market exclusivity, JACIR patent.
Therefore, the combination of air desaturation by air outlet warming up, and the reduction of water spray on the packing ensures the complete plume suppression.
Beyond the plume suppression itself, this system enables significant water savings and is an ultimate obstacle to drifts. This technology proposed by JACIR has been deeply researched in partnership with the CETIAT for over 40 years, and has offered the opportunity to file innovating patents.
Their design makes access and cleaning very easy and ensures performance durability.

Operating modes



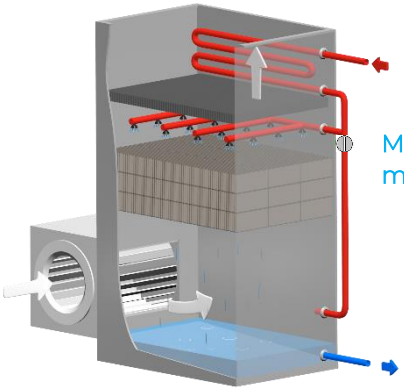
Dry operation: WINTER

In wet operating, the hot water is first fed into the plume suppression coil and then sprayed in its entirety onto the exchange surface by spray nozzles.
This water is cooled via the coil by sensible heat transfer and by the air pulsed in counterflow through the fans by latent heat transfer. In wet operating, 5-10% of the power is even so removed by pre-cooling the water in the coil.



Wet / Dry operation: MID SEASON

When the dry cooling in not powerful enough part of the water flow goes to the spraying system thanks to the by-pass valve. A temperature probe (option) located in the water outlet send the information to the regulator monitoring the valve. So only the minimum water quantity is sprayed on the packing.
This cooling mode lowers the water / air exchange and optimize the power evacuated in the dry coil.
According to ambient conditions, 30 to 70% of the power can be dissipated in dry mode.



Wet operation: SUMMER

If necessary, the bypass valve is totally closed: the water leaves the tube coil, and can be totally sprayed over the packing through the nozzles.
This water is first cooled by sensitive heat, then by latent heat (evaporation on the exchange surface).
In wet operation, 5 to 10 % of the power is dissipated by the finned tube coil.

Manufacturing details KS

Casing structure

Self-supporting rigid panels, with 2 or 4 folds on the four sides, (JACIR design) allowing sound attenuation casing addition if required. Thanks to this technology, we can offer cooling towers with an extremely low sound level.

Towers are assembled with waterproof stainless-steel rivets (uniform, high-capacity locking).
There is no welding on assembled panels for parts in contact with water; a high covering seal ensures the close fit between the panels. The material used for the hydraulic connections is identical to that of the tower body.
As standard model, the panels are in galvanised steel mm2 thick ZENDZIMIR process 275 gr / m^2 (galvanised plates are protected by zinc oxidation process on the surface).
X-STEEL stainless steel is optional (corrosion resistance higher than 316L).

Sloped and flat basin bottom

The basin has a large capacity to enable managing the needs and inertia of the installation. For example, the KS 1750 basin can contain till 9m^3.
The sloped bottom basin allows a complete and easy drain.

On the utilities panels of the basin are located:

- An overflow,
- A drain below the lower level of the basin and Power-flow access enabling to quickly and completely evacuate all sludge and other accumulated parts in the bottom of the casing using simple water spray (260 x 110mm),
- A make-up water system by float valve or electro valve as an option,
- A water outlet through a removable strainer (in stainless steel or PEHD) with a flange, oversized to eliminate cavitation, with a perforated steel plate,
- Large doors to access the basin through a rectangular access (540x 390 mm).
- Option: anti-freeze electrical heater of 230V or 400V and waterproof thermostat with separate bulb and automatic cleaning generated by opening the purge circuit (AiD option).

For automatic resistance control, suitable contactors must be provided.

Exchange surface: FREEFILM

The exchange surface, also called packing or infill is made of vacuum pressed PVC sheets. This material is non-putrescible, long lasting and offers the following benefits:

- Very low pressure drop thanks to the vertical channels so low power consumption,
- Highly resistant to fouling thanks to large size channels: 20 mm.
- can be used up to 55 °C as standard, and up to 80 °C as option with PP or ABS material
- High thermal efficience,
- Highly resistant to chemicals.

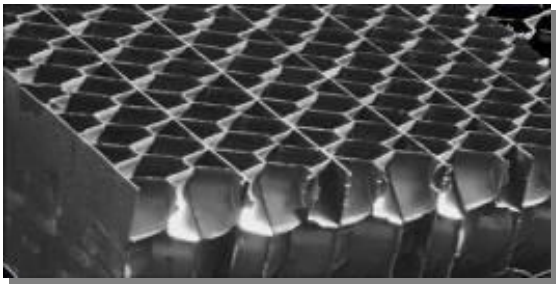
Water distribution

Water distribution is made of PP pipes through highly efficient water distributors.
The polypropylene nozzles distribute the water uniformly over the exchange surface.
They operate under low pressure (8 kPA) to reduce drifts: 0.8 m WC, therefore considerably reduces the risk of bacteriological contamination: indeed, low pressure creates heavier droplets, so less drifts out the cooling tower.
The water nozzles are widely sized to avoid any clogging, even in the case of high suspended solids content.

Drift eliminators

Highly efficient, drift eliminators are made of PP sheets and prevent the water from being sprayed out of the tower: the drift is 0.01 % maximum of the re-circulating water flow. This value has been certified by EUROVENT certification.

Ultraviolet resistant, they are easy to remove from the top in order to access the distributors and the exchange surface.



Fans

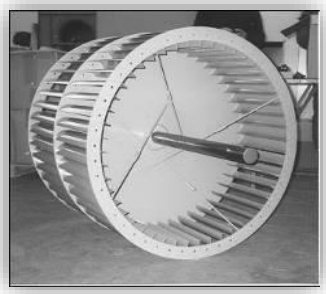
The centrifugal fans are specially designed and manufactured by JACIR. The impeller is a double side air inlet type. The air inlet ducts are removable to access to the impeller, and are made of polyester. Their shape noticeably improves the performances of the fans.

The bearings are self-aligning, lubricated in our factory and to be regularly lubricated thanks to a copper deported line lubrication as a standard for a simple and quick maintenance without any removal. Each shaft is supported by two bearings. There is one motor per fan. The volutes side-plates are used to fix the motor support. This design prevents the belts from producing a slapping effect.

Trapezoidal pulleys and V-belts transmission are used. Tension is applied to the belts by tipping the motor seat, for easy adjustment.

The impeller is treated and protected by a baked EPOXY coating. The volute is made of stainless steel.

Complete stainless-steel impeller design can be selected as an option.



Standard motor

- IE3 three-phase asynchronous motor, frequency drive compliant,
- 1500 rpm,
- 230/400 V up to 5,5 kW,
- 400/690 V above 5,5 kW,
- Hz 50,
- IP55 (possible open sky operating),
- F/B class,
- Direct connection to terminal box,

Accessibility

As standard, the basin is equipped with access hatch(es) sized 990 x 540 mm, and one POWER FLOW access sized 260x110 mm located under the basin's bottom level allowing using simple water jet a fast complete drain and easy cleaning of sludge or other accumulated parts in bottom casing.

Two large hatches sized 990 x 540mm made of the same material as the cooling tower casing are also provided: one is located on the bottom casing and the second one on its upper part. These large access hatches allow quickly removing of drift eliminators, nozzles, packing (infill) and water distribution pipes.

If sound baffles or outlet air duct are required, large access (540 x 390 mm) is provided. These accesses are used to remove easily drift eliminators, nozzles, exchange surface and water distribution pipes.

If a plume suppression coil is installed, an additional middle casing located between the coil and the drift eliminators and fitted with at least one access door of 540 x 390 mm is supplied.

Plume suppression coil and modulating valve (JACIR patent) – KSIM option

As standard, the coil is made of a carbon steel header coated with primer paint. Two air vents secure from the freezing risk. The tubes made of copper are arranged in a triangular pitch. As an option, they can be made of stainless steel. The fins are made of copper.

A motorised valve for regulating the packing watering is associated with the coil.

As soon as climatic conditions allow it, substantial water savings are made through evacuating the calories in the dry mode rather than by evaporation.

Sound attenuations (options):

IB standard sound attenuation

Additional casing of the air inlet fan(s), made of self-supporting rigid steel panels covering, double folding on the 4 internal sides of the panels. Internal lagging is made of absorbent sound material. Complete access door is provided for a total accessibility maintenance in front door with 4 lockers, activated by key.
At the air outlet, an exhaust cone reduces the acoustic emission surface.

ICV complete sound attenuation

Additional casing of the air inlet fan(s), made of self-supporting rigid steel panels covering, double folding on the 4 internal sides of the panels. Internal lagging is made of absorbent sound material and contains sound acoustics baffles. These galvanized steel sound baffles, made of high-density rock wool panels, are easily removable.
At the air inlet, the rock wool is coated by a fibre glass layer.
At the air outlet, baffles receive a reinforced protection by a stainless-steel grid.

ICVK complete sound attenuation with double casing

The entire casing of ICV cooling tower is fitted with a double casing: high density rock wool covered by an additional steel sheet - ICVK.

Special sound attenuation

ICVK solution is adapted to reach required sound level, up to NR 30 at 10m.

OPTIONS

- Pump frequency drive,
- Plume suppression coil system (**KSIM** series),
- **X-STEEL stainless-steel** casing (resistance to corrosion superior to 316L),
- Non-freezing heater with thermostat,
- Fans frequency drive,
- Electric water level control (with electric-valve and input filter),
- Automatic Inductive blow down (see separate documents AiD),
- All accessories made of stainless-steel (fan casing, wheel, plume suppression coil frame, etc.),
- Discharge cone (increase of air outlet speed with lower sound radiation and recycling),
- **EFFI-SILENT** basin noise abatement ,
- Available air pressure for connection to the duct,
- Equipment delivered in parts, ready to be assembled,
- Assembly on site by our experienced technicians.

Technical characteristics KS

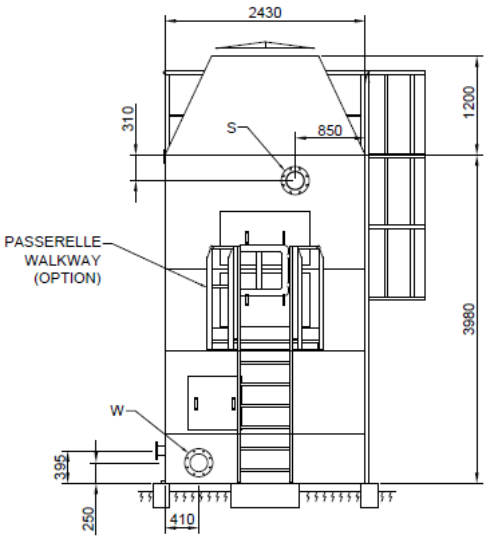
KS Series	OPEN TOWER WITHOUT SOUND ATTENUATION							
	Heat power ref. (1) average [kW]	Fans Qty	Outlet air flow rate [m³/h]	Heat power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty (without air exhaust) [kg]	Weight full (without air exhaust) [kg]	Overall dimensions (without air exhaust) [mm]
KS-700-QK-220-B	1 025	1	90 000	22	57	2 195	6 590	H = 3 980 L = 4 700 W = 2 430
KS-700-QK-300-B	1 086		90 000	30	57	2 235	6 630	
KS-930-QK-110D-B	1 336	2	120 000	11	58	2 760	8 575	H = 3 980 L = 4 460 W = 3 865
KS-930-QK-150D-B	1 396		120 000	15	58	2 800	8 615	
KS-1165-QK-150D-B	1 736	2	150 000	15	59	3 420	10 800	H = 3 980 L = 5 460 W = 4 025
KS-1165-QK-185D-B	1 814		150 000	18.5	59	3 500	10 880	
KS-1450-QK-220D-B	2 096	2	190 000	22	59	3 870	12 780	H = 3 980 L = 5 244 W = 4 595
KS-1450-QK-300D-B	2 221		190 000	30	59	3 950	12 700	
KS-1750-QK-150T-B	2 605	3	230 000	15	60	4 810	15 800	H = 3 980 L = 7 750 W = 4 025
KS-1750-QK-185T-B	2 721		230 000	18.5	60	4 930	15 930	
KS-2175-QK-220T-B	3 146	3	280 000	22	60	5 200	18 475	H = 3 980 L = 7 750 W = 4 595
KS-2175-QK-300T-B	3 332		280 000	30	60	5 320	18 600	

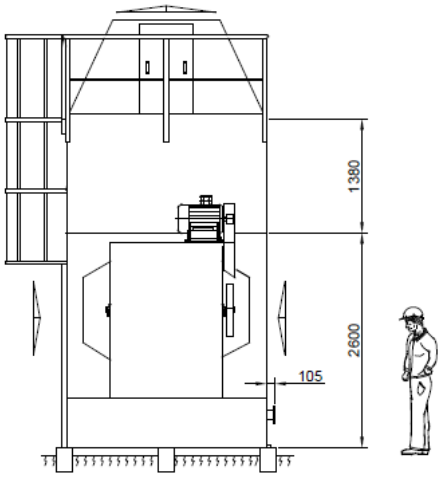
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side.

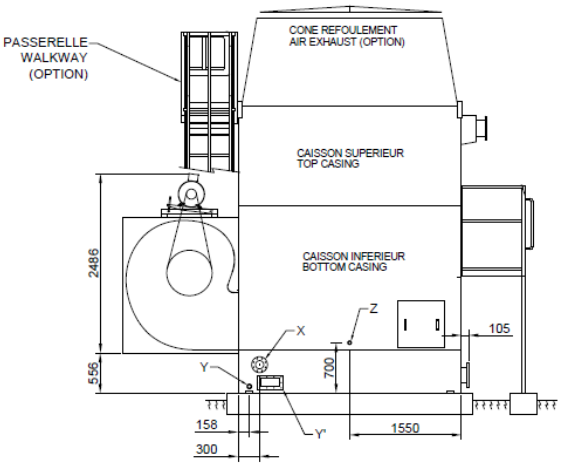
KS Series	IB SOUND ATTENUATED OPEN COOLING TOWER KS							
	Heat power ref. (1) average [kW]	Fans Qty	Outlet air flow rate [m³/h]	Heat power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty (without air exhaust) [kg]	Weight full (without air exhaust) [kg]	Overall dimensions (without air exhaust) [mm]
KS-700-QK-220-B-IB	1 014	1	90 000	22	45	3 100	7 530	H = 5 300 L = 5 600 W = 2 430
KS-700-QK-300-B-IB	1 073		90 000	30	45	3 140	7 570	
KS-930-QK-110D-B-IB	1 319	2	120 000	11	46	4 640	10 450	H = 5 300 L = 4 460 W = 4 860
KS-930-QK-150D-B-IB	1 378		120 000	15	46	4 680	10 490	
KS-1165-QK-150D-B-IB	1 715	2	150 000	15	47	5 510	12 880	H = 5 300 L = 5 460 W = 4 860
KS-1165-QK-185D-B-IB	1 795		150 000	18.5	47	5 590	12 960	
KS-1450-QK-220D-B-IB	2 072	2	190 000	22	47	5 980	14 890	H = 5 300 L = 5 250 W = 5 430
KS-1450-QK-300D-B-IB	2 193		190 000	30	47	6 160	14 970	
KS-1750-QK-150T-B-IB	2 576	3	230 000	15	48	7 670	18 670	H = 5 300 L = 7 750 W = 4 860
KS-1750-QK-185T-B-IB	2 692		230 000	18.5	48	7 790	18 790	
KS-2175-QK-220T-B-IB	3 111	3	280 000	22	48	8 065	21 340	H = 5 300 L = 7 750 W = 5 430
KS-2175-QK-300T-B-IB	3 294		280 000	30	48	8 185	21 460	

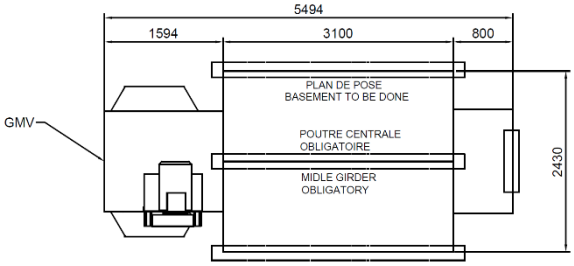
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side.

Drawings & Dimensions KS 700 without sound attenuation



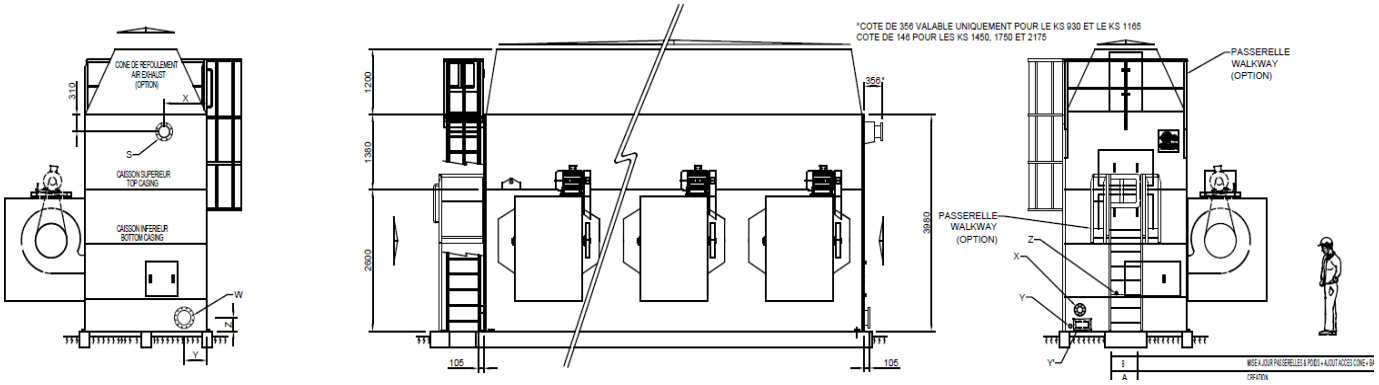


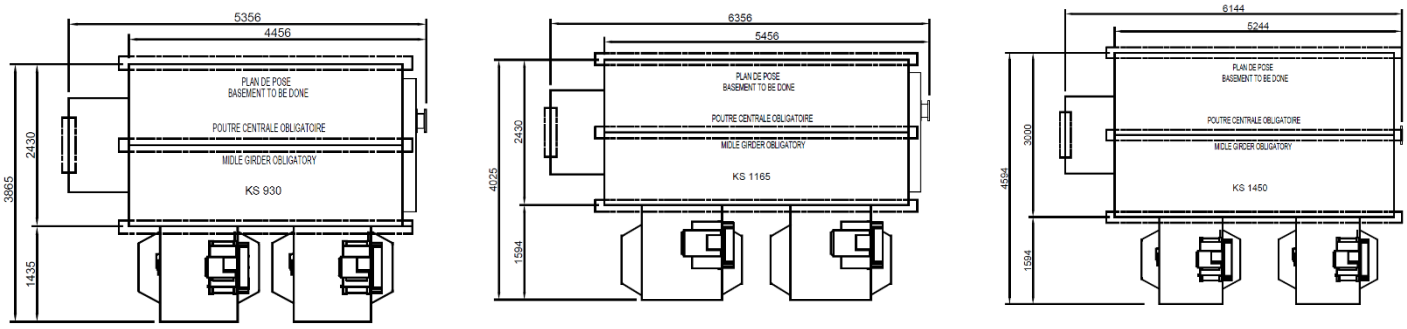


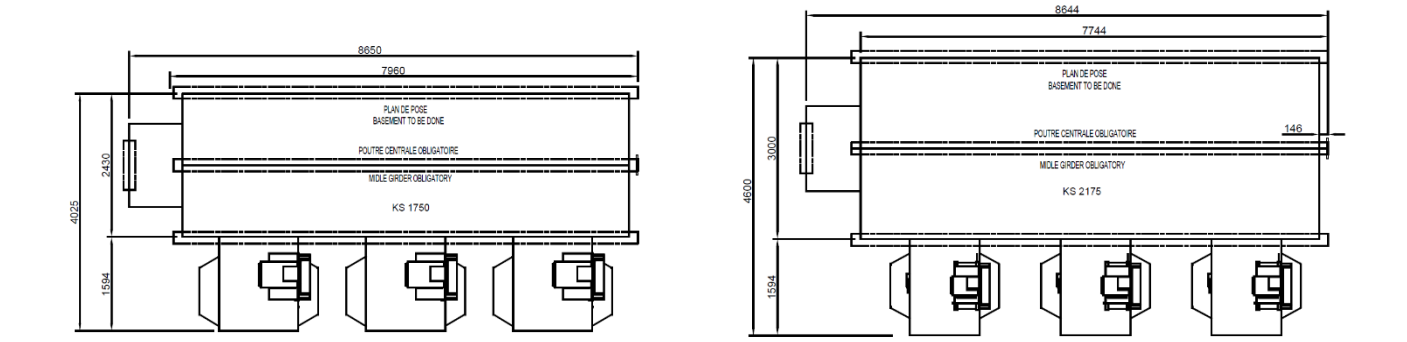


KS 700			
S	Hot water inlet	DN	according flow
W	Cold water outlet	DN	according flow
X	Overflow	DN	100
Y	Drain (female)	DN	50
Y'	Power Flow cleaning basin hatch	mm	260 x 110
Z	Water make up – Float valve (male)	DN	32
CR	Air exhaust cone (option)	Kg	205

Drawings & Dimensions KS 930/1165/1450/1750/2175 without sound attenuation

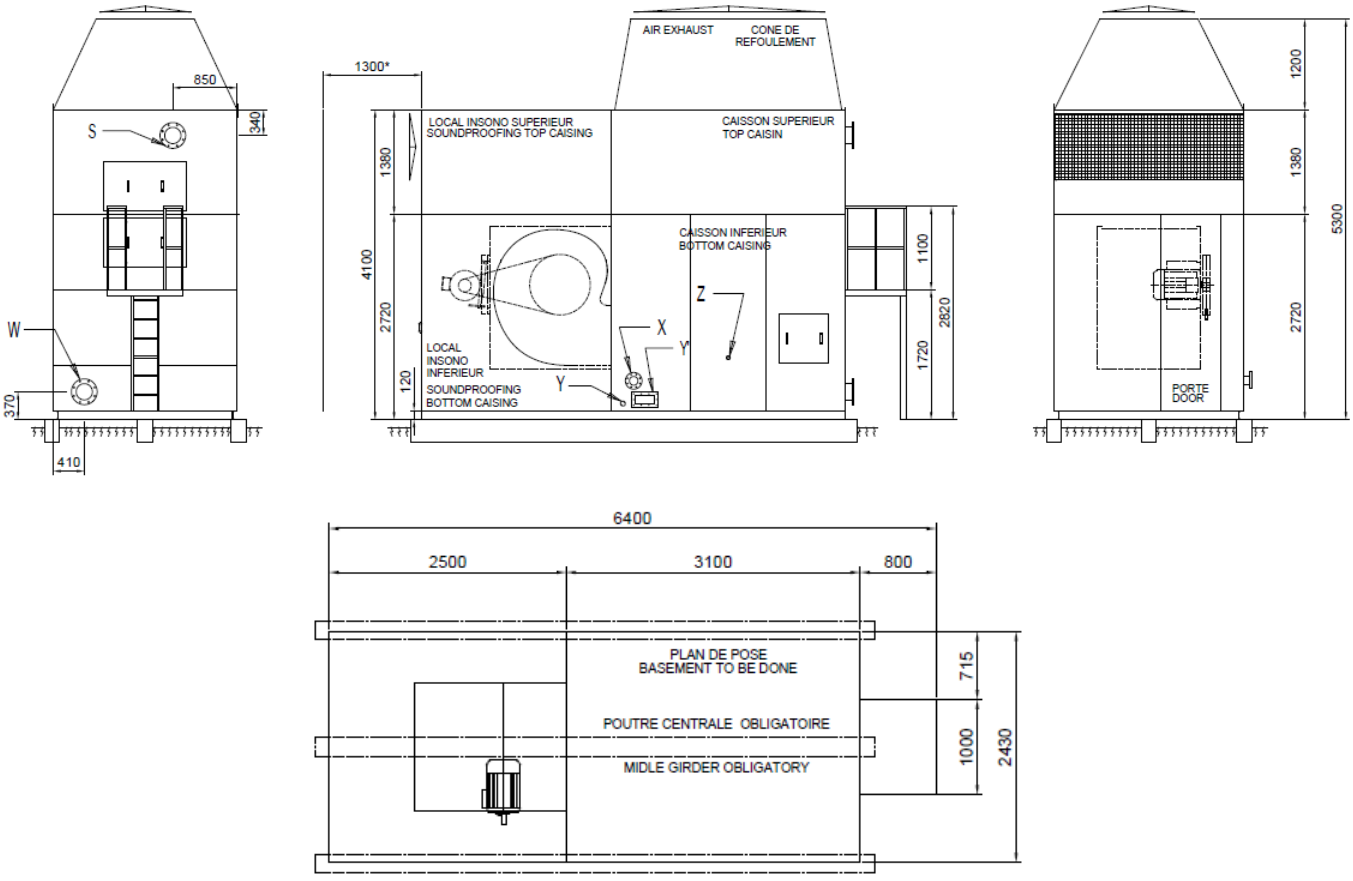






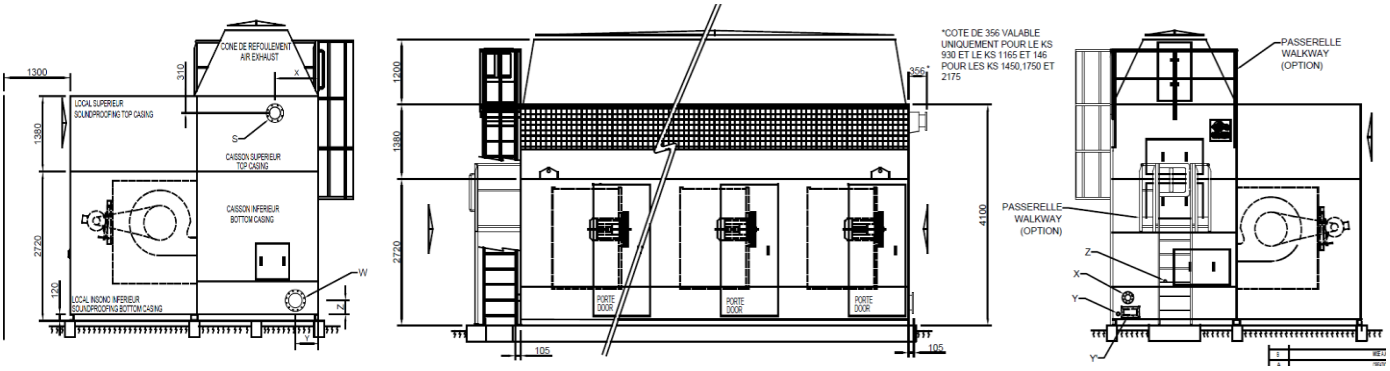
			KS 930	KS 1165	KS 1450	KS 1750	KS 2175
S	Hot water inlet	DN			200		
W	Cold water outlet	DN			250		
X	Overflow	DN			100		
Y	Drain (female)	DN			50		
Y'	Power Flow cleaning basin hatch	mm			260 x 110		
Z	Water make up – Float valve (male)	DN			32		
CR	Air exhaust cone (option)	Kg	235	270	290	435	450

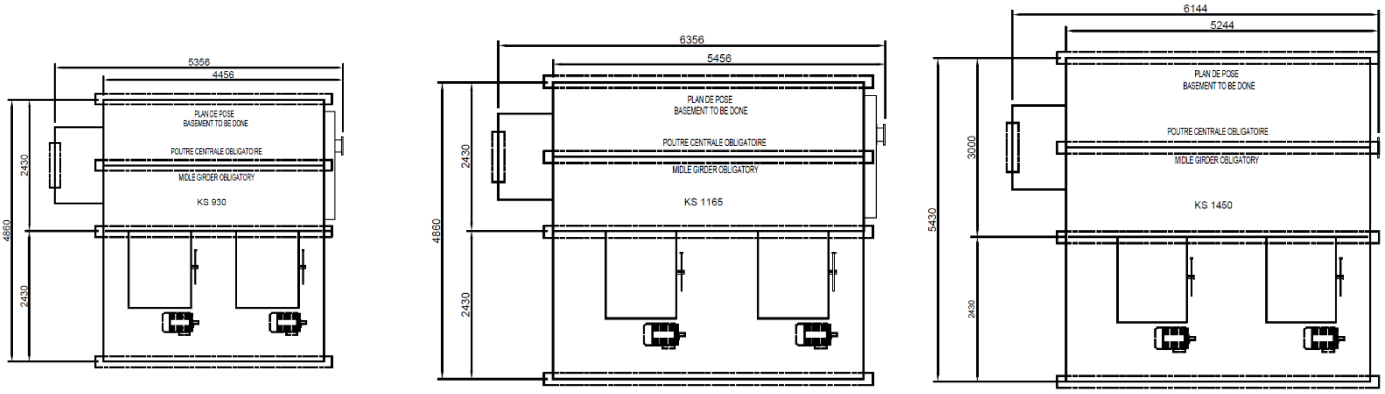
Drawings & Dimensions KS 700 Series with IB insonorisation

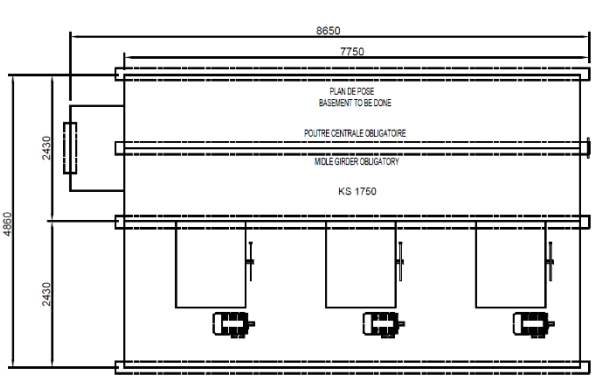


			KS 700 IB
S	Hot water inlet	DN	According flow
W	Cold water outlet	DN	According flow
X	Overflow	DN	100
Y	Drain (female)	DN	50
Y'	Power Flow cleaning basin hatch	mm	260 x 110
Z	Water make up – Float valve (male)	DN	32

Drawings & Dimensions KS 930/1165/1450/1750/2175
IB sound attenuation

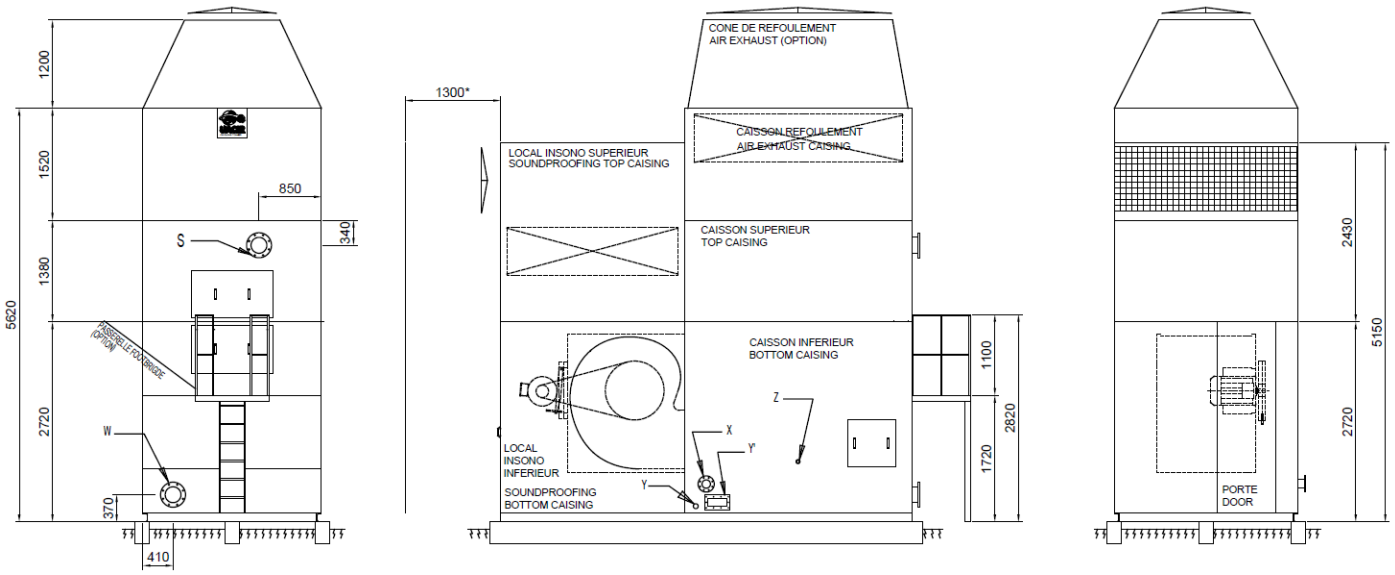


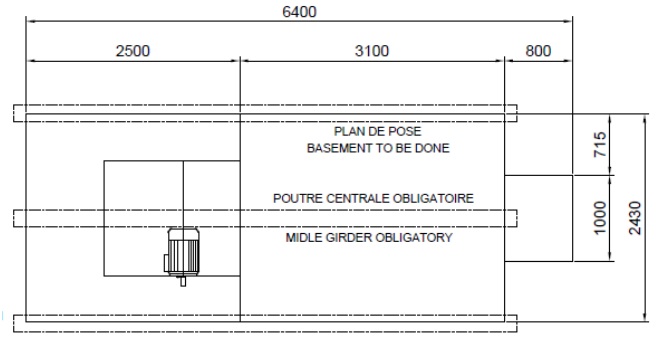




			KS 930 IB	KS 1165 IB	KS 1450 IB	KS 750 IB	KS 2175 IB
S	Hot water inlet	DN	200				
W	Cold water outlet	DN	250				
X	Overflow	DN	100				
Y	Drain (female)	DN	50				
Y'	Power Flow cleaning basin hatch	mm	260 x 110				
Z	Water make up – Float valve (male)	DN	32				

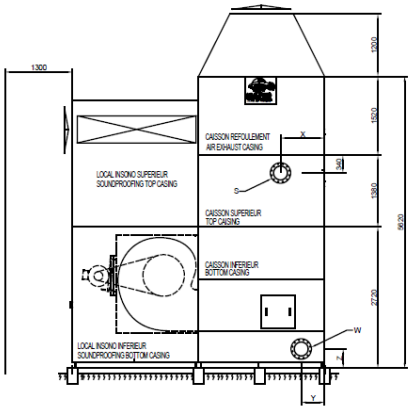
Drawings & Dimensions KS 700
ICV-ICVK-NR30 sound attenuation

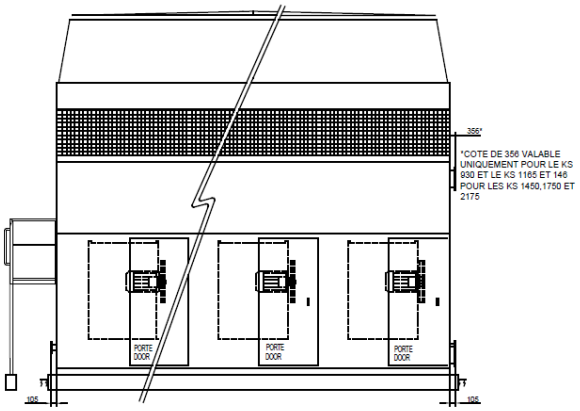


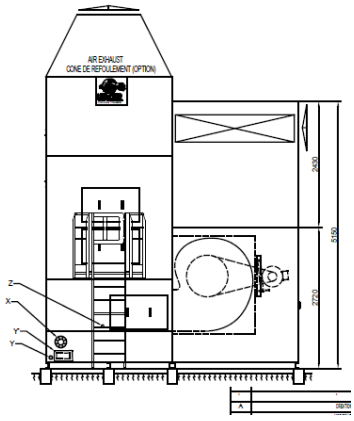


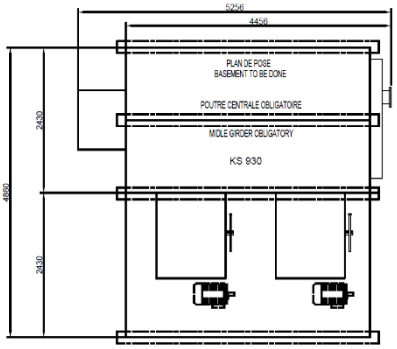
			KS 700 ICV / ICVK / NR30
S	Hot water inlet	DN	according flow
W	Cold water outlet	DN	according flow
X	Overflow	DN	100
Y	Drain (female)	DN	50
Y'	Power Flow cleaning basin hatch	mm	260 x 110
Z	Water make up – Float valve (male)	DN	32
CR	Air exhaust cone (option)	Kg	230

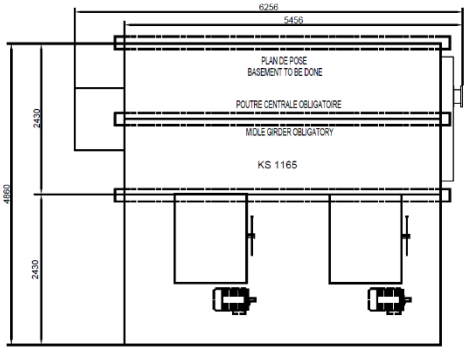
Drawings & Dimensions KS 960/1165/1450/1750/2175
ICV-ICVK-NR30 sound attenuation

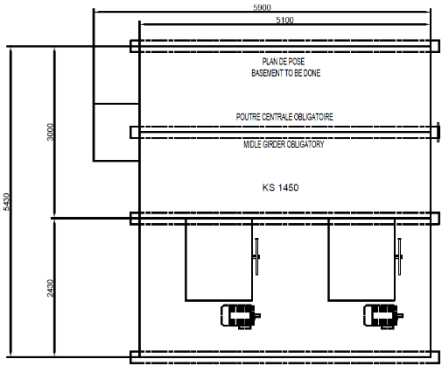


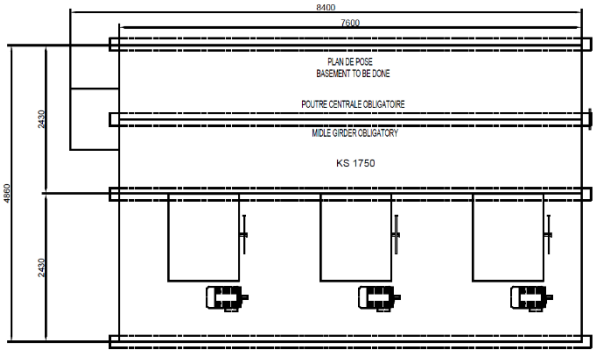


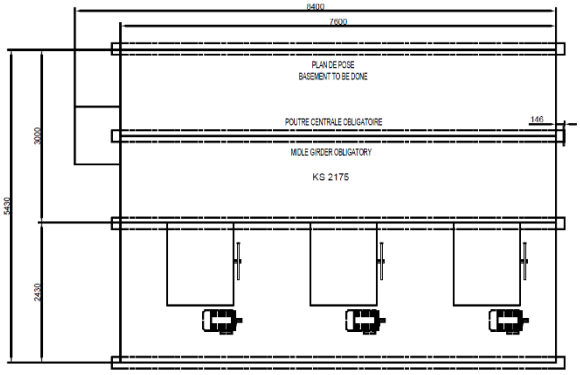












			KS 930 ICV-K NR30	KS 1165 ICV-K NR30	KS 1450 ICV-K NR30	KS 1750 ICV-K NR30	KS 2175 ICV-K NR30
S	Hot water inlet	DN	According flow				
W	Cold water outlet	DN	250				
X	Overflow	DN	100				
Y	Drain (female)	DN	50				
Y'	Power Flow cleaning basin hatch	mm	260 x 110				
Z	Water make up – Float valve (male)	DN	32				
CR	Air exhaust cone (option)	Kg	235	270	290	435	530

Technical characteristics KSIM

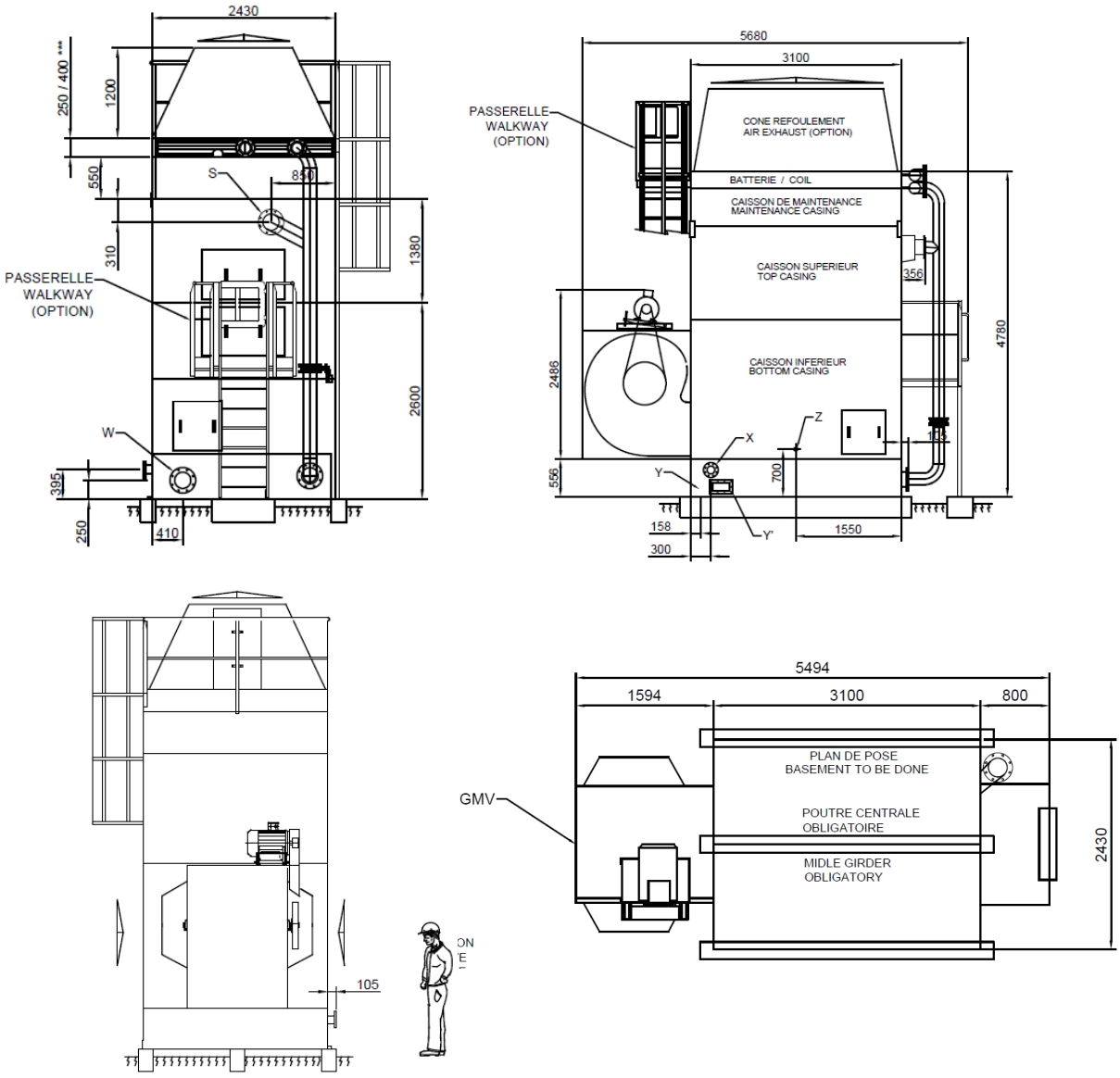
KSIM Series	OPEN HYBRID COOLING TOWER KSIM							
	Heat power réf. (1) average [kW]	Fans Qty	Outlet air flow rate [m³/h]	Heat power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty [kg]	Weight full [kg]	Overall dimensions [mm]
KSIM-700-QK-220-B	1 053	1	90 000	22	57	2 830	7 635	H = 4 780 L = 5 060 W = 2 430
KSIM-930-QK-110D-B	1 354	2	120 000	11	58	3 780	10 135	H = 5 010 L = 4 100 W = 4 215
KSIM-1165-QK-150D-B	1 760	2	150 000	15	59	4 570	12 630	H = 5 010 L = 5 100 W = 4 370
KSIM-1450-QK-220D-B	2 154	2	190 000	22	59	5 040	14 690	H = 5 010 L = 5 100 W = 4 930
KSIM-1750-QK-150T-B	2 640	3	230 000	15	60	6 430	18 360	H = 5 010 L = 7 600 W = 4 370
KSIM-2175-QK-220T-B	3 232	3	280 000	22	60	6 910	21 190	H = 5 010 L = 7 600 W = 4 930

(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side.

Série KSIM	OPEN HYBRID COOLING TOWER IB SOUND ATTENUATED							
	Heat power réf. (1) average [kW]	Fans Qty	Outlet air flow rate [m³/h]	Heat power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty [kg]	Weight full [kg]	Overall dimensions [mm]
KSIM-700-QK-220-B-IB	1 040	1	90 000	22	45	3 775	8 580	H = 5 980 L = 5 835 W = 2 430
KSIM-930-QK-110D-B-IB	1 336	2	120 000	11	46	5 660	12 010	H = 6 130 L = 4 100 W = 5 210
KSIM-1165-QK-150D-B-IB	1 740	2	150 000	15	47	6 660	14 720	H = 6130 L = 5 100 W = 5 210
KSIM-1450-QK-220D-B-IB	2 127	2	190 000	22	47	7 150	16 800	H = 6 130 L = 5 100 W = 5 770
KSIM-1750-QK-150T-B-IB	2 611	3	230 000	15	48	9 280	21 210	H = 6 130 L = 7 600 W = 5 210
KSIM-2175-QK-220T-B-IB	3 195	3	280 000	22	48	9 780	24 060	H = 6 130 L = 7 600 W = 5 785

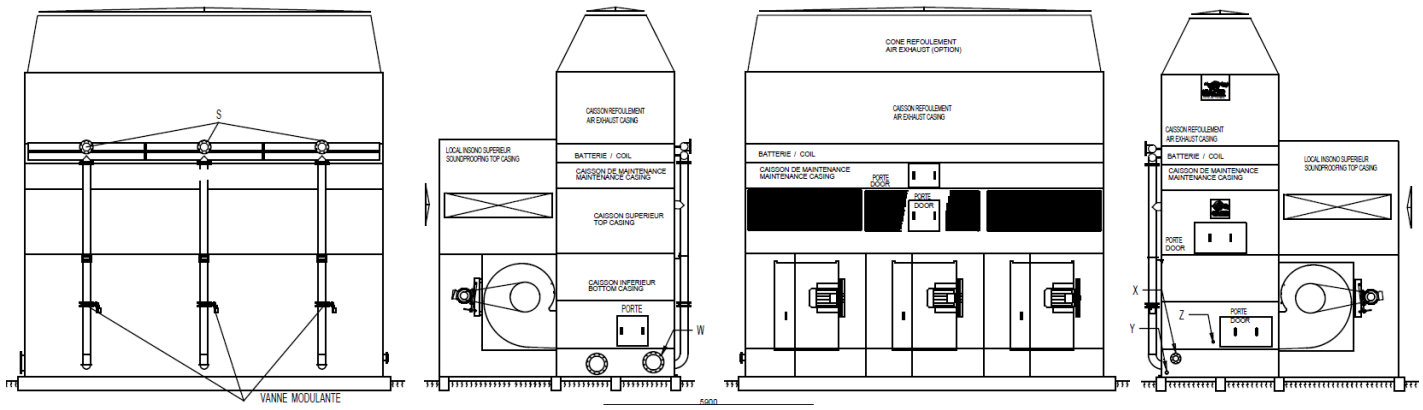
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side.

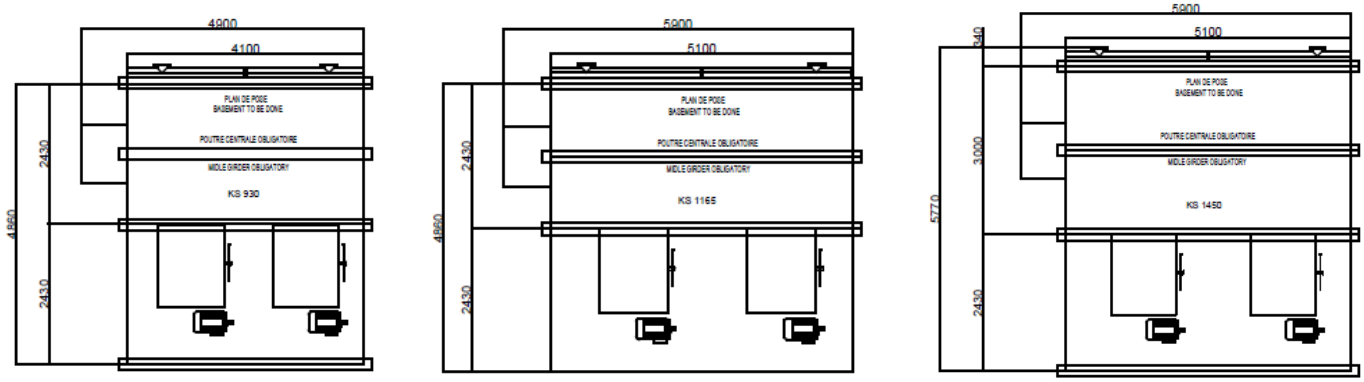
Drawings & Dimensions KSIM 700
without sound attenuation

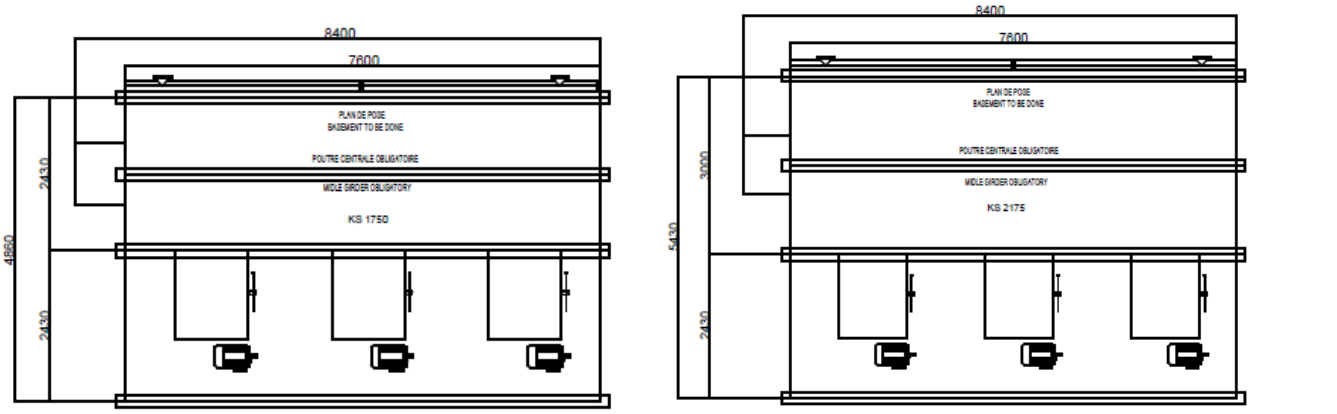


KSIM 700			
S	Hot water inlet	DN	according flow
W	Cold water outlet	DN	according flow
X	Overflow	DN	100
Y	Drain (female)	DN	50
Y'	Power Flow cleaning basin hatch	mm	260 x 110
Z	Water make up – Float valve (male)	DN	32
CR	Air exhaust cone (option)	Kg	230

Drawings & Dimensions KSIM 930/1165/1450/1750/2175 without sound attenuation

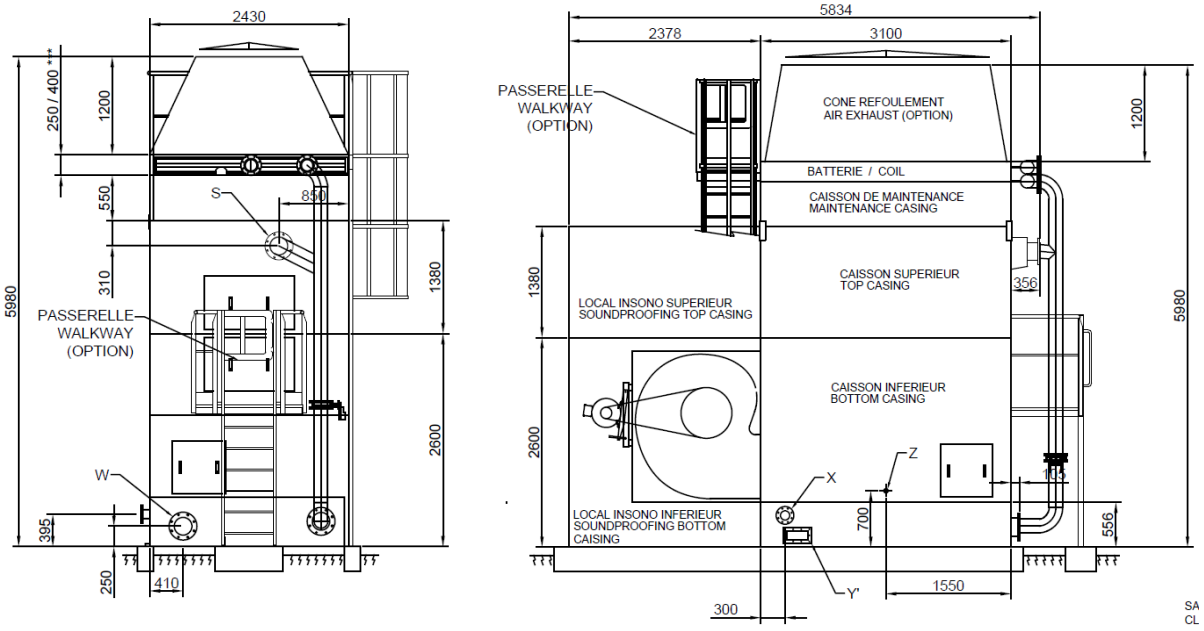


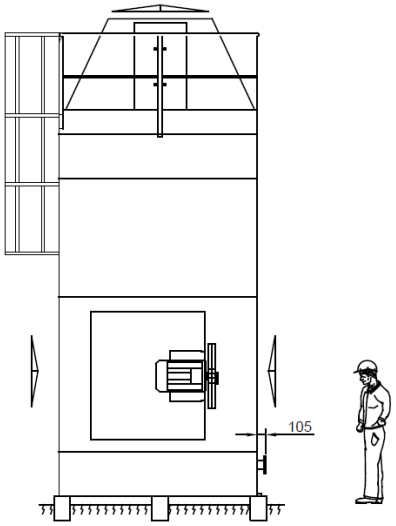


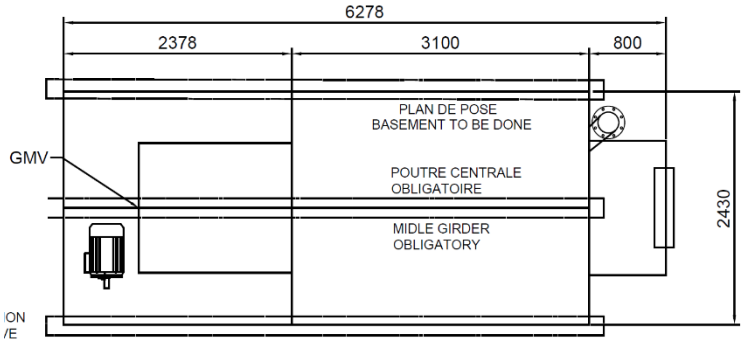


			KSIM 930	KSIM 1165	KSIM 1450	KSIM 1750	KSIM 2175
S	Hot water inlet	DN			200		
W	Cold water outlet	DN			250		
X	Overflow	DN			100		
Y	Drain (female)	DN			50		
Y'	Power Flow cleaning basin hatch	mm			260 x 110		
Z	Water make up – Float valve (male)	DN			32		
CR	Air exhaust cone (option)	Kg	235	270	290	435	450

Drawings & Dimensions KSIM 700
IB sound attenuation

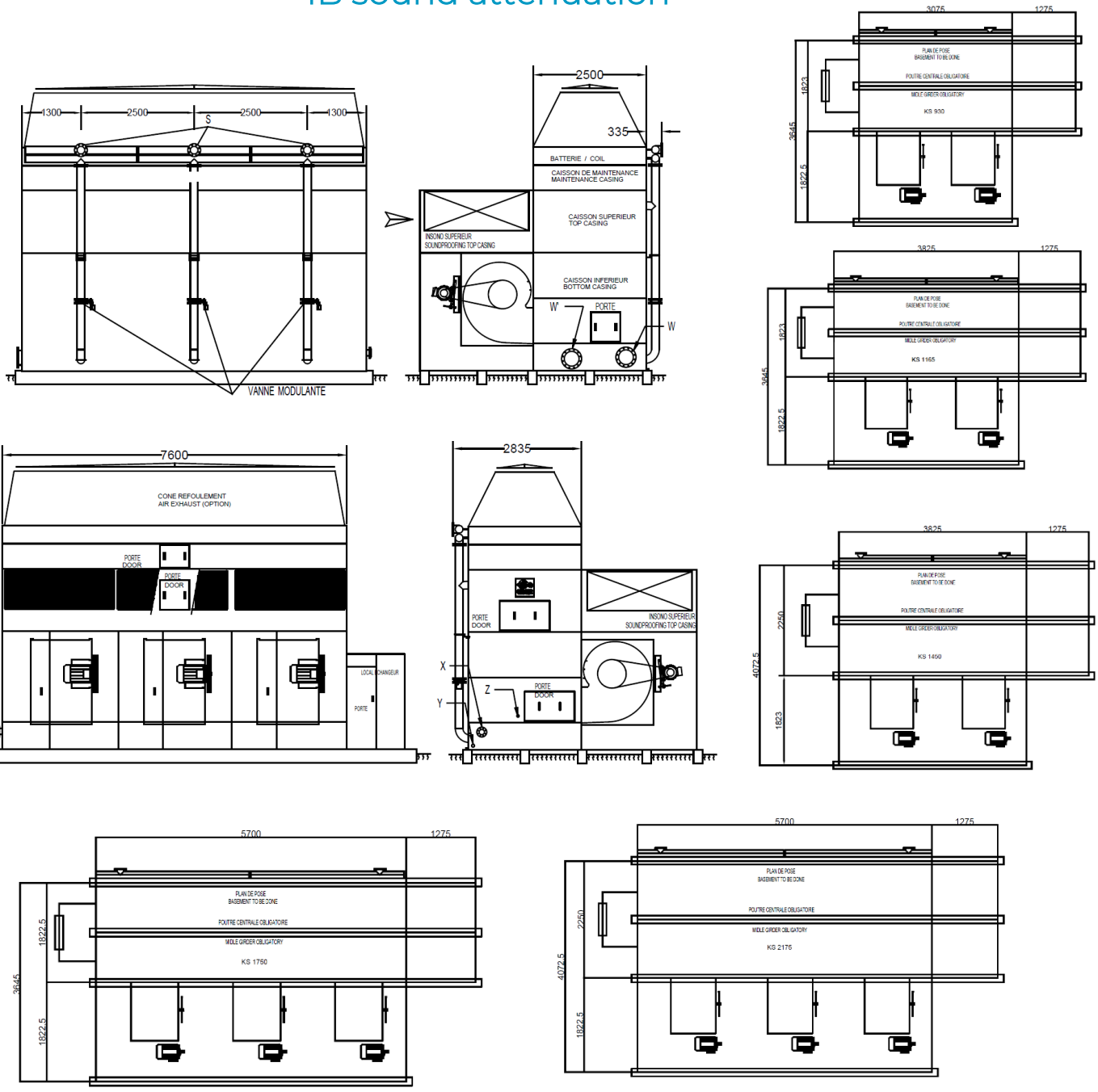






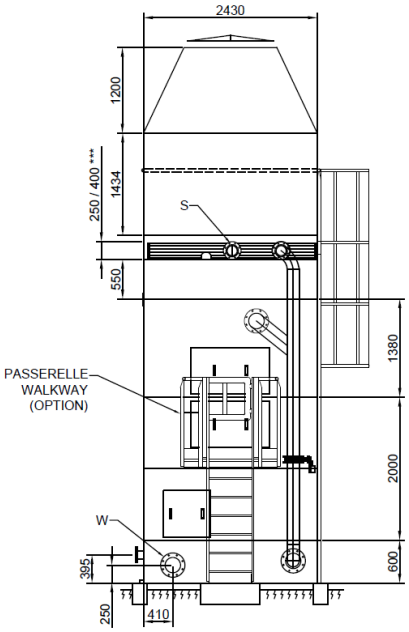
			KSIM 700 IB
S	Hot water inlet	DN	according flow
W	Cold water outlet	DN	According flow
X	Overflow	DN	100
Y	Drain (female)	DN	50
Y'	Power Flow cleaning basin hatch	mm	260 x 110
Z	Water make up – Float valve (male)	DN	32

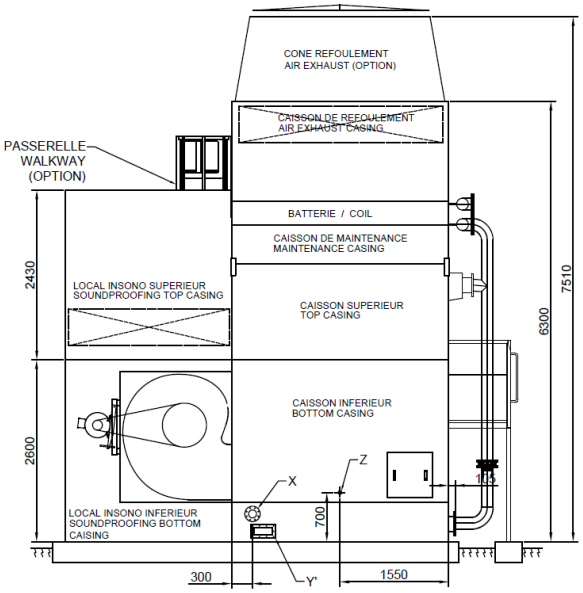
Drawings & Dimensions KSIM 930/1165/1450/1750/2175
IB sound attenuation

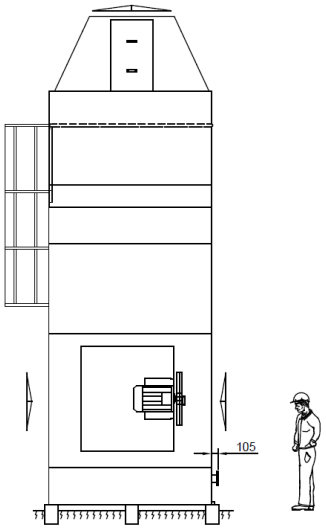


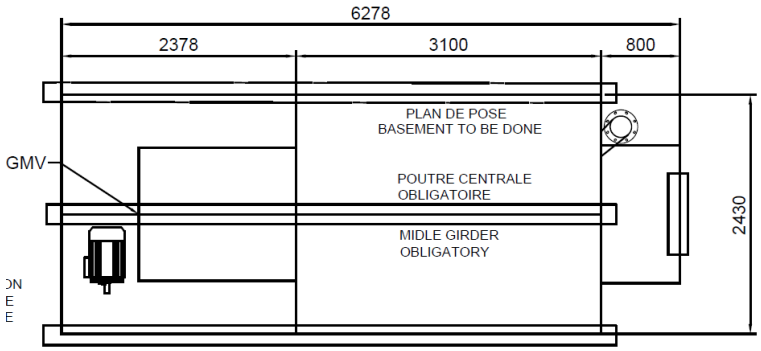
			KSIM 930 IB	KSIM 1165 IB	KSIM 1450 IB	KSIM 1750 IB	KSIM 2175 IB
S	Hot water inlet	DN	150				
W	Cold water outlet	DN	300				
W'	Balance (option)	DN	300				
X	Overflow	DN	100				
Y	Drain (female)	DN	50				
Y'	Power Flow cleaning basin hatch	mm	260 x 110				
Z	Water make up – Float valve (male)	DN	32				

Drawings & Dimensions KSIM 700
ICV-ICVK-NR30 sound attenuation



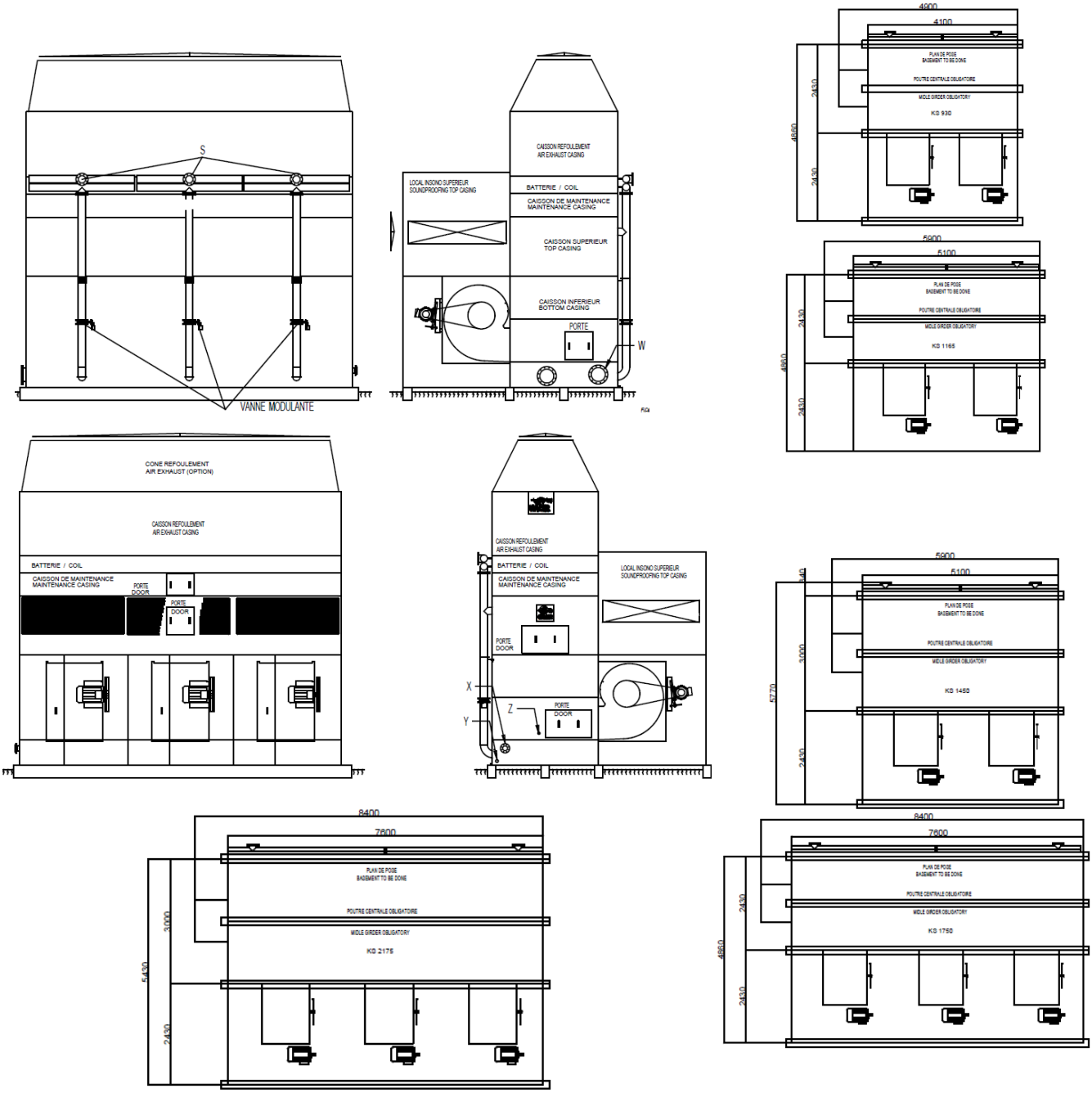






			KSIM 700 ICV / ICVK / NR30
S	Hot water inlet	DN	According flow
W	Cold water outlet	DN	According flow
X	Overflow	DN	100
Y	Drain (female)	DN	50
Y'	Power Flow cleaning basin hatch	mm	260 x 110
Z	Water make up – Float valve (male)	DN	32
CR	Air exhaust cone	Kg	230

Drawings & Dimensions KSIM 960/1165/1450/1750/2175
ICV-ICVK-NR30 sound attenuation



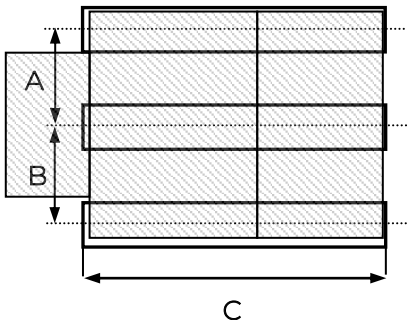
			KSIM 930 ICV-K NR30	KSIM 1165 ICV-K NR30	KSIM 1450 ICV-K NR30	KSIM 1750 ICV-K NR30	KSIM 2175 ICV-K NR30
S	Hot water inlet	DN	according flow				
W	Cold water outlet	DN	250				
X	Overflow	DN	100				
Y	Drain (female)	DN	50				
Y'	Power Flow cleaning basin hatch	mm	260 x 110				
Z	Water make up – Float valve (male)	DN	32				
CR	Air exhaust cone (option)	Kg	235	270	290	435	530

Support KS - KSIM

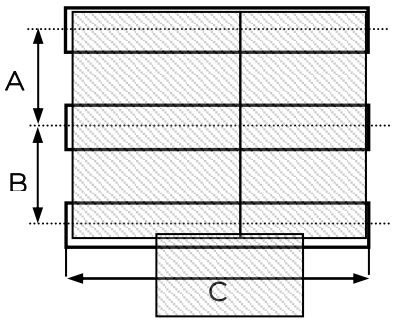
Our towers can stand on the ground or on a concrete floor, but it is advisable to install them on concrete or support beams.
Make sure that the floor on which they will be placed can support the load during operation and that the floor or supports are perfectly flat.

Quantity and position of concrete or metallic beams (customer supply) for cooling towers without sound attenuation

KS 700



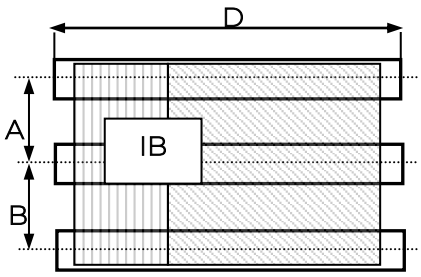
Others KS



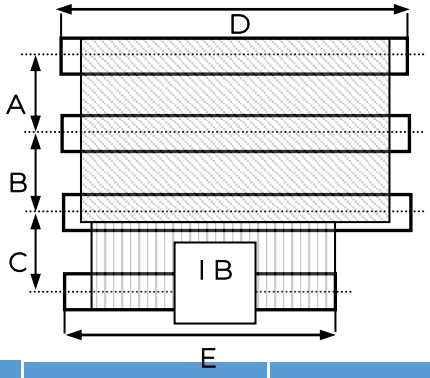
	Qty	Distance between beams under basins A and B [mm]	Length superior to C [mm]
KS-KSIM 700	3	1 230	3 200
KS-KSIM 930		1 230	4 200
KS-KSIM 1165		1 230	4 200
KS-KSIM 1450		1 515	5 200
KS-KSIM 1750		1 230	7 700
KS-KSIM 2175		1 506	7 700

Quantity and position of concrete or metallic beams (customer supply) for cooling towers with IB sound attenuation

KS 700



Others KS



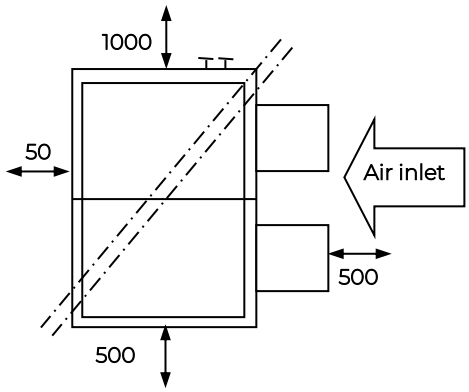
	Qté	Distance between beams under basins A and B [mm]	Distance between beams under basin C [mm]	Length superior to D [mm]	Length superior to E [mm] under fans
KS-KSIM 700 IB	3	1 230		5900	
KS-KSIM 930 IB	4	1230	2430	4200	4200
KS-KSIM 1165 IB		1230	2430	4200	4200
KS-KSIM 1450 IB		1515	2430	5200	5200
KS-KSIM 1750 IB		1230	2430	7700	7700
KS-KSIM 2175 IB		1515	2430	7700	7700

On Site Layout KS - KSIM

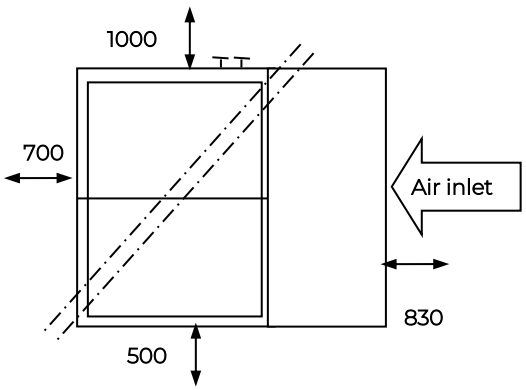
Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings. This could create a risk of a « re-circulation »; the air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower.
In any case, the free access on the four sides of the tower must be secured to ensure that the fans are supplied correctly with air and that there is proper access for installation and maintenance.
If these rules are not applied, it is inevitable that the cooling tower will not operate properly.

Recommended minimum free access (mm) for standard cooling towers: Top view

Tower without sound attenuation



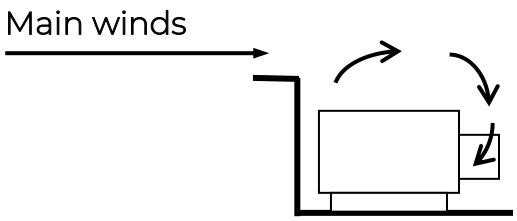
Tower with sound attenuation



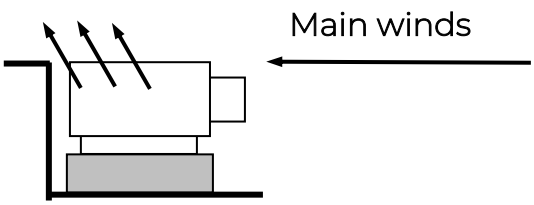
Do not hesitate to contact us for any advice

Layout examples:

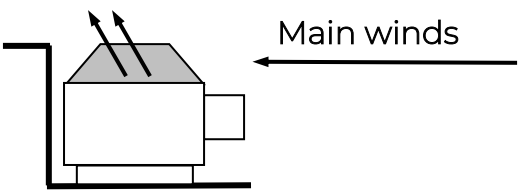
NOT TO DO:



TO DO:



Install a base in order to
up the cooling tower



Install a cone in order to
up the air outlet of the cooling tower

WATER EVAPORATION

Consumption by evaporation is approximately 1.7kg/h per 1 000kcal/h.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible).
There are three possibilities to choose according to the case:

1- Continuous blow down

Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.

The blow down flow rate can be calculated using the formula: [100 S / (M - S)] % of the make-up water in which:
S: Salinity of the make-up water compensating for evaporation.
M: Maximum acceptable salinity level of water in circuits.

Example:
Salinity of make-up water = HT 20 ° F
Maximum acceptable salinity = HT 40 ° F
100 x 20 / (40 - 20) = 100 % make-up water flow rate
Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).

Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous blow down

The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- JACIR Automated Inductive Blow down

Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level. See separate documentation.

WATER TREATMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly. If the water contains a significant amount of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10% of the recycled water flow.
If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.
In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to prevent these organisms from developing.

Water treatment should be undertaken by a specialized Company.
PREVENTS THE RISK OF LEGIONNAIRES' DISEASE: see separate documentation

Prescription KS

Evaporative cooling tower, high efficiency open circuit with forced centrifugal fans, KS ..... JACIR type,

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Sound level characteristics

The sound pressure level will not exceed.... dB (A) at ..... meters in free field over 4 directions. To ensure this, the tower is equipped with one of the following types of soundproofing devices:

1 – IB option with sound attenuators without baffles at air inlet, and outlet cone coated with acoustic foam.

2 – ICV – ICVK or Special sound attenuation with parallel baffles both at air inlet and outlet, equipped with 50mm thick high density rock wool double casing, covered by 1.2 mm thick steel sheet. NR30 at 10m may be reached.

Tower casing, with sloped bottom basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive if necessary a double casing later on.
Stainless steel rivets with uniform and high locking capacity will be used for assembly.
The casing will be assembled without any bolting or welding for parts in contact with water; a special designed high covering seal will ensure waterproofing between panels.

The basin will be equipped with a rectangular access hatch sized 990 x 540 mm, an easily adjustable floating valve, a drain, an overflow and an anti-cavitation strainer.
The sloped bottom of the basin will allow a complete and easy drain thanks to the POWER FLOW drain hole located under the basin's lowest part in order to ease the cleaning. The size of its opening will be 260x110 mm.
Height between basin bottom and the infill is 1400 mm for easy access.

Casing structure

The cooling tower panels casing will be made of:

- As a standard, galvanized steel 2mm thick ZENDZIMIR process 275 gr/m² (galvanized plates protected by zinc oxidation of the surface) or,
- Option, X-STEEL stainless steel (corrosion resistance higher than 316L) for its long-lasting properties, water saving and easy cleaning.

Accessibility

As standard, the basin will be equipped with access hatch(es) (990 x 540mm), and a POWER FLOW hatch (260x110 mm) for express cleaning and draining of sludge and other accumulated matters from the bottom casing using simple water jet.

Two large access doors (990 x 540 mm) made of the same material as the tower will also be provided: one on casing lower part and the other on the upper part. These hatches will allow quick removal of drift eliminators, nozzles, packing (infill) and water distribution pipes.

If sound baffles or outlet air ducts are required, large access (540x390mm) will be provided to allow easy removal of drift eliminators, nozzles, the exchange surface and water distribution pipes.

Fans

The low-pressure centrifugal fan(s) with forward inclined blades and double air inlet will be placed in the dry air flow, outside the basin and at man's height for easier access for disassembly and maintenance.
The polyester volute shall be profiled to optimise air intake and removable to simplify maintenance.
The impeller will be coated by baked-on EPOXY. The volute is made of X-STEEL stainless steel.
Optional stainless steel impeller construction is available.
Each fan will be coupled to its own motor.

Electric motor(s) and coupling

The IE3 three-phase asynchronous motor(s) shall be of the enclosed ventilated type with a maximum power of ..... kW, ... rpm, IP55 protection, class F/B. The transmission will be ensured by V-belts sized up to 150% of the nominal power.

Water distribution

Water distribution will be made through highly efficient polypropylene nozzles specially designed to optimally and uniformly distribute water over the whole exchange surface. These nozzles will operate at low pressure (0.8 mCE), thus reducing the pumps' power and producing large droplets avoiding vesicular entrainment.

Exchange surface

The exchange surface FREEFILM will be made of vacuum pressed PVC sheets for a water temperature up to 55 °C as a standard. Highly resistant to fouling thanks to large size 20 mm vertical channels the FREEFILM will guarantee a low pressure drop. This exchange surface will be non-putrescible, long lasting, and resistant to chemicals and will have a good thermal efficiency.

This exchange surface will be integrated into a self-supporting 20/10th galvanized sheet metal with double fold on the 4 sides.

Drift eliminators

Highly efficient EUROVENT certified, the PP sheets drift eliminators will prevent the water from being sprayed out at the outlet tower. Ultraviolet resistant, they will be easy to remove from the top in order to access to the distributors and to the exchange surface if needed. The drift will be 0.01 % maximum of the re-circulating water flow.

Options

An Automatic Inductive blown down (AiD) inside the exchanger room may be integrated, as an option (see separate documentation).

The following options are also available:

- Anti-freeze resistance with thermostat,
- Frequency variators on fans,
- Water top-up by electric level control,
- EFFI-SILENT basin soundproofing,
- All stainless-steel accessories (volute, impeller, shaft, plume suppression coil frame, etc.).

The equipment can be delivered in spare parts to be assembled, with assembly on site by one of our experienced technicians.

Prescription KSIM

Evaporative cooling tower, high efficiency open circuit with forced centrifugal fans, KSIM ..... JACIR type,

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Sound level characteristics

The sound pressure level will not exceed.... dB (A) at ..... meters in free field over 4 directions. To ensure this, the tower is equipped with one of the following types of soundproofing devices:

1 – IB option with sound attenuators without baffles at air inlet, and outlet cone coated with acoustic foam.

2 – ICV – ICVK or Special sound attenuation with parallel baffles both at air inlet and outlet, equipped with 50mm thick high density rock wool double casing, covered by 1.2 mm thick steel sheet. NR30 at 10m may be reached.

Tower casing, with sloped bottom basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive if necessary, a double casing later on.
Stainless steel rivets with uniform and high locking capacity will be used for assembly.
The casing will be assembled without any bolting or welding for parts in contact with water; a special designed high covering seal will ensure waterproofing between panels.

The basin will be equipped with a rectangular access door (990 x 540 mm), an easily adjustable floating valve, a drain, an overflow and an anti-cavitation strainer.
The sloped bottom of the basin will allow a complete and easy drain thanks to the POWER FLOW drain hole located under the basin's lowest part in order to ease the cleaning. The size of its opening will be 260x110 mm.
Height between basin bottom and the infill is 1400 mm for easy access.

Casing structure

The cooling tower panels casing will be made of:

- As a standard, galvanized steel 2mm thick ZENDZIMIR process 275 gr/m² (galvanized plates protected by zinc oxidation of the surface) or,
- Option, X-STEEL stainless steel (corrosion resistance higher than 316L) for its long-lasting properties, water saving and easy cleaning.

Accessibility

As standard, the basin will be equipped with access hatch(es) (990 x 540mm), and a POWER FLOW hatch (260x110 mm) for express cleaning and draining of sludge and other accumulated matters from the bottom casing using simple water jet.

Two large hatches (990 x 540 mm) made of the same material as the tower will also be provided: one on casing lower part and the other on the upper part. These hatches will allow quick removal of drift eliminators, nozzles, packing (infill) and water distribution pipes.

If sound baffles or outlet air ducts are required, large access (540x390mm) will be provided to allow easy removal of drift eliminators, nozzles, the exchange surface and water distribution pipes.

Fans

The low-pressure centrifugal fan(s) with forward inclined blades and double air inlet will be placed in the dry air flow, outside the basin and at man's height for easier access for disassembly and maintenance.
The polyester volute shall be profiled to optimise air intake and removable to simplify maintenance.
The impeller will be coated by baked-on EPOXY. The volute is made of X-STEEL stainless steel. Optional stainless steel impeller construction is available.

Each fan will be coupled to its own motor.

Electric motor(s) and coupling

The IE3 three-phase asynchronous motor(s) shall be of the enclosed ventilated type with a maximum power of ..... kW, ... rpm, IP55 protection, class F/B. The transmission will be ensured by V-belts sized up to 150% of the nominal power.

Water distribution

Water distribution will be made through highly efficient polypropylene nozzles specially designed to optimally and uniformly distribute water over the whole exchange surface. These nozzles will operate at low pressure (0.8 mCE), thus reducing the pumps' power and producing large droplets avoiding vesicular entrainment.

Exchange surface

The exchange surface FREEFILM will be made of vacuum pressed PVC sheets for a water temperature up to 55 °C as a standard. Highly resistant to fouling thanks to large size 20 mm vertical channels the FREEFILM will guarantee a low pressure drop. This exchange surface will be non-putrescible, long lasting, and resistant to chemicals and will have a good thermal efficiency.

This exchange surface will be integrated into a self-supporting 20/10th galvanized sheet metal with double fold on the 4 sides.

Drift eliminators

Highly efficient EUROVENT certified, the PP sheets drift eliminators will prevent the water from being sprayed out at the outlet tower. Ultraviolet resistant, they will be easy to remove from the top in order to access to the distributors and to the exchange surface if needed. The drift will be 0.01 % maximum of the re-circulating water flow.

Plume suppression coil (Jacir patent)

As standard model, the tubes will be assembled in a triangular pitch, in copper (stainless steel optional), outside diameter 16 mm, and 0.5 mm thick. The fins will be in copper and the fin pitch will be 3 mm in standard. A monitored valve adjusting the water flow sprays over the infill will be associated to the plume coil. As soon as climatic conditions allow it, substantial water savings will be made by cooling water in the dry mode rather than evaporation.

Connections

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection.
The servitudes panels will include a high-level switch, a drain hole and water make up.

Options

An Automatic Inductive blown down (AiD) inside the exchanger room may be integrated, as an option (see separate documentation).
Will be available also as option: plume suppression coil system, fans frequency drive, water level control with electric valve, EFFI-SILENT basin sound attenuation, and all accessories made of stainless-steel (fan casing, wheel, plume suppression coil, etc). Equipment delivered in parts, ready to be assembled on site by our experimented technicians.

JACIR
Cooling for life

KSF

Closed circuit cooling tower

Capacity 400 to 4 000kW

Commercial Documentation

- Glycol free
- No freezing risk
- Mechanical resistance
- Hygiene compliance

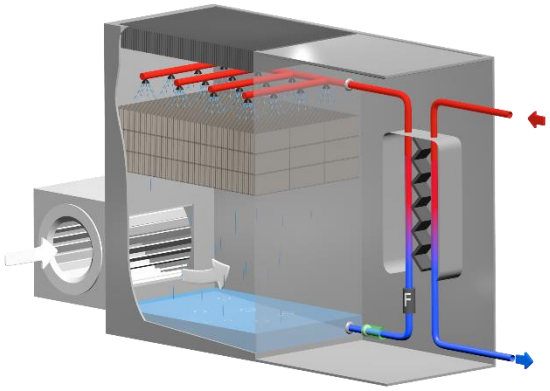
MADE IN FRANCE
FABRICATION FRANÇAISE

La FRENCH FAB

CLOSED CIRCUIT COOLING TOWER: KSF

Operating principle

Water cooling tower, closed-type, centrifugal, forced-draft, designed for a glycol-free operating during winter.
The SF range is fully factory assembled on a single frame and composed of a dismountable and cleanable Plate Heat Exchanger, a pump and a filter with all technical accessories grouped together inside a closed room that is accessible through a large door for its maintenance.



Casing

As a standard, the rigid self-supporting panels are made of galvanized steel, 2mm thick plates, folded twice or 4 times on the 4 sides of the panel (JACIR design) allowing a complete noise insulation of the tower's casing.
All the folds of the plates are outwards, and assembled by stainless steel sealed rivets (powerful and uniform tightening) and the panels are assembled without welding and without any bolt in contact with the water.
Silver-steel casing or X-STEEL stainless steel is available as an option (corrosion resistance superior to 316L).

Basin

The basin is sloped for a complete drain, with an access door. It includes an easily adjustable float valve, an overflow, a water heater and an anti-cavitation strainer made of stainless steel and PEHD. It is also equipped with a « POWER FLOW » trap door, enabling to quickly and completely evacuate all sludge and other accumulated parts in the bottom of the casing using simple water spray and also a centrifugal FRC filter (JACIR patent):
- 100 % of the tower's water volume is continuously filtered every 1.2 minutes, with a 60 µm efficiency,
- Automatic cleaning managed by the opening of the drain circuit (with DAI, inductive blow-down option).
Therefore, the entire evaporative loop remains clean and decreases the risk of legionella proliferation.

Exchange surface

The FREEFILM infill is made of vacuum pressed PVC sheets, offering a large free surface and high resistance to fouling. Its large section vertical channels, also avoids from fouling and reduces pressure drop.

Accessibility

As a standard, 3 large access doors are supplied in the same material as the tower casing. Each access allows an easy and quickly removing of the drift eliminators, the nozzles, the infill and the water distribution pipes.
A « POWER FLOW » access, located under the low level of the slope basin, allows an easy cleaning during complete drain.

Non-freezing Plate Heat Exchanger room

Especially designed for an easy access and maintenance, the stainless-steel plate heat exchanger is totally protected from weather conditions thanks to its self-supporting stiff panels made of 15/10e galvanized steel (X-STEEL stainless-steel option), and equipped with lockers access door (2100 x 600mm). Customer connection is directly fixed outside the room to facilitate connection with primary circuit.

Water distribution

Water distribution is made of PP pipes through highly efficient water distributors operating under low pressure (8 kPA) to reduce drifts: 0.8 m WC.
This conception considerably reduces the risk of bacteriological contamination: low pressure creates heavier droplets, avoiding drifts out the cooling tower.
The water nozzles are widely sized to avoid any clogging, even in the case of high suspended solids content.

Heat exchanger room

The stainless steel Plate Heat Exchanger is fully protected from the outdoor conditions thanks to a galvanized, 1,5 mm thick self-supporting casing (X-STEEL as an option) with a large access door to ease the maintenance.
The connection to the Heat Exchanger is made through flanges located outside the room: there are only 2 connections: inlet and outlet, placed on the tower's length.

Motor fan set

The fans especially designed and manufactured by JACIR, have continuously been perfected over the years. The impeller is a double side air inlet type. Polyester air inlet ducts are profiled to optimise air suction, allowing low pressure and slow rotation speeds. This leads to a very low power consumption of the fan motors. Located in the air flow and outside the tower's basin, motor fan set is easily accessible for maintenance.

Silence

Acoustic attenuation levels are provided as an option:
- IB silencer,
- ICV, ICVK or Special sound attenuation levels

Options

Non-freezing plume suppression coil (Hybrid KSFIM range), Automatic Inductive blow-down and frequency drive on the pump, electro-valve driven by level switch, EFFI-SILENT sound attenuation, on site erection, all accessories in stainless-steel, etc.

KSF and KSFIM

Closed circuit cooling tower

Closed circuit hybrid cooling tower

JACIR
Cooling for life

CONTENTS Page(s)

Documentation Technique

LA FRENCH FAB

JACIR

With more than 60 years' experience, our company:

∞ Has invested in detailed research and development in order to propose technical solutions in accordance with environmental protection through unequalled realizations and patents.

* Is today the European leader thanks to its technology beyond market requirements.

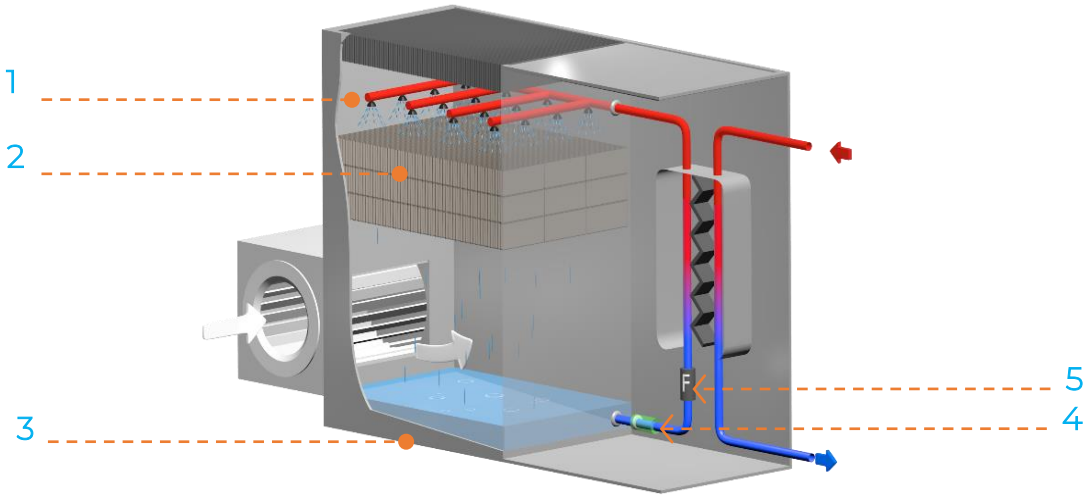
STRONG BENEFITS OF THE KSF - KSFIM

∞ SAFETY et HYGIENE	Compliant with December 2020 standard NF E 38-424.
∞ PLATE HEAT EXCHANGER	Made of stainless-steel, the plates are removable to ease cleaning and reassembly.
∞ NO FREEZING RISK	Glycol free plate heat exchanger.
∞ WATER PROOF	Thanks to our assembling technology, we guaranty no leak equipment.
∞ SILENCE	Very silent cooling towers in standard version, can be adapted according requirements.
∞ EXCHANGE SURFACE	High efficiency, with low fouling and low pressure drop characteristics thanks to vertical channels.
∞ ANTICORROSION COATING	Casing of the tower is assembled without any welding, also proposed in X-STEEL stainless steel
∞ EASY MAINTENANCE	Large access doors, fan outside the tower and at man's height, inclined and plane basin for a complete drain.
∞ ELECTRICAL POWER	Fully optimized.
∞ EVOLUTIVE TOWER	Possible to increase easily the exchanged power by addition of plates, to lower the sound level without increasing the motor power.
∞ MODULAR CONSTRUCTION	Easy handling and transport

Principle of a closed-circuit cooling tower KSF

A cooling tower is a heat exchanger, which enables water to be cooled through direct contact with air. The heat transfer from the water to the air is carried out partly by sensible heat transfer, but mainly by latent heat transfer (evaporation of part of the water into the air), which makes it possible to reach cooling temperatures lower than ambient temperatures.

Operation of a closed wet air cooler:



The fluid to be cooled flows through the primary circuit of a stainless steel plate heat exchanger. The water from the secondary circuit, flows from the heat exchanger by pipes to the top of the cooling tower. This water is distributed on the exchange surface (2) through the nozzles (1).

The air is forced by the fan from the bottom to the top of the cooling tower. During the pass, it has been warmed up and saturated in water through the exchange surface.

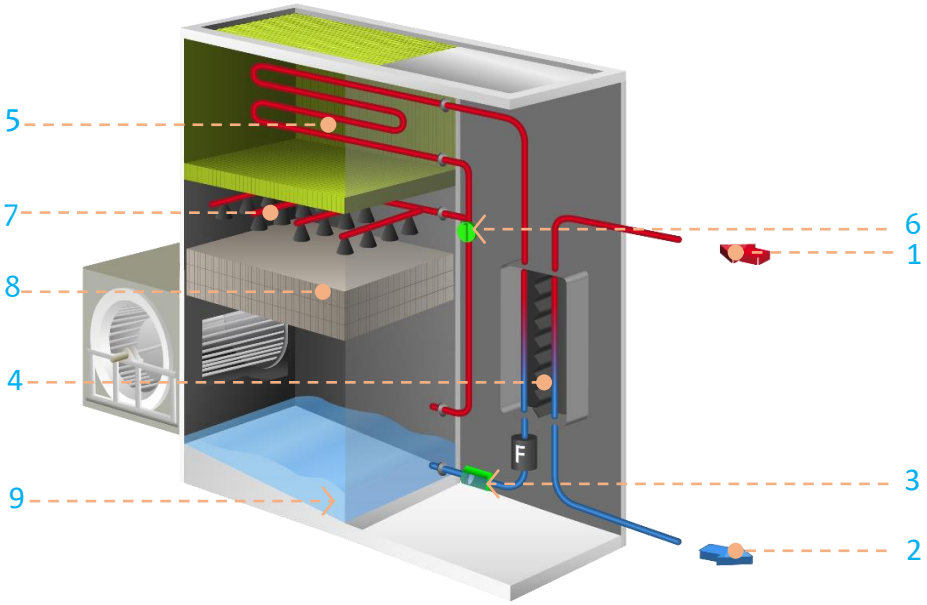
Because of the superficial tension created by the exchange surface, the water equally flows down along the whole height of the so extended exchange surface.
Cooled by the forced air, the water falls by gravity to the inclined basin (3) located on the bottom of the tower.

This water is recycled on the plate heat exchanger by the circulating pump (4) filtered by a strainer and then by a FRC centrifugal filter (5).

Principle of an open hybrid cooling tower KSFIM

Standard KSF closed circuit cooling tower ranges have originally been designed to receive the plume abatement coil option; these KSF ranges are then referred to as KSFIM Closed Hybrid Cooler range. Their efficiency is ensured by a finned tube coil combined with a valve for adjusting the water spray on the exchange surface (packing). This water flow regulation over the exchange surface is a market exclusivity, JACIR patented.
Therefore, the combination of the air desaturation by air outlet warming up, and the reduction of the water spray on the packing, ensures the complete plume suppression. Beyond the plume suppression itself, this system can provide significantly water savings and is an ultimate obstacle to the drifts.
This technology proposed by JACIR has been deeply researched in partnership with the CETIAT for over 40 years, and has offered the opportunity to file innovating patents.
The closed-circuit hybrid towers are perfectly adapted for operating without glycol in winter. Their design makes access and cleaning very easy and ensures performance durability.

Operation of a hybrid open tower:



Process (primary) Side:

The water to be cooled (1) enters into the integrated plate heat exchanger and exits once cooled (2). Primary (user) circuit is closed and is not in contact with the air.

Cooling tower side (evaporation):

Water is sucked up by a pump (3), circulates through the plate heat exchanger (4) filtered by a strainer and a FRC centrifugal filter, and enters into the non-freezing plume suppression coil (5) – JACIR patent; then, via a power-activated valve (6), water goes either to the water spraying system (7) to be distributed over the exchange surface (8), or directly to the basin if the ambient conditions are cold enough for a dry cooling. The water cooled thanks to the forced draft fan, falls into the bottom cooling tower sloped basin (9).

Hors gel, sans glycol et facilité d'entretien :

This technology does not require glycol to avoid exchanger freezing risk. Designed for an easy cleaning or descaling of all the cooling tower components by a very simple operation maintenance.

I –AIR-WATER EXCHANGE: TOWER CIRCUIT

Casing structure

Self-supporting rigid panels, with 2 or 4 folds on the four sides, (JACIR design) allowing sound attenuation casing addition if required. Thanks to this technology, we can offer cooling towers with an extremely low sound level.

Towers are assembled with waterproof stainless-steel rivets (uniform, high-capacity locking). There is no welding on assembled panels for the parts in contact with water; a high covering seal ensures the close fit between the panels. Folds and cutting plan are all outside oriented.

The material used for hydraulic connections is identical to that of the tower's casing.

As standard model, the panels are in galvanised steel 2mm thick ZENDZIMIR process 275 gr/m² (galvanised plates are protected by the zinc oxidation on the surface).

X-STEEL stainless steel is optional.

Sloped and flat basin

The basin has a large capacity to take into account the needs and inertia of the installation. For an example, the basin of a KSF 1750 can contains till 9m³.
The sloped and plan basin allows a complete and easy drain.

On the utilities panels of the basin are located:

- A high-capacity overflow,
- A drain below the lower level of the basin and Power-flow access enabling to quickly and completely evacuate all sludge and other accumulated parts in the bottom of the casing using simple water spray
- A makeup water by float valve or electro valve as an option,
- A water outlet through a removable strainer in stainless steel or PEHD) with a flange, oversized to eliminate cavitation, with a perforated steel plate,
- a hatch to access to access the basin: (990 x 540 mm)

- Option: electrical heater of V 230 or V 400 and waterproof thermostat with separate bulb.

For automatic resistance control, suitable contactors must be provided.

Exchange surface: FREEFILM

The exchange surface, also called packing or infill is made of vacuum pressed PVC sheets. This material is non-putrescible, long lasting, also offers the following benefits:

- Very low pressure drop, so low power consumption thanks to the vertical channels
- Highly resistant to fouling thanks to large size channels: 20 mm.
- can be used up to 55 °C as standard, and up to 80 °C as option with PP or ABS material
- High thermal efficiency,
- Resistance to chemicals.

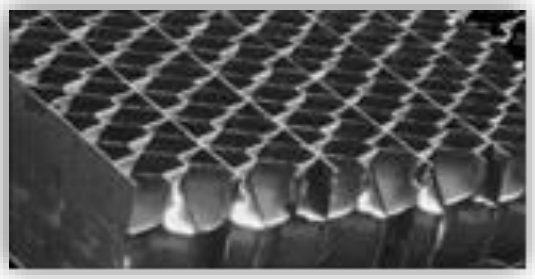
Water distribution

Water distribution is made of PP pipes through highly efficient water distributors. These nozzles are made of polypropylene and distribute the water under low pressure (8kPA) uniformly on the whole exchange surface. This low pressure reduces drifts (0.8 m WC), and bacteriological contamination risk: indeed, low pressure creates heavier droplets, so less drifts out the cooling tower.

The water nozzles are widely sized to avoid any clogging, even in the case of high suspended solids content.

Drift eliminators

Highly efficient, drift eliminators are made of PP sheets and prevent the water from being sprayed out of the tower: the drift is 0.01 % maximum of the re-circulating water flow. This value has been Eurovent certified.
Ultraviolet resistant, they are easy to remove from the top in order to access to the distributors and to the exchange surface.



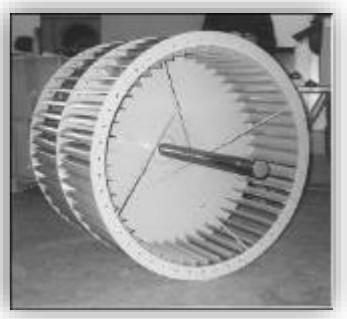
Fans

The centrifugal fans are specially designed and manufactured by JACIR. The impeller is a double side air inlet type. The air inlet ducts are removable to access to the impeller, and are made of polyester. Their shape noticeably improves the performances of the fans.

The bearings are self-aligning, lubricated in our factory and to be regularly lubricated thanks to a copper deported line lubrication as a standard for a simple and quick maintenance without any removal.

Each shaft is supported by two bearings. The volutes side-plates are used to fix the motor support. This design prevents the belts from producing a slapping effect.

Trapezoidal pulleys and V-belts transmission are used. Tension is applied to the belts by tipping the motor seat, for easy adjustment.



The impeller is treated and protected by a baked EPOXY coating.
The volute is fully stainless steel.
As an option, the impeller can be built using Stainless stell.

Standard Motors:

- IE3 asynchronous three-phases motor, compatible with a frequency converter,
- 1500 rpm,
- 230/400 V up to 5,5 kW,
- 400/690 V above 5,5 kW,
- Hz 50,
- IP55 (possible open sky operating),
- F / B class,
- Direct connection to Raccordement direct sur terminal box.

Accessibility

As a standard, the basin is equipped with access door(s) sized 990 x 540 mm, and one POWER FLOW access sized 260x110 mm : located under the bottom level of the basin, it allows a fast complete drain and an easy cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

Two large doors sized 990 x 540 mm in the same material as the cooling tower casing are also provided: the first one is located on the bottom casing, and the second one on the upper part casing. These large access doors allow quickly removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

If sound baffles or outlet air duct are required, large access (540 x 390 mm) is provided. This access is used to remove easily the drift eliminators, nozzles, exchange surface and water distribution pipes.

In the case a plume suppression coil is installed, an additional middle casing is supplied located between the coil and the drift eliminators, and fitted with at least one access door of 540 x 390 mm.

Non-freezing plume suppression coil (JACIR patent) – KSFIM option

As a standard model, the stainless-steel headers are totally removable for access and complete cleaning of both tubes and headers. This “cover” type configuration protects the coil from accidental damage related to possible freeze-over. Two air vents secure the freezing risk. The tubes are assembled in a triangular pitch, in copper (Stainless steel option), outside diameter 16 mm, and 0.5 mm thick. The fins are in copper. The fin pitch is 3 mm in standard. A monitored valve adjusting the water flow sprays over the infill, associated to the plume coil.

As soon as ambient conditions are met, this system makes it possible to operate significant water saving by cooling the water in the dry mode, rather than spraying and evaporating it.

II – WATER-WATER EXCHANGE: USER CIRCUIT
Integrated exchanger room to the cooling tower

Made of galvanized steel in standard, self-supporting stiff panels equipped with an access door (2100 x 600 mm) with key lockers. The panels can be disassembled, and all components are designed for easy access and maintenance. As a standard, the exchanger room is equipped with automatic presence detection lightening.

Plate heat exchanger

It is protected from weather conditions inside its dedicated room.
User's connection is directly fixed outside the room to facilitate connection with primary circuit, with only two connections: inlet and outlet located either in the cooling tower axe or perpendicularly. It does not require antifreeze protection: in case of electrical stop, the water-cooling tower circuit automatically drains by gravity down the basin, protecting by the way plates and gaskets of the plate heat exchanger. For easy re-assembly, Jacir selects with symmetrical plates and clipped gaskets.

Heat exchanger pump

Protected against freezing by a patented thermostatic valve: no electrical tracing need. A water level switch is included and a pump frequency drive is also proposed as an option.

Pressure manometers

Installed before and after the pump, and also before water distribution piping.

FRC centrifugal filter

Located at the basin outlet, a 5 mm filtration strainer is installed. A FRC centrifugal filter chosen in the same material as the piping (galvanized or 304 – 316L stainless steel options) is located at the plate exchanger inlet. It offers the following characteristics:

- 100% of the cooling tower flow is filtered continuously every minute: very high efficiency: 60µm,
- Automatic cleaning during the blow down of water circuit.

The evaporative circuit remains clean and avoids Legionella growth risk.

Automatic Inductive blow down (DAi)

Automatic Inductive blow down is available in option (Jacir patented system).

III – SOUND ATTENUATIONS (options) :

IB standard sound attenuation

Additional casing of the air inlet fan(s), made of self-supporting rigid steel panels covering, double folding on the 4 internal sides of the panels. Internal lagging is made of absorbent sound material.
Complete access door is provided for a total accessibility maintenance in front door with 4 lockers, activated by key.
At the air outlet, an exhaust cone reduces the acoustic emission surface.

ICV complete sound attenuation

Additional casing of the air inlet fan(s), made of self-supporting rigid steel panels covering, double folding on the 4 internal sides of the panels. Internal lagging is made of absorbent sound material and contains sound acoustics baffles. These galvanized steel sound baffles, made of high-density rock wool panels, are easily removable.
At the air inlet, the rock wool is coated by a fibre glass layer.
At the air outlet, baffles receive a reinforced protection by a stainless-steel grid.

ICVK complete sound attenuation with double casing

The entire casing of ICV cooling tower is fitted with a double casing: high density rock wool covered by an additional steel sheet - ICVK.

NR 30 special sound attenuation

Evolution of the ICVK solution adapted to reach required sound level, up to NR 30 at 10m.

OPTIONS

- Pump frequency drive,
- 316L stainless steel plate heat exchanger,
- Non-freezing plume suppression coil system (see **KSFIM** range),
- X-STEEL stainless steel casing (resistance to corrosion superior to 316L),
- Non-freezing heater with thermostat
- 2 speeds motor (separate wiring or PAM – 1500/1000 rpm),
- Fans frequency drive,
- Water level control with electric-valve and input filter,
- Automatic Inductive BLOW DOWN (see specific documentation),
- All accessories made of stainless steel (fan casing, wheel, plume suppression coil, etc.),
- Discharge cone (increase of air outlet speed with lower sound radiation and recycling),
- Available air pressure for connection to the duct,
- Equipment delivered in parts, ready to be assembled,
- Assembly on site by our experimented technicians.

Technical characteristics KSF

CLOSED COOLING TOWER WITHOUT SOUND ATTENUATION

KSF range	Heat power ref. (1) [kW]	NDKL Fans quantity	Outlet air flow rate [m3/h]	Heater power [kW]	Motor power [kW]	Sound level (2) at 20 m [dB(A)]	Empty weight (without discharge cone) [kg]	Loaded weight (without discharge cone) [kg]	Overall dimensions (without discharge cone) [mm]
KSF-700-QK-300-B-S62-60/60	756	1	90 000	10	30	57	4 600	9 600	H = 4 100 L = 6 400 W = 2 430
KSF-700-QK-300-B-S62-18/162	845		90 000		30	57			
KSF-930-QK-150D-B-S62-80/80	973	2	120 000	10	30	58	5 800	12 200	H = 4 100 L = 5 800 W = 4 025
KSF-930-QK-150D-B-S62-24/216	1 082		120 000		30	58			
KSF-1165-QK-185D-B-S62-100/100	1 280	2	150 000	10	37	59	6 500	14 600	H = 4 100 L = 6 800 W = 4 025
KSF-1165-QK-185D-B-S62-30/270	1 430		150 000		37	59			
KSF-1450-QK-300D-B-S62-120/120	1 561	2	190 000	10	60	59	6 900	16 600	H = 4 100 L = 6 800 W = 4 595
KSF-1450-QK-300D-B-S62-32/288	1 706		190 000		60	59			
KSF-1750-QK-185T-B-S100-100/100	1 920	3	230 000	10	55.5	60	7 900	19 900	H = 4 100 L = 7 600 W = 4 025
KSF-1750-QK-185T-B-S100-30/270	2 163		230 000		55.5	60			
KSF-2175-QK-300T-B-S100-110/110	2 279	3	280 000	10	90	60	8 200	22 500	H = 4 100 L = 7 600 W = 4 595
KSF-2175-QK-300T-B-S100-32/288	2 559		280 000		90	60			

(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level : average pressure level (Lp) in free field in 4 directions at 1.5m high.
Nota: for higher power, towers can be added side by side.

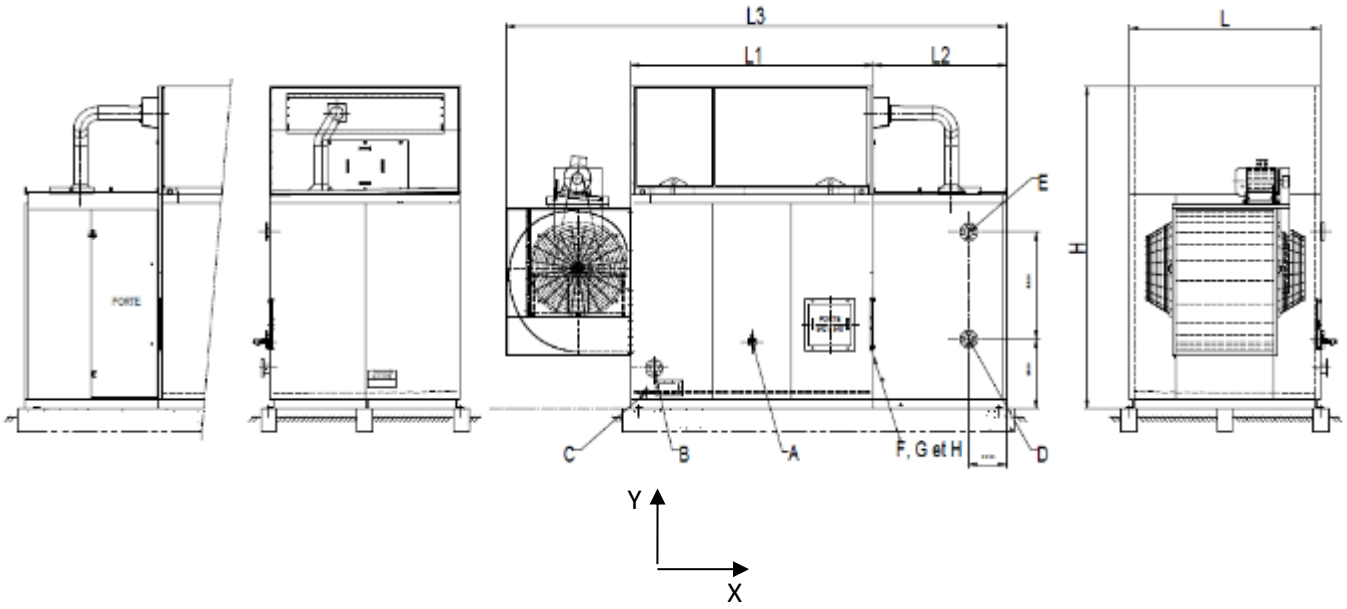
IB SOUND ATTENUATED CLOSED COOLING TOWER

KSF range	Heat power ref. (1) [kW]	NDKL Fans quantity	Outlet air flow rate [m3/h]	Heater power [kW]	Motor power [kW]	Sound level (2) at 20 m [dB(A)]	Empty weight (without discharge cone) [kg]	Loaded weight (without discharge cone) [kg]	Overall dimensions (without discharge cone) [mm]
KSF-700-QK-300-B-IB-S62-60/60	726	1	90 000	10	30	45	5 500	10 550	H = 5 320 L = 7 140 W = 2 430
KSF-700-QK-300-B-IB-S62-18/162	812		90 000		30	45			
KSF-930-QK-150D-B-IB-S62-80/80	929	2	120 000	10	30	46	7 700	14 100	H = 5 320 L = 5 800 W = 4 860
KSF-930-QK-150D-B-IB-S62-24/216	1 034		120 000		30	46			
KSF-1165-QK-185D-B-IB-S62-100/100	1 233	2	150 000	10	37	47	8 650	16 700	H = 5 320 L = 6 800 W = 4 860
KSF-1165-QK-185D-B-IB-S62-30/270	1 376		150 000		37	47			
KSF-1450-QK-300D-B-IB-S62-120/120	1 504	2	190 000	10	60	47	9 150	18 700	H = 5 320 L = 6 800 W = 5 430
KSF-1450-QK-300D-B-IB-S62-32/288	1 640		190 000		60	47			
KSF-1750-QK-185T-B-IB-S100-100/100	1 853	3	230 000	10	55.5	48	11 050	22 700	H = 5320 L = 7 600 W = 4 860
KSF-1750-QK-185T-B-IB-S100-30/270	2 075		230 000		55.5	48			
KSF-2175-QK-300T-B-IB-S100-110/110	2 209	3	280 000	10	90	48	11 400	25 350	H = 5320 L = 7 600 W = 5 430
KSF-2175-QK-300T-B-IB-S100-32/288	2 480		280 000		90	48			

(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level : average pressure level (Lp) in free field in 4 directions at 1.5m high.
Nota: for higher power, towers can be added side by side.

Drawings and dimensions

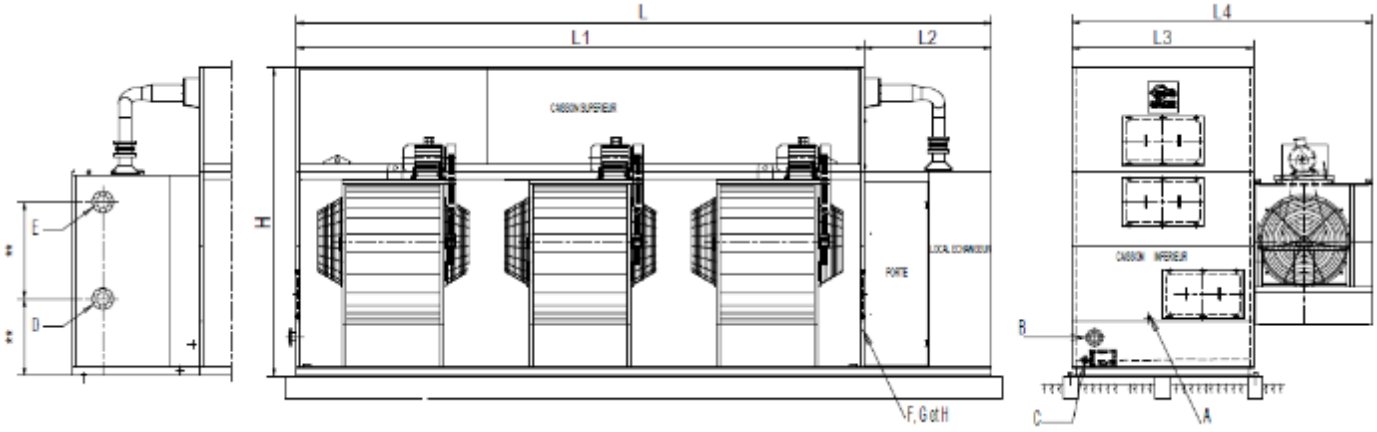
KS 700 without sound attenuation, or with standard IB sound attenuation



KSF RANGE Dimensions - mm Items X/Y on drawing			KSF 700 WITHOUT SOUND ATTENUATION	KSF 700 IB SOUND ATTENUATION
L			2430	2430
L 1			3100	3100
L 2			1700	1700
L 3			6400	7140
Height H			4100	5320
A	Electro valve	Ø*	1''	1''
	Float valve (male)	Ø*	1''	1''
	Water make up	X	1 550	1 550
		Y	855	855
B	Overflow	DN	100	100
		X	300	300
		Y	515	515
C	Drain (female)	DN	50	50
		X	200	200
		Y	215	215
D	Water outlet	DN	150	150
		X	**	**
		Y	**	**
E	Hot water inlet	DN	150	150
		X	**	**
		Y	**	**
F	Non-freezing heater (option)			
G	Thermostat (option)			
H	Water level switch (option)			
	Low level (option)			
	High level (option)			

* : According to thermal data
**: According selected servitudes

Drawings and dimensions KSF 930/1165/1450/1750/2175 Without sound attenuation, or with standard IB sound attenuation



KSF RANGE Dimensions - mm Items X/Y on drawing			KSF 930		KSF 1165		KSF 1450		KSF 1750		KSF 2175	
			Without sound att.	IB sound att.	Without sound att.	IB sound att.	Without sound att.	IB sound att.	Without sound att.	IB sound att.	Without sound att.	IB sound att.
L			5800		6800		6800		9300		9300	
L 1			4100		5100		5100		7600		7600	
L 2*			1700		1700		1700		1700		1700	
L 3			2430		2430		3000		2430		3000	
L 4			4025	4860	4025	4860	4595	5430	4025	4860	4595	5430
H			4100	5320	4100	5320	4100	5320	4100	5320	4100	5320
A	Electro valve	Ø*	1''		1''		1''		1''		1''	
	Float valve (male)	Ø*	1'' ¼		1'' ¼		1'' ¼		1'' ¼		1'' ¼	
	Water make up	X	1100		1100		1665		1100		1665	
		Y	780		780		780		780		780	
B	Overflow	DN	100		100		100		100		100	
		X	300		300		300		300		300	
		Y	515		515		515		515		515	
C	Drain (female)	DN	50		50		50		50		50	
		X	171		171		171		171		106	
		Y	215		215		215		215		215	
D	Water outlet	DN	150		150		150		150		200	
		X	**		**		**		**		**	
		Y	**		**		**		**		**	
E	Hot water inlet	DN	150		150		150		150		200	
		X	**		**		**		**		**	
		Y	**		**		**		**		**	
F	Non-freezing heater (option)											
G	Thermostat (option)											
H	Water level switch (option)											
	Low level (option)											
	High level (option)											

* : According to thermal data
**: According selected servitudes

Technical characteristics KSFIM

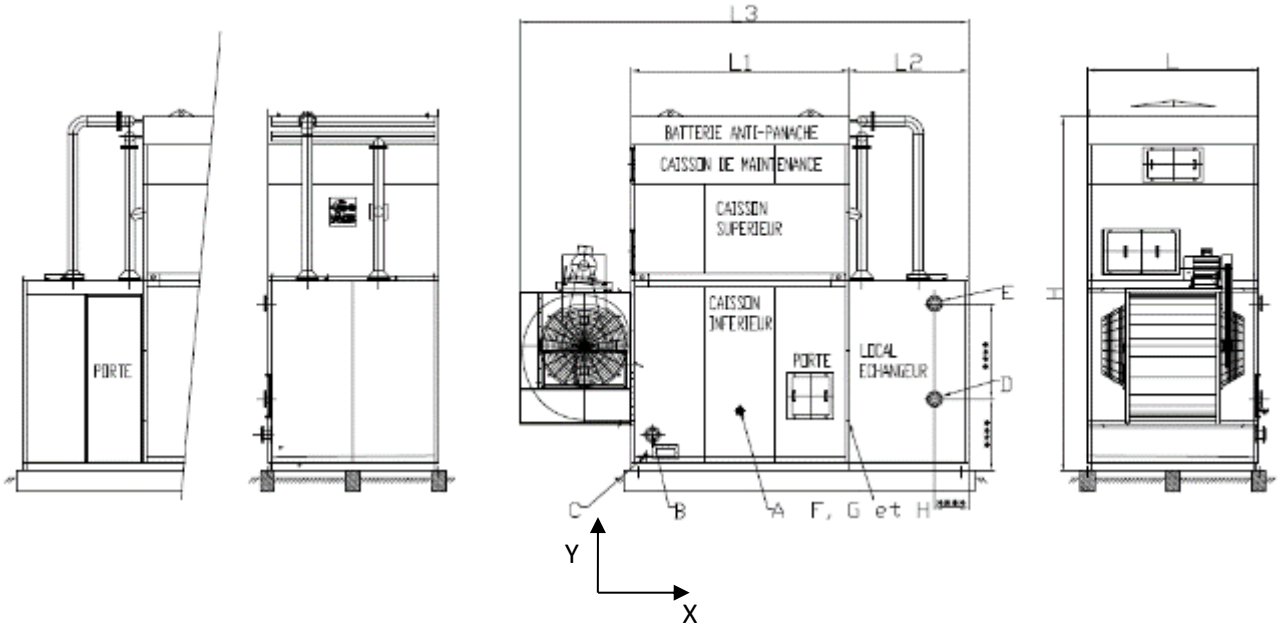
KSFIM range	HYBRID CLOSED COOLING TOWER WITHOUT SOUND ATTENUATION								
	Heat power ref. (1) [kW]	NDKL Fans quantity	Outlet air flow rate [m3/h]	Heater power [kW]	Motor power [kW]	Sound level (2) at 20 m [dB(A)]	Empty weight (without discharge cone) [kg]	Loaded weight (without discharge cone) [kg]	Overall dimensions (without discharge cone) [mm]
KSFIM-700-QK-300-B	800	1	90 000	10	30	57	5 100	9 900	H = 5 050 L = 6 400 W = 2 430
KSFIM-930-QK-150D-B	1030	2	120 000	10	30	58	6 500	12 600	H = 5 050 L = 5 800 W = 4 680
KSFIM-1165-QK-185D-B	1280	2	150 000	10	37	59	7 300	15 000	H = 5 050 L = 6 800 W = 4 680
KSFIM-1450-QK-300D-B	1630	2	190 000	10	60	59	7 900	17 000	H = 5 050 L = 6 800 W = 5 350
KSFIM-1750-QK-185T-B	2040	3	230 000	10	55.5	60	9 250	20 400	H = 5 050 L = 9 300 W = 4 680
KSFIM-2175-QK-300T-B	2420	3	280 000	10	90	60	9 750	23 000	H = 5 050 L = 9 300 W = 5 350

(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level : average pressure level (Lp) in free field in 4 directions at 1.5m high.
Nota: for higher power, towers can be added side by side.

KSFIM range	HYBRID CLOSED COOLING TOWER IB SOUND ATTENUATED								
	Heat power ref. (1) [kW]	NDKL Fans quantity	Outlet air flow rate [m3/h]	Heater power [kW]	Motor power [kW]	Sound level (2) at 20 m [dB(A)]	Empty weight (without discharge cone) [kg]	Loaded weight (without discharge cone) [kg]	Overall dimensions (without discharge cone) [mm]
KSFIM-700-QK-300-B-IB	770	1	90 000	10	30	45	6 050	11 500	H = 6 270 L = 7 140 W = 2 430
KSFIM-930-QK-150D-B-IB	980	2	120 000	10	30	46	8 400	16 400	H = 6 270 L = 5 800 W = 5 455
KSFIM-1165-QK-185D-B-IB	1300	2	150 000	10	37	47	9 400	18 150	H = 6 270 L = 6 800 W = 5 455
KSFIM-1450-QK-300D-B-IB	1570	2	190 000	10	60	47	10 000	20 300	H = 6 270 L = 6 800 W = 6 180
KSFIM-1750-QK-185T-B-IB	1960	3	230 000	10	55.5	48	12 150	24 750	H = 6 270 L = 9 300 W= 5 455
KSFIM-2175-QK-300T-B-IB	2340	3	280 000	10	90	48	12 700	27 650	H = 6 270 L = 9 300 W = 6 180

(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level : average pressure level (Lp) in free field in 4 directions at 1.5m high.
Nota: for higher power, towers can be added side by side.

Drawings and dimensions KSFIM 700
Without sound attenuation, or with IB standard sound attenuation



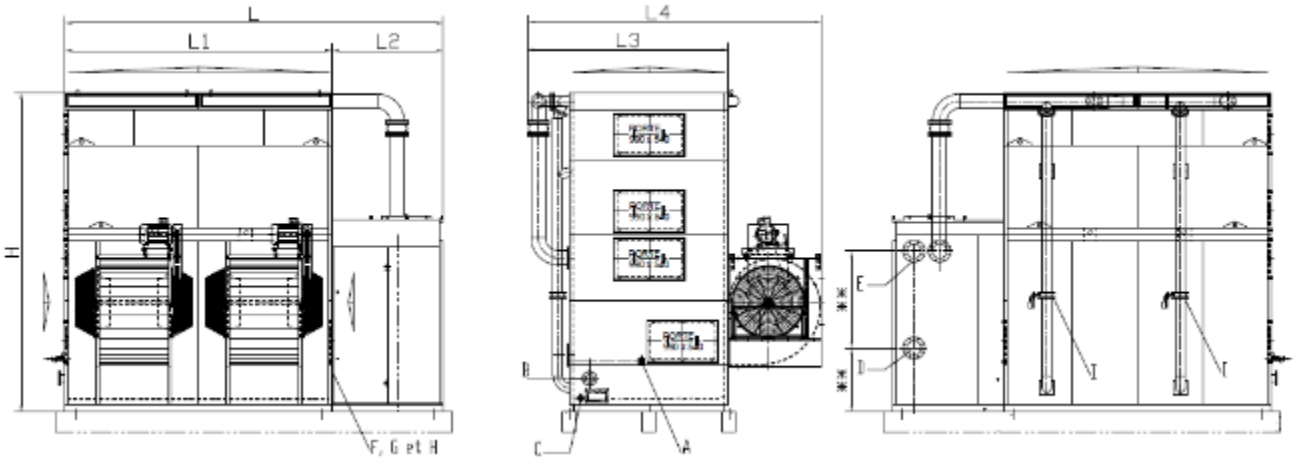
KSFIM RANGE

Dimensions - mm
Items X/Y on drawing

			KSFIM 700 Without sound attenuation	KSFIM 700 With IB sound attenuation
L			2430	2430
L 1			3100	3100
L 2			1700	1700
L 3			6400	7140
H **			5050	6270
A	Electro valve	Ø*	1''	1''
	Float valve (male)	Ø*	1''	1''
	Water make up	X	1 550	1 550
		Y	855	855
B	Overflow	DN	100	100
		X	300	300
		Y	515	515
C	Drain (female)	DN	50	50
		X	200	200
		Y	215	215
D	Water outlet	DN	150	150
		X	**	**
		Y	**	**
E	Hot water inlet	DN	150	150
		X	**	**
		Y	**	**
F	Non-freezing heater (option)			
G	Thermostat (option)			
H	Water level switch (option)			
	Low level (option)			
	High level (option)			

*: According to thermal data
**: According plume suppression coil type
***: According selected servitudes

Drawings and dimensions KSFIM 930/1165/1450/1750/2175 Without sound attenuation, or with standard IB sound attenuation



KSFIM RANGE Dimensions - mm Items X/Y on drawing			KSF 930		KSF 1165		KSF 1450		KSF 1750		KSF 2175	
			Without sound att.	IB sound att.	Without sound att.	IB sound att.	Without sound att.	IB sound att.	Without sound att.	IB sound att.	Without sound att.	IB sound att.
L			5800		6800		6800		9300		9300	
L 1			4100		5100		5100		7600		7600	
L 2*			1700		1700		1700		1700		1700	
L 3			3090		3090		3750		3090		3750	
L 4			4680	5455	4680	5455	5350	4680	5455	4680	5455	5350
H**			5050	6270	5050	6270	5050	5050	6270	5050	6270	5050
A	Electro valve Float valve (male) Water make up	Ø	1''		1''		1''		1''		1''	
		Ø	1'' ¼		1'' ¼		1'' ½		1'' ¼		1'' ¼	
		X	1 665		1 100		1 665		1 100		1 100	
		Y	780		780		780		780		780	
B	Overflow	DN	100		100		100		100		100	
		X	300		300		300		300		300	
		Y	515		515		515		515		515	
C	Drain (female)	DN	50		50		50		50		50	
		X	171		171		106		171		171	
		Y	215		215		215		215		215	
D	Water outlet	DN	150		150		200		150		150	
		X	***		***		***		***		***	
		Y	***		***		***		***		***	
E	Hot water inlet	DN	150		150		200		150		150	
		X	***		***		***		***		***	
		Y	***		***		***		***		***	
F	Non-freezing heater (option)											
G	Thermostat (option)											
H	Water level switch (option)											
	Low level (option)											
	High level (option)											

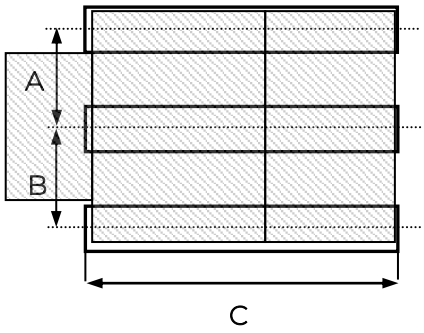
*: According to thermal data
**: According plume suppression coil type
***: According selected servitudes

Support KSF and KSFIM

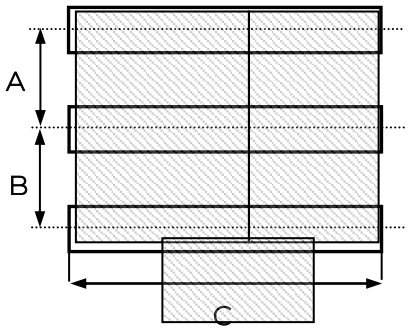
KSF and KSFIM cooling tower ranges can stand on a concrete base or on steel frame beams (customer supply).
Check that the ground can stand the operating load, and that surface or supports are flat and horizontal.

Quantity and position of concrete or metallic beams (customer supply) for cooling towers without sound attenuation

KSF 700



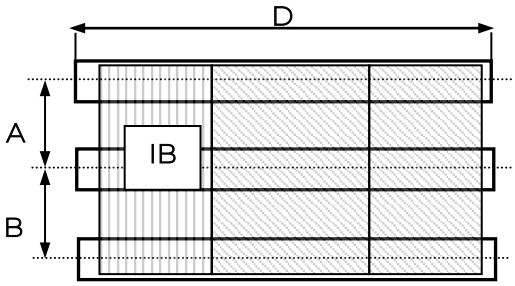
Others KSF



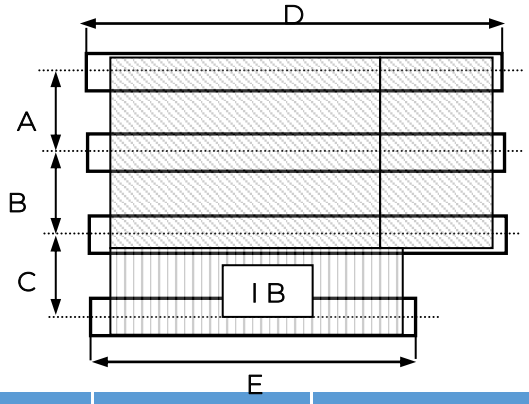
	Qty	Distance between beams under basin A [mm]	Distance between beams under basin B [mm]	Length superior to C [mm]
KSF 700	3	1 230	1 230	4 800
KSF 930		1 230	1 230	5 800
KSF 1165		1 230	1 230	6 800
KSF 1450		1 230	1 506	6 800
KSF 1750		1 230	1 230	9 300
KSF 2175		1 230	1 506	9 300

Quantity and position of concrete or metallic beams (customer supply) for cooling towers with IB sound attenuation

KSF 700



Autres KSF



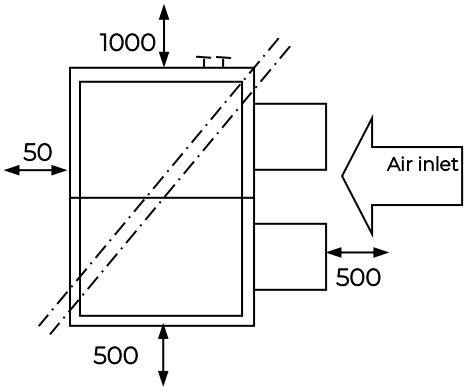
	Qty	Distance between beams under basin A [mm]	Distance between beams under basin B [mm]	Distance between beams under basin C [mm]	Length superior to D [mm]	Length superior to E under fans [mm]
KSF 700 IB	3	1 256	1 256		7 100	
KSF 930 IB	4	1 656	850	2 506	5 600	4 100
KSF 1165 IB		1 656	850	2 506	6 600	5 100
KSF 1450 IB		1 956	1 050	2 506	6 600	5 100
KSF 1750 IB		1 656	850	2 506	9 100	7 600
KSF 2175 IB		1 956	1 050	2 506	9 100	7 600

Choice of location KSF and KSFIM

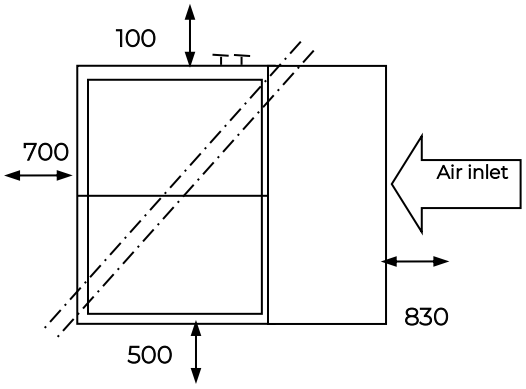
Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings. This could create a risk of a « re-circulation »; the air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower.
In any case, the free access on the four sides of the tower must be secured to ensure that the fans are supplied correctly with air and that there is proper access for installation and maintenance.
If these rules are not applied, it is inevitable that the cooling tower will not operate properly.

Recommended minimum free access (mm) for standard cooling towers: (top view)

Cooling tower without sound attenuation



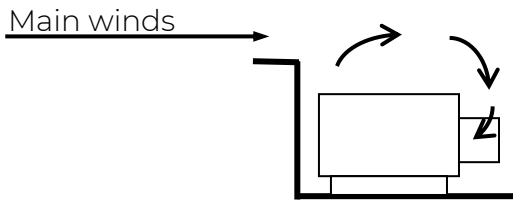
Sound attenuated cooling tower



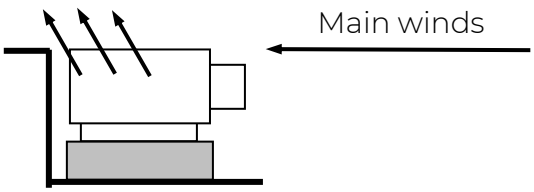
Do not hesitate to contact us for any advice

Lay-out examples:

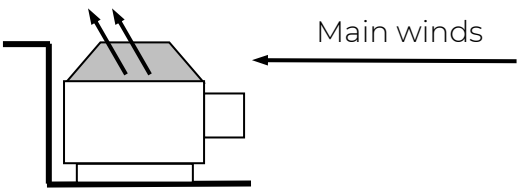
NO



YES



Install a base in order to
up the cooling tower



Install a cone in order to
up the air outlet of the cooling tower

WATER EVAPORATION

Consumption by evaporation is approximately 1.7 kg/h per 1 000 kcal/h.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible).
There are three possibiles deconcentration solutions available according to the case:

1- Continuous blow down

Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.

The blow down flow rate can be calculated using the formula: [100 S / (M - S)] % of the make-up water in which:

S : Salinity of the make-up water compensating for evaporation.
M : Maximum acceptable salinity level of water in circuits.

Example :
Salinity of make-up water = HT 68°F
Maximum acceptable salinity = HT 104°F
100 x 20 / (40 - 20) = 100 % make-up water flow rate

Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).
Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous purges

The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- Maintenance free JACIR Automated Inductive Blow down

Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level. See separate documentation. (See separate document).

WATER TRAITMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly. If the water contains a significant amount of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10 % of the recycled water flow.
If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.
In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to prevent these organisms from developing.

Water treatment should be undertaken by a specialized Company.
PREVENTS THE RISK OF LEGIONNAIRES' DISEASE: See separate documentation.

Evaporative cooling tower, high efficiency closed circuit with forced centrifugal fans, KSF ..... JACIR type, designed for a glycol free operation during freezing period.

The system will be with a double exchange: a direct exchange air/ water, and an exchange water/ water, both counter flow types.

The cooling tower will be designed and delivered by the supplier, totally assembled on frame, exchanger, pump and technical accessories gathered in a same technical area with large access door.

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Sound level characteristics

The sound pressure level will not exceed.... dB (A) at ..... meters in free field over 4 directions. To ensure this, the tower has one of the following types of soundproofing devices:

1 – IB option with sound attenuators without baffles at air inlet, and outlet cone coated with acoustic foam.

2 – ICV – ICVK or Special sound attenuation with parallel baffles both at air inlet and outlet, equipped with 50mm thick high density rock wool double casing, covered by 1.2 mm thick steel sheet. NR30 at 10m may be reached.

WATER-AIR EXCHANGE: COOLING TOWER CIRCUIT

Tower casing, sloped and plane bottom basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive, if necessary, a double casing later on. Stainless steel rivets with uniform and high-capacity locking will be used for assembly. The cooling tower casing will be assembled without any bolting or welding for the parts in contact with water; a special designed high covering seal ensure waterproofing between the panels.

The basin will be equipped with a rectangular access door (990 x 540 mm), with a floating valve that can easily be adjusted, a drain, an overflow and an anti-cavitation strainer.

The sloped bottom of the basin will allow a complete and easy drain thanks to the POWER FLOW drain hole located under the lowest part of the basin in order to ease the cleaning. The size of this opening will be 260x110 mm. Height between basin bottom and the infill is 1400 mm for easy access.
The basin will have large capacity to take into account the needs and inertia of the installation and the efficiency lasting of the water treatment.

Casing structure

The cooling tower panels casing will be made of:

- As a standard, galvanized steel 2 mm thick ZENDZIMIR process 275 gr/m² (galvanized plates are protected by the zinc oxidation on the surface) or,
- Option, X-STEEL stainless steel (corrosion resistance higher than 316L) for its long-lasting properties, water saving and easy cleaning.

Accessibility

As a standard, the basin will be delivered with access door(s) sized 990 x 540 mm, and a POWER FLOW access 260 x 110 mm allowing express draining and cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.
Two large doors sized 990 x 540 mm in the same material as the cooling tower casing will also be provided: the first one will be located on the bottom casing, and the second one on the upper part casing. These large access doors will allow quick removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.
If sound baffles or outlet air duct are required, large access (540 x 390 mm) will be provided. This access will be used to remove easily the drift eliminators, nozzles, exchange surface and water distribution pipes.

Filtration

Located at the outlet of the basin, a 5 mm strainer will be installed and a FRC centrifugal filter made of the same material as the piping (galvanized steel, or 304-316L options) will be provided before the plate heat exchanger.
The centrifugal FRC filter will offer the following characteristics:

- 100 % of the cooling tower flow will be filtered continuously every minute: very high efficiency at 60µ
- Automatic cleaning during the blow down of water circuit.

The evaporative circuit will then remain clean to avoid Legionella growth risk.

Fans

The low-pressure centrifugal fan(s) with forward-inclined blades and double air admission will be placed outside the basin in dry airflow and at man chest to access without disassembly.
The polyester inlet duct(s) stand out to optimise air suction will be simple to disassemble for easy maintenance.
The impeller(s) will be coated by baked EPOXY, and the volute will be made of stainless steel. Each fan will be coupled with its own motor.

Electric motor and coupling

The IE3 asynchronous three-phase motor(s) will be closed type ventilated case(s) with a power of maximum kW....., rpm ....., IP55 protected, class F/B. Coupling will be made of trapezoidal belts selected for 150 % of nominal power.

Water distribution

Water distribution will be made of PP pipes through highly efficient polypropylene water distributors: the nozzles will distribute the water uniformly on the whole exchange surface. These nozzles will operate under low pressure (0.8 mCE), allowing to reduce power pumps and produce large droplets to avoid drift.

Exchange surface

The exchange surface FREEFILM will be made of vacuum pressed PVC sheets for a water temperature up to 55 °C as a standard. Highly resistant to fouling thanks to large size 20 mm vertical channels the FREEFILM will offer a low pressure drop. This exchange surface will be non-putrescible, long lasting, and resistant to chemicals and will have a good thermal efficiency.

Drift eliminators

Highly efficient Eurovent certified, the PP sheets drift eliminators will prevent the water from being sprayed out at the outlet tower. Ultraviolet resistant, they will be easy to remove from the top in order to access to the distributors and to the exchange surface if needed. The drift will be 0.01 % maximum of the re-circulating water flow.

WATER-WATER EXCHANGE: USER CIRCUIT

Integrated exchanger room

The stainless-steel plate heat exchanger will be imperatively protected from bad weather in its dedicated room: self-supporting galvanized structure (20/10e minimum) paint coating as a standard. This integrated exchanger room with removable panels for easy maintenance will be equipped with a large access door sized 2100 x 600 mm as a standard.
The plate heat exchanger connection will be provided outside the room by 2 flanges.
The plate heat exchanger will be equipped with gaskets and symmetric plates.

Connections

A stainless-steel strainer and a cleanable filter (on large size exchanger room only) will secure the proper water filtration before the inlet to the plate heat exchanger. The water circulation inside the system will be secured by a pump. This pump will be protected against freeze by a thermostatic valve. All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection. As standard, a low-level switch will avoid the start of the pump and will protect the water heaters in case of “too low” water level.
Pressure manometers for control will be located before and after the pump, and before the water distribution header. They will secure a constant control of the system. A blow down hole with setting valve will be provided, and an electro valve as an option.
The servitudes panels will include a high-level switch, a drain hole and a water make up.

Exchanger pump

Protected from freezing thanks to a patented thermostatic valve, the pump will not need any electrical tracing. A safety level switch will be provided to protect from cavitation.

Options

A water treatment may be integrated, as an option, as well as an integrated blow down inside in the exchanger room (see separate documentation).

Evaporative cooling tower, high efficiency closed circuit with forced centrifugal fans, KSFIM ..... JACIR type, designed for a glycol free operation during freezing period.

The system will be with a double exchange: a direct exchange air/ water, and an exchange water/ water, both counter flow types.

The cooling tower will be designed and delivered by the supplier, totally assembled on frame, exchanger, pump and technical accessories gathered in a same technical area with large access door.

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Sound level characteristics

The sound pressure level will not exceed.... dB (A) at ..... meters in free field over 4 directions. To ensure this, the tower has one of the following types of soundproofing devices:

1 – IB option with sound attenuators without baffles at air inlet, and outlet cone coated with acoustic foam.

2 – ICV – ICVK or Special sound attenuation with parallel baffles both at air inlet and outlet, equipped with 50mm thick high density rock wool double casing, covered by 1.2 mm thick steel sheet. NR30 at 10m may be reached.

WATER-AIR EXCHANGE: COOLING TOWER CIRCUIT

Tower casing, sloped and plane bottom basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive, if necessary, a double casing later on. Stainless steel rivets with uniform and high-capacity locking will be used for assembly. The cooling tower casing will be assembled without any bolting or welding for the parts in contact with water; a special designed high covering seal ensure waterproofing between the panels.

The basin will be equipped with a rectangular access door (990 x 540 mm), with a floating valve that can easily be adjusted, a drain, an overflow and an anti-cavitation strainer.

The sloped bottom of the basin will allow a complete and easy drain thanks to the POWER FLOW drain hole located under the lowest part of the basin in order to ease the cleaning. The size of this opening will be 260x110 mm. Height between basin bottom and the infill is 1400 mm for easy access.
The basin will have large capacity to take into account the needs and inertia of the installation and the efficiency lasting of the water treatment.

Casing structure

The cooling tower panels casing will be made of:

- As a standard, galvanized steel 2 mm thick ZENDZIMIR process 275 gr/m² (galvanized plates are protected by the zinc oxidation on the surface) or,
- Option, X-STEEL stainless steel (corrosion resistance higher than 316L) for its long-lasting properties, water saving and easy cleaning.

Accessibility

As a standard, the basin will be delivered with access door(s) sized 990 x 540 mm, and a POWER FLOW access 260 x 110 mm allowing express draining and cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.
Two large doors sized 990 x 540 mm in the same material as the cooling tower casing will also be provided: the first one will be located on the bottom casing, and the second one on the upper part casing. These large access doors will allow quick removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.
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Filtration

Located at the outlet of the basin, a 5 mm strainer will be installed and a FRC centrifugal filter made of the same material as the piping (galvanized steel, or 304-316L options) will be provided before the plate heat exchanger.
The centrifugal FRC filter will offer the following characteristics:

- 100 % of the cooling tower flow will be filtered continuously every minute: very high efficiency at 60µ
- Automatic cleaning during the blow down of water circuit.

The evaporative circuit will then remain clean to avoid Legionella growth risk.

Fans

The low-pressure centrifugal fan(s) with forward-inclined blades and double air admission will be placed outside the basin in dry airflow and at man chest to access without disassembly.
The polyester inlet duct(s) stand out to optimise air suction will be simple to disassemble for easy maintenance.
The impeller(s) will be coated by baked EPOXY, and the volute will be made of stainless steel. As an option the impeller can be made of Stainless steel. Each fan will be coupled with its own motor.

Electric motor and coupling

The IE3 asynchronous three-phase motor(s) will be closed type ventilated case(s) with a power of maximum kW....., rpm ....., IP55 protected, class F/B. Coupling will be made of trapezoidal belts selected for 150 % of nominal power.

Water distribution

Water distribution will be made of PP pipes through highly efficient polypropylene water distributors: the nozzles will distribute the water uniformly on the whole exchange surface. These nozzles will operate under low pressure (0.8 mCE), allowing to reduce power pumps and produce large droplets to avoid drift.

Exchange surface

The exchange surface FREEFILM will be made of vacuum pressed PVC sheets for a water temperature up to 55 °C as a standard. Highly resistant to fouling thanks to large size 20 mm vertical channels the FREEFILM will offer a low pressure drop.
This exchange surface will be integrated into a self-supporting 20/10th galvanised sheet metal in double fold on the 4 sides.

Drift eliminators

Highly efficient Eurovent certified, the PP sheets drift eliminators will prevent the water from being sprayed out at the outlet tower. Ultraviolet resistant, they will be easy to remove from the top in order to access to the distributors and to the exchange surface if needed. The drift will be 0.01 % maximum of the re-circulating water flow.

Non-freezing plume suppression coil JACIR patent

As a standard model, the stainless-steel headers will be totally removable for access and complete cleaning. This “cover” type configuration will protect the coil from accidental damage related to possible freeze-over. Two air vents will secure the freezing risk. The tubes will be assembled in a triangular pitch, in copper (Stainless steel option), outside diameter 16 mm, and 0.5 mm thick. The fins will be in copper.
The fin pitch will be 3 mm in standard. A monitored valve adjusting the water flow sprays over the infill, will be associated to the plume coil. As soon as ambient conditions will be met, this system will make it possible to operate significant water saving by cooling the water in the dry mode, rather than spraying and evaporating it.
The battery will discharge the rated power without plume up to 2°C and 80% humidity.

WATER-WATER EXCHANGE: USER CIRCUIT

Integrated exchanger room

The stainless-steel plate heat exchanger will be imperatively protected from bad weather in its dedicated room: self-supporting galvanized structure (20/10e minimum) paint coating as a standard. This integrated exchanger room with removable panels for easy maintenance will be equipped with a large access door sized 2100 x 600 mm as a standard.
The plate heat exchanger connection will be provided outside the room by 2 flanges.
The plate heat exchanger will be equipped with gaskets and symmetric plates.

Connections

A stainless-steel strainer and a cleanable filter (on large size exchanger room only) will secure the proper water filtration before the inlet to the plate heat exchanger. The water circulation inside the system will be secured by a pump. This pump will be protected against freeze by a thermostatic valve.
All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection. As standard, a low-level switch will avoid the start of the pump and will protect the water heaters in case of “too low” water level.
Pressure manometers for control will be located before and after the pump, and before the water distribution header. They will secure a constant control of the system. A blow down hole with setting valve will be provided, and an electro valve as an option.
The servitudes panels will include a high-level switch, a drain hole and a water make up.

Exchanger pump

Protected from freezing thanks to a patented thermostatic valve, the pump will not need any electrical tracing. A safety level switch will be provided to protect from cavitation.

Options

A water treatment may be integrated, as an option, as well as an integrated blow down inside in the exchanger room (see separate documentation).

JACIR
Cooling for life

ATM - ATIM

Open cooling tower
Hybrid open circuit cooling tower

Commercial Documentation

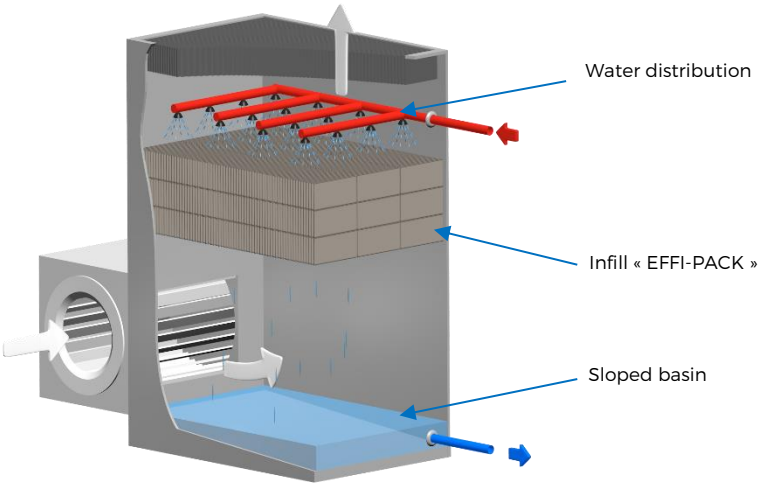
Water flow from 60 to 295m³/h

Power from 300 to 3 000kW

- Modular conception
- Multi ventilation

La FRENCH FAB

Open silent centrifugal cooling tower: ATM range



Casing structure

In standard, self-supporting rigid panels are in galvanised steel ZENDZIMIR process gr/m² 275 (galvanised plates are protected by the zinc oxidation on the surface). 2 or 4 folds on the four sides of the casing, plates are assembled with waterproof stainless-steel rivets (uniform, high-density locking), and without welding or screwing for the parts in contact with water. Once assembled, panels give our towers solidity and incomparable tightness.
In option, X-STEEL stainless-steel is available (corrosion resistance higher than L316)

Basin

The inclined and plane basin is equipped with a drain connection and a POWER FLOW hatch below the low level of the basin to boost an easy and quick evacuation of any impurities during the cleaning.
A large access door (mm 540 x mm 390) is integrated in order to ease the accessibility to the basin.
It has been integrated to the tower (L 490 x L 610 per module) and has been designed to answer the response time of the setting-up. Finally, panels have all servitudes (overflow, drain, water make-up, antifreeze resistance, ...)

Water distribution

Water distribution is made of PVC pipes equipped with polypropylene nozzles. Especially designed to achieve optimal water distribution at a very low height, nozzles distribute water in form of a cone of a full jet cone in order to obtain an even distribution over the entire exchange surface. Screwed to the pipes, they allow an easy disassembly while ensuring a good mechanical strength.

Exchange surface: EFFI-PACK

EFFI-PACK exchange surface is made of PP sheet, UV and crumbling resistant. Its design offers an important free surface within the exchange surface, which is limiting risks of clogging. High resistance to chemicals and impacts, it has an excellent temperature resistance.

Fans

The centrifugal fans are especially designed and manufactured by Jacir, and upgraded throughout years. The impeller is a double side air inlet and the air inlet ducts, made of polyester, allow a total pressure and a low rotation speed resulting in a very quiet and a low power consumption operation. These fans, placed in the airflow inlet, out of the basin, and at human height in order to ease maintenance.

Silence

Level of acoustic protection proposed as an option:
- IB standard sound attenuation,
- ICV complete sound attenuation,
- ICVK complete sound attenuation with double casing.

Options

Plume suppression coil (ATIM hybrid series), two-speed-motor, beams, electrical level control with electro valve, electro valve guided by level contractors, electrical cabinet, speed variator, EFFI-SILENT basin sound attenuation, assembly on site, ...

ATM and ATIM

Modular open circuit cooling towers

JACIR
Cooling for life

Technical Documentation

CONTENT Page(s)

La FRENCH FAB

JACIR

With more than 60 years of experience, our company:

∞ Has invested in detailed research and development to offer technical solutions in line with environmental protection through unparalleled achievements and numerous patents.

∞ Is today the European market leader thanks to its technology ahead of market requirements.

The strengths of the ATM and ATIM series

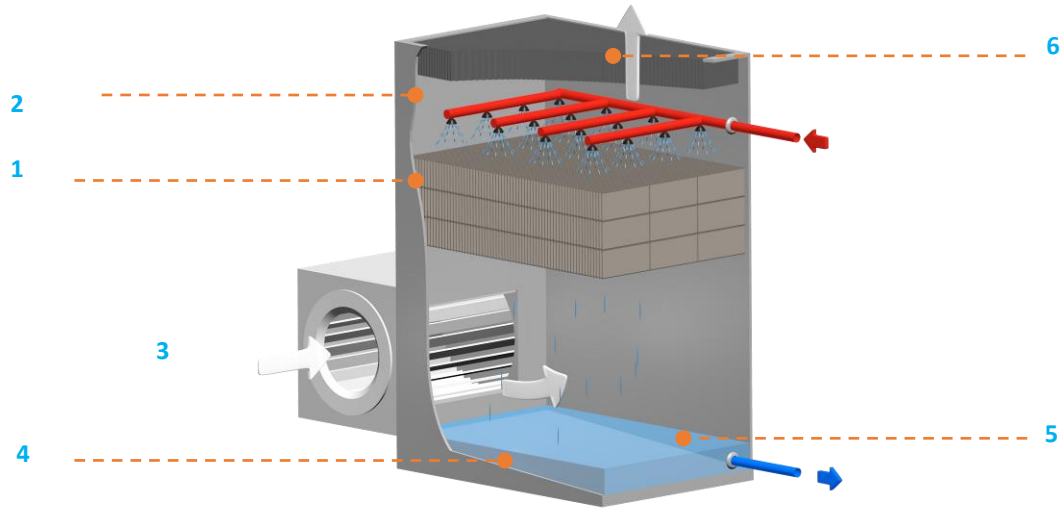
∞ SAFETY AND HYGIENE	Towers design compliant with December 2020 NF E 38-424 standard.
∞ TIGHTNESS	Thanks to our assembling technology, we guaranty no leak equipment.
∞ SILENCE	Very quiet towers in standard version that can reach exceptionally low sound levels and be adapted to match further requirements.
∞ EXCHANGE SURFACE	Highly efficient and easy to maintain, its excellent temperature resistance (75 ° C continuously) also allows use up to 95 ° C as an option.
∞ ANTICORROSION COATING	The tower casing assembled without any welding in galvanized steel is also proposed in X-STEEL stainless-steel (corrosion resistance higher than that of the 316L).
∞ EASY MAINTENANCE	Large visit hatches, fan out of the tower and at man's height, sloped basin for a total emptying and hygienic maintenance.
∞ EVOLUTIVE TOWER	Possibility of easily increasing the discharged power by adding a plate exchanger to isolate the primary network (refer to ATIM or CRIM series), Possibility to decrease the sound level using silencers without necessarily increasing the installed electrical power.
∞ MODULAR CONSTRUCTION	One-piece construction providing easy handling and transport. For a larger capacity of the basin, the ATM range can be declined in (G)ATM.

Open cooling tower principle ATM

Principle of operation:

A cooling tower is a heat exchanger that allows water to be cooled by direct contact with air. The transfer of heat from water to air is carried out partly by transfer of sensible heat, but above all by latent heat (evaporation of part of the water in the air), which makes it possible to achieve cooling temperatures lower than those of ambient air.

Operation of an open cooler:



The hot water to be cooled is pumped to the top of the device through pipes. This water is divided and distributed over the heat exchange surface **(1)** by low pressure water distribution nozzles **(2).**

Blown by the fan **(3)** the fresh air enters into the lower section of the unit and escapes through the upper section after being heated up and saturated, by passing through the wetted heat exchange surface.

As a result of surface tension caused by the exchange surface mesh, the water spreads evenly, and falls down over the whole cooler height. The exchange surface is thus increased.

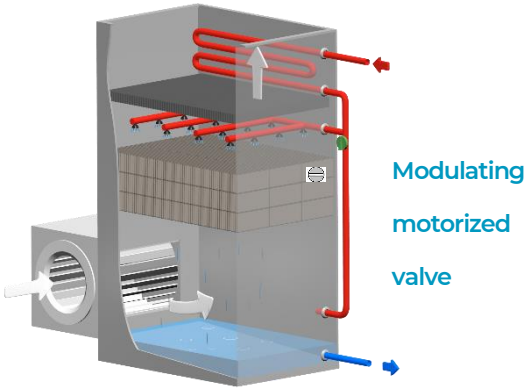
The water, cooled thanks to forced ventilation, falls into the inclined basin **(4)** located at the bottom of the tower. It is then sucked through the strainer (**5**). Droplet separators **(6)** are placed at the air outlet to limit bladder training.

Hybrid open circuit cooling tower principle – ATIM Series

Standard ATM series have originally been designed to receive the plume abatement coil option; these ATM ranges are then referred to as ATIM open hybrid Cooler range. Their efficiency is ensured by a finned tube coil combined with a valve for adjusting the water spray on the exchange surface (packing). This water flow regulation over the exchange surface is a market exclusivity, JACIR patent.

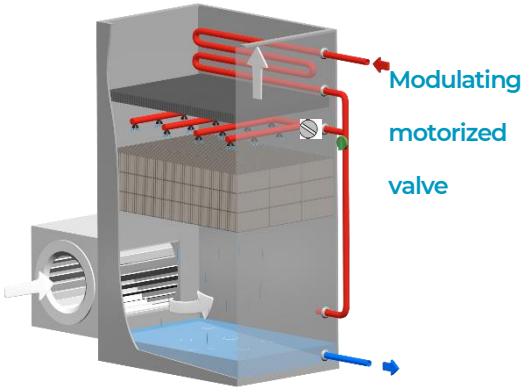
Therefore, the combination of the air desaturation by air outlet warming up, and the reduction of the water spray on the packing, ensures the complete plume suppression. Beyond the plume suppression itself, this system can provide significant water savings and is an ultimate obstacle to the drifts.
This technology proposed by JACIR has been deeply researched in partnership with the CETIAT for over 50 years, and has offered the opportunity to file innovating patents.

Operation of a hybrid open tower:



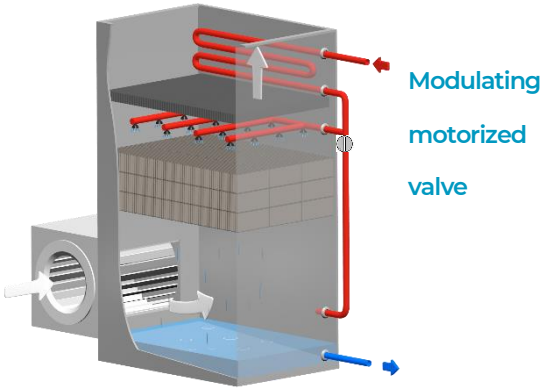
Dry operation: WINTER

The by-pass valve is totally open, so the whole water flow leaves directly the tube coil to the basin: there is no water spray on the packing, no water evaporation, so no water consumption. The whole power can be dissipated through the plume suppression coil.



Dry/ wet operation: MID SEASON

When the dry cooling in not powerful enough part of the water flow goes to the spraying system thanks to the by-pass valve. A temperature probe (option) located in the water outlet send the information to the regulator monitoring the valve. So only the minimum water quantity is sprayed on the packing. This cooling mode lowers the water / air exchange and optimize the power evacuated in the dry coil.
According to the ambient conditions, 30 to 70% of the power can be dissipated in dry mode.



Wet operation: SUMMER

If necessary, the bypass valve is totally closed, the water is first sent to the plume removal battery, and then can be dispersed in its entirety on the runoff surface by distribution nozzles.
This water is cooled first via the battery by transfer of sensible heat and then by latent heat transfer (evaporation on the runoff surface).
In wet operation, 5 to 10% of the power will be evacuated dry thanks to the pre-cooling of the water in the battery.

Tower casing

Self-supporting rigid panels, with 2 or 4 folds on the four sides, (JACIR design) allowing sound attenuation casing addition if required. Thanks to this technology, we can offer cooling towers with an extremely low sound level.
Towers are assembled with waterproof stainless-steel rivets (uniform, high-capacity locking).
There is no welding on assembled panels for the parts in contact with water; a high covering seal ensures the close fit between the panels.
Hydraulic connections are made of the same material as the cooling tower casing

As standard model, the panels are in galvanised steel mm2 thick ZENDZIMIR process 275 gr / m² (galvanised plates are protected by the zinc oxidation on the surface).

X-STEEL stainless steel is proposed as an option (corrosion resistance higher than AISI 316).

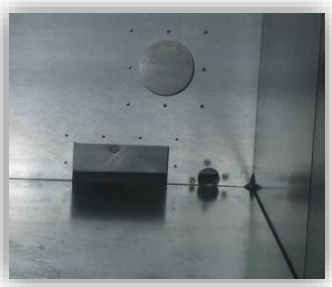
Inclined bottom basin

Large capacity basin to account for installation response time.

The bottom of the basin is flat and inclined for an easy and total emptying and the assembly of the panels is carried out without any e-welding to avoid any area of attachment (source of corrosion).

On the utilities panels of the basin are located:

- An overflow and PP flange,
- Drain below the lower level of the basin and Power-flow access enabling to quickly and completely evacuate all sludge and other accumulated parts in the bottom of the casing using simple water spray
- Make up water by float valve or electro valve as an option,
- Water outlet through a removable strainer (stainless steel or PEHD according DN) with a flange oversized to eliminate cavitation, with a perforated steel plate,
- Large access door(s) to the basin (990 x 540 mm)
- Option: electrical heater of V 230 or V 400 and waterproof thermostat with separate bulb. For automatic resistance control, suitable contactors must be provided.



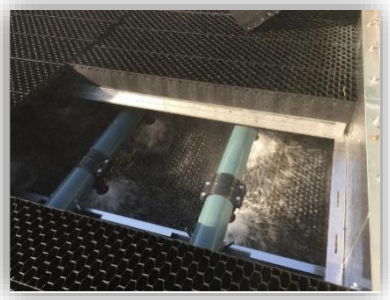
Exchange surface : EFFI-PACK

Consisting of thermoformed and welded polypropylene sheets, the EFFI-PACK exchange surface is shock resistant and offers a maximum surface. Its excellent thermal efficiency also promotes energy savings.

- Good temperature resistance (75°C continuously),
- Extensive area of high efficiency,
- Ease of maintenance,
- High resistance to chemical agents,
- Range of use up to 95°C on request (option).

Water distribution

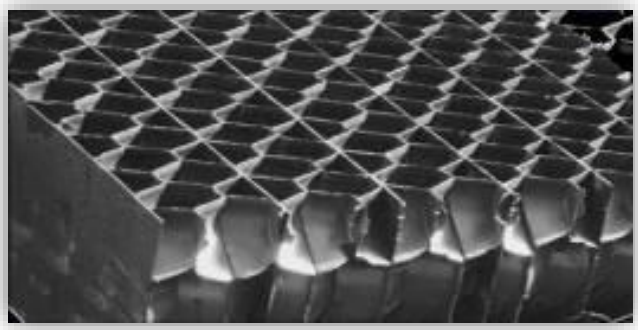
Water distribution is ensured by PVC ramps through highly efficient water distributors. These polypropylene nozzles distribute water in the form of a full jet cone. Screwed to the distribution pipes, for easy maintenance and strong mechanical resistance.
An internal turbulator distributes the water in order to obtain a uniform distribution over the entire exchange surface.



Drift eliminators

Highly efficient, drift eliminators are made of PP sheets and prevent the water from being sprayed out of the tower: the drift is 0.01 % maximum of the re-circulating water flow. This value has been certified by independent third part (Eurovent).

Ultraviolet resistant, they are easy to remove from the top in order to access to the distributors and to the exchange surface.



Standard motors

- IE3 asynchronous three-phases motor, compatible with a frequency drive,
- 1500 rpm,
- 400/690 V - 5.5 kW,
- Hz 50,
- IP 55 (outdoor operation possible),
- Class F / B,
- Direct connection to terminal box

Fans

Centrifugal fans studied and manufactured by JACIR. The turbine is of the double-hearing type. The removable suction pavilions for the disassembly of the turbine, are designed in polyester. Their calciform shape significantly improves the performance of the fan.

The bearings are self-aligned, greased in factory and re-greaseable using a remote copper lubrication line for simple and fast maintenance, without disassembly.

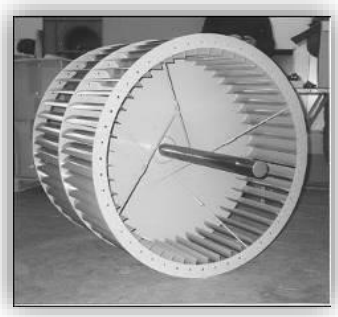
One fan per module and a single motor driving a maximum of two fans. In the event that the motor drives three fans, the connection would be ensured by a flexible coupling between the shaft carrying two fans and the shaft carrying the third fan.

The flanges of the volute are used to fix the engine support. This design of the motor-fan avoids the whip effect of the belts.

Belt and trapezoidal pulley transmissions and belt tension by tilting the motor chair for easy adjustment.

The turbine is protected by an EPOXY coating baked in the oven.
The volute is made of X-STEEL stainless steel.

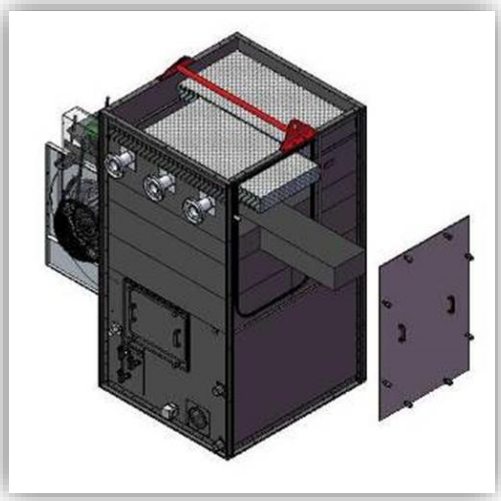
As an option, possibility of construction of the stainless-steel turbine.



Accessibility

As standard model, the basin is equipped with a large access door mm 390 x 540 mm, and a Power Flow access mm 260x110: located under the bottom level of the basin, it allows a fast complete drain and an easy cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

Also as standard, a large access door per module (ventilation section) of the same material as the 1350 x 900mm tower is also planned: they allow the rapid disassembly of drop eliminators, dispersers, exchange body and water distribution ramps along the entire length of the tower.



Plume suppression coil and modulating valve **Jacir Patent**

As a standard model, the tubes are assembled in a triangular pitch, in copper (Stainless steel option), outside diameter 16 mm, and 0.5 mm thick. The fins are in copper.

The fin pitch is 3 mm in standard. A monitored valve adjusting the water flow sprays over the infill, associated to the plume coil.

As soon as ambient conditions are met, this system makes it possible to operate significant water saving by cooling the water in the dry mode, rather than spraying and evaporating it. In standard, the header coil is in carbon steel, primer and epoxy coated. Two air valves secure the freezing matters. The tubes are assembled in a triangular pitch, in copper (outside diameter 16 mm, 0. 5 mm thick). In option, they can be in stainless-steel. The fins are in aluminium epoxy coated in standard, optionally in copper or in stainless steel. The fin pitch is 3 mm in standard. A monitored valve to adjust the water spray on the infill is associated to the plume coil.

Sound attenuations (OPTION)

IB sound attenuation

Additional casing of the air inlet fan(s), made of self-supporting rigid steel panels covering, double folding on the 4 internal sides of the panels. Internal lagging is made of absorbent sound material.
Complete access door is provided for a total accessibility maintenance in front door with 4 lockers, activated by key.
At the air outlet, an exhaust cone reduces the acoustic emission surface.

ICV Complete sound proofing

Additional casing of the air inlet fan(s), made of self-supporting rigid steel panels covering, double folding on the 4 internal sides of the panels. Internal lagging is made of absorbent sound material and contains sound acoustics baffles. These galvanized steel sound baffles, made of high-density rock wool panels, are easily removable.
At the air inlet, the rock wool is coated by a fibre glass layer.
At the air outlet, baffles receive a reinforced protection by a stainless-steel grid.

ICVK complete sound attenuation with double casing

The entire casing of ICV cooling tower is fitted with a double casing: high density rock wool covered by an additional steel sheet - ICVK.

NR 30 special sound attenuation

ICVK solution is adapted to reach required sound level, up to NR 30 at 10m.

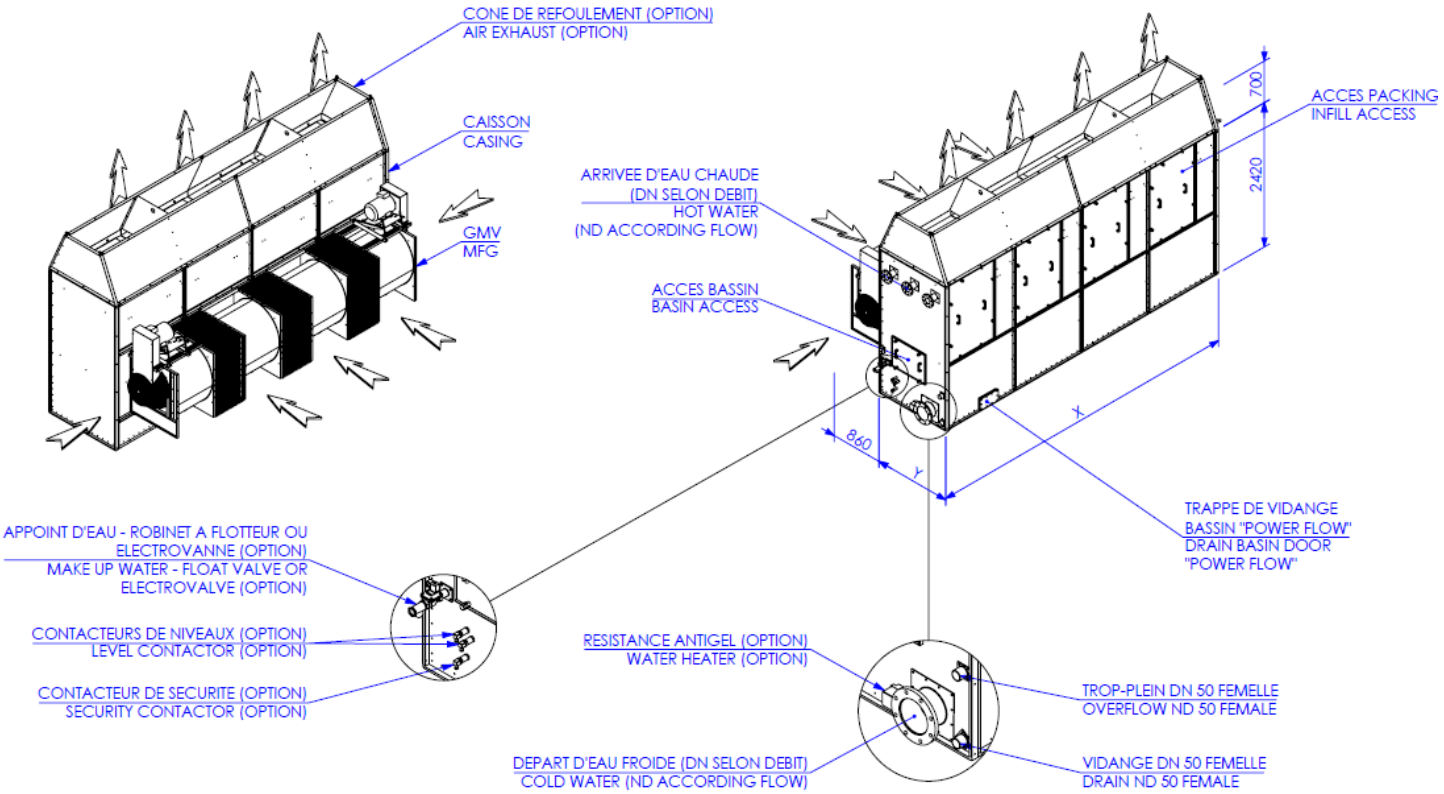
Options

- Plume suppression coil system (see ATIM series),
- X-STEEL stainless-steel (corrosion resistant above 316L (1.4404)),
- EFFI-SILENT basin sound abatement,
- Electric heater with thermostat,
- Two - speed motor (separate wiring or PAM – rpm 1500/1000),
- Frequency controller,
- Water level control with solenoid valve (with electric-valve and input filter),
- Automated Inductive blow down,
- All stainless-steel fittings (fan casing, wheel, plumeless battery, etc.),
- Discharge cone (increase of air outlet speed with the reduction of acoustic radiation and recycling),
- Air pressure available for connection to the duct,
- Equipment delivered in parts, ready to be assembled,
- Assembly on site by experimented technicians from our factory,
- IB, ICV, ICVK or special sound-attenuation.

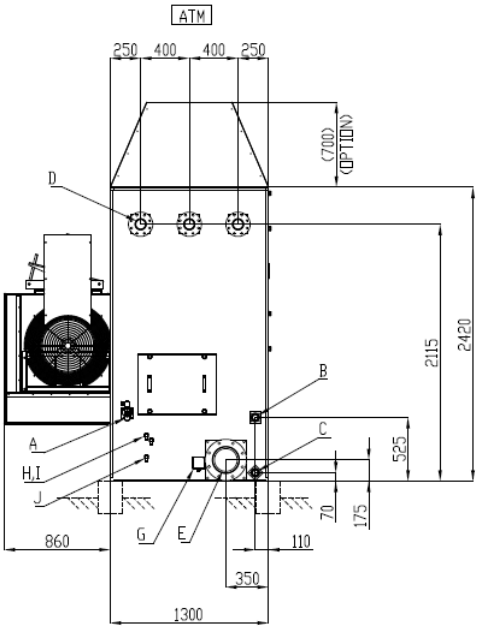
Technical characteristics ATM-(G)ATM

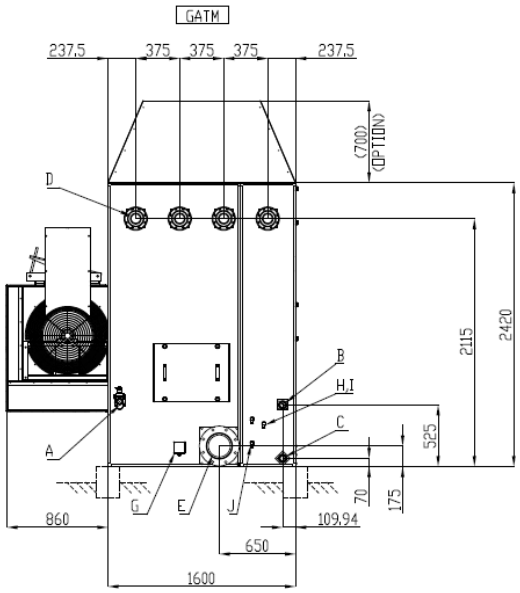
ATM serie		ATM 4M	GATM 4M	ATM 5M	GATM 5M
Overall height including air exhaust option	mm	3120	3120	3120	3120
Length	mm	5300	5300	6600	660
Width	mm	2160	2460	2160	2460
Heat power average ref. (1)	Kw	900	1090	1120	1370
NDKL fan	Qty	4	4	5	5
Total engine power	Kw	18	30	24	37
Sound level at 20m (2)	[dBA]	54	55	54	55
Empty weight (without beams)	Kkg	1770	1860	2100	2350
Full weight (without beams)	Kg	4820	5680	5920	7110
Overflow (female)	Dn	50			
Drain (female)	Dn	50			
Hot water inlet	Dn	Depending on the flow			
Connection flange	Qty	3	3	4	4
Height	mm	2115	2115	2115	2115
Cold water outlet	Dn	Depending on the flow			
Drain basin **POWER FLOW**	mm	260 x 110			
Electric heater with thermostat (optional)	Kw	3	3	3	6
Float valve (male) or optional electro valve		option			
Low level		option			
High level		option			
Safety lack of water		option			

(1) : average reference cooling capacities calculated for thermal conditions of 32 / 27 / 21 ° C.
(2) : Sound level: Average pressure level (Lp) in the free field in the 4 directions at 1.5 m from the ground.
Note: For greater powers, towers may be juxtaposed.

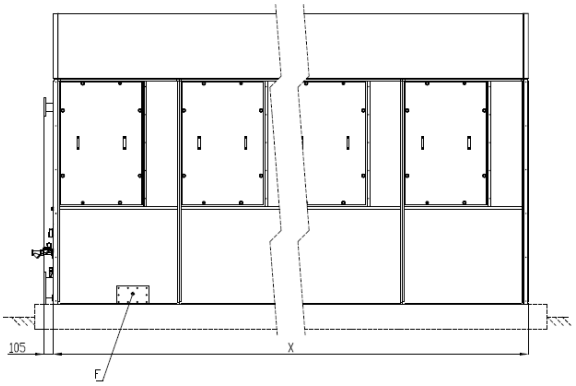


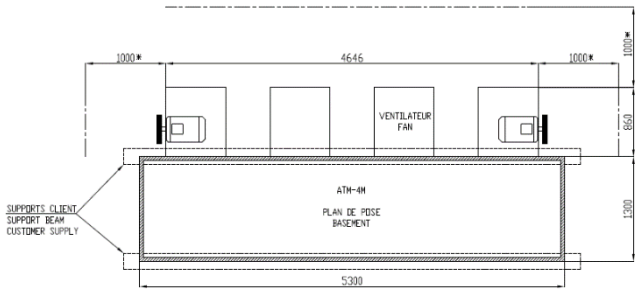
Drawings and dimensions ATM-(G)ATM series

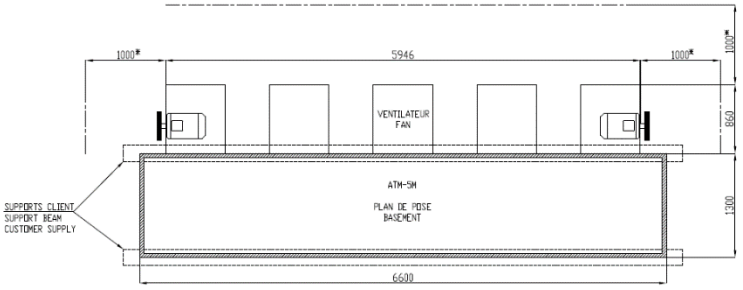


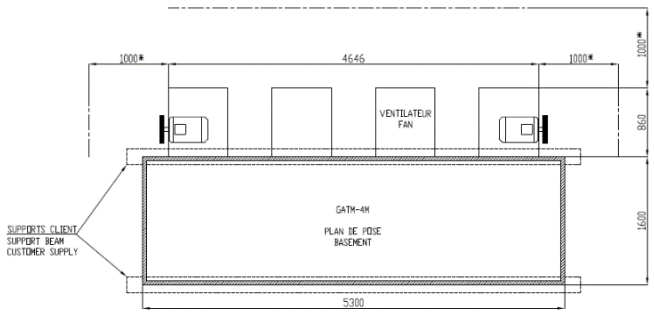


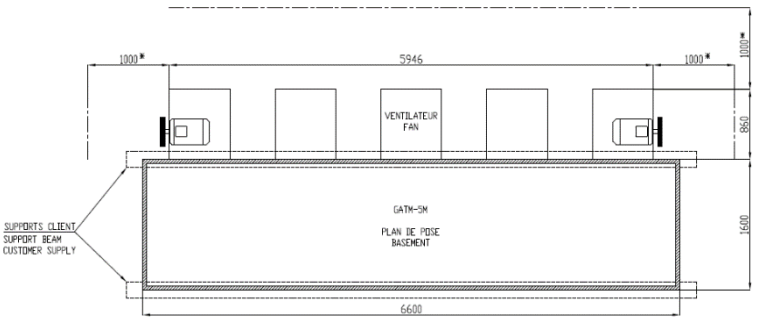
A APPOINT D'EAU - ROBINET A FLOTTEUR OU ELECTROVANNE (OPTION)
MAKE UP WATER - FLOAT VALVE OR ELECTROVALVE (OPTION)
B TROP-PLEIN - G 2'' FEMELLE
OVERFLOW - G2'' FEMALE
C VIDANGE - G 2'' FEMELLE
DRAIN - G2'' FEMALE
D ENTREE EAU CHAUDE
HOT INLET WATER
E SORTIE EAU FROIDE
COLD OUTLET WATER
F TRAPPE DE VIDANGE BASSIN "POWER FLOW"
DRAIN BASIN DOOR "POWER FLOW"
G RESISTANCE ANTI-GEL AVEC THERMOSTAT
WATER HEATER WITH THERMOSTAT
H, I 2 CONTACTEURS (NIVEAU HAUT / BAS) (OPTION)
2 SWITCHS (HIGH / LOW LEVEL) (OPTION)
J 1 CONTACTEUR (SECURITE MANQUE D'EAU) (OPTION)
1 SWITCH (WATER LEVEL SECURITY) (OPTION)







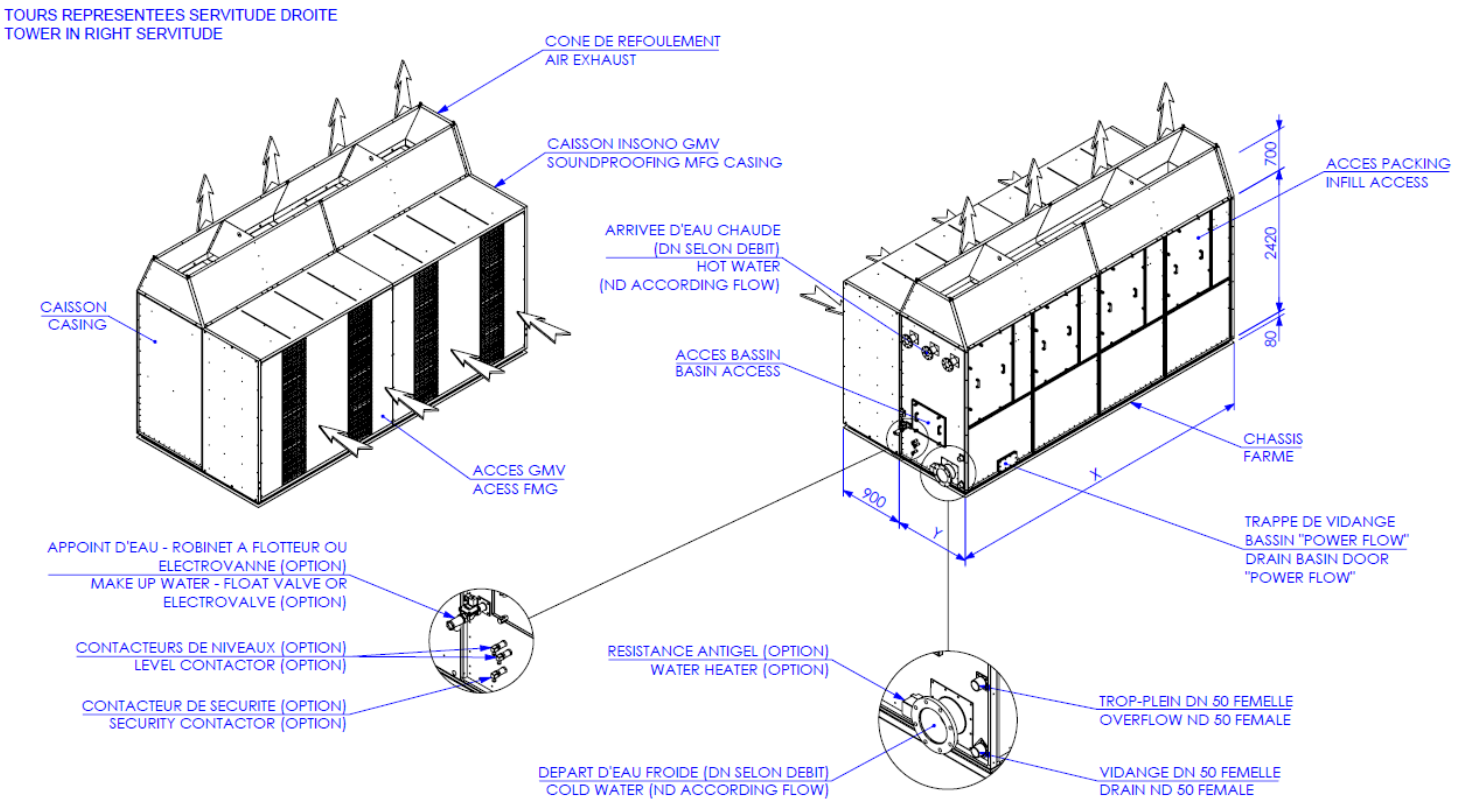




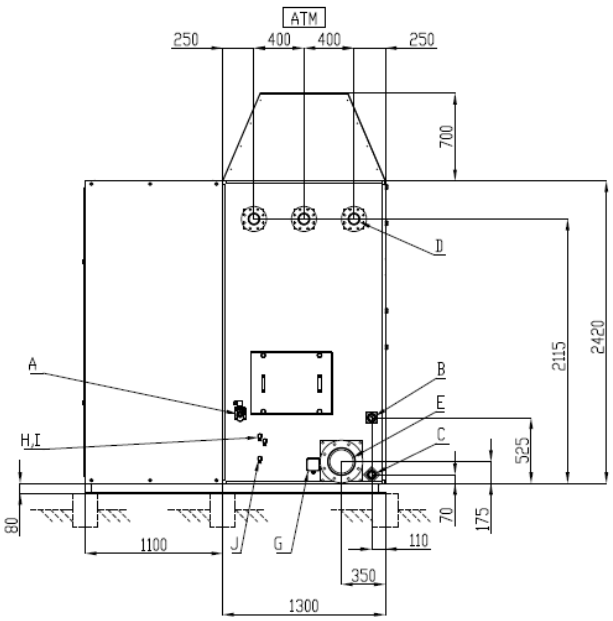
Technical characteristics ATM-(G)ATM with IB sound attenuation

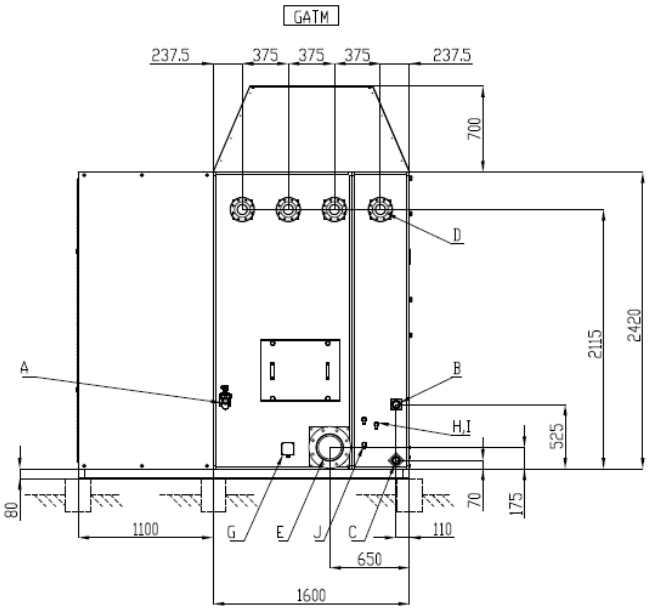
ATM serie		ATM 4M IB	GATM 4M IB	ATM 5M IB	GATM 5M IB
Overall height including air exhaust option	mm	3 120	3 120	3 120	3 120
Length	mm	5 300	5 300	6 600	6 600
Width	mm	2 400	2 700	2 400	2 700
Heat power average ref. (1)	Kw	880	1070	1100	1340
NDKL fan	Qty	4	4	5	5
Total engine power	Kw	18	30	24	37
Sound level at 20m (2)	[dBA]	46	47	46	47
Empty weight (without beams)	Kkg	2 570	2 690	3 100	3 350
Full weight (without beams)	Kg	5 630	6 500	6 910	8 120
Overflow (female)	Dn	50			
Drain (female)	Dn	50			
Hot water inlet	Dn	Depending on the flow			
Connection flange	Qty	3	3	4	4
Height	mm	2 115	2 115	2 115	2 115
Cold water outlet	Dn	Depending on the flow			
Drain basin **POWER FLOW**	mm	260 x 110			
Electric heater with thermostat (optional)	Kw	3	3	3	6
Float valve (male) or optional electro valve		option			
Low level		option			
High level		option			
Safety lack of water		option			

(1) : average reference cooling capacities calculated for thermal conditions of 32 / 27 / 21 ° C.
(2) : Sound level: Average pressure level (Lp) in the free field in the 4 directions at 1.5 m from the ground.
Note: For greater powers, towers may be juxtaposed.

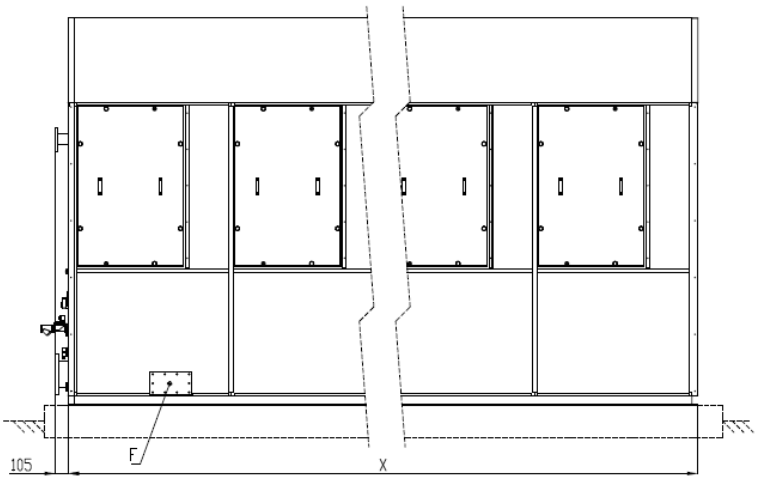


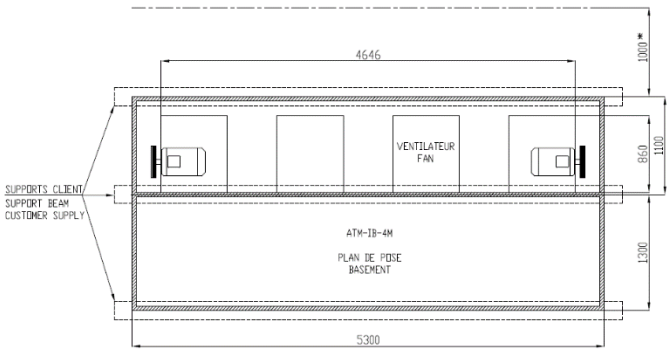
Drawings and dimensions ATM-(G)ATM with IB sound attenuation

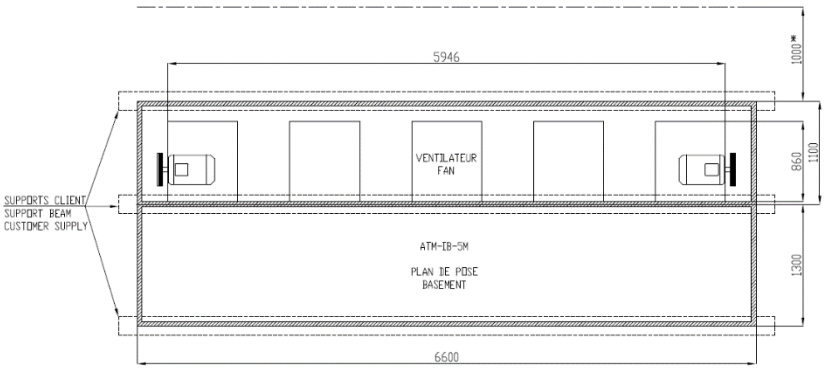


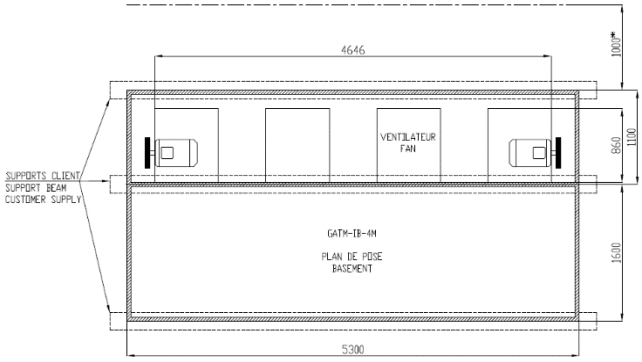


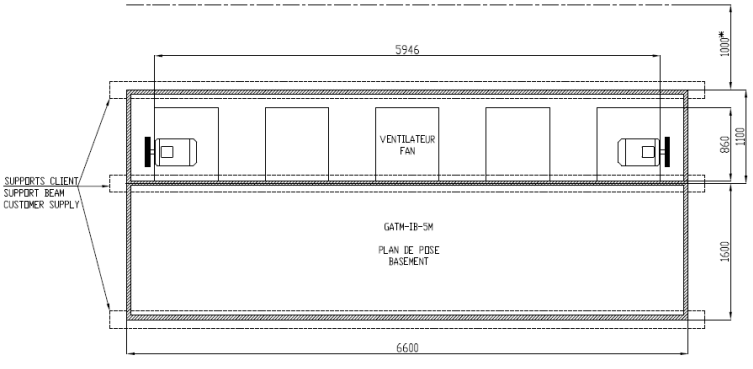
A APPOINT D'EAU - ROBINET A FLOTTEUR OU ELECTROVANNE (OPTION)
MAKE UP WATER - FLOAT VALVE OR ELECTROVALVE (OPTION)
B TROP-PLEIN - G 2'' FEMELLE
OVERFLOW - G2'' FEMALE
C VIDANGE - G 2'' FEMELLE
DRAIN - G2'' FEMALE
D ENTREE EAU CHAUDE
HOT INLET WATER
E SORTIE EAU FROIDE
COLD OUTLET WATER
F TRAPPE DE VIDANGE BASSIN "POWER FLOW"
DRAIN BASIN DOOR "POWER FLOW"
G RESISTANCE ANTI-GEL AVEC THERMOSTAT
WATER HEATER WITH THERMOSTAT
H, I 2 CONTACTEURS (NIVEAU HAUT / BAS) (OPTION)
2 SWITCHS (HIGH / LOW LEVEL) (OPTION)
J 1 CONTACTEUR (SECURITE MANQUE D'EAU) (OPTION)
1 SWITCH (WATER LEVEL SECURITY) (OPTION)







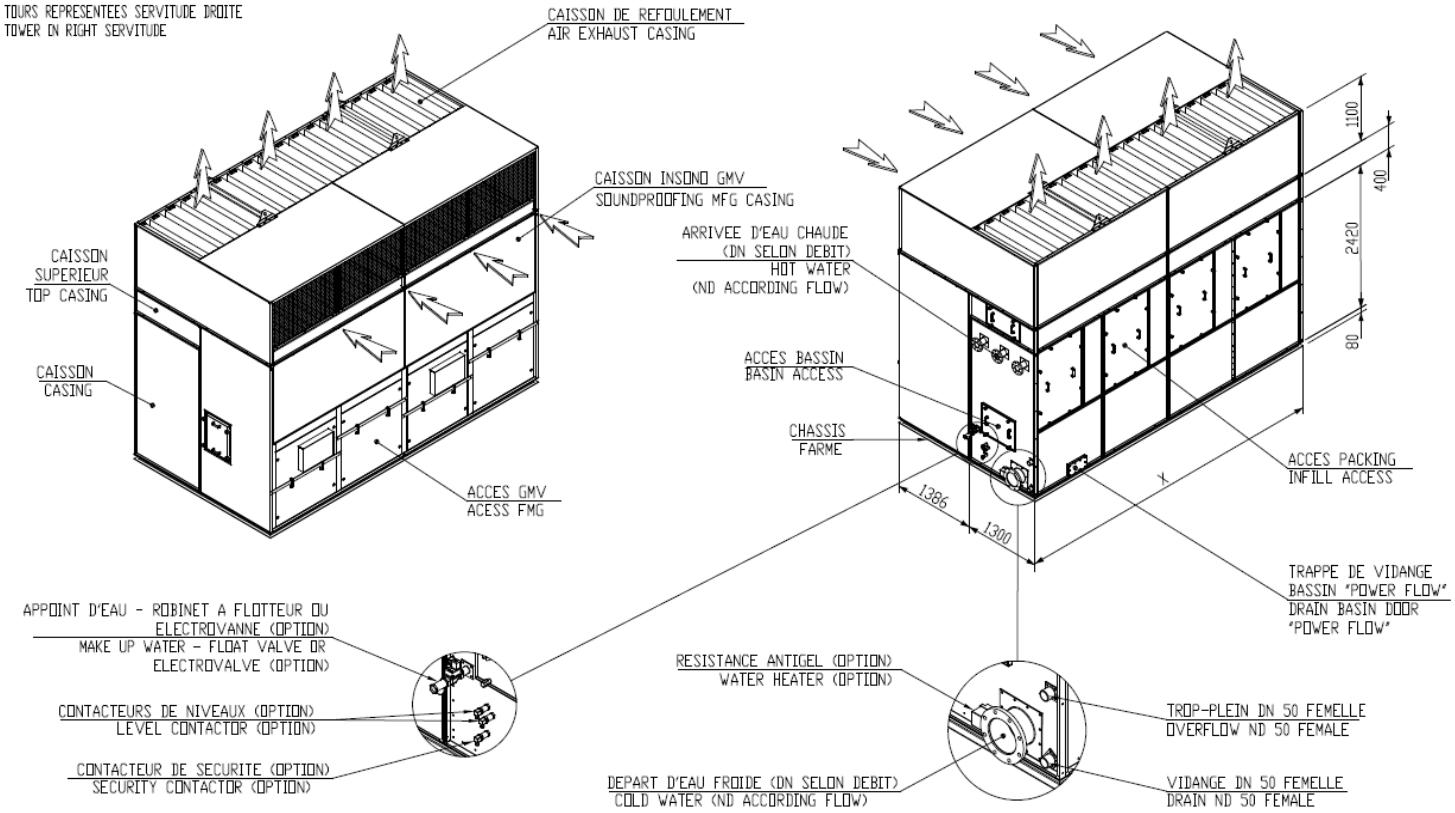




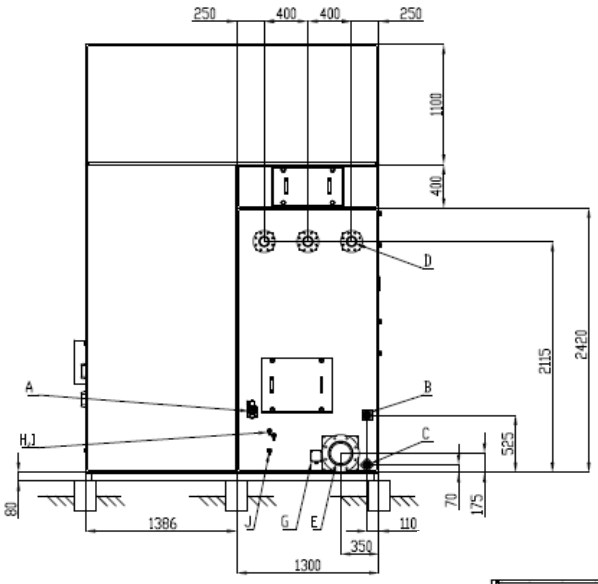
Technical characteristics ATM-(G)ATM with ICV/ICVK sound attenuation

ATM serie		ATM 4M ICV	GATM 4M ICVK	ATM 5M ICV	GATM 5M ICVK
Overall height including air exhaust option	mm	4 000	4 000	4 000	4 000
Length	mm	5 300	5 300	6 600	6 600
Width	mm	2 686	2 986	2 686	2 986
Heat power average ref. (1)	Kw	840	840	1050	1050
NDKL fan	Qty	4	4	5	5
Total engine power	Kw	18	18	30	30
Sound level at 20m (2)	[dBA]	43	40	44	41
Empty weight (without beams)	Kkg	3 780	4 170	4 610	5 100
Full weight (without beams)	Kg	6 840	7 220	8 430	8 910
Overflow (female)	Dn	50			
Drain (female)	Dn	50			
Hot water inlet	Dn	Depending on the flow			
Connection flange	Qty	3	3	4	4
Height	mm	2 115	2 115	2 115	2 115
Cold water outlet	Dn	Depending on the flow			
Drain basin **POWER FLOW**	mm	260 x 110			
Electric heater with thermostat (optional)	Kw	3	3	3	6
Float valve (male) or optional electro valve		option			
Low level		option			
High level		option			
Safety lack of water		option			

(1) : average reference cooling capacities calculated for thermal conditions of 32 / 27 / 21 ° C.
(2) : Sound level: Average pressure level (Lp) in the free field in the 4 directions at 1.5 m from the ground.
Note: For greater powers, towers may be juxtaposed.



Drawings and dimensions ATM-(G) ATM with ICV/ICVK sound attenuation



A APPOINT D'EAU - ROBINET A FLOTTEUR OU ELECTROVANNE (OPTION)
MAKE UP WATER - FLOAT VALVE OR ELECTROVALVE (OPTION)
B TROP-PLEIN - G 2'' FEMELLE
OVERFLOW - G2'' FEMALE
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DRAIN - G2'' FEMALE
D ENTREE EAU CHAUDE
HOT INLET WATER
E SORTIE EAU FROIDE
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DRAIN BASIN DOOR "POWER FLOW"
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WATER HEATER WITH THERMOSTAT
H, I 2 CONTACTEURS (NIVEAU HAUT / BAS) (OPTION)
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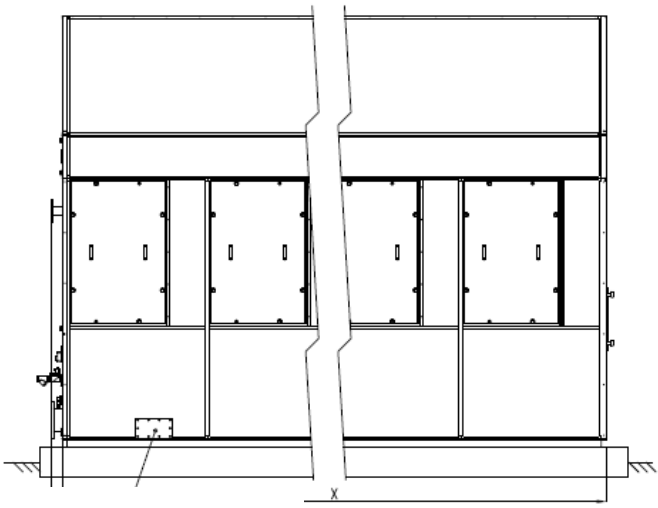
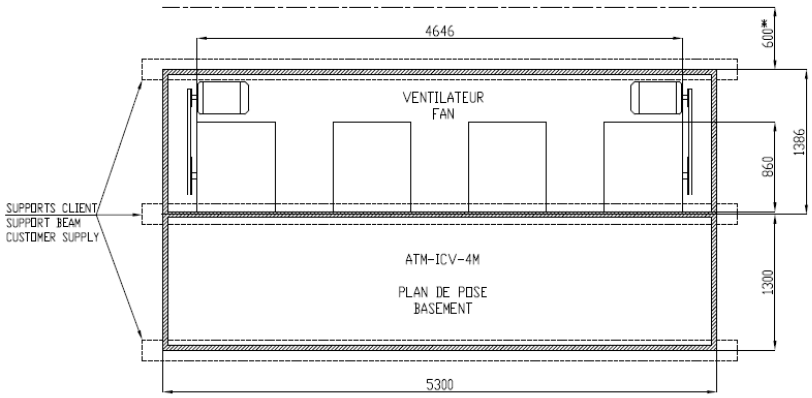
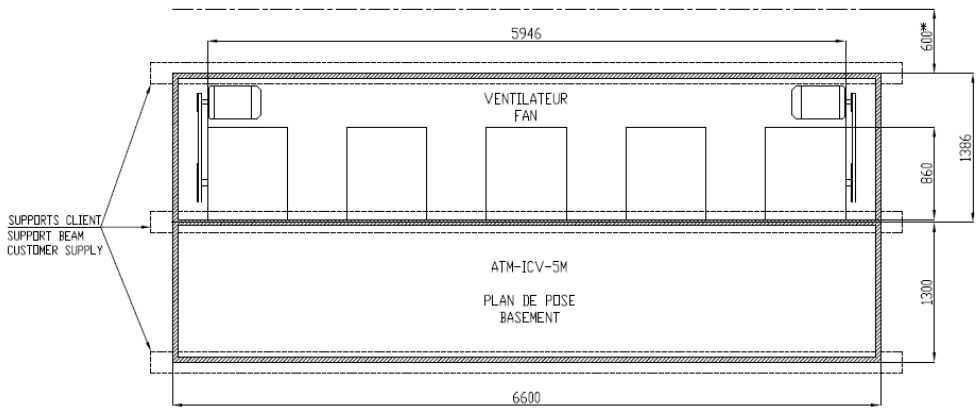
1 SWITCH (WATER LEVEL SECURITY) (OPTION)



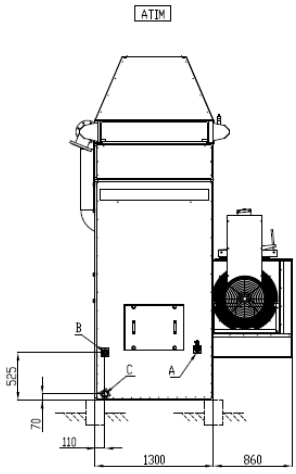


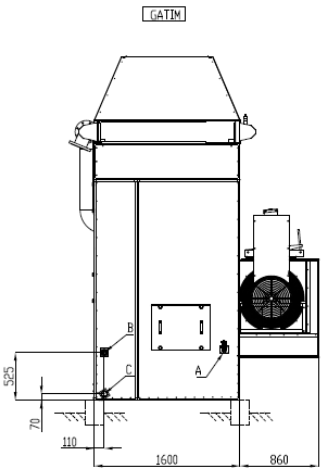


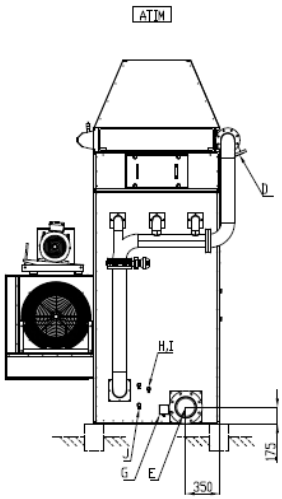
Technical Characteristics ATIM-(G)ATIM series

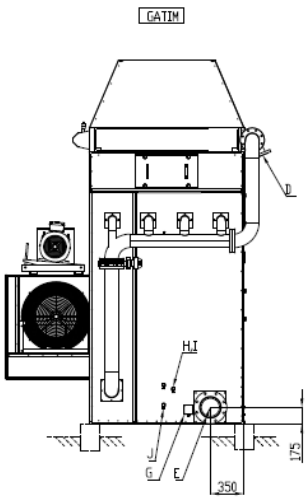
ATIM serie		ATIM 4M	GATIM 4M	ATIM 5M	GATIM 5M
Overall height including air exhaust option	mm	3 770	3 770	3 770	3 770
Length	mm	5 300	5 300	6 600	6 600
Width	mm	2 160	2 460	2 160	2 460
Heat power average ref. (1)	Kw	900	1090	1120	1370
NDKL fan	Qty	4	4	5	5
Total engine power	Kw	18	30	24	37
Sound level at 20m (2)	[dBA]	54	55	54	55
Empty weight (without beams)	Kkg	2 420	2 580	2 870	3 170
Full weight (without beams)	Kg	5 720	6 690	6 980	8 310
Overflow (female)	Dn	50			
Drain (female)	Dn	50			
Hot water inlet	Dn	According to throughput			
Connection flange	Qty	1	1	1	1
Height	mm	2 800	2 800	2 800	2 800
Cold water outlet	Dn	According to throughput			
Drain basin **POWER FLOW**	mm	260 x 110			
Electric heater with thermostat (optional)	Kw	3	3	3	6
Float valve (male) or optional electro valve		option			
Low level		option			
High level		option			
Safety lack of water		option			

(1) : average reference cooling capacities calculated for thermal conditions of 32 / 27 / 21 ° C.
(2) : Sound level: Average pressure level (Lp) in the free field in the 4 directions at 1.5 m from the ground.
Note: For greater powers, towers may be juxtaposed.









Drawings and dimensions ATIM-(G)ATIM

A APPOINT D'EAU - ROBINET A FLOTTEUR OU ELECTROVANNE (OPTION)
MAKE UP WATER - FLOAT VALVE OR ELECTROVALVE (OPTION)
B TROP-PLEIN - G 2'' FEMELLE
OVERFLOW - G2'' FEMALE
C VIDANGE - G 2'' FEMELLE
DRAIN - G2'' FEMALE
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HOT INLET WATER
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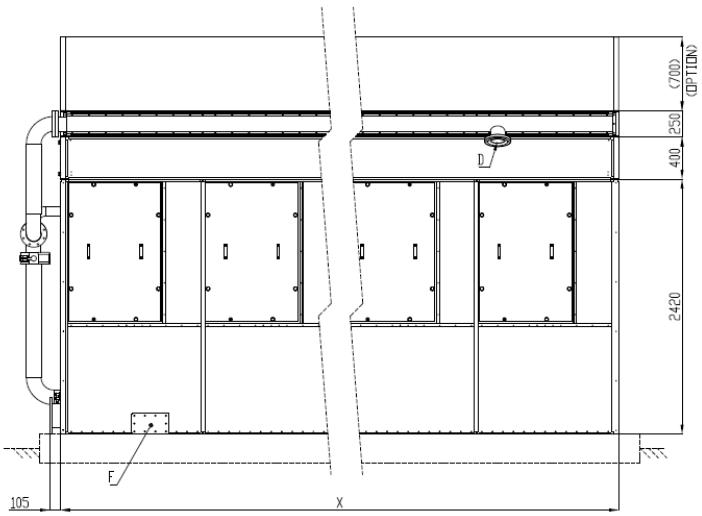
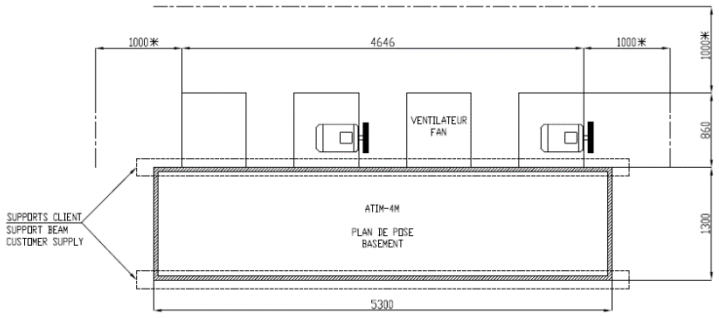
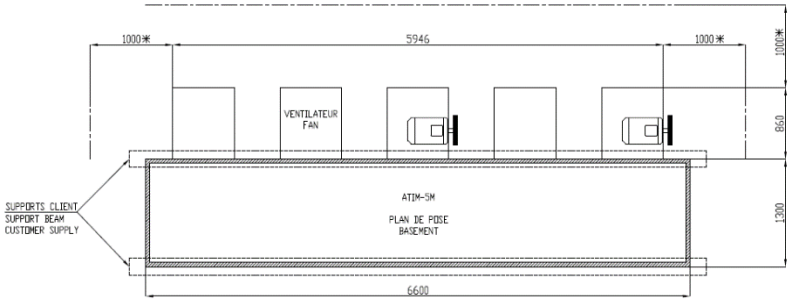
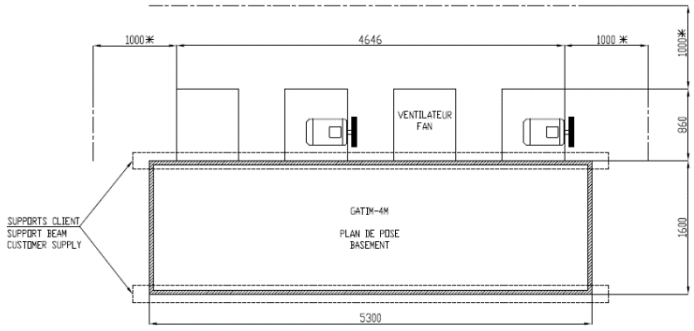
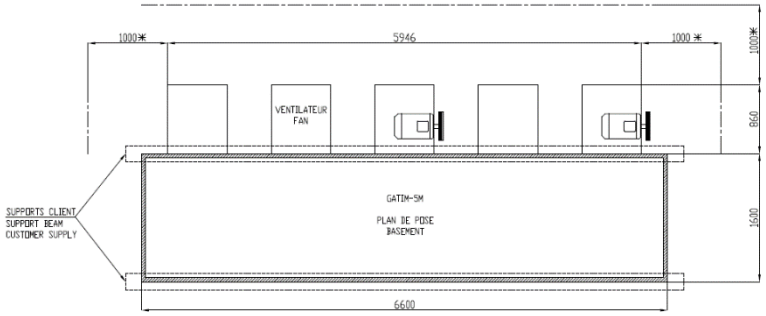
1 SWITCH (WATER LEVEL SECURITY) (OPTION)







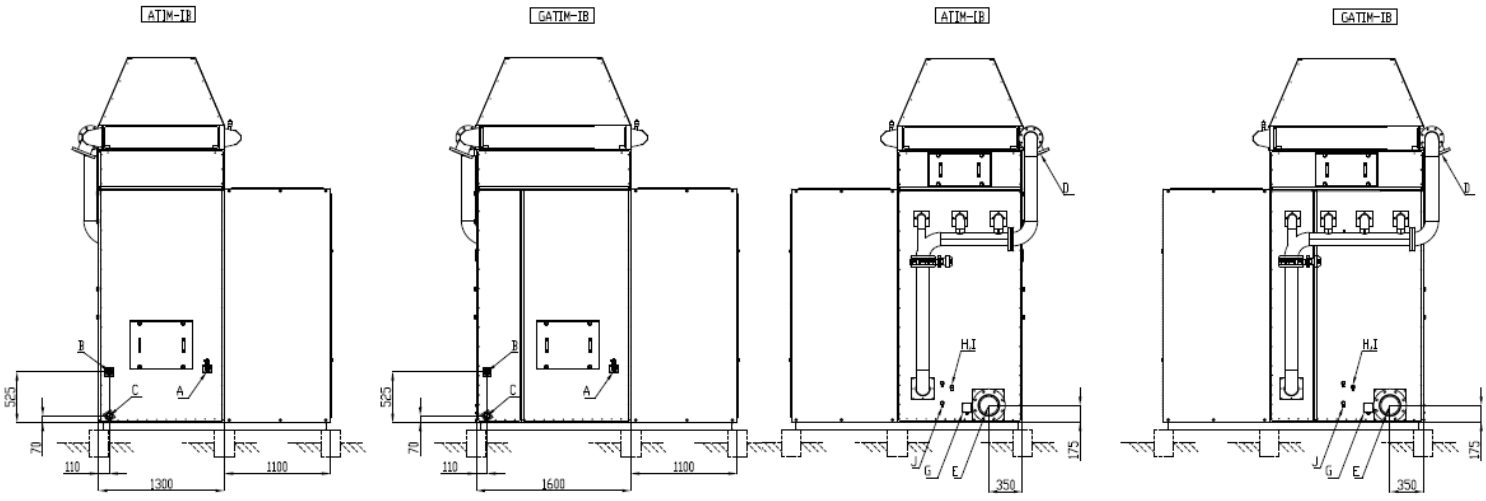




Technical characteristics ATIM-(G)ATIM with IB sound attenuation

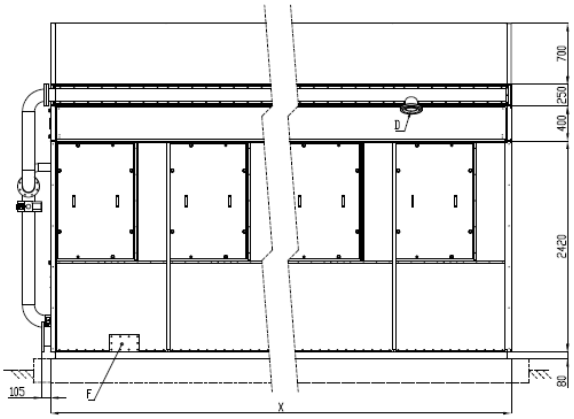
ATIM serie		ATIM 4M IB	GATIM 4M IB	ATIM 5M IB	GATIM 5M IB
Overall height including air exhaust option	mm	3 770	3 770	3 770	3 770
Length	mm	5 300	5 300	6 600	6 600
Width	mm	2 400	2 700	2 400	2 700
Heat power average ref. (1)	Kw	880	1070	1100	1340
NDKL fan	Qty	4	4	5	5
Total engine power	Kw	18	30	24	37
Sound level at 20m (2)	[dBA]	46	47	46	47
Empty weight (without beams)	Kkg	3 230	3 410	3 860	4 180
Full weight (without beams)	Kg	6 520	7 520	7 970	9 310
Overflow (female)	Dn	50			
Drain (female)	Dn	50			
Hot water inlet	Dn	Depending on the flow			
Connection flange	Qty	1	1	1	1
Height	mm	2 800	2 800	2 800	2 800
Cold water outlet	Dn	Depending on the flow			
Drain basin **POWER FLOW**	mm	260 x 110			
Electric heater with thermostat (optional)	Kw	3	3	3	6
Float valve (male) or optional electro valve		option			
Low level		option			
High level		option			
Safety lack of water		option			

(1) : average reference cooling capacities calculated for thermal conditions of 32 / 27 / 21 ° C.
(2) : Sound level: Average pressure level (Lp) in the free field in the 4 directions at 1.5 m from the ground.
Note: For greater powers, towers may be juxtaposed.

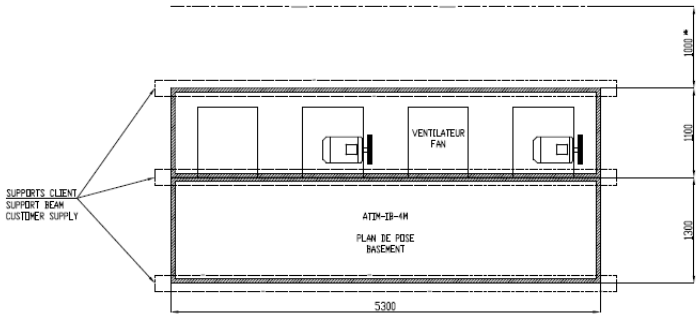


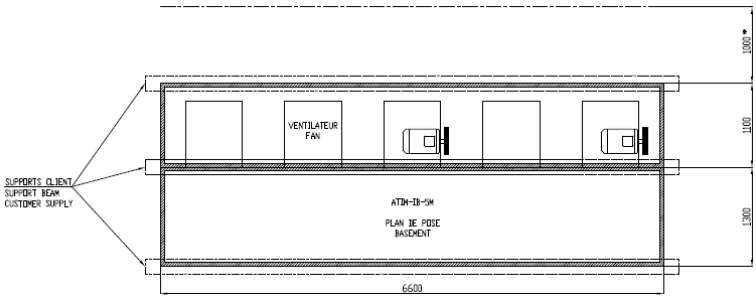
Drawings and dimensions ATM –(G)ATM with IB sound attenuation

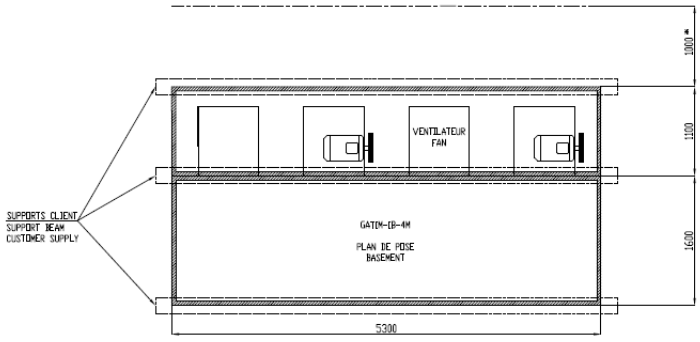
A APPOINT D'EAU - ROBINET A FLOTTEUR OU ELECTROVANNE (OPTION)
MAKE UP WATER - FLOAT VALVE OR ELECTROVALVE (OPTION)
B TROP-PLEIN - G 2'' FEMELLE
OVERFLOW - G2'' FEMALE
C VIDANGE - G 2'' FEMELLE
DRAIN - G2'' FEMALE
D ENTREE EAU CHAUDE
HOT INLET WATER
E SORTIE EAU FROIDE
COLD OUTLET WATER
F TRAPPE DE VIDANGE BASSIN "POWER FLOW"
DRAIN BASIN DOOR "POWER FLOW"
G RESISTANCE ANTI-GEL AVEC THERMOSTAT
WATER HEATER WITH THERMOSTAT
H, I 2 CONTACTEURS (NIVEAU HAUT / BAS) (OPTION)
2 SWITCHS (HIGH / LOW LEVEL) (OPTION)
J 1 CONTACTEUR (SECURITE MANQUE D'EAU) (OPTION)
1 SWITCH (WATER LEVEL SECURITY) (OPTION)

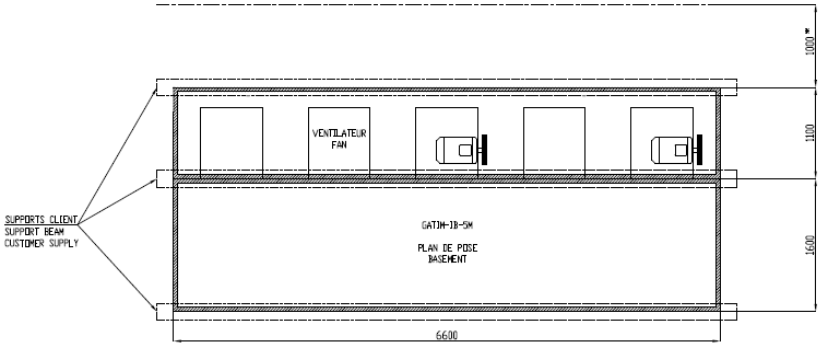


(*) ESPACES LIBRES RECOMMANDES





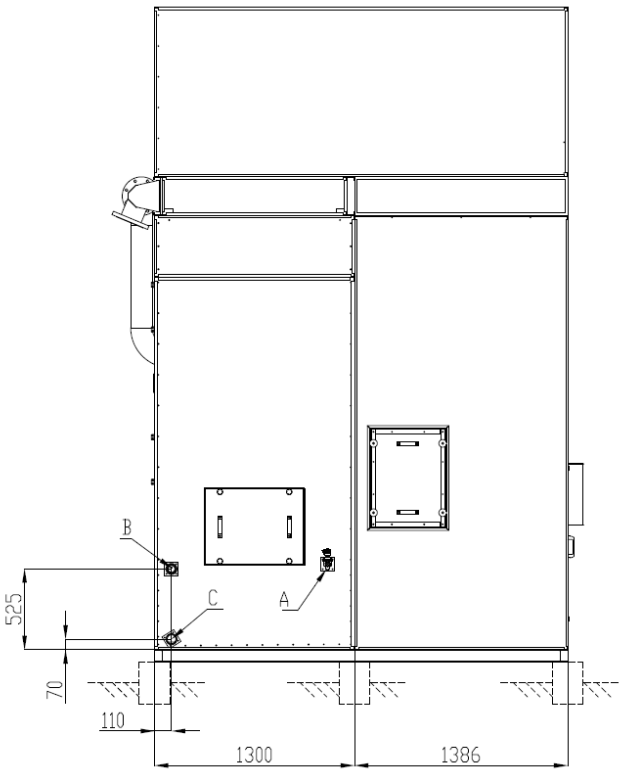


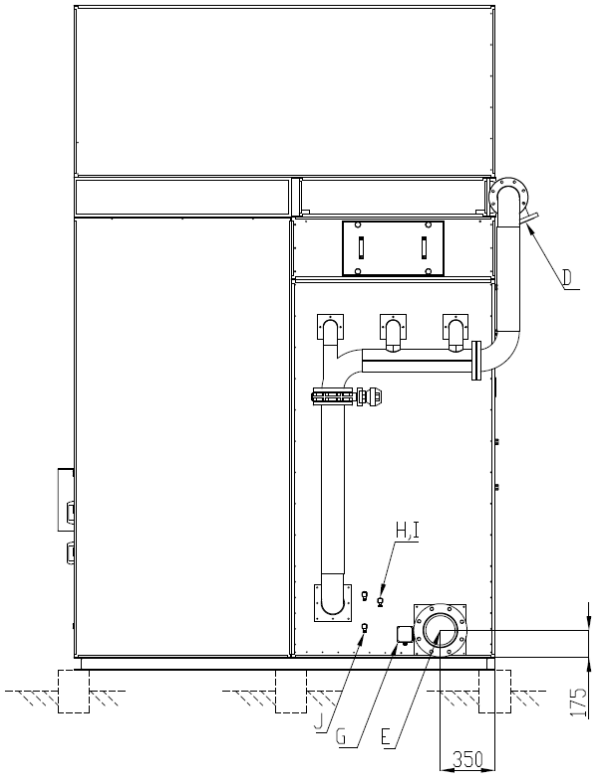


Technical Characteristics ATIM -(G)ATIM with ICV/ICVK sound attenuation

ATIM serie		ATIM 4M ICV	GATIM 4M ICVK	ATIM 5M ICV	GATIM 5M ICVK
Overall height including air exhaust option	mm	4 170	4 170	4 170	4 170
Length	mm	5 300	5 300	6 600	6 600
Width	mm	2 686	2 686	2 686	2 686
Heat power average ref. (1)	Kw	840	840	1050	1050
NDKL fan	Qty	4	4	5	5
Total engine power	Kw	18	18	30	30
Sound level at 20m (2)	[dBA]	43	40	44	41
Empty weight (without beams)	Kkg	4 410	4 790	5 360	5 840
Full weight (without beams)	Kg	7 700	8 090	9 480	9 960
Overflow (female)	Dn	50			
Drain (female)	Dn	50			
Hot water inlet	Dn	Depending on the flow			
Connection flange	Qty	1	1	1	1
Height	mm	2 800	2 800	2 800	2 800
Cold water outlet	Dn	Depending on the flow			
Drain basin **POWER FLOW**	mm	260 x 110			
Electric heater with thermostat (optional)	Kw	3	3	3	6
Float valve (male) or optional electro valve		option			
Low level		option			
High level		option			
Safety lack of water		option			

(1) : average reference cooling capacities calculated for thermal conditions of 32 / 27 / 21 ° C.
(2) : Sound level: Average pressure level (Lp) in the free field in the 4 directions at 1.5 m from the ground.
Note: For greater powers, towers may be juxtaposed.





Drawings and dimensions ATIM-(G)ATIM with ICV/ICVK sound attenuation

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MAKE UP WATER - FLOAT VALVE OR ELECTROVALVE (OPTION)
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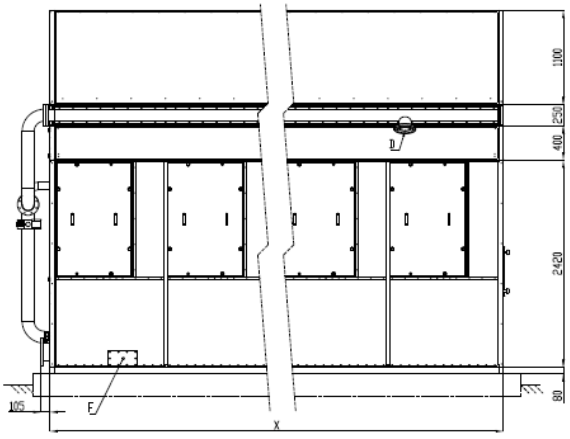
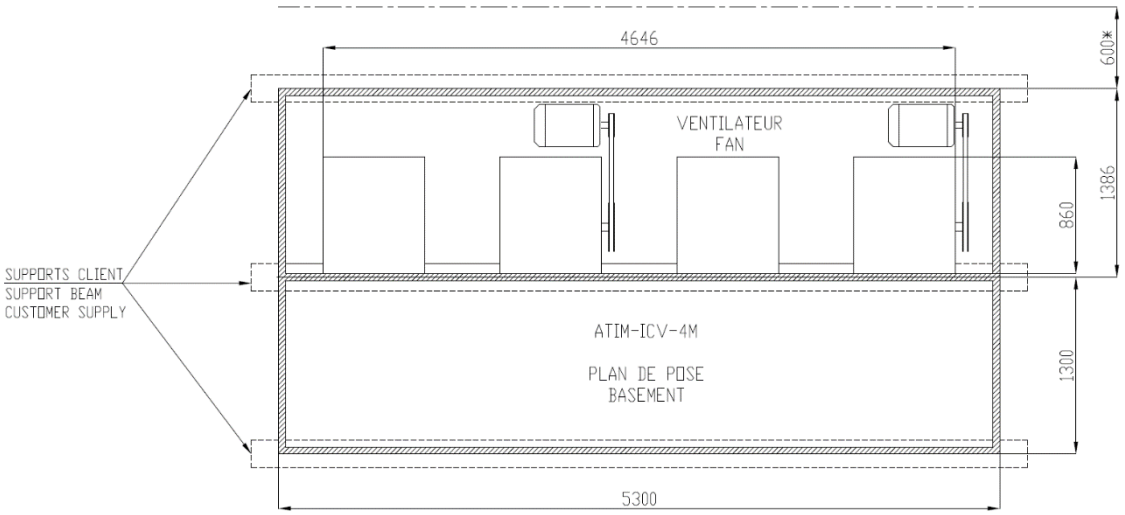
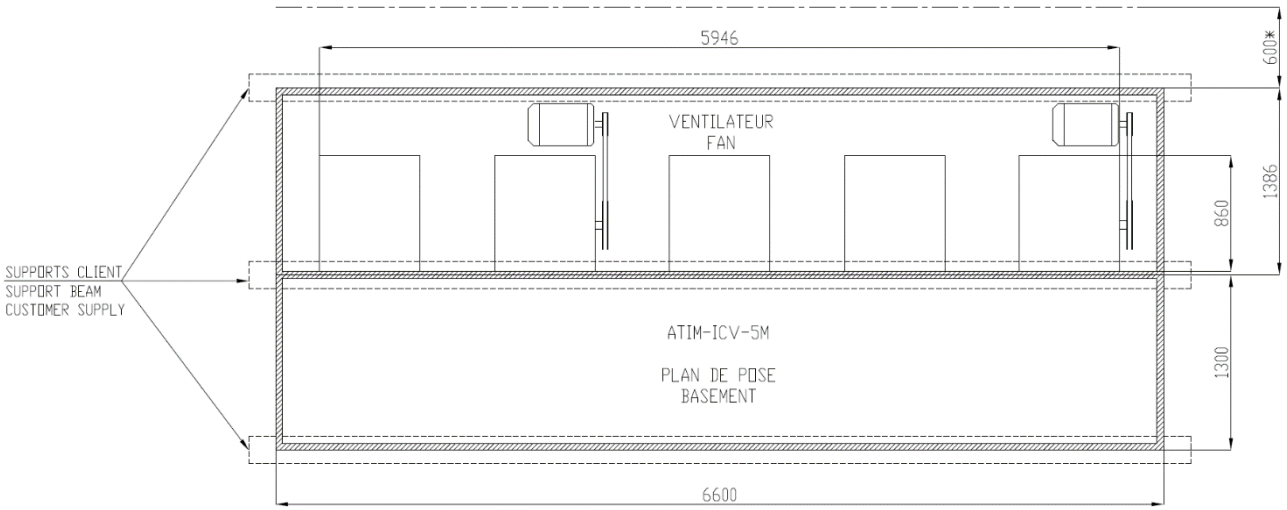






Support ATM-(G)ATM series

Our cooling towers can stand on the ground or on a concrete ground, but we recommend installing them on a concrete longitudinal beam or on a steel frame.

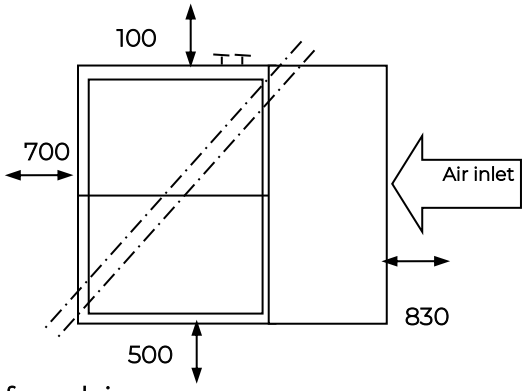
Check that the ground can stand the operating load, and that the surface or supports are flat

Choice of location ATM-(G)ATM

The cooling tower should not be surrounded on all sides by walls greater than or equal to its height, and moreover without opening, since a risk of "short circuit" could occur.
The air discharged at the exit of the tower (hot air saturated with moisture) could be recycled into the unit and consequently reduce the thermal efficiency of the tower.

In any case, it is necessary to respect minimum spaces on all four sides of the tower to ensure proper supply to the fans and sufficient access for assembly and maintenance.
Failure to comply with these few rules would inevitably lead to a malfunction of the cooling tower.

Recommended minimum free access (mm) for standard cooling towers: Top view

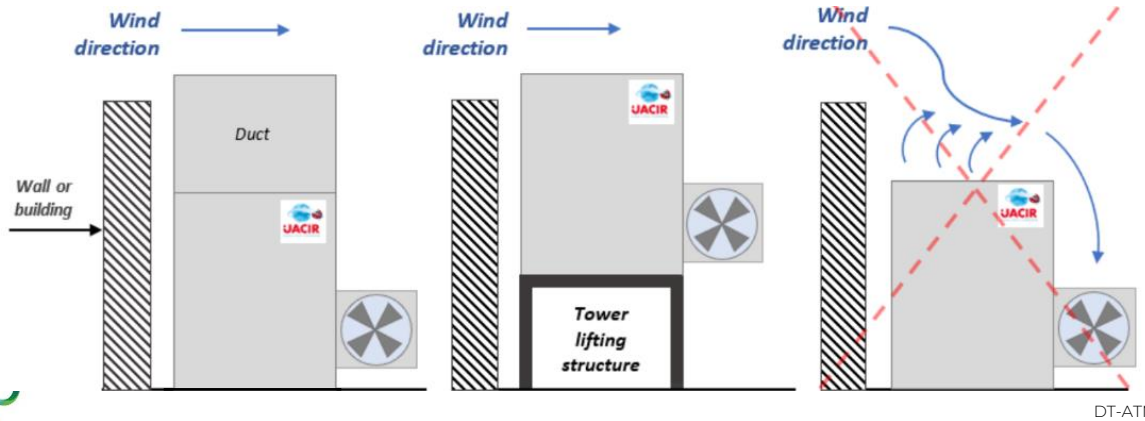


Do not hesitate to consult JACIR for advice.

Layout example:

The location choice for tower installation must follow these recommendations:

- The air intake area must always be kept free of any major obstruction.
  => The obstacle-free distance to be kept around each air inlet is shown on the overall plan and is approximately 1 metre (unless otherwise stated).
- The air discharge must not be disturbed either by direct obstacles.
  =>The installation of acoustic baffles or ducts must be approved by JACIR's Technical Department.
- The risk of hot air being blown back (at tower outlet) to the air intake area must be prevented.
  => The direction of the prevailing wind and the proximity of surrounding buildings (possibly generating risks of back-flow) are elements to be considered.



WATER EVAPORATION

Consumption by evaporation is approximately 1.7 kg/h per 1 000 kcal/h.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible).
There are three available solutions according to the case:

1- Continuous blow down

Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.

The blow down flow rate can be calculated using the formula: [100 S / (M - S)] % of the make-up water in which:
S: Salinity of the make-up water compensating for evaporation.
M: Maximum acceptable salinity level of water in circuits.

Example:
Salinity of make-up water = HT 20°
Maximum acceptable salinity = HT 40°

100 x 20 / (40 - 20) = 100 % make-up water flow rate

Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).
Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous blow down

The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- JACIR Automated Inductive Blow dow

Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level. See separate documentation. (see separate documentation).

WATER TREATMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly. If the water contains a significant number of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10 % of the recycled water flow.
If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.
In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to prevent these organisms from developing.

Water treatment should be undertaken by a specialized Company.
PREVENTS THE RISK OF LEGIONNAIRES' DISEASE (See separate documentation).

High performance open circuit evaporative water cooling tower, centrifugal fan(s), JACIR type (G)ATM . series .....

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Acoustic characteristics

The sound pressure level of the unit shall not exceed ..... dB (A) to ..... free field meters in all 4 directions; to do this, the tower will be equipped with one of the following sound attenuations if necessary:

1 – type IB: Sound trap without suction cabinets and a discharge cone lined with acoustic foam,

2 – type ICV / ICVK or special: soundproofing by adding acoustic boxes to suction and discharge, possibly supplemented by a doubling of the tower body with high density rock wool, up to NR30 to 10m.

Tower casing and inclined bottom basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive, if necessary, a double casing later on.
Stainless steel rivets with uniform and high-capacity locking will be used for assembly.

The cooling tower casing will be assembled without any bolting or welding for the parts in contact with water; a special designed high covering seal ensure waterproofing between the panels.
The basin will be equipped with a rectangular access hatch (390 x 540 mm), with a floating valve that can easily be adjusted, a drain, an overflow and an anti-cavitation strainer.
The sloped bottom of the basin will allow a complete and easy drain thanks to the POWER FLOW drain hole located under the lowest part of the basin in order to ease the cleaning. The size of this opening will be 260x110 mm.

Casing

The cooling tower panels casing will be made of:

- As a standard, galvanized steel 2 mm thick ZENDZIMIR process 275 gr/m² (galvanized plates are protected by the zinc oxidation on the surface) or,
- Option, X-STEEL stainless steel for its long-lasting properties, water saving and easy cleaning.

Accessibility

As standard, a large access door (1350 x 900 mm) per module (ventilation section) and made of the same material as the tower will be provided to allow quick and easy disassembly of drop eliminators, dispersers, exchange surface and water distribution ramps along the entire length of the tower.

Fans

The low-pressure centrifugal fan(s) with forward-tilted, double-voiced blade(s) will be external to the basin, placed in the dry air stream, at man-height for easy access for disassembly and maintenance. The polyester pavilion(s) will be profiled to optimize air suction and removable to simplify maintenance.
The turbine is protected by an EPOXY coating baked in the oven. The volute is made of X-STEEL stainless steel. As an option, possibility of stainless-steel turbine.

One fan per module and a single motor driving a maximum of two fans. If a motor drives three fans, the connection shall be ensured by a flexible coupling between the shaft carrying two fans and the shaft carrying the third fan.

Electric motor(s) and transmission(s)

The asynchronous three-phase motor(s) IE3 shall be of the closed type with ventilated carcass of maximum power of..... Kw..... rpm, IP55 protection, class F/B. The transmission will be provided by trapezoidal belts sized up to 150% of the rated power.

Water supply

Water distribution will be ensured from PVC ramps, which will supply polypropylene nozzles with internal turbulator for optimal water distribution, and easy dismantling.

Exchange surface

The EFFI-PACK exchange surface will be made of PP sheets. Resistant to shocks and offering the maximum exchange surface, the system will thus limit the risks of fouling.

Drift eliminators

Eurovent certified for high-efficiency the PP sheets drift eliminators will prevent the water from being sprayed out at the tower outlet. Resistant to ultraviolet rays, they will be easily removable from above to access the nozzles and the exchange surface if necessary. The vesicular drive will be a maximum of 0.01% of the recirculating flow.

Connections

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection. The servitudes panels will include a high-level switch, a drain hole and a water make up.

Options

As options will also be available, a plume suppression coil, frequency drives on fans, a water supplement by electrical level control, soundproofing basin EFFI-SILENT, and all stainless steel accessories (turbine, wheel, shaft, etc.). The equipment can be delivered in spare parts to be assembled with on-site assembly by one of our experienced technicians.

High performance open circuit evaporative water cooling tower, centrifugal fan(s), JACIR type (G)ATIM . series .....

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

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Plume suppression battery and modulating valve (Jacir patent)

As standard, the battery will be made of a steel collector coated with a primary paint + epoxy. Two air vents will ensure frost control. The tubes, arranged in a triangular pitch, will be made of copper. As an option, they can be made of stainless steel. The fins will be made of copper. A motorised valve to regulate the watering of the packing will be associated with the battery. As soon as climatic conditions permit, the installation will generate substantial water savings by evacuating the heat in the dry battery rather than by evaporation.

Connections

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection.
The servitudes panels will include a high-level switch, a drain hole and water make up.

Options

As options will also be available, a plume suppression coil, frequency drives on fans, a water supplement by electrical level control, soundproofing basin EFFI-SILENT, and all stainless-steel accessories (turbine, wheel, shaft, etc.). The equipment can be delivered in spare parts to be assembled with on-site assembly by one of our experienced technicians.

Connexions

Toutes les tuyauteries de raccordement seront prévues en acier galvanisé à chaud, ou en option Inox pour une protection intérieure et extérieure optimisée.
Les panneaux de servitudes comprendront : un dispositif de trop plein, un orifice de vidange et un appoint d'eau.

Options

En option seront disponibles également, une batterie de suppression de panache, des variateurs de fréquences sur ventilateurs, un appoint d'eau par contrôle du niveau électrique, insonorisation bassin EFFI-SILENT, et tous accessoires en Inox (volute, roue, arbre, etc.). Le matériel pourra être livré en pièces détachées à assembler, avec un montage sur site par l'un de nos techniciens expérimentés.

JACIR
Cooling for life

CRF

Closed circuit cooling towers

Range: water flow rate from 10 to 250m³/h

Evacuated power: from 50 to 3 000kW

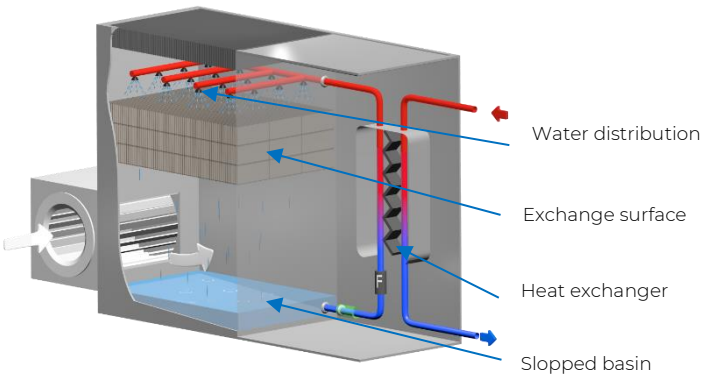
Commercial Documentation

La FRENCH FAB

Modular closed circuit cooling towers: CRF serie

Innovative technology

Thanks to its long-lasting experience, Jacir is proud to propose the most reliable technology for monobloc closed type cooling towers: combination of highly efficient exchange surface water – air made of high-density polyethylene, with steel plate heat exchanger.



Lasting performance

Designed for long-lasting efficiency even in drastic operation and maintenance conditions, the CRF cooling tower, after cleaning, still provides the original design thermal and mechanical performances. Indeed, the exchange surface CONFITER is totally cleanable by elastic warping and high-pressure spray. The access to the plate heat exchanger in stainless-steel is quite easy, and its assembly, disassembly and cleaning very simple.

Antifreeze without glycol

The exchanger, outside the airflow, in a separate closed casing is freeze resistant. In the case of an electrical stop during freezing conditions, the secondary circuit is automatically drained by gravity, giving space for the dilatation of the freezing primary circuit. It is possible to operate the tower without glycol, so to improve the performances by 5% to 15%. The integrated pump does not require any electrical antifreeze tracing.

Steel works

All the steel sheets for the casing are twice or 4 times folded on the four sides of the panels. This design secures very rigid panels, strong and exceptionally tight.

Materials

As standard, stainless-steel plate heat exchanger, hot dip galvanised piping, PVC pipes, turbine pump in stainless-steel or in cast iron, exchange surface in polyethylene vertical channels.

Environnent protection

3 sound attenuation levels

- Standard attenuation IB,
- Complete attenuation ICV plus casing insulation ICVK,
- NR 30 attenuation (approx. 35dBA at 10m).

Plume suppression coil

Jacir design (see option in hybrid documentation CRIM)

- Plume reduction system,
- Plume suppression system,
- Water savings by 30% to 50% per year.

Easy access and cleanable basin

In order to avoid bacteria proliferation, there are no welds on areas in contact with the water. The basin is inclined for a complete drain. Large access doors are provided: 540 x 390mm. All the utilities are located on the same panel: overflow, drain, make-up, electrical heater, etc. There is only one flange for connection per water inlet and outlet.

Anticorrosion protection

Two possibilities:

- Stainless-steel sheets (304L or 316L) for an extended life time, a better hygiene, and substantial water and water treatment savings,
- Galvanized steel sheets Z 275, rich zinc paint coated on the external side. All the folds are outwards, so that the internal sides are totally zinc coated.

Note: sheets (except tower casing) can be coated before assembly, by baked polyester powder.

Acoustics and water savings

The fans are made by Jacir, and are permanently improved. The inlet cones, double inlets are generously designed. So, the total pressure and the speed are quite low: very low sound design. The electrical consumption of the fans is located inside the dry airflow, outside the basin and are protected by a thick latex coating of 350 to 400 microns on each side.

JACIR
Cooling for life

CRIM and KSFIM

Hybrid cooler closed circuit

Commercial Documentation

Water flow rate: from 10 to 250 m³/h

Power: 50 to 3 000kW

La FRENCH FAB

Refroidisseur hybride à circuit fermé : série CRIM-KSFIM

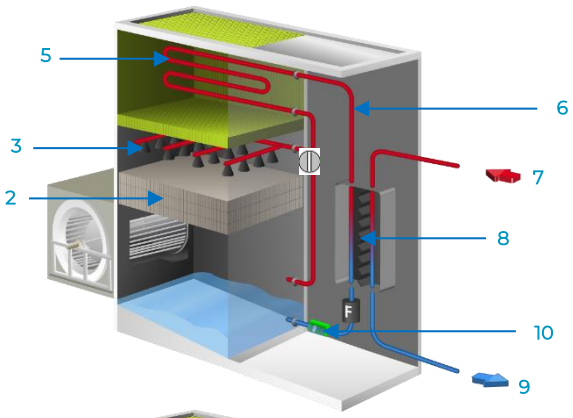
Since 1973, CRF and KSF closed cooling towers have originally been designed to fit with a plumeless coil. These ranges are then called CRIM and KSFIM series. The efficiency of the system is secured by a finned tube coil, along with a variable water flow valve on the spraying system over the packing. Thus, regulation of the water flow rate is very unique on the market. Therefore, the combination of the air desaturation by air outlet warming up, and the reduction of the water spray on the packing, guaranties a complete plume suppression. Beyond the plume suppression itself, this system can provide water savings up to 80% and is an ultimate obstacle to the drifts. This technology engineered by Jacir bas been implemented with CETIAT laboratory more than 30 years ago, and has led to several innovating patents. The hybrid coolers can perfectly be operated in winter in freezing conditions without glycol. Their design secures a very good access for an easy cleaning and for performance lasting.

Primary circuit (process):
To be cooled, the water enters (7) in the integrated plate heat exchanger (8) and goes back to the process (9) once cooled. The primary circuit is closed and is not in contact with the air.

Secondary circuit (evaporation tower side):
The water leaves the basin through a pump (10), Runs through the plate heat exchanger (8) Protected by 2 filters ; then, it goes into the plume suppression coil (5) ; and, via a power activated valve (6), goes either to the water spraying system (3), or directly to the basin if the ambient conditions are cold enough for a dry cooling.

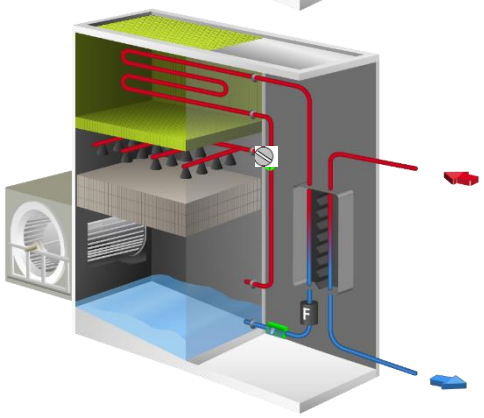
Dry cooling: WINTER

The bypass power-activated valve is totally open (6) and the whole water flow goes into the basin: there is no water spray, no water evaporation, so no water consumption. The whole power can be dissipated through the plumeless coil.



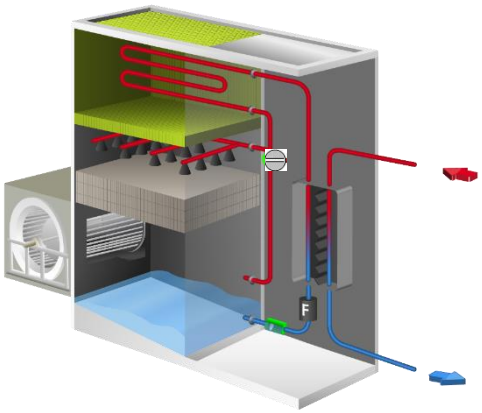
Wet/dry operation: MID-SEASON

When the dry cooling is no powerful enough, part of the spray is bypassed by the variable valve (6). A temperature probe (option) located on the water outlet, send the information to a regulator (option) to proportionally regulate the valve; the minimum water quantity is sprayed on the packing (2). This operation mode can lower the air/water exchange, and higher the exchange in the tube coil, without any impact on the heat transfer inside the plate heat exchanger.
According to the ambient condition, 30 to 70% of the power can be dissipated in the dry mode.



Wet operation : SUMMER

If necessary, the bypass valve is totally closed (6), the water of the secondary circuit leaving the plate heat exchanger (8) runs first to the plume suppression coil (5), then can be fully sprayed on the exchanger surface (2) through the spray nozzles (3).
The water is first cooled by the tube coil (5) by sensitive heat and then by latent heat (evaporation on the packing (2)).
In wet mode, 5% to 10% of the power will be dissipated through the finned tube coil.



CRF and CRIM

Closed tower

Hybrid closed circuit cooler

JACIR
Cooling for life

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Technical Documentation

La FRENCH FAB

General description and benefits CRF-CRIM

JACIR

With more than 60 years' experience, our company:

∞ Has invested in detailed research and development in order to propose technical solutions in accordance with environmental protection through unequalled realizations and patents.

∞ Is today the European leader thanks to its technology beyond market requirements.

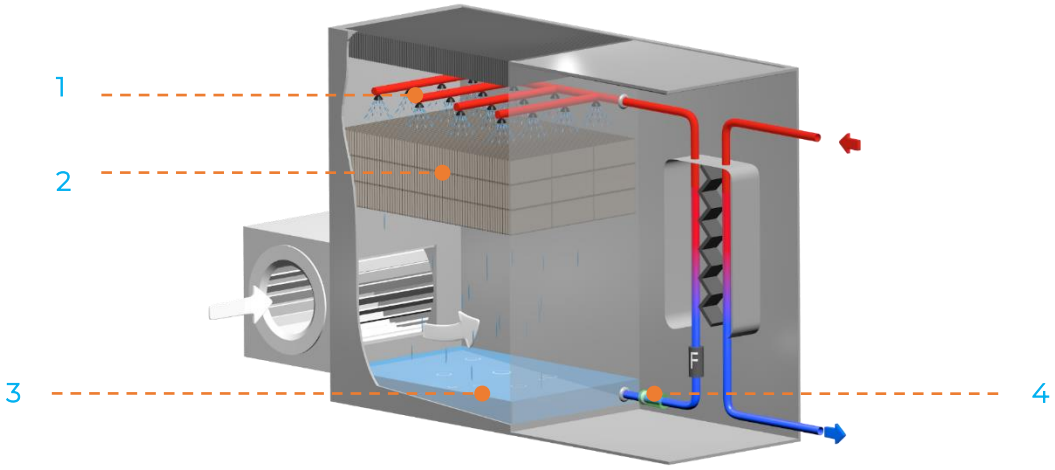
Strong points of CRF-CRIM series

∞ PLATE HEAT EXCHANGER	Made of stainless steel, the plates are removable to ease cleaning and reassembling
∞ PLATE HEAT EXCHANGER	Glycol free Plate Heat Exchanger: no freezing risk during winter as it stands out of the air flow.
∞ WATER PROOF	Thanks to our assembling technology, we guaranty no leak equipment
∞ SILENCE	Very silent cooling towers in standard version with very low sound levels up to NR 30 at 10m.
∞ EXCHANGE SURFACE	Made by Jacir in high density polyethylene. Thanks to its easy cleaning, it secures long lasting performances
∞ ANTICORROSION PROTECTION	Made of galvanised steel in standard, casing of the cooling tower can be in stainless steel 304L or 316L in option and assembled without any weld.
∞ EASY MAINTENANCE	Larges access hatches (540 x 390mm) fan outside the tower and at man height, exchange surface cleanable by elastic warping and high-pressure water spray, sloped basin for complete drain.
∞ ELECTRIC POWER	Minimal consumption.
∞ EVOLUTIVE TOWER	Possibility to increase the evacuated power by adding plates to the heat exchanger. The sound level can be lowered with attenuation, without necessarily increasing the absorbed power.
∞ ONE PIECE CONSTRUCTION	Easy handling and transport.

Principle of a closed cooling tower: CRF-CRIM

A cooling tower is a heat exchanger, cooling the water by direct contact with air. This process involves two simultaneous physical phenomena: convection and evaporation. The convection allows the transfer of sensitive heat. The evaporation, the main one, allows the transfer of latent heat and so makes it possible to reach lower water temperature than the ambient air temperature.

Operating principle of a wet cooling tower:



The fluid to be cooled flows through the primary circuit of a stainless-steel plate heat exchanger. The water from the secondary circuit, flows from the heat exchanger to the top of the cooling tower. This water is distributed on the exchange surface (2) through the nozzles (1).

The air is forced by the fan from the bottom to the top of the cooling tower. During the pass, it has been warmed up and saturated in water through the exchange surface.

Because of the superficial tension created by the exchange surface, the water equally flows down along the whole height of the so extended exchange surface.

Cooled by the forced air, the water falls by gravity to the inclined basin (3) located on the bottom of the tower.

This water is recycled on the plate heat exchanger by the circulating pump (4).

Advantages of the cooling tower versus dry air fins coolers:

Antifreeze and glycol savings:

- As the exchanger is not in the air flow, it does not require any glycol in the water, and is freezing resistant.

Energy savings:

- The condensers of the chillers will be lower cooled by a cooling tower i.e., a better efficiency of the system.
- It takes 7 to 10 times more air in a dry cooler, i.e., more fans and more electrical motors. So, the electrical consumption is approximately 40 % higher than in the wet cooling tower. The maintenance is therefore higher. Beyond its cost, this electrical over consumption requires the contribution of the Environment.
- For a same evacuated power, a cooling tower is 30 to 50 % cheaper than a dry cooler.
- A 1 % increase of the ambient air has a direct and proportional impact on the performance of a dry cooler. In the case of a cooling tower, the fluctuation of the performance is only related to wet bulb changes.

Sound attenuation:

Jacir supplies cooling towers much more silent than dry coolers.

I- AIR-WATER EXCHANGE: TOWER CIRCUIT

Tower casing:

The casing is made of self-supporting rigid panels, with double or 4 times folding on the four sides of each panel (Jacir design) which fit with sound attenuation on the casing. Therefore, we can offer cooling towers with sound level lower than NR 30 at 10m.

The towers are assembled by water proof rivets: powerful and regular torque. There is no weld for the assembly, and the sealing between the panels is secured by a gasket specially designed for this application.

Delivery in one-piece units, up to 5 units, with same height (2.5 m).

As standard, the panels are in 2mm galvanised steel, ZENDZIMIR 275 g/m2 (the protection of galvanised sheets is secured by the zinc oxidation on the surface).

As an option, 304L or 316L stainless steel for a reinforced resistance to corrosion.

Inclined basin: easy and complete drain:

- Capacity of 700 litres per module for the CRF towers, and 800l for the GCRF. (example: GCRF 5 modules: the basin contains 4400l).
- The assembly is made without any welds on all the parts in contact with water: reliability and totally smooth to avoid nest for bacteria proliferation.

On the utilities side, of the basin are located:

- Over flow,
- Drain hole,
- Water makeup with float valve or electro valves as option,
- Water outlet through strainer in stainless steel and in PEHD, removable and with a large nozzle to avoid any cavitation, and a pre filter,
- Options: water heater 230 or 400V, with separated waterproof thermostat.

For the connection of the heater, use the proper contactors.

Water distribution:

The water distribution is secured by PVC pipes with high efficiency PP nozzles. These nozzles split the water on the exchange surface in a cone shaped flow. They can easily be unscrewed for service and have a very strong mechanical resistance.

An internal turbulator provides and equal water distribution, and allows a very wide water flow fluctuation.

Exchange surface:

The *exchange surface*, or *packing*, is made by Jacir, in high density polyethylene, heat welded. This material is imputrescible, long lasting, and high temperature resistant. It can be cleaned by elastic warping and water spray. The advantages are as follows:

- high efficiency: 240 or 280 m2/m3,
- Increased efficiency (wettability) due to the "mesh" effect,
- Mechanical softness
- Easy maintenance
- High resistance to chemicals
- High temperature resistance: up to 75°C for standard
- Low pressure drop thanks to vertical channels, so low electrical consumption and low noise.

Drift eliminators:

Their purpose is to reduce the drift out the cooling tower. Highly efficient, they are UV resistant and can be removed from the top of the cooling tower. Then there is a direct access to the water nozzles and to the exchange surface.

Access for maintenance:

Large door(s) are provided to access to the basin (540 X 390mm) and to access to the water nozzles (740 X 390mm) ; these doors are mandatory if options for sound attenuators, for plume suppression coil, or for outlet cones are selected. This access can be used for easy disassembly of drift eliminators, water nozzles, exchange surface and water distribution. A 260x110mm trap hatch allows the rapid and complete removal of sludge and other material accumulated at the bottom of the basin.

Fans:

The centrifugal fans are designed and made by JACIR. The impeller is double inlet action type. The removable polyester inlet cones make it possible to easily disassemble the impeller. Their shape improves the fan efficiency.

The shaft bearings are self-aligned, factory greased, and to be regularly re-greased. Each shaft line is supported by two bearings, and two fans per shaft maximum.

One fan per module and only one motor for two fans maximum. In the case where the motor would drive three fans, the coupling is secured by a flexible part between the shaft with 2 fans and the shaft with the third fan.

The casing of the fan is used as motor support. This design allows the ideal belt tension. The coupling is made by trapezoidal pulleys and belts. The belt tension is secured by the adjustment of the motor support.
As an alternative, the casing and the impeller can be in stainless steel. The impeller is coated by a baked epoxy painting.

As an option the impeller can be made of X Steel stainless steel.

Connections:

As standard, flanges are made of galvanised steel whatever diameter and tower casing material. Overflow is made of PP.

Standard motor:

- 3 phases asynchrony
- 1500 rpm
- 230/ 400 V up to 5.5 kW motors
- 400/ 690 V above 5.5 kW
- 50 Hz
- IP 55
- Direct wiring on connection glands.

II- WATER-WATER HEAT TRANSFER: USER CIRCUIT

Room included in the cooling tower:

Made in galvanised steel in standard, it includes an access door 2100mm x 600mm with lockers activated by key. The panels can be disassembled, as all components are designed for easy access and maintenance.

Plate heat exchanger:

It is in-door protected in the exchanger room. The pipe connection is made with flanges outside the exchanger room. There are only two flanges: 1 for inlet, 1 for outlet. They can be located either on the length or on the width side of the cooling tower. It does not require anti-freeze protection: in case of electrical stop, the tower circuit automatically drains by gravity down to the basin, so that the customer circuit can freeze without damaging the plates and the gaskets.
Connection piece for chemical cleaning of the exchanger and blow down They are located on the exchanger piping.

Exchanger pump:

It is protection against freeze by a patented thermostatic valve: so there is no need for electrical tracing.

Pressure manometers:

Located before and after the pump and before the water distribution header.

Filters:

At the basin outlet, a 5mm strainer is installed. In addition, a centrifugal filter chosen in the same material as the piping (galvanized or stainless steel in option) is located at the plate exchanger inlet. It has the following characteristics:

- 100% of the tower volume is continuously filtrated every 1.2 minutes: high efficiency,
- automatic cleaning made during the blow down of the water circuit (Jacir patent).

The evaporative circuit remains clean and therefore decreases the risk of Legionella proliferation.

Electrical heater and lightening as options.

Plume suppression coil (option CRIM)

In standard, the header coil is in carbon steel, primer and epoxy coated. Two air valves secure the freezing matters.
The tubes are assembled in a triangular pitch, in copper. In option, they can be in stainless steel. The fins are in copper.

A monitored valve to adjust the water spray on the infill is associated to the plume coil.

As soon as ambient conditions are met, this system makes it possible to operate significant water savings by cooling the water in the dry mode, rather than spraying and evaporating it.

Sound attenuation (OPTION)

IB sound attenuation:

Sound attenuators at the air inlet: insulation of the fan(s) casing with strong self-supporting panels, double folded inwards, on the 4 sides of the panels.

Large doors for complete front access for maintenance. They are supplied with lockers activated by key. Sound attenuators at the air outlet: cone to reduce the acoustic surface.

ICV complete sound attenuation:

Housing of the fan(s) casing with self-supporting stiff panels, double folded outwards on the 4 sides. The internal side is coated with absorbent material; it includes sound baffles; those have a galvanised frame, high density rock wool, and are installed on sliding rails for easy disassembly. At the air inlet, the rock wool is protected by a fibre glass film. At the air outlet, the baffles are protected by a stainless-steel mesh.

ICVK complete sound attenuation with double casing:

The whole ICV tower is fitted with a second tower casing including high density rock wool : ICV-K.

Special NR 30 soundproofing:

It consists in an improvement of the ICVK solution, to reach NR 30 at 10 metres

OPTIONS

- Plate heat exchanger in stainless steel 316 or 316 TI.
- Plume suppression device: see CRIM series documentation.
- Panels in SS 304L or 316L.
- Electrical heater with thermostat.
- 2 speed motor (Dahlander 1500/ 750 rpm, or double wiring, or PAM 1500/ 1000 rpm).
- Stand-by motor, ready for connection.
- Frequency controller for motor control: energy savings.
- Make up by electrical water level switch (with electro valve en inlet filter).
- Automatic deconcentration by induction device; see Dai documentation.
- Polyester baked coating for all parts not in contact with water.
- All accessories in stainless steel (fan casing, impeller, coil support, flanges, pipes...).
- Outlet cone (for outlet air speed acceleration).
- Air inlet filter (fan adaptation + filter).
- Air pressure available for connection on casing.
- Electrical control panel,
- Equipment totally unassembled for site erection only,
- Site erection by skilled workers and supervisors,
- Vibration plots.
- A fan bearing lubrication line (made in Rilsan) is extended on the fan stack.

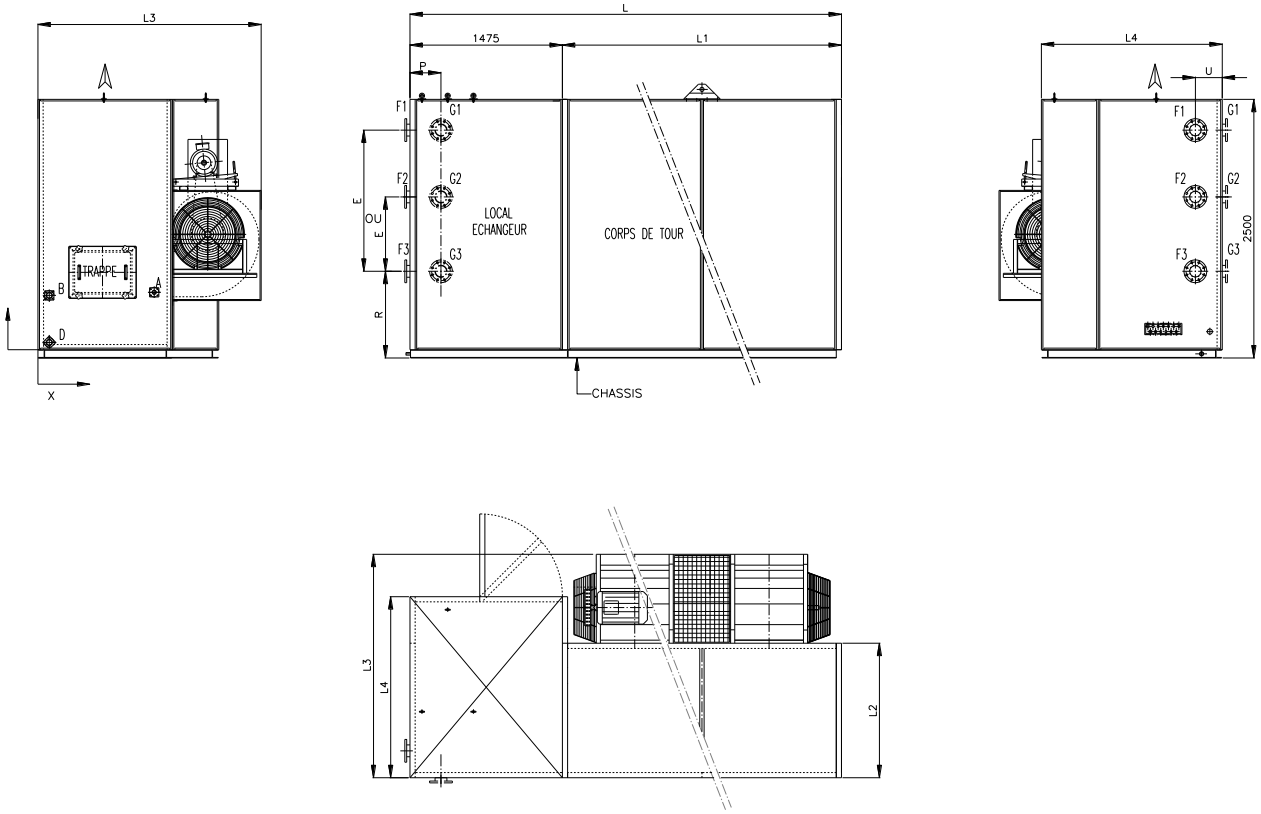
Technical characteristics CRF

CRF series	CLOSED TOWER WITHOUT SOUND ATTENUATION											
	Heat power ref. (1) [kW]	Fans qty type NDKL 560	Outlet air Average flow rate [m³/h]	Heat power [kW]	MFU power [kW]	Sound level (2) at 20 m [dBA]	Empty weight Small exch. room PH [kg]	Empty weight Large exch. room GH [kg]	Full weight Small exch. room PH [kg]	Full weight Large exch. room GH [kg]	Overall dimensions Small exch. room PH [mm]	Overall dimensions Large exch. room GH [mm]
CRF 1 HZ (15 to 47 m3/h)												
22	150	1	14 600	3	2,2	42	2150		3033		H = 2500	
30	175		16 400		3	44					L = 2875	
55	210		19 000		5,5	46					l = 2160	
GCRF 1 HZ (20 to 59 m3/h)												
55	220	1	23 600	3	5,5	47	2235		3307		H = 2500	
											L = 2875	
75	250		25 000		7,5	49					l = 2460	
CRF 2 HZ (30 to 94 m3/h)												
40	240	2	29 600	3	4	45	2597		4235		H = 2500	
75	285		33 200		7,5	47					L = 4175	
90	335		38 300		9	49					l = 2160	
GCRF 2 HZ (40 to 117 m3/h)												
110	435	2	47 200	3	11	50	2717		4733		H = 2500	
											L = 4175	
150	505		50 000		15	52					l = 2460	
CRF 3 HZ (45 to 140 m3/h)												
75	445	3	44 500	3	7,5	47	3152	3812	5545	6311	H = 2500	H = 2500
110	536		49 900		11	49					L = 5475	L = 5475
150	645		53 900		15	51					l = 2160	l = 2400
GCRF 3 HZ (58 to 175 m3/h)												
150	700	3	70 800	6	15	52	3268	3914	6227	6978	H = 2500	H = 2500
											L = 5475	L = 5475
150/75	770		75 000		15 + 7,5	54					l = 2460	l = 2460
CRF 4 HZ (60 to 190 m3/h)												
40 D	600	4	59 200	6	2 x 4	48		4193		7446		H = 2500
75 D	710		66 300		2 x 7,5	50						L = 6775
90 D	830		76 600		2 x 9	52						l = 2400
GCRF 4 HZ (78 to 235 m3/h)												
110 D	945	4	94 400	6	2 x 11	53		4396		8404		H = 2500
												L = 6775
150 D	1015		100 000		2 x 15	55						l = 2460
CRF 5 HZ (75 to 235 m3/h)												
75/40	745	5	74 000	6	7,5 + 4	49		4660		8668		H = 2500
110/75	890		83 000		11 + 7,5	51						L = 8075
150/90	1040		92 200		15 + 9	53						l = 2400
GCRF 5 HZ (100 to 295 m3/h)												
150/110	1155	5	118 000	6	15 + 11	54		4919		9871		H = 2500
												L = 8075
150/220	1290		125 000		15 + 22	56						l = 2460

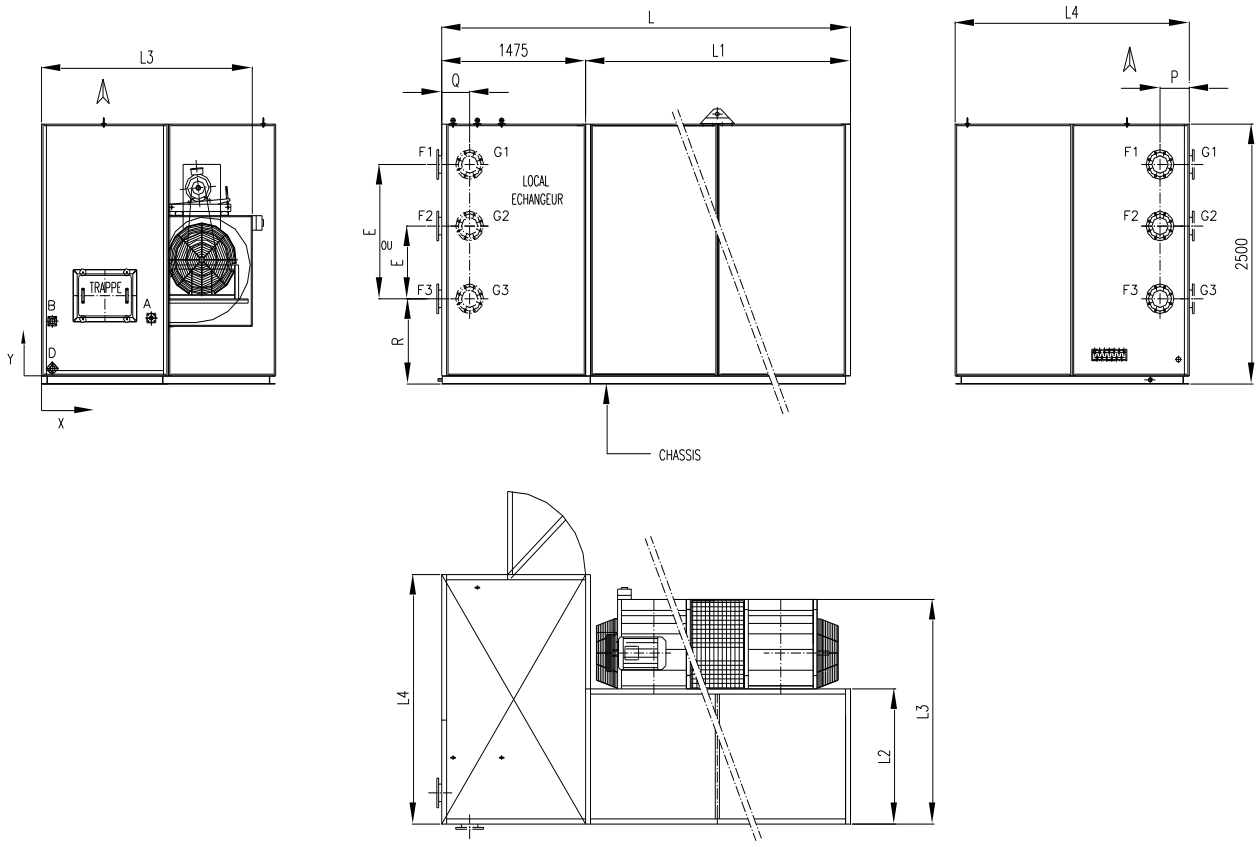
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side. (see KSF series)

Drawings and dimensions CRF

CRF small exchanger room PH – without sound attenuation



CRF large exchanger room GH – without sound attenuation



CRF series

Dimensions in mm

			CRF	GCRF	CRF	GCRF	CRF	GCRF	CRF	GCRF	CRF	GCRF
			1 HZ		2 HZ		3 HZ		4 HZ		5 HZ	
L = L1 + 1475			2875		4175		5475		6775		8075	
L 1			1400		2700		4000		5300		6600	
L 2			1300	1600	1300	1600	1300	1600	1300	1600	1300	1600
L 3 (without flanges)			2160	2460	2160	2460	PH 2160 / GH 2400	2460	2400	2460	2400	2460
L 4			1750						2400			
A	Solenoid valve and filters	Ø	3/4		1’		1’	1’1/4	1’1/4		1’1/4	
		DN	20		25		25	32	32			
	Floating valve (male)	Ø	3/4		1’	1’ 1/4	1’ 1/4		1’1/4		1’1/4	
		DN	20		25	32	32					
	Make up water	X	1125	1425	1125	1425	1125	1425	1125	1425	1125	1425
		Y	555									
B	overflow (female)	DN	50									
		X	110									
		Y	450									
C	Antifreeze resistance		Inside room									
D	Drain (female)	DN	50									
		X	110									
		Y	70									
E			719 or 1365						890 or 1292			
F	Water inlet	DN	100						150			
G	Water outlet	DN	100						150			
H	Thermostat (option): inside exch. room											
J	Safety lack of water (option):											
K	Low level (option): inside exch. room											
L	High level (option) : inside exch. room											
M			622,5						744,5			
Q			227						256			
R			778						806			

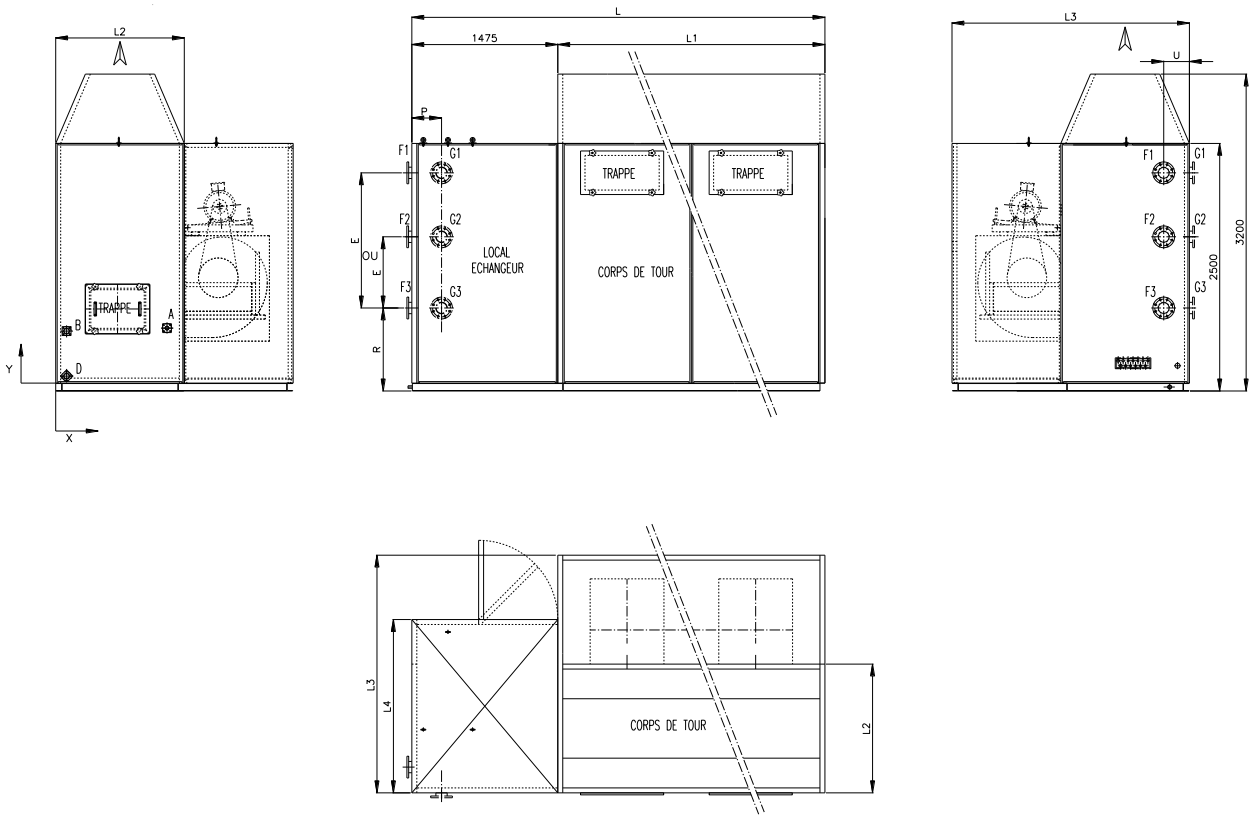
Technical characteristics CRF with IB sound attenuation

Type	CLOSED TOWER WITH IB SOUND ATTENUATION											
	Heat power ref. (1) [kW]	Fans qty type NDKL 560	Outlet air Average flow rate [m³/h]	Heat power [kW]	MFU power [kW]	Sound level (2) at 20 m [dBA]	Empty weight Small exch. room PH [kg]	Empty weight Large exch. room GH [kg]	Full weight Small exch. room PH [kg]	Full weight Large exch. room GH [kg]	Overall dimensions Small exch. room PH [mm]	Overall dimensions Large exch. room GH [mm]
CRF 1 HZ ..... IB (15 to 47 m3/h)												
22	150	1	14 600	3	2,2	39	2447		3330		H = 3200	
30	175		16 400		3	40					L = 2875	
55	210		19 000		5,5	42					I = 2400	
GCRF 1 HZ ..... IB (20 to 59 m3/h)												
55	220	1	23 600	3	5,5	42	2538		3610		H = 3200	
											L = 2875	
75	250		25 000		7,5	44					I = 2700	
CRF 2 HZ ..... IB (30 to 94 m3/h)												
40	220	1	23 600	3	5,5	42	2538		3610		H = 3200	
75											L = 2875	
90	250		25 000		7,5	44					I = 2700	
GCRF 2 HZ ..... IB (40 to 117 m3/h)												
110	220	1	23 600	3	5,5	42	2538		3610		H = 3200	
											L = 2875	
150	250		25 000		7,5	44					I = 2700	
CRF 3 HZ ..... IB (45 to 140 m3/h)												
75	445	3	44 500	3	7,5	42	3786	4451	6179	6949	H = 3200	H = 3200
110	536		49 900		11	44					L = 5475	L = 5475
150	645		53 900		15	46					I = 2400	I = 2400
GCRF 3 HZ ..... IB (58 to 175 m3/h)												
150	700	3	70 800	6	15	46	3909	4545	6868	7609	H = 3200	H = 3200
											L = 5475	L = 5475
150/75	770		75 000		15 + 7,5	48					I = 2700	I = 2700
CRF 4 HZ ..... IB (60 to 190 m3/h)												
40 D	600	4	59 200	6	2 x 4	43		4994		8247		H = 3200
75 D	710		66 300		2 x 7,5	45						L = 6775
90 D	830		76 600		2 x 9	47						I = 2400
GCRF 4 HZ ..... IB (78 to 235 m3/h)												
110 D	600 710	4	59 200 66 300	6	2 x 4 2 x 7,5	43 45		4994		8247		H = 3200 L = 6775
150 D	830		76 600		2 x 9	47						I = 2400
CRF 5 HZ ..... IB (75 to 235 m3/h)												
75/40	745	5	74 000	6	7,5 + 4	44		5639		9647		H = 3200
110/75	890		83 000		11 + 7,5	46						L = 8075
150/90	1040		92 200		15 + 9	48						I = 2400
GCRF 5 HZ ..... IB (100 to 295 m3/h)												
150/110	745 890	5	74 000 83 000	6	7,5 + 4 11 + 7,5	44 46		5639		9647		H = 3200 L = 8075
150/220	1040		92 200		15 + 9	48						I = 2400

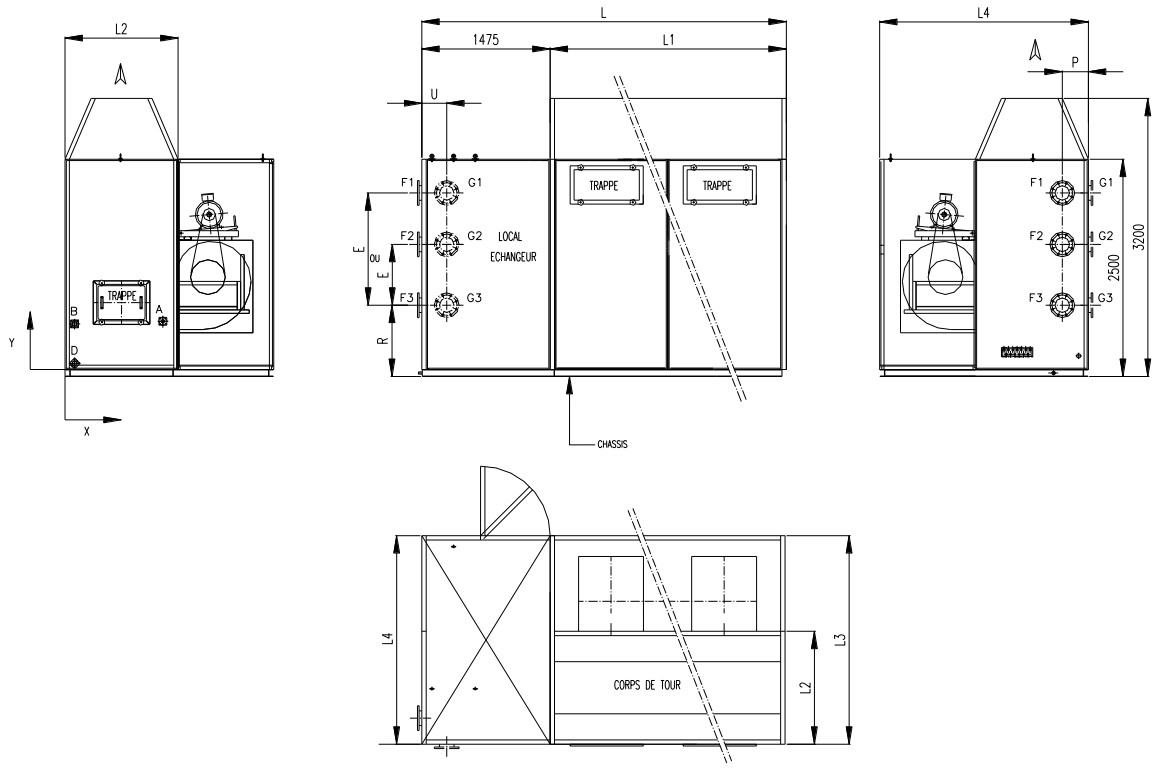
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side. (see KSF series)

Drawings and dimensions CRF with IB sound attenuation

CRF small exchanger room PH – IB sound attenuation



CRF large exchanger room GH –IB sound attenuation



Dimensions in mm

CRF series			CRF	GCRF	CRF	GCRF	CRF	GCRF	CRF	GCRF	CRF	GCRF
			1 HZ		2 HZ		3 HZ		4 HZ		5 HZ	
L = L1 + 1475			2875		4175		5475		6775		8075	
L 1			1400		2700		4000		5300		6600	
L 2			1300	1600	1300	1600	1300	1600	1300	1600	1300	1600
L 3 (without flanges)			2400	2700	2400	2700	2400	2700	2400	2700	2400	2700
L 4			1750						2400			
A	Solenoid valve and filters	Ø	3/4		1’		1’	1’1/4	1’1/4		1’1/4	
		DN	20		25		25	32	32			
	Floating valve (male)	Ø	3/4		1’	1’ 1/4	1’ 1/4		1’1/4		1’1/4	
		DN	20		25	32	32					
	Make up water	X	1125	1425	1125	1425	1125	1425	1125	1425	1125	1425
		Y	555									
B	overflow (female)	DN	50									
		X	110									
		Y	450									
C	Antifreeze resistance		Inside room									
D	Drain (female)	DN	50									
		X	110									
		Y	70									
E			719 ou 1365						890 ou 1292			
F	Water inlet	DN	100						150			
G	Water outlet	DN	100						150			
H	Thermostat (option): inside exch. room											
J	Safety lack of water (option):											
K	Low level (option): inside exch. room											
L	High level (option) : inside exch. room											
M			622,5						744,5			
Q			227						256			
R			778						806			

Technical characteristics CRF with ICV sound attenuation

Type	CLOSED TOWER WITH COMPLETE ICV SOUND ATTENUATION										
	Heat power ref. (1) [kW]	Fans qty type NDKL 560	Outlet air Average flow rate [m³/h]	Heat power [kW]	MFU power [kW]	Empty weight Small exch. room PH [kg]	Empty weight Large exch. room GH [kg]	Full weight Small exch. room PH [kg]	Full weight Large exch. room GH [kg]	Overall dimensions Small exch. room PH [mm]	Overall dimensions Large exch. room GH [mm]
CRF 1 HZ ..... ICV (15 to 47 m3/h)											
30	150	1	15 200	3	3	H = 4000	32	3249		4132	
40	175		17 500		4	L = 2875	34				
55	210		19 000		5,5	l = 2686	36				
CRF 2 HZ ..... ICV (130 to 94 m3/h)											
55	240	2	31 900	3	5,5	H = 4000	35	4145		5783	
90	285		35 500		9	L = 4175	37				
110	336		38 300		11	l = 2686	39				
CRF 3 HZ ..... ICV (45 to 140 m3/h)											
75	445	3	48 000	3	7,5	H = 4000	37	5084	5697	7477	8195
150	535		49 900		15	L = 5475	39				
185	615		53 900		18,5	l = 2686	41				
CRF 4 HZ ..... ICV (60 to 190 m3/h)											
55 D	595	4	63 800	6	2 x 5,5	H = 4000	38		6585		9838
90 D	710		70 900		2 x 9	L = 6775	40				
110 D	830		76 500		2 x 11	l = 2686	42				
CRF 5 HZ ..... ICV (75 to 235 m3/h)4											
75/55	745	5	79 800	6	7,5 + 5,5	H = 4000	39		7474		11 482
90/150	890		85 400		9 + 15	L = 8075	41				
110/185	1040		90 200		11 + 18,5	l = 2686	43				

(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side. (see KSF series)

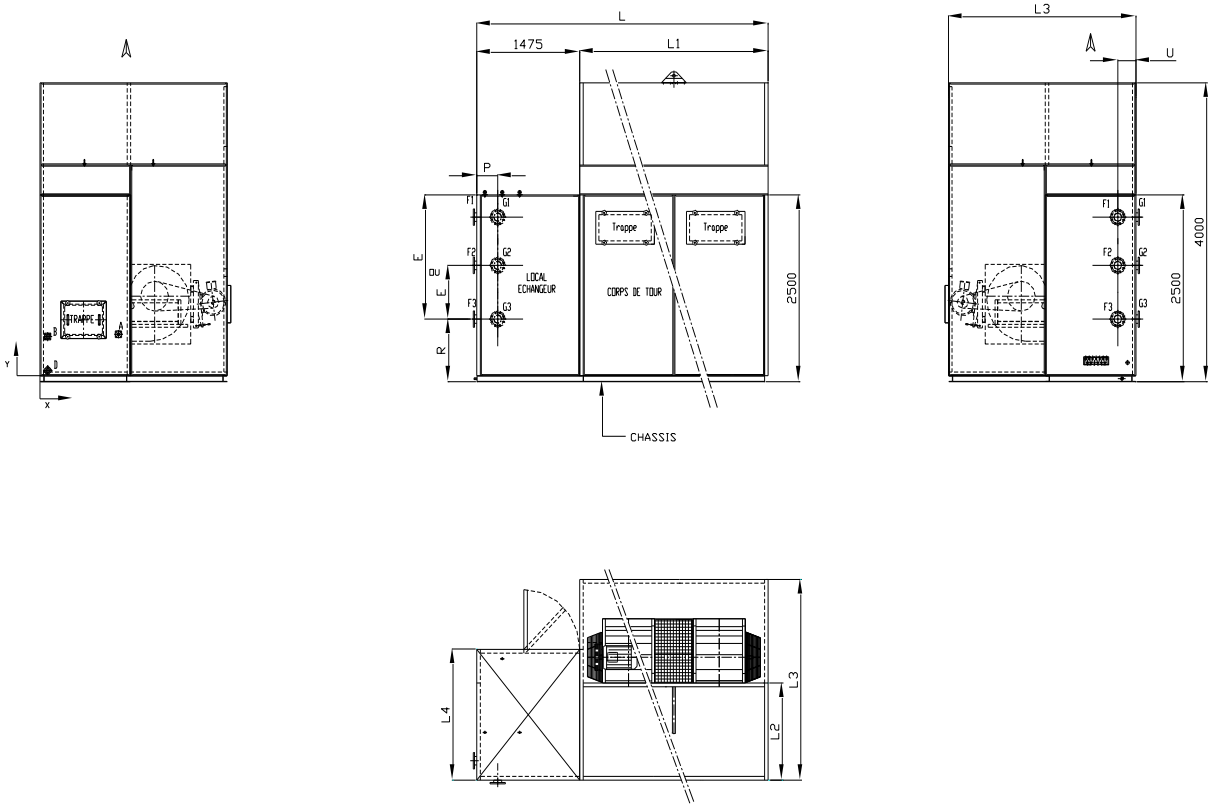
Technical characteristics CRF with ICVK and NR 30 sound attenuation

							COMPLETE SOUNDPROOFED ICVK					SOUNDPROOFED NR 30				
							TOWER CASING DOUBLING INCLUDED					SPECIAL- Sp SOUNDPROOFED				
Type	Heat power ref. (1) [kW]	Fans qty type NDKL 560	Outlet air Average flow rate [m³/h]	Heat power [kW]	MFU power [kW]	Overall dimensions [mm]	Sound level (2) at 20 m [dBA]	Empty weight Small exch. room PH [kg]	Empty weight Large exch. room GH [kg]	Full weight Small exch. room PH [kg]	Full weight Large exch. room GH [kg]	Sound level (2) at 20 m [dBA]	Empty weight Small exch. room PH [kg]	Empty weight Large exch. room GH [kg]	Full weight Small exch. room PH [kg]	Full weight Large exch. room GH [kg]
CRF 1 HZ (15 to 47 m3/h)							**ICVK**					**NR 30**				
30	150	1	15 200	3	3	H = 4000	NR 30	3653		4536		NR 30	3874		4757	
40	175		17 500		4	L = 2875	NR 30					NR 30				
55	210		19 000		5,5	I = 2686	31					NR 30				
CRF 2 HZ (30 to 94 m3/h)							**ICVK**					**NR 30**				
55	240	2	31 900	3	5,5	H = 4000	30	4672		6310		NR 30	4997		6635	
90	285		35 500		9	L = 4175	32					NR 30				
110	336		38 300		11	I = 2686	34					NR 30				
CRF 3 HZ (45 to 140 m3/h)							**ICVK**					**- Sp**				
75	445	3	48 000	3	7,5	H = 4000	32	5734	6238	8127	8736	NR 30	6164	6462	8557	8960
150	535		49 900		15	L = 5475	34					NR 30				
185	615		53 900		18.5	I = 2686	36					40				
CRF 4 HZ (60 to 190 m3/h)							**ICVK**					**- Sp**				
55 D	595	4	63 800	6	2 x 5,5	H = 4000	33		7212		10465	37		7471		10724
90 D	710		70 900		2 x 9	L = 6775	35					39				
110 D	830		76 500		2 x 11	I = 2686	37					41				
CRF 5 HZ (75 to 235 m3/h)							**ICVK**					**- Sp**				
75/55	745	5	79 800	6	7,5 + 5,5	H = 4000	34		8186		12194	38		8480		12488
90/150	890		85 400		9 + 15	L = 8075	36					40				
110/185	1040		92 200		11 +18.5	I = 2686	38					42				

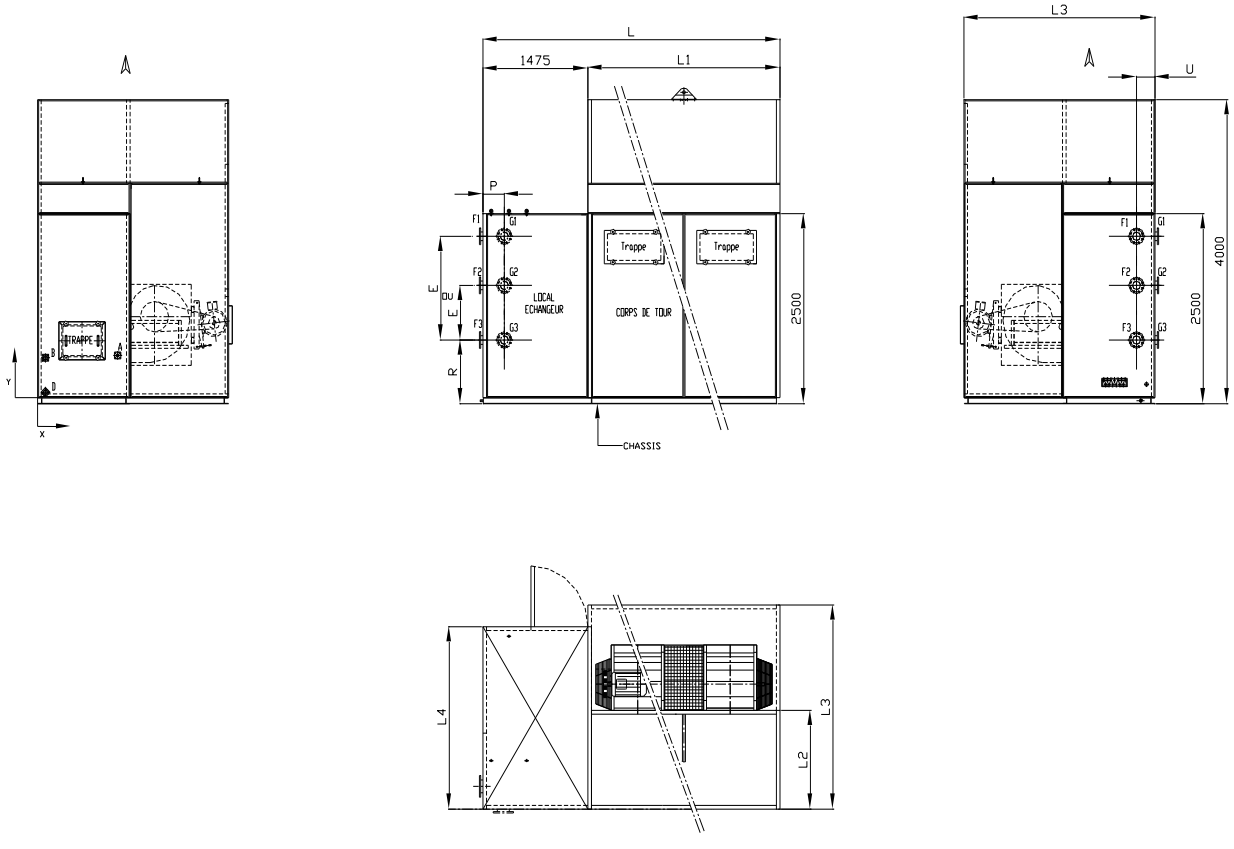
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side. (see KSF series)

Drawings and dimensions CRF ICV-ICVK-NR30 sound attenuation

CRF small exchanger room PH–ICV-K and NR30 sound attenuation



CRF large exchanger room GH –ICV-K and NR30 sound attenuation



CRF series

Dimensions in mm

			CRF 1 HZ	CRF 2 HZ	CRF 3 HZ	CRF 4 HZ	CRF 5 HZ
L			2875	4175	5475	6775	8075
L 1			1400	2700	4000	5300	6600
L 2			1300				
L 3 (without flanges)			2686				
L 4			1750			2400	
A	Solenoid valve and filters	Ø	3/4'	1’		1’1/4	
		DN	20	25		32	
	Floating valve (male)	Ø	3/4'	1’		1’ 1/4	
		DN	20	25		32	
	Make up water	X	1125			1425	
		Y	555				
B	overflow (female)	DN	50				
		X	110				
		Y	450				
C	Antifreeze resistance		Inside room				
D	Drain (female)	DN	50				
		X	110				
		Y	70				
E			719 ou 1365			890 ou 1292	
F	Water inlet	DN	100			150	
G	Water outlet	DN	100			150	
H	Thermostat (option): inside exch. room						
J	Safety lack of water (option):						
K	Low level (option): inside exch. room						
L	High level (option) : inside exch. room						
M			622,5			744,5	
Q			227			256	
R			778			806	

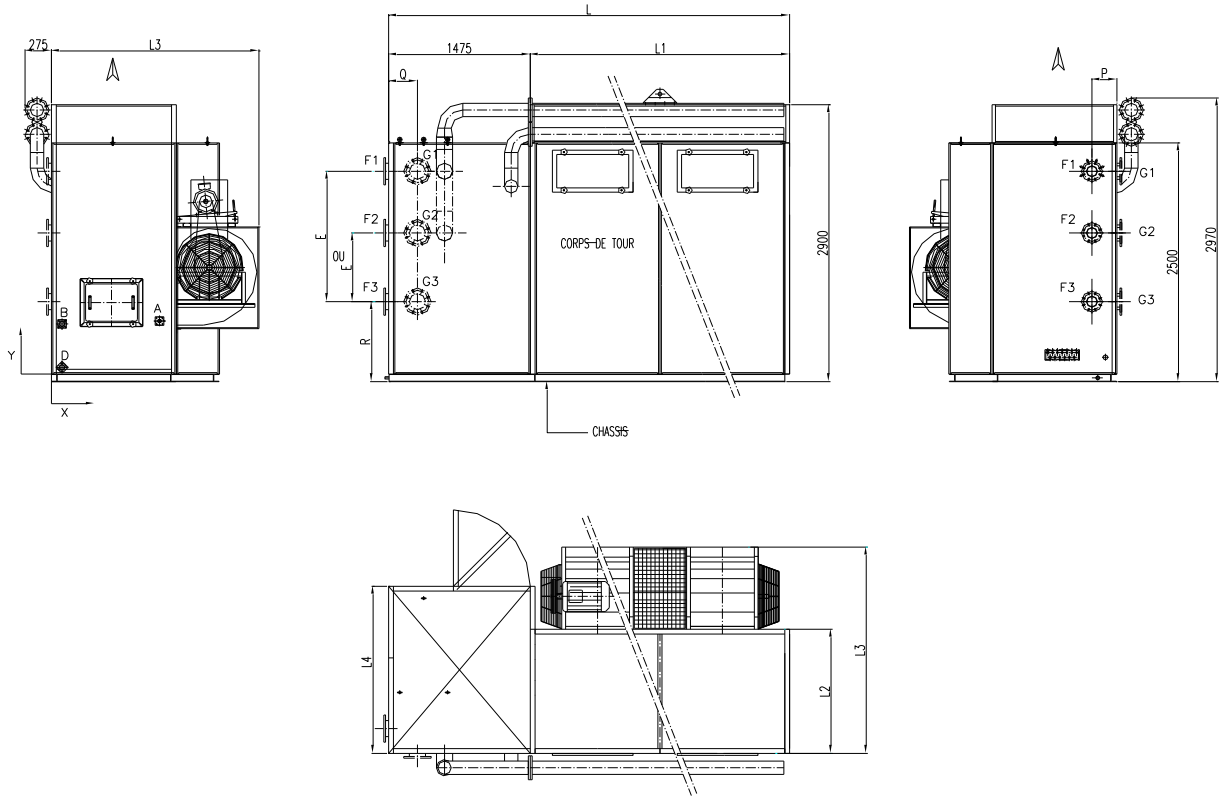
Technical characteristics CRIM

Type	CLOSED HYBRID TOWER WITHOUT SOUND ATTENUATION											
	Heat power ref. (1) [kW]	Fans qty type NDKL 560	Outlet air Average flow rate [m³/h]	Heat power [kW]	MFU power [kW]	Sound level (2) at 20 m [dBA]	Empty weight Small exch. room PH [kg]	Empty weight Large exch. room GH [kg]	Full weight Small exch. room PH [kg]	Full weight Large exch. room GH [kg]	Overall dimensions Small exch. room PH [mm]	Overall dimensions Large exch. room GH [mm]
CRIM 1 HZ (15 to 47 m3/h)												
22	150	1	14 600	3	2,2	42	2350		3303		H = 2900	
30	175		16 400		3	44					L = 2875	
55	210		19 000		5,5	46					l = 2160	
GCRIM 1 HZ (20 to 59 m3/h)												
55	220	1	23 600	3	5,5	47	2481		3632		H = 2900	
											L = 2875	
75	250		25 000		7,5	49					l = 2460	
CRIM 2 HZ (30 to 94 m3/h)												
40	240	2	29 600	3	4	45	2987		4745		H = 2900	
75	285		33 200		7,5	47					L = 4175	
90	335		38 300		9	49					l = 2160	
GCRIM 2 HZ (40 to 117 m3/h)												
110	435	2	47 200	3	11	50	3192		5358		H = 2900	
											L = 4175	
150	505		50 000		15	52					l = 2460	
CRIM 3 HZ (45 to 140 m3/h)												
75	445	3	44 500	3	7,5	47	3722	4382	6295	7061	H = 2900	H = 2900
110	536		49 900		11	49					L = 5475	L = 5475
150	645		53 900		15	51					l = 2160	l = 2400
GCRIM 3 HZ (58 to 175 m3/h)												
150	700	3	70 800	6	15	52	3972	4618	7157	7908	H = 2900	H = 2900
											L = 5475	L = 5475
150/75	770		75 000		15 + 7,5	54					l = 2460	l = 2460
CRIM 4 HZ (60 to 190 m3/h)												
40 D	600	4	59 200	6	2 x 4	48		4953		8446		H = 2900
75 D	710		66 300		2 x 7,5	50						L = 6775
90 D	830		76 600		2 x 9	52						l = 2400
GCRIM 4 HZ (78 to 235 m3/h)												
110 D	945	4	94 400	6	2 x 11	53		5331		9639		H = 2900
												L = 6775
150 D	1015		100 000		2 x 15	55						l = 2460
CRIM 5 HZ (75 to 235 m3/h)												
75/40	745	5	74 000	6	7,5 + 4	49		5605		9913		H = 2900
110/75	890		83 000		11 + 7,5	51						L = 8075
150/90	1040		92 200		15 + 9	53						l = 2400
GCRIM 5 HZ (100 to 295 m3/h)												
150/110	1155	5	118 000	6	15 + 11	54		6079		11401		H = 2900
												L = 8075
150/220	1290		125 000		15 + 22	56						l = 2460

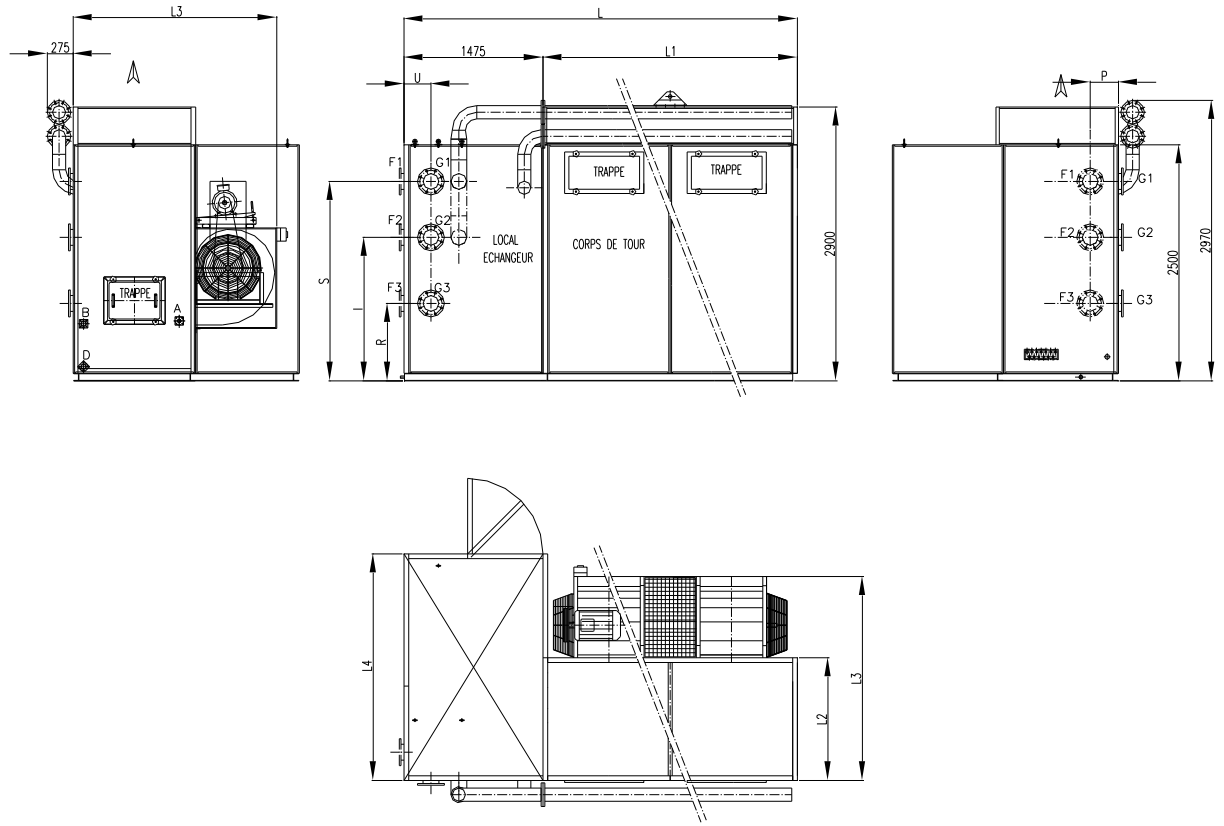
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 5 directions.
Note: for higher power, towers can be added side by side. (see KSFIM series)

Drawings and dimensions CRIM

CRIM small exchanger room PH – without sound attenuation



CRIM large exchanger room GH – without sound attenuation



CRIM series

Dimensions in mm

			CRIM	GCRIM	CRIM	GCRIM	CRIM	GCRIM	CRIM	GCRIM	CRIM	GCRIM
			1 HZ		2 HZ		3 HZ		4 HZ		5 HZ	
L = L1 + 1475			2875		4175		5475		6775		8075	
L 1			1400		2700		4000		5300		6600	
L 2			1300	1600	1300	1600	1300	1600	1300	1600	1300	1600
L 3 (hors brides)			2160	2460	2160	2460	PH 2160 / GH 2400	2460	2400	2460	2400	2460
L 4			1750						2400			
A	Solenoid valve and filters	Ø	3/4		1’		1’	1’1/4	1’1/4		1’1/4	
		DN	20		25		25	32	32			
	Floating valve (male)	Ø	3/4		1’	1’ 1/4	1’ 1/4		1’1/4		1’1/4	
		DN	20		25	32	32					
	Make up water	X	1125	1425	1125	1425	1125	1425	1125	1425	1125	1425
		Y	555									
B	overflow (female)	DN	50									
		X	110									
		Y	450									
C	Antifreeze resistance		Inside room									
D	Drain (female)	DN	50									
		X	110									
		Y	70									
E			719 or 1365						890 or 1292			
F	Water inlet	DN	100						150			
G	Water outlet	DN	100						150			
H	Thermostat (option): inside exch. room											
J	Safety lack of water (option):											
K	Low level (option): inside exch. room											
L	High level (option) : inside exch. room											
M			622,5						744,5			
Q			227						256			
R			778						806			

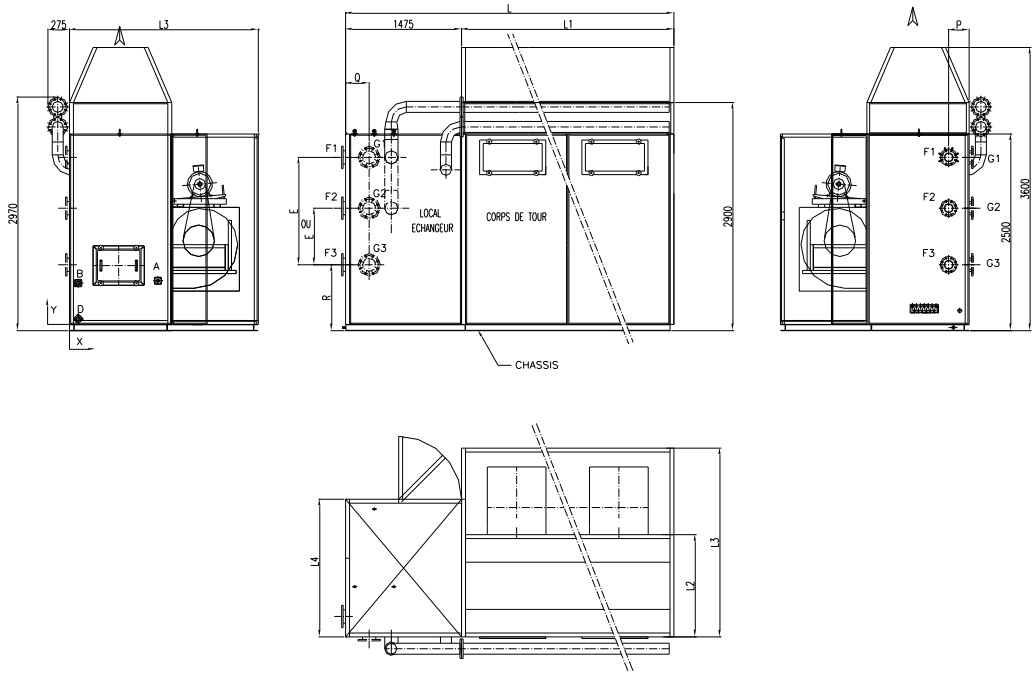
Technical characteristics CRIM with IB sound attenuation

Type	CLOSED TOWER WITH IB SOUND ATTENUATION											
	Heat power ref. (1) [kW]	Fans qty type NDKL 560	Outlet air Average flow rate [m^3/h]	Heat power [kW]	MFU power [kW]	Sound level (2) at 20 m [dBA]	Empty weight Small exch. room PH [kg]	Empty weight Large exch. room GH [kg]	Full weight Small exch. room PH [kg]	Full weight Large exch. room GH [kg]	Overall dimensions Small exch. room PH [mm]	Overall dimensions Large exch. room GH [mm]
CRIM 1 HZ ..... IB (15 to 47 m3/h)												
22	150	1	14 600	3	2,2	39	2647		3600		H = 3600	
30	175		16 400		3	40					L = 2875	
55	210		19 000		5,5	42					l = 2400	
GCRIM 1 HZ ..... IB (20 to 59 m3/h)												
55	220	1	23 600	3	5,5	42	2784		3935		H = 3600	
											L = 2875	
75	250		25 000		7,5	44					l = 2700	
CRIM 2 HZ ..... IB (30 to 94 m3/h)												
40	240	2	29 600	3	4	40	3444		5202		H = 3600	
75	285		33 200		7,5	42					L = 4175	
90	335		38 300		9	44					l = 2400	
GCRIM 2 HZ ..... IB (40 to 117 m3/h)												
110	435	2	47 200	3	11	44	3656		5822		H = 3600	
											L = 4175	
150	505		50 000		15	46					l = 2700	
CRIM 3 HZ ..... IB (45 to 140 m3/h)												
75	445	3	44 500	3	7,5	42	4356	5021	6929	7699	H = 3600	H = 3600
110	536		49 900		11	44					L = 5475	L = 5475
150	645		53 900		15	46					l = 2400	l = 2400
GCRIM 3 HZ ..... IB (58 to 175 m3/h)												
150	700	3	70 800	6	15	46	4613	5249	7798	8539	H = 3600	H = 3600
											L = 5475	L = 5475
150/75	770		75 000		15 + 7,5	48					l = 2700	l = 2700
CRIM 4 HZ ..... IB (60 to 190 m3/h)												
40 D	600	4	59 200	6	2 x 4	43		5754		9247		H = 3600
75 D	710		66 300		2 x 7,5	45						L = 6775
90 D	830		76 600		2 x 9	47						l = 2400
GCRIM 4 HZ ..... IB (78 to 235 m3/h)												
110 D	945	4	94 400	6	2 x 11	47		6124		10432		H = 3600
												L = 6775
150 D	1015		100 000		2 x 15	49						l = 2700
CRIM 5 HZ ..... IB (75 to 235 m3/h)												
75/40	745	5	74 000	6	7,5 + 4	44		6584		10892		H = 3600
110/75	890		83 000		11 + 7,5	46						L = 8075
150/90	1040		92 200		15 + 9	48						l = 2400
GCRIM 5 HZ ..... IB (100 to 295 m3/h)												
150/110	1155	5	118 000	6	15 + 11	48		7046		12368		H = 3600
												L = 8075
150/220	1290		125 000		15 + 22	50						l = 2700

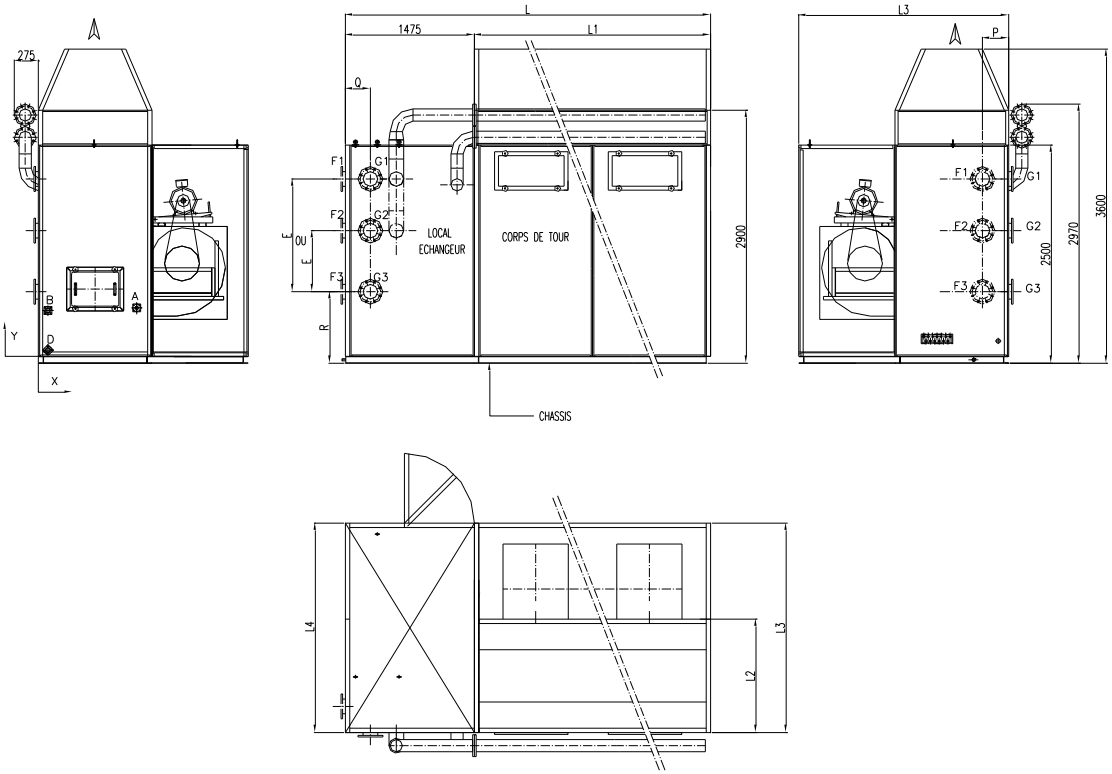
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 5 directions.
Note: for higher power, towers can be added side by side. (see KSFIM series)

Drawings and dimensions CRIM with IB sound attenuation

CRIM small exchanger room PH – with IB sound attenuation



CRIM small exchanger room GH – with IB sound attenuation



CRIM series			CRIM	GCRIM	CRIM	GCRIM	CRIM	GCRIM	CRIM	GCRIM	CRIM	GCRIM
Dimensions in mm			1 HZ		2 HZ		3 HZ		4 HZ		5 HZ	
L = L1 + 1475			2875		4175		5475		6775		8075	
L 1			1400		2700		4000		5300		6600	
L 2			1300	1600	1300	1600	1300	1600	1300	1600	1300	1600
L 3 (without flanges)			2400	2700	2400	2700	2400	2700	2400	2700	2400	2700
L 4			1750						2400			
A	Solenoid valve and filters	Ø	3/4		1’		1’	1’1/4	1’1/4		1’1/4	
		DN	20		25		25	32	32			
	Floating valve (male)	Ø	3/4		1’	1’ 1/4	1’ 1/4		1’1/4		1’1/4	
		DN	20		25	32	32					
	Make up water	X	1125	1425	1125	1425	1125	1425	1125	1425	1125	1425
		Y	555									
B	overflow (female)	DN	50									
		X	110									
		Y	450									
C	Antifreeze resistance		Inside room									
D	Drain (female)	DN	50									
		X	110									
		Y	70									
E			719 or 1365						890 or 1292			
F	Water inlet	DN	100						150			
G	Water outlet	DN	100						150			
H	Thermostat (option): inside exch. room											
J	Safety lack of water (option):											
K	Low level (option): inside exch. room											
L	High level (option) : inside exch. room											
M			622,5						744,5			
Q			227						256			
R			778						806			

Technical characteristics CRIM with ICV sound attenuation

Type	CLOSED TOWER WITH COMPLETE ICV SOUND ATTENUATION										
	Puissance de ref. (1) [kW]	Nombre de ventilateurs de type NDKL 560	Débit d'air moyen en sortie de tour [m³/h]	Puissance de RAG [kW]	Puissance moteur ventilateur [kW]	Dimension hors tout [mm]	Niveau sonore à 20m (2) [dBA]	Poids à vide Petit local PH [kg]	Poids à vide Grand local GH [kg]	Poids en eau Petit local PH [kg]	Poids en eau Grand local GH [kg]
CRIM 1 HZ ..... ICV (15 to 47 m3/h)											
30	150	1	15 200	3	3	H = 4000	32	3449		4402	
40	175		17 500		4	L = 2875	34				
55	210		19 000		5,5	l = 2686	36				
CRIM 2 HZ ..... ICV (130 to 94 m3/h)											
55	240	2	31 900	3	5,5	H = 4000	35	4535		6293	
90	285		35 500		9	L = 4175	37				
110	336		38 300		11	l = 2686	39				
CRIM 3 HZ ..... ICV (45 to 140 m3/h)											
75	445	3	48 000	3	7,5	H = 4000	37	5654	6267	8227	8945
150	535		49 900		15	L = 5475	39				
185	615		53 900		18.5	l = 2686	41				
CRIM 4 HZ ..... ICV (60 to 190 m3/h)											
55 D	595	4	63 800	6	2 x 5,5	H = 4000	38		7345		10838
90 D	710		70 900		2 x 9	L = 6775	40				
110 D	830		76 500		2 x 11	l = 2686	42				
CRIM 5 HZ ..... ICV (75 to 235 m3/h)4											
75/55	745	5	79 800	6	7,5 + 5,5	H = 4000	39		8419		12727
90/150	890		85 400		9 + 15	L = 8075	41				
110/185	1040		92 200		11 +18.5	l = 2686	43				

(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 5 directions.
Note: for higher power, towers can be added side by side. (see KSFIM series)

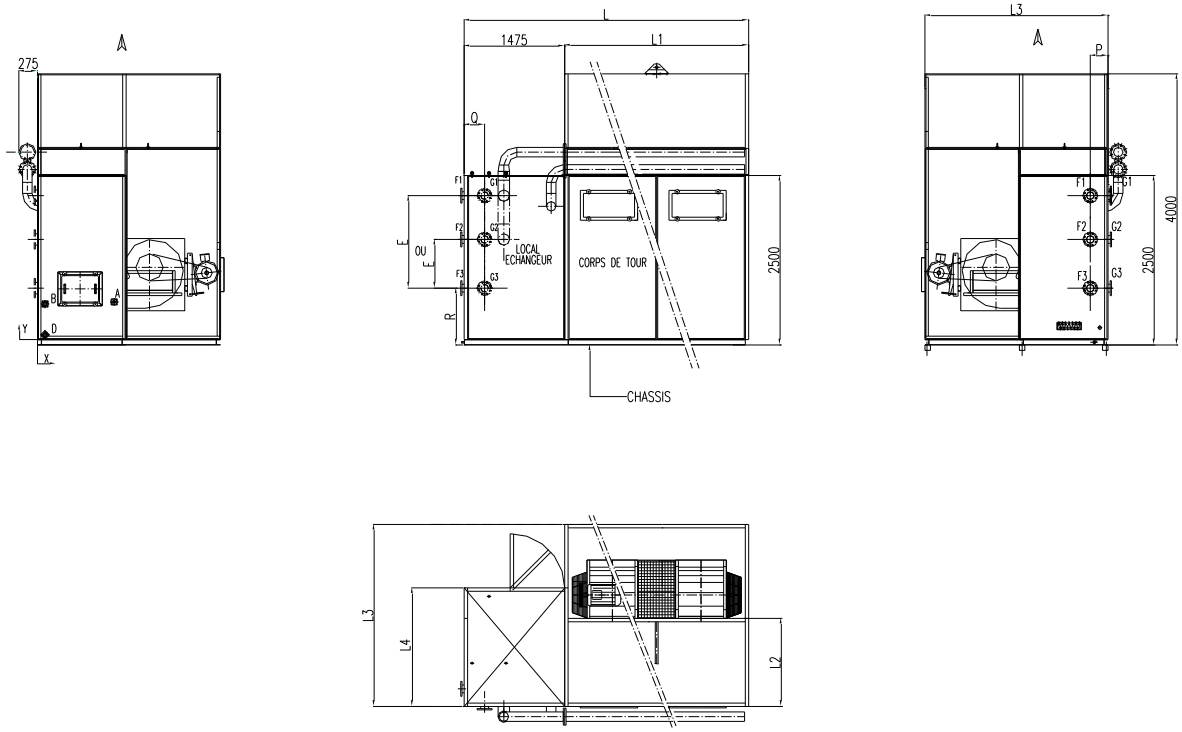
Technical characteristics CRIM with ICVK and NR 30 sound attenuation

							INSONORISATION COMPLETE ICVK					INSONORISATION NR 30				
							DOUBLAGE CORPS DE TOUR INCLUS					INSONORISATION SPECIALE-Sp				
Type	Puissance de ref. (1) [kW]	Nombre de ventilateurs de type NDKL 560	Débit d'air moyen en sortie de tour [m3/h]	Puissance de RAG [kW]	Puissance moteur ventilateur [kW]	Dimension hors tout [mm]	Niveau sonore à 20m (2) [dBA]	Poids à vide Petit local PH [kg]	Poids à vide Grand local GH [kg]	Poids en eau Petit local PH [kg]	Poids en eau Grand local GH [kg]	Niveau sonore à 20m (2) [dBA]	Poids à vide Petit local PH [kg]	Poids à vide Grand local GH [kg]	Poids en eau Petit local PH [kg]	Poids en eau Grand local GH [kg]
CRF 1 HZ (15 to 47 m3/h)							**ICVK**					**NR 30**				
30	150	1	15 200	3	3	H = 4000	NR 30	3853		4806		NR 30	4074		5027	
40	175		17 500		4	L = 2875	NR 30					NR 30				
55	210		19 000		5,5	l = 2686	31					NR 30				
CRF 2 HZ (30 to 94 m3/h)							**ICVK**					**NR 30**				
55	240	2	31 900	3	5,5	H = 4000	30	5062		6820		NR 30	5387		7145	
90	285		35 500		9	L = 4175	32					NR 30				
110	336		38 300		11	l = 2686	34					NR 30				
CRF 3 HZ (45 to 140 m3/h)							**ICVK**					**- Sp**				
75	445	3	48 000	3	7,5	H = 4000	32	6304	6808	8877	9486	NR 30	6734	7032	9307	9710
150	535		49 900		15	L = 5475	34					NR 30				
185	615		53 900		18.5	l = 2686	36					40				
CRF 4 HZ (60 to 190 m3/h)							**ICVK**					**- Sp**				
55 D	595	4	63 800	6	2 x 5,5	H = 4000	33		7972		11465	37		8231		11724
90 D	710		70 900		2 x 9	L = 6775	35					39				
110 D	830		76 500		2 x 11	l = 2686	37					41				
CRF 5 HZ (75 to 235 m3/h)							**ICVK**					**- Sp**				
75/55	745	5	79 800	6	7,5 + 5,5	H = 4000	34		9131		13439	38		9425		13733
90/150	890		85 400		9 + 15	L = 8075	36					40				
110/185	1040		92 200		11 +18.5	l = 2686	38					42				

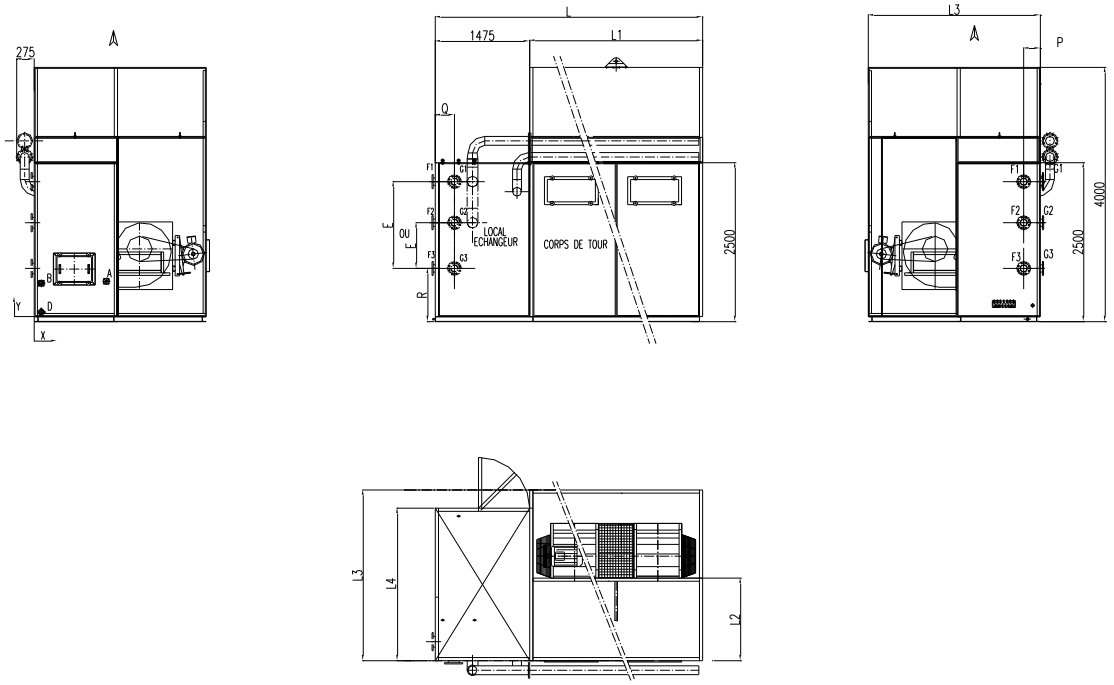
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 5 directions.
Note: for higher power, towers can be added side by side. (see KSFIM series)

Drawings and dimensions CRIM with ICV – ICVK - NR30 sound attenuation

CRIM small room PH –ICV-K or NR30 sound attenuation



CRIM large rool GH – ICV-K or NR30 sound attenuation



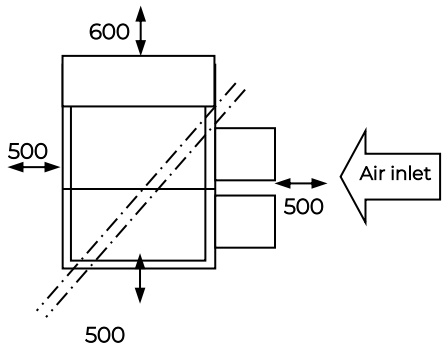
Dimensions in mm	CRIM series		CRIM 1 HZ	CRIM 2 HZ	CRIM 3 HZ	CRIM 4 HZ	CRIM 5 HZ
L			2875	4175	5475	6775	8075
L 1			1400	2700	4000	5300	6600
L 2			1300				
L 3 (hors brides)			2686				
L 4			1750			2400	
A	Solenoid valve and filters	Ø	3/4'	1'		1'1/4	
		DN	20	25		32	
	Floating valve (male)	Ø	3/4'	1'	1' 1/4		
		DN	20	25	32		
	Make up water	X	1125			1425	
		Y	555				
B	overflow (female)	DN	50				
		X	110				
		Y	450				
C	Antifreeze resistance		Inside room				
D	Drain (female)	DN	50				
		X	110				
		Y	70				
E			719 or 1365			890 or 1292	
F	Water inlet	DN	100			150	
G	Water outlet	DN	100			150	
H	Thermostat (option): inside exch. room						
J	Safety lack of water (option):						
K	Low level (option): inside exch. room						
L	High level (option) : inside exch. room						
M			622,5			744,5	
Q			227			256	
R			778			806	

Choice of location CRF-CRIM

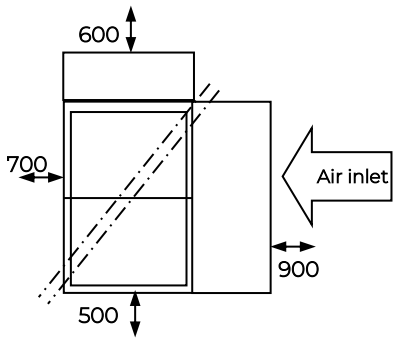
The cooling tower should not be located beside walls on the 4 sides, equal of higher than the tower itself. In addition, the walls should have openings.
The outlet air, hot and saturated with water can be recycled to the air inlet, and therefore the performance of the cooling tower would be decreased.
In any case, please consider minimum distance between the tower and the walls on the 4 sides in order to secure the designed air flow to the fan, and to ease installation and maintenance.
Would these rules not be considered; the cooling tower performance would be affected.

Minimum distance in mm for standard cooling towers: top views

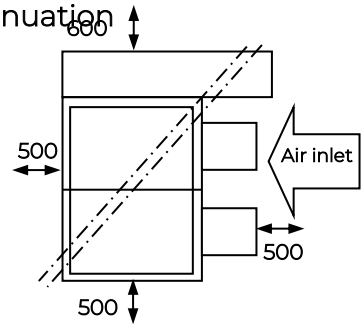
Tower without sound attenuation and small room attenuation & small room



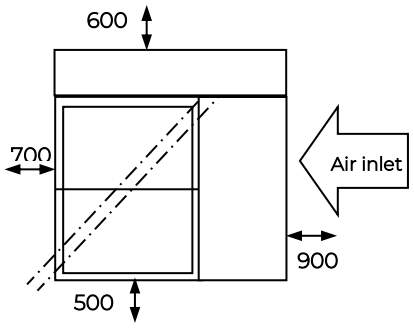
Tower with IB or ICVK sound



Tower without sound attenuation and large room attenuation



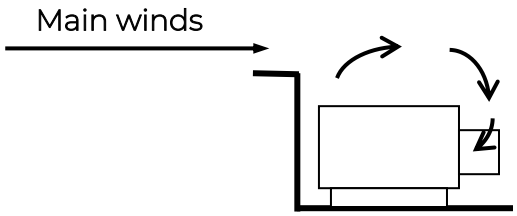
Tower with IB or ICVK sound



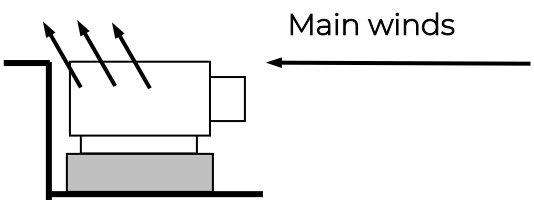
Do not hesitate to contact us for advice

Examples of implantation :

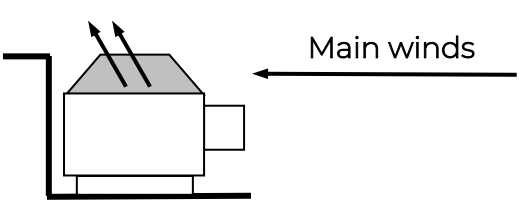
NO



YES



Install a support to up the air outlet



Intall an exhaust cone to up the air outlet

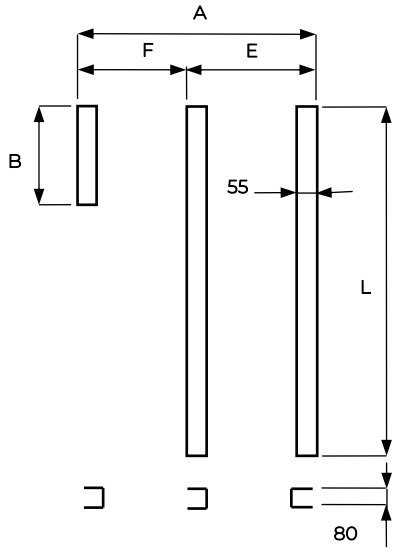
Support CRF-CRIM

Our closed loop cooling towers are delivered on a steel frame. Make sure the ground where the towers will be installed can stand the weight of the unit, and that the supports are properly aligned. Vibration plots can be provided as an option.

Arrangement of cooling tower support (steel or concrete beams)

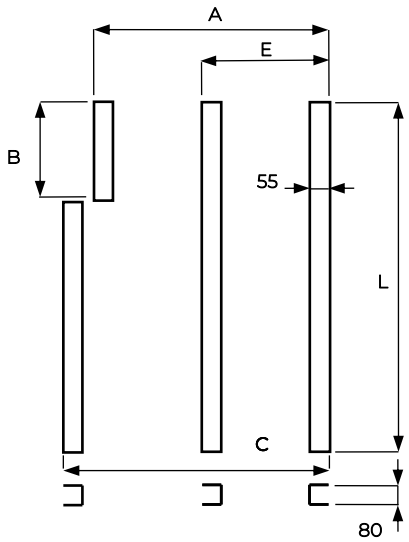
CRF series without sound attenuation

	Number of supports	Length L [mm]	Width A [mm]	Space between supports under basin E [mm]	B [mm]	F [mm]
CRF 1HZ	3	2870	1750	1300	1470	450
GCRF 1HZ				1600		150
CRF 2HZ		4170		1300		450
GCRF 2HZ				1600		150
CRF 3HZ		5470		1300		450
GCRF 3HZ				1600		150
CRF 4HZ		6770	2400	1300		1100
GCRF 4HZ				1600		800
CRF 5HZ		8070		1300		1100
GCRF 5HZ				1600		800



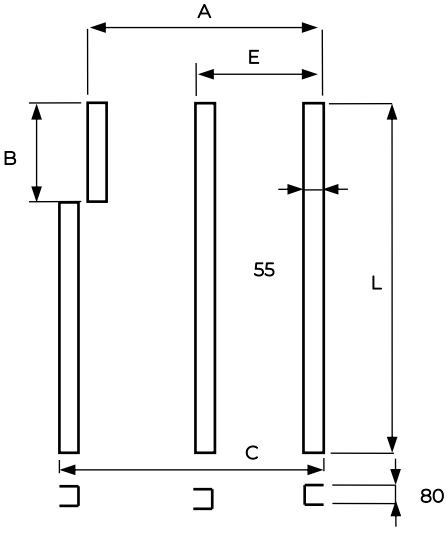
CRF Serie with IB sound attenuation

	Number of supports	Length L [mm]	Width A [mm]	Space between supports under basin E [mm]	B [mm]	F [mm]
CRF 1HZ	4	2870	1750	1300	1470	2400
GCRF 1HZ				1600		2700
CRF 2HZ		4170		1300		2400
GCRF 2HZ				1600		2700
CRF 3HZ		547		1300		2400
GCRF 3HZ				1600		2700
CRF 4HZ		6770	2400	1300		2400
GCRF 4HZ				1600		2700
CRF 5HZ		8070		1300		2400
GCRF 5HZ				1600		2700



CRF Series with ICV – ICVK and NR 30sound attenuation

	Number of supports	Length L [mm]	Width A [mm]	Space between supports under basin E [mm]	B [mm]	F [mm]
CRF 1HZ	4	2870	1750	1300	1470	2700
CRF 2HZ		4170				
CRF 3HZ		5470				
CRF 4HZ		6670	2400			
CRF 5HZ		8070				



WATER EVAPORATION

The water consumption by evaporation is approximately 1.7 kg/h for 1000 kcal/h evacuated.

DECONCENTRATION

Because of the evaporation and of the recycling of water, the salts and solids concentrate in the remaining water. To avoid the concentration, it is necessary to drain.
Without draining, the concentration rate could reach 10, 100 or even 1000 after time.
For the pre-sizing of installations, consider twice the value of the evaporation : rate = 2. This rate can be improved with the proper water treatment and with the use of stainless steel tower very resistant to aggressive chemical cleaning. Then the rate could be 3 to 5, so drain and so water savings.

According to the situation, 3 solutions can be chosen:

1- Continuous drain:
Connection piece at the pump outlet, just before the cooling tower, preferably at the same level as the water distribution system, so that the drain in made only when the pump is in operation.
The pump flow rate can be calculated with the following formula: [100 S / (M - S)] % of the flow rate with:
S : salt content in the make up water.
M : maximum admissible salt content in the re-circulating water.

Example :
S = salt content in the make up water : TH 20°
M = maximum allowed salt content : TH 40 °.
100X 20/ (40-20) = 100 % of the make up flow rate.
So the continuous drain should be equal to the evaporated water flow rate (rate = 2). Therefore, the actual water make up is twice the evaporation flow rate.

2- Uncontinuous drain:
According to the water make up, the installation is drained through electro valve, set by the impulsion meter.

3- Automatic deconcentration by induction (JACIR made)
Maintenance free. An electro valve is monitored by conductivity meter. The valve opens until the water reaches the right concentration rate.

WATER TREATMENT

In order to secure the right operation of a closed cooling circuit, the good water quality is essential.
If the solid content is high, it is recommended to foresee a filtration for 5 to 10 % of the recirculated water flow.
If the salt content, or aggressive chemical content are high, there must be a water treatment of the make up water, to reach soft and neutral water for safe cooling.
In some cases algae, fungus, shells can grow. Please procure regularly chemicals to prevent the growth of these bodies.

The water treatment should be carried out by a specialist.
LEGIONELLA PREVENTION (see separate document).

Evaporative cooling tower, closed loop, high efficiency, modular, with forced centrifugal fans Jacir made CRF type....., designed for a glycol free operation during freezing period.

The system should be with a double exchange: a direct exchange air/ water, counter flow type, and an exchange water/ water, counter flow type.

The cooling tower is designed and delivered by the supplier, totally assembled on frame, exchanger, pump and technical accessories gathered in a same technical area with access door.

Thermal data

The power to be evacuated is .....kW, inlet temperature: ...°C, down to ... °C, with a wet bulb at the air inlet :.....°C.

Acoustic data

The sound pressure level should not be higher than .....dB(A) at .....meters, in all 4 directions in free line. Therefore, the cooling tower should include the following component:

1 –IB attenuation: Sound attenuators at the air inlet and at the air outlet,

2 –ICV / ICVK type or special type:
sound baffles at air inlet and air outlet, and eventually coupled with fan casing insulation with high density rock wool, up to NR30 at 10m.

Casing and inclined basin

Made of self-supporting steel panels, with double fold on the 4 sides. The side panels are designed to be insulated later on, to reduce the sound pressure. They are assembled by high torque waterproof stainless-steel rivets.

The basin is fitted with an access door, a floating valve easy to set, a drain, an overflow and anti-cavitation strainer in stainless steel and PEHD. There are no welds on the parts in contact with the water. A special elastomer joint secures a perfect tightness.

Fans

The low-pressure centrifugal fan (s) with double inlets and front wards blades are located outside the basin, out of the air flow, at man height; so, the access is very easy for the maintenance and the disassembly.

The impeller (s) is (are) baked epoxy painted. The volute is made of X-STEEL stainless steel. As an option, the impeller can be made of stainless steel. Each fan will be coupled to its own motor.
The impeller is coupled on large diameter shaft; two turbines maximum are coupled on a same shaft. In the case of 3 fans for the same motor, the coupling of the third fan to the shaft of the first 2 fans is flexible. Bearings are self-aligned.

Motor(s) and coupling

The motor(s) are closed and ventilated casing type, with a power of .....kW, ...rpm, IP 55 protected, class F. The coupling is secured by several trapezoidal belts, 150 % of the nominal power sized.

Water distribution

The nozzles are made of Polypropylene. They can be removed easily, and include and internal turbulator for an optimised distribution, and can stand very large flow rate fluctuation.

Access for maintenance

If sound attenuators, plume suppression coil, or outlet duct are installed, a large access door (740 X 390mm) is provided, to visit and access easily to drift eliminators, nozzles, water distribution pipes and exchange surface. Another access door is located on the basin: 540 X 390mm.

Tower casing

There is no weld on parts in contact with water. An elastomer joint secures the tightness. The tower is made of:

- 2mm thick galvanised steel panels folded twice on the 4 sides, Zendzimir 275 gr/ m2, plus ZINCALU painting as finish, after the assembly or,
- Stainless steel 304L or 316L folded 4 times the 4 sides, for a longer lasting, a better resistance to aggressive chemical and mechanical cleaning,
- and higher Galvanised steel + EPOXY baked painting on all parts not in contact with the water.

AIR-WATER DIRECT EXCHANGE: USER CIRCUIT

The exchange surface is made of high-density polyethylene welded wire, with a surface of 280 m2/ m3. It can easily be removed and is resistant to temperature up to 75 °C in standard. It is built in vertical channels with low pressure drop. These parts remain flexible, uncracked, and can stand strong high-pressure spray for cleaning. (100 bars); they can be twisted for cleaning.
The exchange surface is located in the self-supporting galvanised structure, with double fold and the 4 sides 20/10thmm thick. The water nozzles in polypropylene include a turbulator for optimized water distribution and can easily be removed, as well as the PP drift eliminators.
The utilities panels include: overflow, drain, water make up.

WATER – WATER EXCHANGE: USER CIRCUIT

A plate heat exchanger made of stainless steel is provided; it is necessarily protected by a self-supporting galvanised structure in standard 15/10th minimum, including a door: 2100mm X 600mm and removable panels. The design is all maintenance oriented.
The pipe connection is made with flanges outside the exchanger room. There are only 2 flanges: 1 for the inlet, 1 for the outlet. They can be located either on the length or on the width side of the cooling tower.

Filters and connections

A stainless-steel strainer and a centrifugal filter with automatic cleaning secure the proper water filtration before the inlet to the plate heat exchanger (if DAi option chosen). The water circulation in the system is secured by monobloc pump. This pump is protected against freezing by a thermostatic valve. All the connection pipes are hot dip galvanised or in option in stainless steel. As option, a low-level switch avoids the start of the pump and protect the water heaters if any.

Pressure manometers are located before and after the pump, and before the water distribution header. They secure a constant control of the system. A deconcentration pipe with setting valve is provided; electro valve optional. Ideally located accesses in the pipe are provided for easy chemical cleaning, with disassembly. As standard, flanges are made of galvanised steel whatever diameter and tower casing material. Overflow is made of PP.

Automatic Inductive Deconcentration (DAI)

Installed as an option (see separate documentation).

Technical prescription CRIM

Evaporative cooling tower, closed loop, high efficiency, modular, with forced centrifugal fans Jacir made, CRIM ....., designed for a glycol free operation during freezing period.

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Thermal data

The power to be evacuated is .....kW, inlet temperature: ...°C, down to ... °C, with a wet bulb at the air inlet :.....°C.

Acoustic data

The sound pressure level should not be higher than .....dB(A) at .....meters, in all 4 directions in free line. Therefore, the cooling tower should include the following component:

1 –IB attenuation: Sound attenuators at the air inlet and at the air outlet, and a discharge cone lined with acoustic foam,

2 –ICV / ICVK type or special type:
sound baffles at air inlet and air outlet, and eventually coupled with fan casing insulation with high density rock wool, up to NR30 at 10m

Plume suppression coil

In standard, the header coil is in carbon steel, primer and epoxy coated. Two air valves secure the freezing matters. The tubes are assembled in a triangular pitch, in copper. The fins are in aluminium epoxy coated.

A monitored valve to adjust the water spray on the infill is associated to the plume coil. This modulating by-pass valve has a nodular cast iron body and a stainless-steel pavilion, elastomer seal.

Casing and inclined basin

Made of self-supporting steel panels, with double fold on the 4 sides. The side panels are designed to be insulated later on, to reduce the sound pressure. They are assembled by high torque waterproof stainless-steel rivets.

The basin is fitted with an access door, a floating valve easy to set, a drain, an overflow and anti-cavitation strainer in stainless steel and PEHD. There are no welds on the parts in contact with the water. A special elastomer joint secures a perfect tightness.

Fans

The low-pressure centrifugal fan (s) with double inlets and front wards blades are located outside the basin, out of the air flow, at man height; so, the access is very easy for the maintenance and the disassembly.

The impeller (s) is (are) baked epoxy painted. The volute is made of X-STEEL stainless steel. As an option, the impeller can be made of stainless steel. Each fan will be coupled to its own motor. The impeller is coupled on large diameter shaft; two turbines maximum are coupled on a same shaft. In the case of 3 fans for the same motor, the coupling of the third fan to the shaft of the first 2 fans is flexible. Bearings are self-aligned.

Motor(s) and coupling

The motor(s) are closed and ventilated casing type, with a power of .....kW, ...rpm, IP 55 protected, class F. The coupling is secured by several trapezoidal belts, 150 % of the nominal power sized.

Water distribution

The nozzles are made of Polypropylene. They can be removed easily, and include and internal turbulator for an optimised distribution, and can stand very large flow rate fluctuation.

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If sound attenuators, plume suppression coil, or outlet duct are installed, a large access door (740 X 390mm) is provided, to visit and access easily to drift eliminators, nozzles, water distribution pipes and exchange surface. Another access door is located on the basin: 540 X 390mm.

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- Stainless steel 304L or 316L folded 4 times the 4 sides, for a longer lasting, a better resistance to aggressive chemical and mechanical cleaning,
- and higher Galvanised steel + EPOXY baked painting on all parts not in contact with the water.

AIR-WATER DIRECT EXCHANGE: USER CIRCUIT

The exchange surface is made of high-density polyethylene welded wire, with a surface of 280 m2/ m3. It can easily be removed and is resistant to temperature up to 75 °C in standard. It is built in vertical channels with low pressure drop. These parts remain flexible, uncracked, and can stand strong high-pressure spray for cleaning. (100 bars); they can be twisted for cleaning.
The exchange surface is located in the self-supporting galvanised structure, with double fold and the 4 sides 20/10thmm thick. The water nozzles in polypropylene include a turbulator for optimized water distribution and can easily be removed, as well as the PP drift eliminators.
The utilities panels include: overflow, drain, water make up.

WATER – WATER EXCHANGE: USER CIRCUIT

A plate heat exchanger made of stainless steel is provided; it is protected by a self-supporting galvanised structure in standard 15/10th minimum, including a door (2100mm X 600mm) and removable panels. The design ease maintenance.
The pipe connection is made with flanges outside the exchanger room. There are only 2 flanges: 1 for the inlet, 1 for the outlet. They can be located either on the length or on the width side of the cooling tower.

Filters and connections

A stainless-steel strainer and a centrifugal filter with automatic cleaning secure the proper water filtration before the inlet to the plate heat exchanger (if DAi option chosen). The water circulation in the system is secured by monobloc pump. This pump is protected against freezing by a thermostatic valve. All the connection pipes are hot dip galvanised or in option in stainless steel. As option, a low-level switch avoids the start of the pump and protect the water heaters if any.

Pressure manometers are located before and after the pump, and before the water distribution header. They secure a constant control of the system. A deconcentration pipe with setting valve is provided; electro valve optional.
Ideally located accesses in the pipe are provided for easy chemical cleaning, with disassembly.

As standard, flanges are made of galvanised steel whatever diameter and tower casing material. Overflow is made of PP.

Automatic Inductive Deconcentration (DAI)

Installed as an option (see separate documentation).

JACIR
Cooling for life

KH

Open cooling tower forced draft axial fan

Flow rates from 70 to 660 m³/h

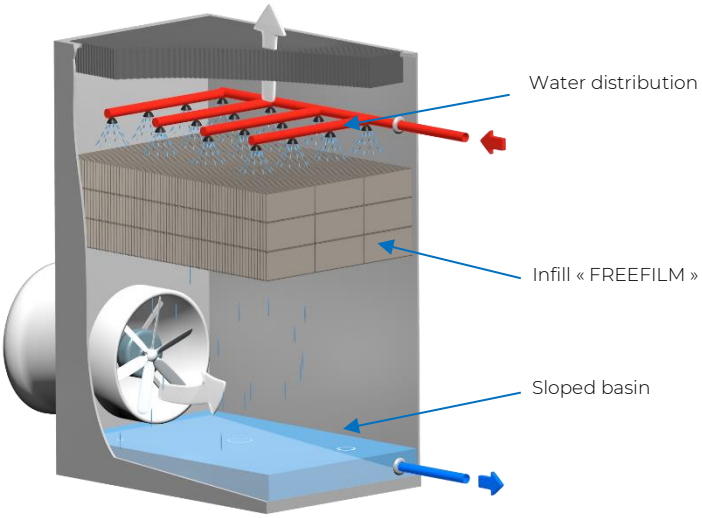
- FREEFILM : industrial infill
- Mechanical robustness
- Standard compliance
- Hygienic maintenance
- Reliability

Commercial Documentation

MADE IN FRANCE

La FRENCH FAB

Forced draft axial open cooling tower: KH



Casing structure

All the galvanized steel cooling tower panels casing have been twice or 4 times folded over the 4 sides, also proposed in SILVER-STEEL or X-STEEL stainless steel as an option (corrosion resistance higher than 316L). The water tightness between the panels is ensured by a special designed high covering seal and stainless-steel rivets (uniform and high-capacity locking), located on external side of the casing. Panels' assembly is made without any bolting or welding for the parts in contact with water: unique strength and waterproof JACIR design.

As a standard, two large doors in the same material as the cooling tower are provided on bottom and upper casings to allow quickly access or removal of the drift eliminators, nozzles, exchange surface and water distribution pipes.

Basin

The basin has been thought to take into account the needs and inertia of the installation. In order to reduce bacteria growth, panel's assembly has been realised without any bolts or screws for the parts in contact with water. The sloped and flat basin is equipped with a drain and a POWER FLOW access, both located under the lower level of the basin, enabling a quick and complete drain of all sludge or other accumulated parts during cleaning maintenance. The basin is also equipped with access doors to ease maintenance.

Water distribution

The water distribution is made of PP pipes through highly efficient water distributors. These nozzles are made of polypropylene and distribute water under low pressure (8kPA) uniformly over the whole exchange surface. This low pressure reduces drifts (0.8m WC) and bacteriological contamination risk. Indeed, low pressure creates heavier droplets, so less drifts out of the cooling tower. Furthermore, water nozzles are widely sized to avoid any clogging, even in the case of high suspended solids contents.

Exchange surface: FREEFILM

Made of vacuum pressed PVC sheets for a standard use up to 55 °C as a standard; and up to 80 °C as option with PP or ABS material. Thanks to its large vertical channels of 20mm, the FREEFILM is highly resistant to fouling and shows a very low pressure drop characteristics.

Motor fan set

The fans specially designed and manufactured by JACIR, have continuously been perfected over the years. Polyester air inlet ducts are profiled to optimise air suction, allowing low pressure and slow rotation speeds. This leads to a very low power consumption of the fan motors. Located in the dry air flow and outside the tower basin, motor fan set is protected from corrosion by a baked epoxy coating. The elliptical scroll is made of X-STEEL stainless steel.

Options

Non-freezing plume suppression coil*:

Jacir Patent (hybrid KHIM* serie) 30% to 50% water savings/year

Other options:

Automatic Inductive Blow down (AiD), frequency drive device, two speed motors, electro valve driven by level switch, control panel, non-freezing blade device, high water capacity basin (HWCB), collecting basin: water passing through (BR), all accessories in X-STEEL stainless-steel, on site erection and/or supervision, etc.

KH and KHIM

Open cooling tower

Open hybrid cooling tower

JACIR
Cooling for life

CONTENT Page(s)

Technical documentation

La FRENCH FAB

JACIR

With more than 60 years' experience, our company:

∞ Has invested in detailed research and development in order to propose technical solutions in accordance with environmental protection through unequalled realizations and patents.

∞ Is today the European leader thanks to its technology beyond market requirements.

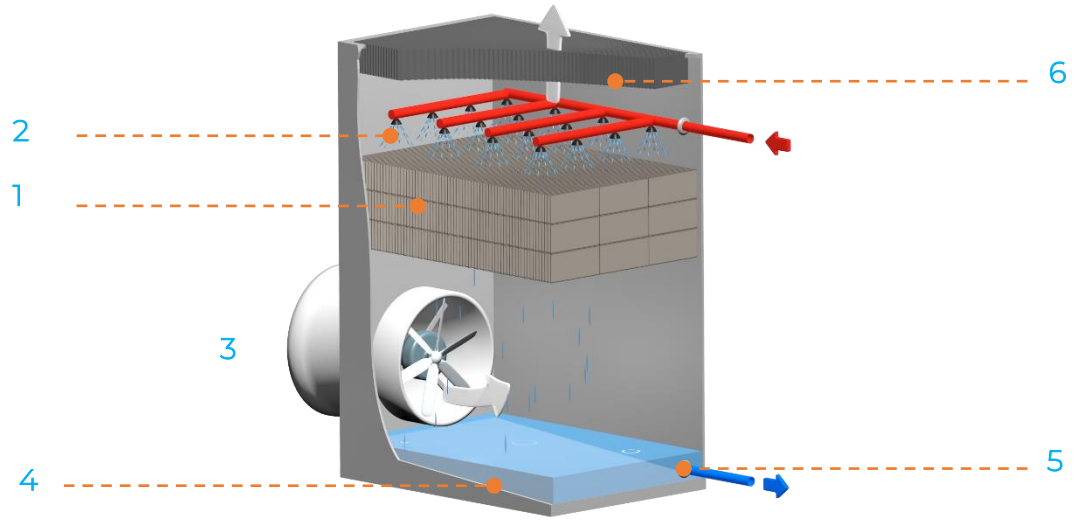
STRONG BENEFITS KH – KHIM RANGE

∞ SAFETY and HYGIENE	Compliant with December 2020 standard NF E 38-424.
∞ EXCHANGE SURFACE	High efficiency, with low fouling and low-pressure drop characteristics thanks to vertical channels. Use up to 55°C as standard.
∞ ANTICORROSION COATING	Casing of the tower is assembled without any welding, also proposed in X-STEEL stainless-steel
∞ EASY MAINTENANCE	Large access doors, fan outside the tower and at man height, inclined and plane basin for a complete drain.
∞ EVOLUTIVE TOWER	Possibility to increase the exchanged power by addition of plates (KHF range), Possibility to add a plume suppression coil further on (KHIM or KHFIM ranges)
∞ MODULAR CONSTRUCTION	Easy handling and transport.
∞ SILENCE	Very silent cooling towers in standard version, can be adapted according requirements.

Open cooling tower principle KH

A cooling tower is a heat exchanger, which enables water to be cooled through direct contact with air. The heat transfer from the water to the air is carried out partly by sensible heat transfer, but mainly by latent heat transfer (evaporation of part of the water into the air), which makes it possible to reach cooling temperatures lower than ambient temperatures.

Operation of an open wet air cooler:



The hot water to be cooled is pumped to the top of the tower through pipes. This water is divided and distributed over the heat exchange surface (1) by low pressure water distribution nozzles (2).

Blown by the fan (3), the fresh air enters into the lower section of the unit and escapes through the upper section after being heated and saturated by passing through the wetted heat exchange surface.

As a result of surface tension, due to the exchange surface, the water spreads in uniform way, falls down the whole height. The exchange surface is then increased.
The water, cooled thanks to forced ventilation, falls into the inclined basin (4) at the bottom of the tower.

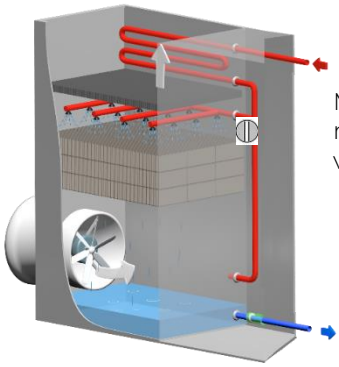
Then the water is sucked through the strainer (5). Drift eliminators (6) located at air outlet reduces drifts losses.

Open circuit hybrid cooling tower principle KHIM

Standard KH open circuit cooling tower ranges have originally been designed to receive the plume abatement coil option; these KH ranges are then referred to as KHIM open hybrid Cooler range. Their efficiency is ensured by a finned tube coil combined with a valve for adjusting the water spray on the exchange surface (packing). This water flow regulation over the exchange surface is a market exclusivity, JACIR patent.

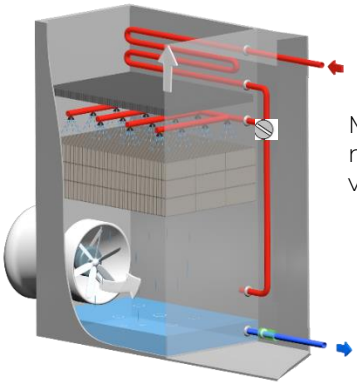
Therefore, the combination of the air desaturation by air outlet warming up, and the reduction of the water spray on the packing, ensures the complete plume suppression. Beyond the plume suppression itself, this system can provide water savings up to 80 % and is an ultimate obstacle to the drifts.
This technology proposed by JACIR has been deeply researched in partnership with the CETIAT for over 40 years, and has offered the opportunity to file innovating patents.
Their design makes access and cleaning very easy and ensures performance durability.

Operation of an open hybrid cooling tower:



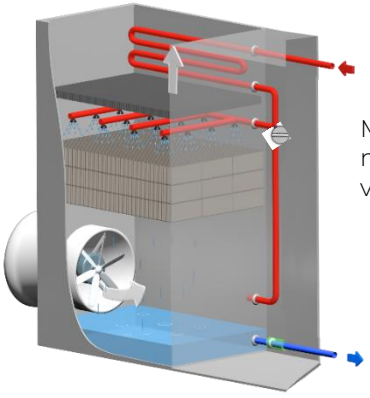
Dry operation: WINTER

In dry operation, the hot water is first sent to the anti-panache battery and then sprayed in its entirety on the runoff surface by spray nozzles.
This water is cooled via the coil by sensible heat transfer and by the air forced in counter-current by the fans by latent heat transfer. In wet operation, 5 to 10% of the power is still removed by pre-cooling the water in the coil.



Wet / dry operation: MID SEASON

When the dry cooling in not powerful enough part of the water flow goes to the spraying system thanks to the by-pass valve. A temperature probe located in the water outlet send the information to the regulator monitoring the valve. So only the minimum water quantity is sprayed on the packing. This cooling mode lowers the water / air exchange and optimize the power evacuated in the dry coil.
According to the ambient conditions, 30 to 70% of the power can be dissipated in dry mode.



Wet operation: SUMMER

If necessary, the bypass valve is totally closed: the water leaves the tube coil, and can be totally sprayed over the packing.

This water is first cooled by sensitive heat, then by latent heat (evaporation on the exchange surface).

In wet operation, 5 to 10 % of the power is dissipated by the finned tube coil.

Tower casing

Self-supporting rigid panels, with 2 or 4 folds on the four sides, (JACIR design) allowing sound attenuation casing addition if required. Thanks to this technology, we can offer cooling towers with an extremely low sound level.
Towers are assembled with waterproof stainless-steel rivets (uniform, high-capacity locking).
There is no welding on assembled panels for the parts in contact with water; a high covering seal ensures the close fit between the panels.

Hydraulic connections are made of the same material as the cooling tower casing.

As standard model, the panels are in galvanised steel mm2 thick ZENDZIMIR process 275 gr / m² (galvanised plates are protected by the zinc oxidation on the surface).
SILVER STEEL coating or X-STEEL stainless steel are optional.
(corrosion resistance superior to 316L)

Sloped and flat basin

It has a high-water capacity in order to offer a high thermal and water treatment inertia. For example, the volume of a KH 2030 is 10 m3 minimum.

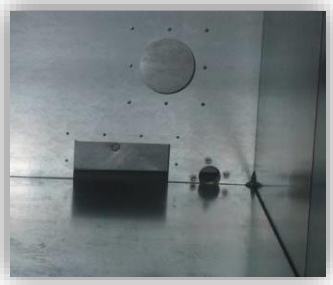
3 types of basins are available:
- Standard basin: B
- High water capacity basin: BCG
- Collecting basin : BR

The bottom of the pool is flat and sloped for easy and complete emptying.

On the utilities panels of the basin are located:

- An overflow,
- A drain below the lower level of the basin and Power-flow access enabling to quickly and completely evacuate all sludge and other accumulated parts in the bottom of the casing using simple water spray
- A make-up water by float valve or electro valve as an option,
- A water outlet through a removable strainer (stainless steel or PEHD according DN) with a flange oversized to eliminate cavitation, with a perforated steel plate,
- A large access door(s) to the basin (990 x 540 mm)
- Option: electrical heater of V 230 or V 400 and waterproof thermostat with separate bulb.

For automatic resistance control, suitable contactors must be provided.



Exchange surface: FREEFILM

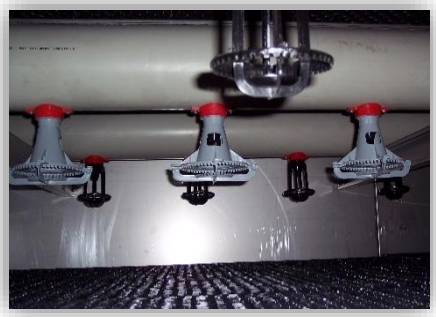
The exchange surface, also called packing or infill is made of vacuum pressed PVC sheets.

This material is non-putrescible, long lasting, also offers the following benefits:

- Very low pressure drop, so low power consumption thanks to the vertical channels,
- High thermal efficiency,
- Highly resistant to fouling thanks to large size channels: 20 mm.
- can be used up to 55 °C as standard, and up to 80 °C as option with PP or ABS material is resistant to chemicals.

Water Distribution

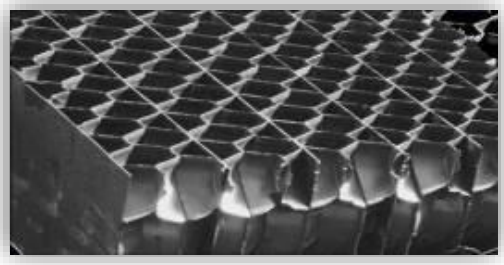
Water distribution is made of PP pipes through highly efficient water distributors.
The water nozzles are widely sized to avoid any clogging, even in case of high suspended solids content. These nozzles made of PP distribute the water uniformly on the whole exchange surface and operate under low pressure to reduce drifts (0.8 mWC).
The very low drift losses (8 kPa) considerably reduce the risk of bacteriological contamination: indeed, low pressure creates heavier droplets, so less drifts out the cooling tower.



Drift eliminators

Highly efficient, drift eliminators are made of PP sheets and prevent the water from being sprayed out of the tower: the drift is 0.01 % maximum of the re-circulating water flow. This value has been EUROVENT certified by independent third part.

Ultraviolet resistant, they are easy to remove from the top in order to access to the distributors and to the exchange surface.



Axial fans

JACIR design, the axial fan is adjustable stand still type. The number of blades and the material (aluminium, FRP option) are selected according to the thermal and sound requirements.
The inlet cones are made of polyester. Their calyx shape drastically improves the fan efficiency. The bearings are self-aligning, lubricated in our factory and to be regularly lubricated.
The shaft is supported by two bearings. A fan bearing lubrication line made of copper is extended on the fan stack and allows a simple and quick maintenance without any removal.
The fan stack is made of X-STEEL stainless steel, 316L as an option, with sloped bottom to avoid water losses and any freezing risk.

The fan stack is warmed by the water inside the cooling tower.

All the mechanical components to be maintained are located at man's height, out of the wet air flow.

Standard motors

IE3 asynchronous three-phases motor,

- 1500 rpm,
- 400 / 690 V,
- Hz 50,
- IP55 (possible open sky operating),
- F/B class,
- Direct connection to terminal box.

Accessibility

As standard model, the basin is equipped with a large access door mm 990 x 540 mm, and a POWER FLOW access mm 260x110: located under the bottom level of the basin, it allows a fast complete drain and an easy cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

Two large access doors in the same material as the cooling tower casing (990 x 540mm) are installed: the first one on the bottom casing, and the second one on the upper part casing. These large access doors allow quickly removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

If there are sound baffles or outlet air duct, large access doors (540 x 390 mm) are provided.

In the case a plume suppression coil is installed, an additional middle casing is supplied located between the coil and the drift eliminators, and fitted with at least one access door of 540 x 390 mm.

Plume suppression coil and modulating valve Jacir Patent

As a standard model the coil is made of a carbon steel collector coated with a primary paint. Two air vents secure the freezing risk. The tubes are assembled in a triangular pitch, in copper (Stainless steel option), outside diameter 16 mm, and 0.5 mm thick. The fins are in copper. The fin pitch is 3 mm in standard.

A monitored valve adjusting the water flow sprays over the infill, associated to the plume coil.

As soon as ambient conditions are met, this system makes it possible to operate significant water saving by cooling the water in the dry mode, rather than spraying and evaporating it.

Options

- Plume suppression coil system (see KHIM range)
- Silver steel coating or X-STEEL stainless steel casing (resistance to corrosion superior to 316L),
- Non-freezing heater with thermostat,
- Fan frequency drive,
- Water level control with electric-valve and input filter,
- Automatic Inductive BLOW DOWN,
- All accessories made of stainless steel (wheel, plume suppression coil, etc.),
- Discharge cone (increase of air outlet speed with lower sound radiation and recycling),
- Available air pressure for connection to the duct,
- Equipment delivered in parts, ready to be assembled,
- Assembly on site by our experimented technicians,
- Ladders and walkways.

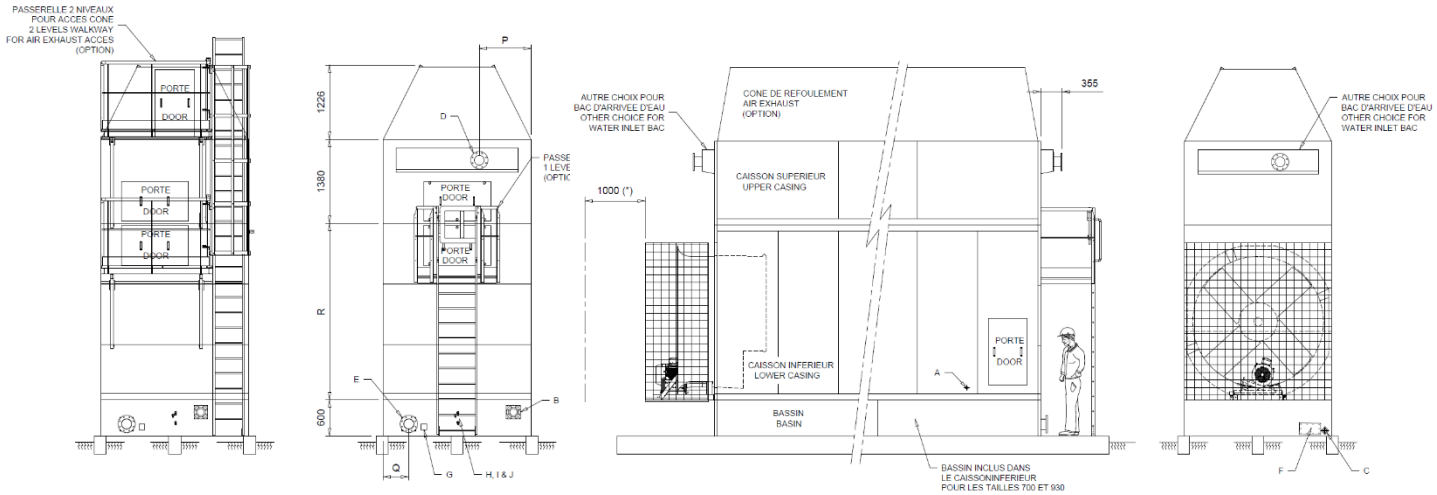
Technical chracteristics KH

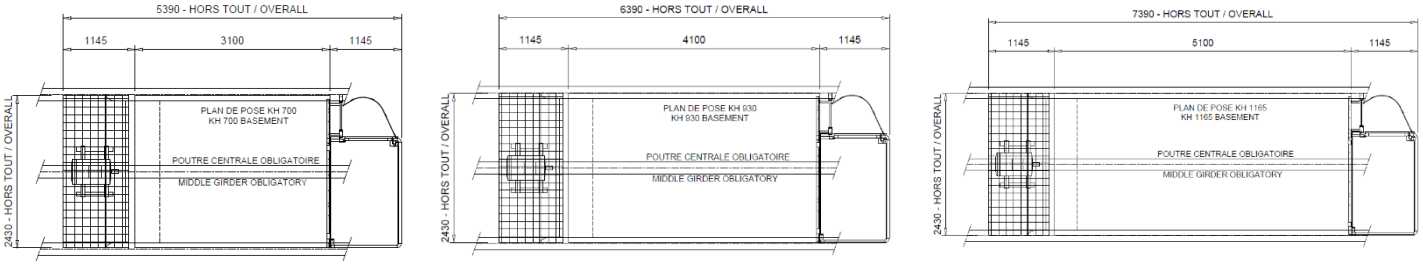
KH Range	OPEN COOLING TOWER WITH BASIN							
	Heat power ref. (1) average [kW]	Fans Qty	Outlet air flow rate [m3/h]	Heat power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty (without air exhaust) [kg]	Weight full (without air exhaust) [kg]	Overall dimensions (without air exhaust) [mm]
KH 700	1100	1	100 000	15	64	2130	6455	H = 4880 L = 4600 W = 2430
KH 930	1530	1	130 000	22	65	2620	8260	H = 4880 L = 5600 W = 2430
KH 1165	1940	1	160 000	30	65	3335	10440	H = 4880 L = 6600 W = 2430
KH 1450	2400	1	205 000	30	66	3870	12920	H = 4880 L = 6795 W = 3000
KH 1740	2910	1	250 000	37	66	4350	15125	H = 5080 L = 7795 W = 3000
KH 2030	3420	1	290 000	45	66	5015	17575	H = 5080 L = 8795 W = 3000
KH 2320	3930	1	330 000	55	66	5910	20270	H = 5080 L = 9795 W = 3000

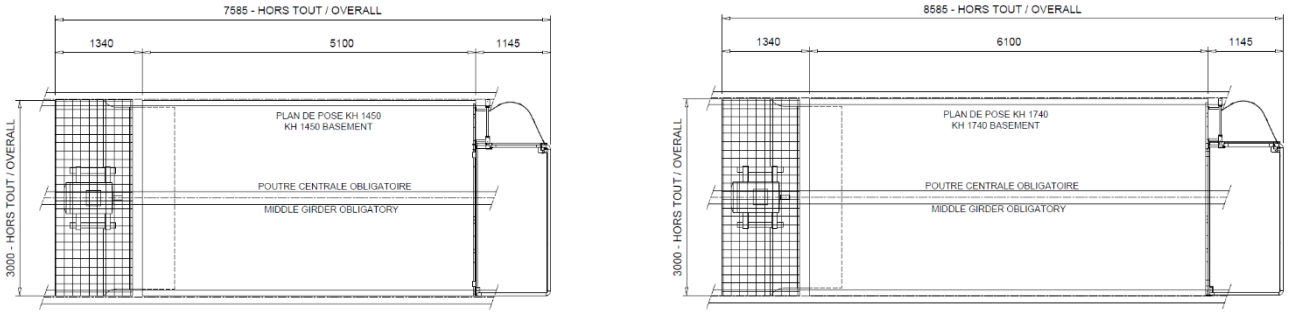
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side.

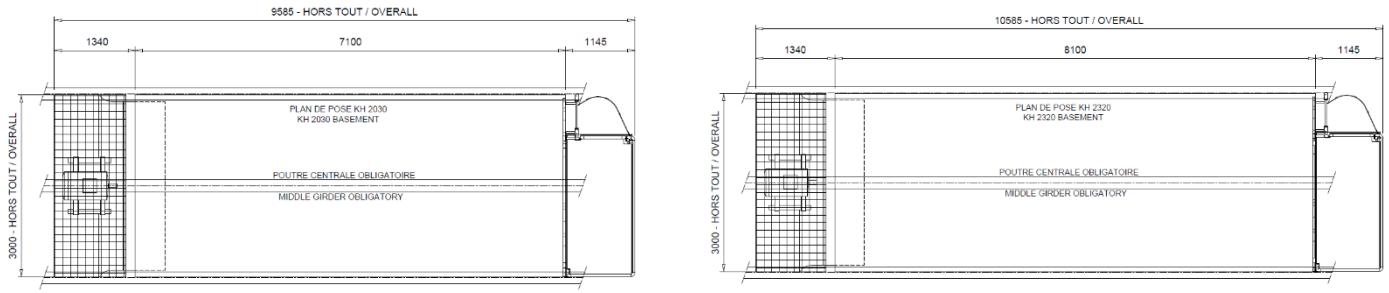
			KH 700	KH 930	KH 1175	KH 1450	KH 1740	KH 2030	KH 2320
A	Water make up or electro-valve as option	DN	male – DN according thermal data						
B	Overflow	DN	100						
C	Drain (female)	''	2''						
D	Water inlet	DN	According water flow						
E	Water outlet	DN	According water flow						
F	Power Flow cleaning basin hatch	mm	110 x 260						
CR	Air exhaust cone (option)	Kg	185	225	260	280	325	360	450

Drawings and Dimensions KH









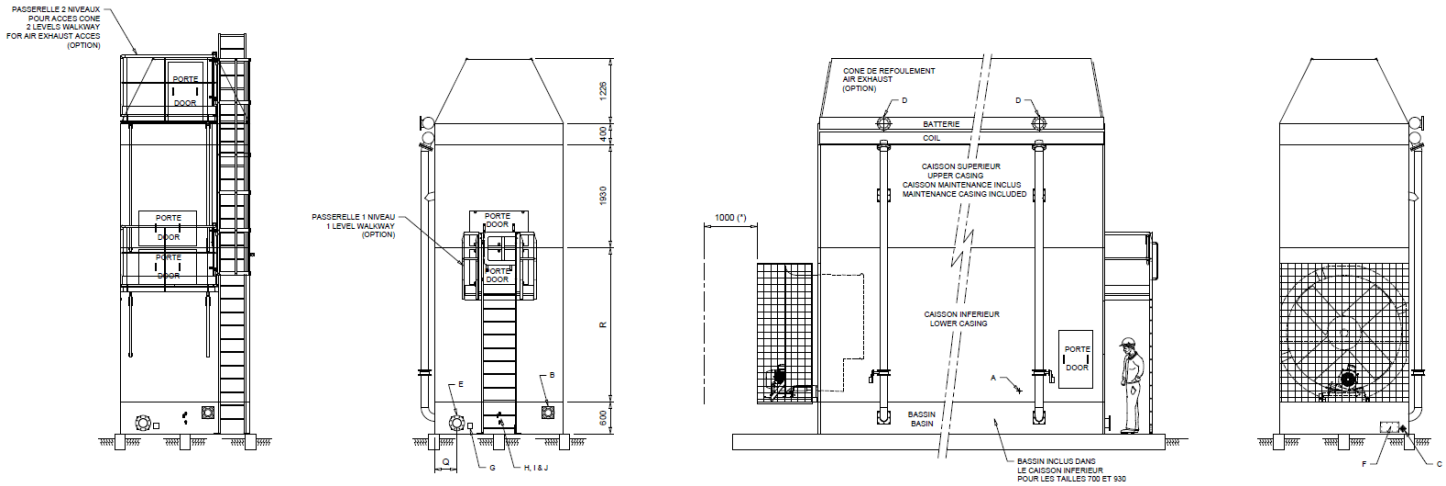
Technical characteristics KHIM

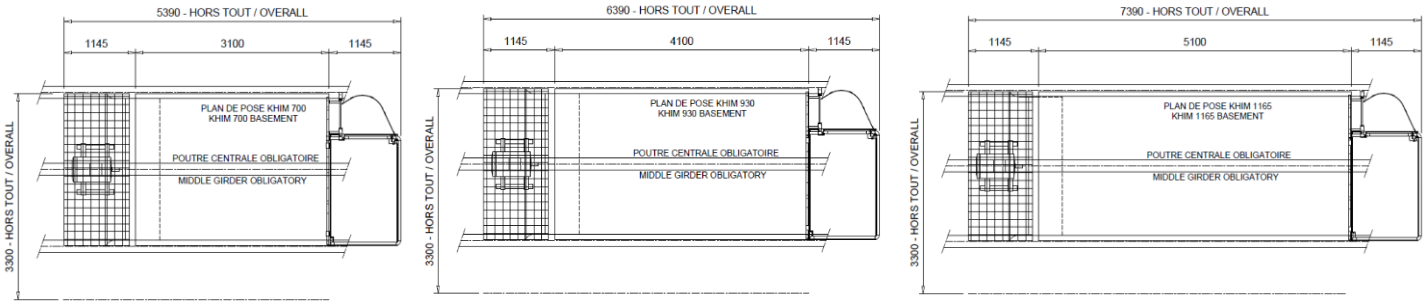
KHIM Range	HYBRID OPEN COOLING TOWER							
	Heat power ref. (1) average [kW]	Fans Qty	Outlet air flow rate [m3/h]	Heat power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty (without air exhaust) [kg]	Weight full (without air exhaust) [kg]	Overall dimensions (without air exhaust) [mm]
KHIM 700	1100	1	100 000	15	64	2830	8150	H = 5830 L = 4245 W = 3300
KHIM 930	1530	1	130 000	22	65	3605	10245	H = 5830 L = 5245 W = 3300
KHIM 1165	1940	1	160 000	30	65	4530	12630	H = 5830 L = 6245 W = 3300
KHIM 1450	2400	1	205 000	30	66	5500	15550	H = 5830 L = 6440 W = 3800
KHIM 1740	2910	1	250 000	37	66	6240	18015	H = 6030 L = 7440 W = 3800
KHIM 2030	3420	1	290 000	45	66	7280	20840	H = 6030 L = 8440 W = 3800
KHIM 2320	3930	1	330 000	55	66	8520	23880	H = 6030 L = 9440 W = 3800

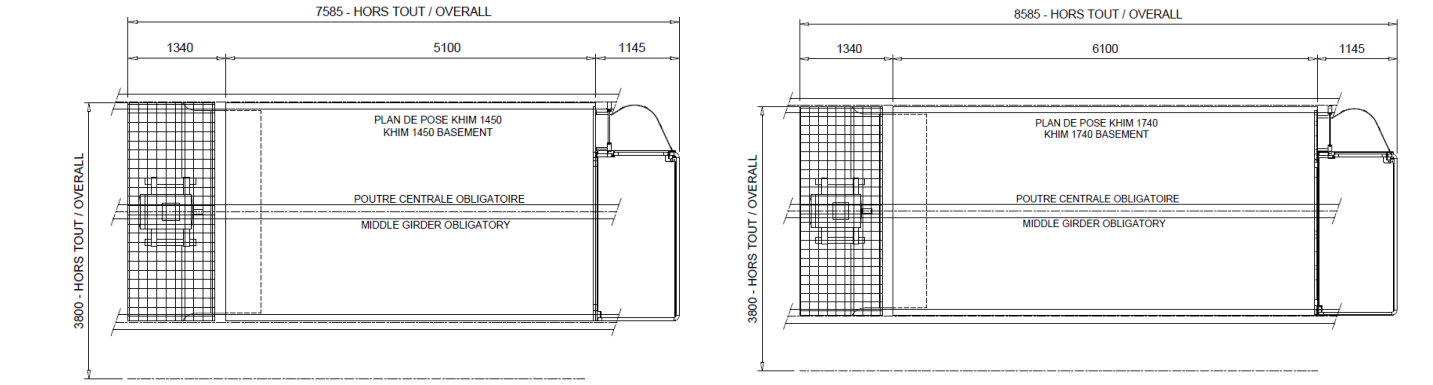
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side.

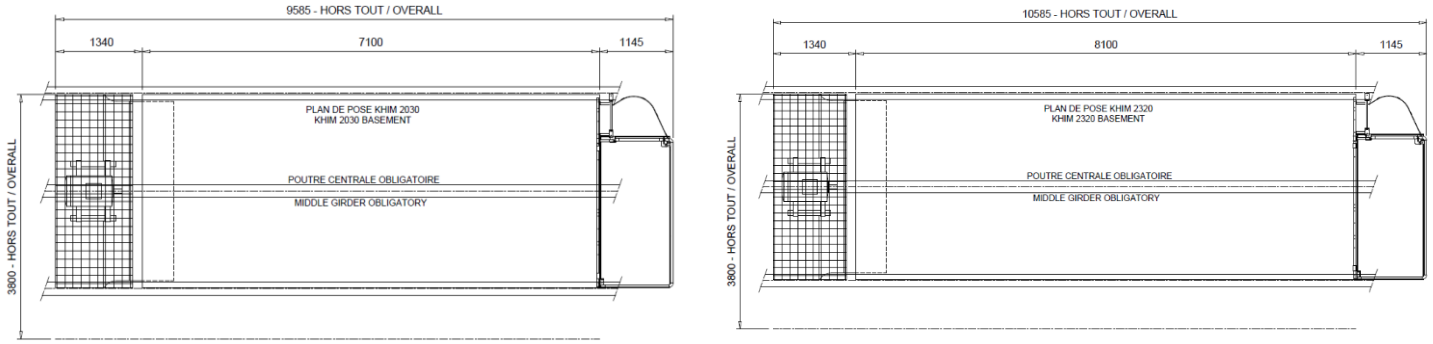
			KHIM 700	KHIM 930	KHIM 1175	KHIM 1450	KHIM 1740	KHIM 2030	KHIM 2320
A	Water make up or electro-valve as option	DN	male – DN according thermal data						
B	Overflow	DN	100						
C	Drain (female)	‘’	2’’						
D	Water inlet	DN	According water flow						
E	Water outlet	DN	According water flow						
F	Power Flow cleaning basin hatch	mm	110 x 260						
CR	Air exhaust cone (option)	Kg	185	225	260	280	325	360	450

Drawings and Dimensions KHIM







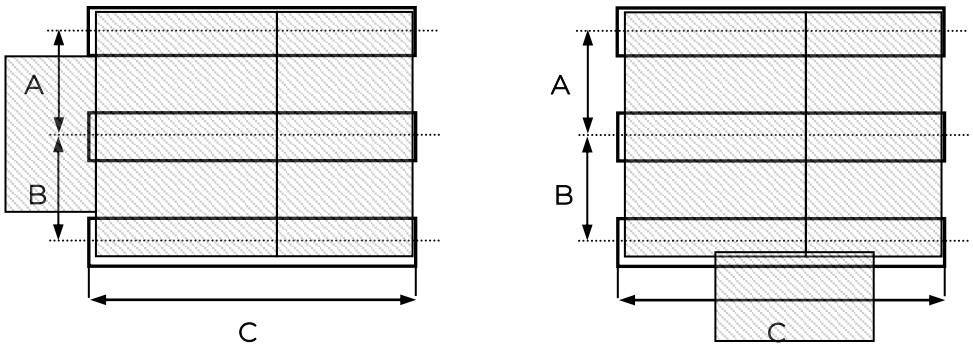


Support KH and KHIM

KH and KHIM cooling tower ranges can stand on a concrete base or on steel frame beams (customer supply).

Check that the ground can stand the operating load, and that surface or supports are flat and horizontal.

Quantity and position of concrete or metallic beams (customer supply) for cooling towers with basin



	Concrete beams of steel frame support [qty]	Distance between beams under basin A & B [mm]	Length superior to C [mm]
KH 700	3	1215	4300
KH 930		1215	5300
KH 1175		1215	6300
KH 1450		1500	6600
KH 1740		1500	7600
KH 2030		1500	8600
KH 2320		1500	9600

	Concrete beams of steel frame support [qty]	Distance between beams under basin A & B [mm]	Length superior to C [mm]
KHIM 700	3	1650	4300
KHIM 930		1650	5300
KHIM 1175		1650	6300
KHIM 1450		1900	6600
KHIM 1740		1900	7600
KHIM 2030		1900	8600
KHIM 2320		1900	9600

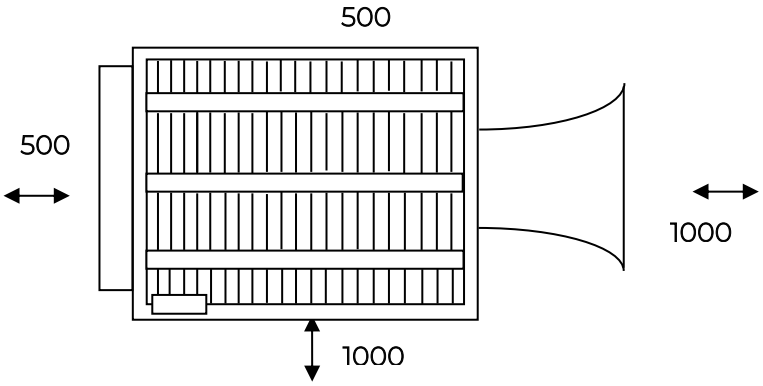
Choice of location KH and KHIM

Walls, higher or equal height of the tower must not surround on all sides the cooling tower, furthermore without any openings. This could create a risk of a « re-circulation »; the air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower.

In any case, the free access on the four sides of the tower must be secured to ensure that the fans are supplied correctly with air and that there is proper access for installation and maintenance.

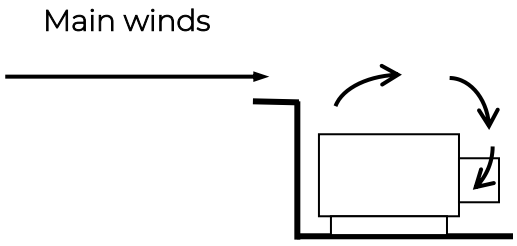
If these rules are not applied, it is inevitable that the cooling tower will not operate properly

Recommended minimum free access (mm) for standard cooling towers: Top view

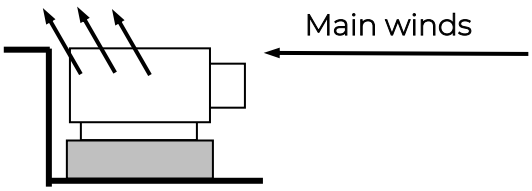


Layout examples

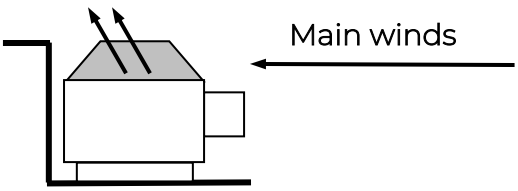
NO



YES



Set up a base to raise
the air discharge from the tower



Set up a discharge cone to raise
the air discharge from the tower

WATER EVAPORATION

Consumption by evaporation is approximately 1.7 kg/h per 1 000 kcal/h.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible).

There are three possible solutions according to the case:

1- Continuous blow down
Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.
The blow down flow rate can be calculated using the formula: *100 S / (M - S)* % of the make-up water in which:
S: Salinity of the make-up water compensating for evaporation.
M: Maximum acceptable salinity level of water in circuits.

Example:
Salinity of make-up water = HT 20 °C
Maximum acceptable salinity = HT 40 °C

100 x 20 / (40 - 20) = 100 % make-up water flow rate

Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).

Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous blow down
The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- JACIR Automated Inductive Blow down
Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level. See separate documentation.

WATER TREATMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly. If the water contains a significant amount of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10 % of the recycled water flow.

If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.

In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to prevent these organisms from developing.

Water treatment should be undertaken by a specialized Company.
PREVENTS THE RISK OF LEGIONNAIRES' DISEASE (See separate documentation).

Prescription KH

Evaporative cooling tower, high efficiency open circuit with forced draft axial fan, KH ..... JACIR range

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Tower casing and sloped and plane bottom basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive, if necessary, a double casing later on.

Stainless steel rivets with uniform and high-capacity locking will be used for assembly.

The cooling tower casing will be assembled without any bolting or welding for the parts in contact with water; a special designed high covering seal ensure waterproofing between the panels.

The basin will be equipped with a rectangular access door (990 x 540 mm), with a floating valve that can easily be adjusted, a drain, an overflow and an anti-cavitation strainer.

The sloped bottom of the basin will allow a complete and easy drain thanks to the POWER FLOW drain hole located under the lowest part of the basin in order to ease the cleaning. The size of this opening will be 260x110 mm.

3 types of basins will be available in option:

- Standard basin (B) or,
- High water capacity basin (BGC) or,
- Collecting basin: water passing through (BR).

The high capacity will increase inertia and water treatment system efficiency. Basin standard (B).

Casing structure

The cooling tower panels casing will be made of:

- As a standard, galvanized steel 2 mm thick ZENDZIMIR process 275 gr/m² (galvanized plates are protected by the zinc oxidation on the surface) or,
- Option Silver Steel casing or,
- Option, X-STEEL stainless steel (corrosion resistance higher than 316L) for its long-lasting properties, water saving and easy cleaning.

Accessibility

As a standard, the basin will be delivered with access door(s) sized 990 x 540 mm, and a POWER FLOW access 260 x 110 mm allowing express draining and cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

Two large doors sized 990 x 540 mm in the same material as the cooling tower casing will also be provided: the first one will be located on the bottom casing, and the second one on the upper part casing. These large access doors will allow quick removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

Fans

The axial fans will be adjustable stand still type. The number of blades and the material will be selected according to the thermal and sound requirements. The inlet cones will be made of polyester. Their calyx shape drastically will improve the fan efficiency.

The fan stack will be made of X-STEEL stainless steel.

All the mechanical components to be maintained will be located at man's height, out of the wet air flow. A fan guard, installed with hinges will make the access to the tower safe.

As an option, a blade non-freezing device may be installed, economical and maintenance free.
A fan bearing lubrication line (Rilsan) will be extended on the fan stack.

Motor(s) and transmission(s)

IE3 asynchronous three-phases motor closed type with ventilated case with a power maximum of kW....., rpm ....., IP55 protected, class F/B.
V-belts, selected for 150 % of nominal power, will be used for transmission.

Water distribution

Water distribution will be made of PP pipes through highly efficient water distributors.
These nozzles made of PP will distribute the water uniformly on the whole exchange surface and will operate under low pressure to reduce drifts (0.8 mWC).
The very low drift losses (8 kPA) will considerably reduce the risk of bacteriological contamination: indeed, low pressure will create heavier droplets, so less drifts out the cooling tower.

Exchange surface

The exchange surface FREEFILM will be made of vacuum pressed PVC sheets for a water temperature up to 55 °C as a standard. Highly resistant to fouling thanks to large size 20 mm vertical channels the FREEFILM will offer a low pressure drop.

Drift eliminators

Highly efficient certified, the PP sheets drift eliminators will prevent the water from being sprayed out at the outlet tower. Ultraviolet resistant, they will be easy to remove from the top in order to access to the distributors and to the exchange surface if needed. The drift will be 0.01 % maximum of the re-circulating water flow.

Connections

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection.
The servitudes panels will include a high-level switch, a drain hole and water make up.

Options

A water treatment may be integrated, as an option, as well as an integrated blow down inside in the exchanger room (see separate documentation), pump or / and fan frequency drive, a non-freezing heater with thermostat, Water level control with electric-valve and input filter, and all accessories made of stainless steel (fan casing, wheel, plume suppression coil, etc.).
The cooling tower will be delivered in parts, ready to be assembled, or assembled on site by our experimented technicians.

Prescription KHIM

Evaporative cooling tower, high efficiency open circuit with forced draft axial fan, KHIM ..... JACIR range

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Tower casing and sloped and plane bottom basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive, if necessary, a double casing later on.

Stainless steel rivets with uniform and high-capacity locking will be used for assembly.

The cooling tower casing will be assembled without any bolting or welding for the parts in contact with water; a special designed high covering seal ensure waterproofing between the panels.

The basin will be equipped with a rectangular access door (990 x 540 mm), with a floating valve that can easily be adjusted, a drain, an overflow and an anti-cavitation strainer.

The sloped bottom of the basin will allow a complete and easy drain thanks to the POWER FLOW drain hole located under the lowest part of the basin in order to ease the cleaning. The size of this opening will be 260x110 mm.

3 types of basins will be available in option:

- Standard basin (B) or,
- High water capacity basin (BGC) or,
- Collecting basin: water passing through (BR).

The high capacity will increase inertia and water treatment system efficiency. Basin standard (B).

Casing structure

The cooling tower panels casing will be made of:

- As a standard, galvanized steel 2 mm thick ZENDZIMIR process 275 gr/m² (galvanized plates are protected by the zinc oxidation on the surface) or,
- Option Silver Steel casing or,
- Option, X-STEEL stainless steel (corrosion resistance higher than 316L) for its long-lasting properties, water saving and easy cleaning.

Accessibility

As a standard, the basin will be delivered with access door(s) sized 990 x 540 mm, and a POWER FLOW access 260 x 110 mm allowing express draining and cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

Two large doors sized 990 x 540 mm in the same material as the cooling tower casing will also be provided: the first one will be located on the bottom casing, and the second one on the upper part casing. These large access doors will allow quick removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

Fans

The axial fans will be adjustable stand still type. The number of blades and the material will be selected according to the thermal and sound requirements. The inlet cones will be made of polyester. Their calyx shape drastically will improve the fan efficiency.

The fan stack will be made of X-STEEL stainless steel.

All the mechanical components to be maintained will be located at man's height, out of the wet air flow. A fan guard, installed with hinges will make the access to the tower safe.

As an option, a blade non-freezing device may be installed, economical and maintenance free. A fan bearing lubrication line (Rilsan) will be extended on the fan stack.

Motor(s) and transmission(s)

IE3 asynchronous three-phases motor closed type with ventilated case with a power maximum of kW....., rpm ....., IP55 protected, class F/B.
V-belts, selected for 150 % of nominal power, will be used for transmission.

Water distribution

Water distribution will be made of PP pipes through highly efficient water distributors.
These nozzles made of PP will distribute the water uniformly on the whole exchange surface and will operate under low pressure to reduce drifts (0.8 mWC).
The very low drift losses (8 kPA) will considerably reduce the risk of bacteriological contamination: indeed, low pressure will create heavier droplets, so less drifts out the cooling tower.

Exchange surface

The exchange surface FREEFILM will be made of vacuum pressed PVC sheets for a water temperature up to 55 °C as a standard. Highly resistant to fouling thanks to large size 20 mm vertical channels the FREEFILM will offer a low pressure drop.

Drift eliminators

Highly efficient certified, the PP sheets drift eliminators will prevent the water from being sprayed out at the outlet tower. Ultraviolet resistant, they will be easy to remove from the top in order to access to the distributors and to the exchange surface if needed. The drift will be 0.01 % maximum of the re-circulating water flow.

Plume suppression battery and modulating valve (Jacir patent)

As standard, the stainless-steel headers will be fully removable for full access and cleaning. Their "covered" configuration will protect the battery from accidental damage due to possible freezing. Two air vents will ensure frost control. The tubes, arranged in a triangular pitch, will be made of copper, 0.5mm thick, 16mm diameter. As an option, they can be made of stainless steel. The fins shall be of epoxy coated aluminium, copper or stainless-steel option. The pitch shall be 3mm as standard. A motorised valve to regulate the watering of the packing will be associated with the battery. As soon as climatic conditions permit, the installation will generate substantial water savings by evacuating the heat in the dry battery rather than by evaporation. The battery will allow the nominal power to be discharged without plume up to 2°C and 80% humidity.

Connections

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection.
The servitudes panels will include a high-level switch, a drain hole and water make up.

Options

A water treatment may be integrated, as an option, as well as an integrated blow down inside in the exchanger room (see separate documentation), pump or / and fan frequency drive, a non-freezing heater with thermostat, Water level control with electric-valve and input filter, and all accessories made of stainless steel (fan casing, wheel, plume suppression coil, etc.).
The cooling tower will be delivered in parts, ready to be assembled, or assembled on site by our experimented technicians.

JACIR
Cooling for life

KHF and KHFIM

Closed circuit axial fan cooling tower

Technical Documentation

CONTENTS

La FRENCH FAB

JACIR

With more than 60 years' experience, our company:

∞ Has invested in detailed research and development in order to propose technical solutions in accordance with environmental protection through unequalled realizations and patents.
∞ Is today the European leader thanks to its technology beyond market requirements.

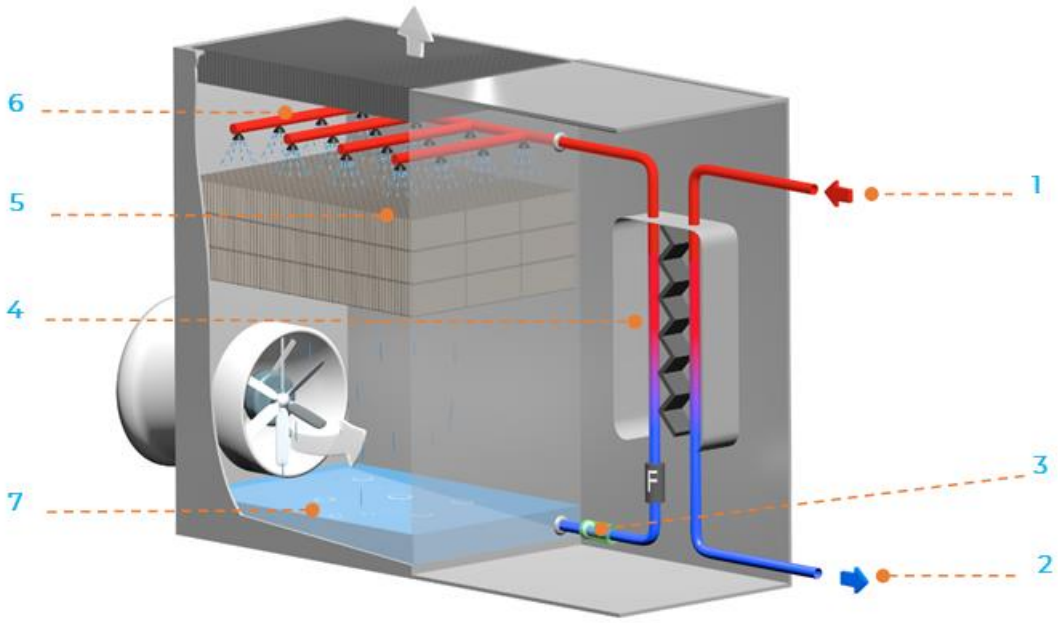
STRONG POINTS KHF – KHFIM SERIES

∞ SAFE and HYGIENIC	In accordance with December 2020 NF E 38-424 standard.
∞ PLATE HEAT EXCHANGER	Made of stainless steel, the plates are removable to ease cleaning and reassembling
∞ NO FREEZING RISK	Glycol free Plate Heat Exchanger: no freezing risk during winter
∞ WATER PROOF	Thanks to our assembling technology, we guaranty no leak equipment
∞ EXCHANGE SURFACE	High efficiency, with low fouling and low pressure drop characteristics thanks to vertical channels. Use up to 55°C as standard.
∞ ANTICORROSION COATING	Casing of the tower is assembled without any welding, also proposed in X-STEEL stainless steel.
∞ EASY MAINTENANCE	Large access doors, fan outside the tower and at man height, inclined and flat basin for a complete drain and cleaning.
∞ EVOLUTIVE TOWER	Possibility to increase the exchanged power by addition of plates. Possibility to add a plume suppression coil further on (KHIM and KHFIM range)
∞ SILENCE	Very silent cooling towers in standard version with very low sound levels. This sound level can be optimized with silencers, without necessarily increase the installed electrical capacity.

Closed circuit cooling tower principle KHF

A cooling tower is a heat exchanger, which enables water to be cooled through direct contact with air. The heat transfer from the water to the air is carried out partly by sensible heat transfer, but mainly by latent heat transfer (evaporation of part of the water into the air), which makes it possible to reach cooling temperatures lower than ambient temperatures.

Open wet air cooling tower operating principle:



Process (primary) side:

The water to be cooled enters into the integrated plate heat exchanger (1) and exits once cooled (2). Primary (user) circuit is closed and is not in contact with the air.

Cooling tower side (evaporation):

Water is sucked up from the basin by a pump (3), circulates through the plate heat exchanger (4) protected by a strainer and FRC centrifugal filter; then it enters the anti-freeze plume suppression battery (Jacir patent) (5); then, via a motorised valve (6), it is sent either to the dispersion ramps (7) to be dispersed over runoff surfaces (8), or directly to the basin if the climatic conditions enable to ensure dry cooling. The water, cooled by the forced ventilation, falls freely into the sloped basin (9) at the bottom of the tower.

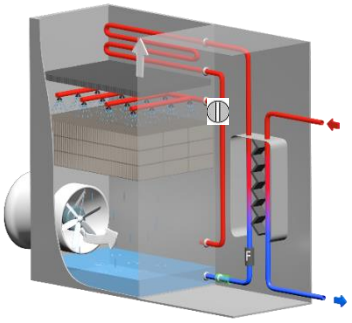
Freeze-free, glycol-free and easy to maintain:

Jacir technology does not require glycol: the heat exchanger's ice cover and all the tower's elements can be cleaned and descaled by a simple maintenance operation.

Closed circuit hybrid cooling tower principle KHFIM

Standard KHF closed circuit cooling tower ranges have originally been designed to receive the plume abatement coil option; these KHF ranges are then referred to as KHFIM closed hybrid Cooler range. Their efficiency is ensured by a finned tube coil combined with a valve for adjusting the water spray on the exchange surface (packing). This water flow regulation over the exchange surface is a market exclusivity, JACIR patent.
Therefore, the combination of the air desaturation by air outlet warming up, and the reduction of the water spray on the packing, ensures the complete plume suppression. Beyond the plume suppression itself, this system can provide significant water savings and is an ultimate obstacle to the drifts.
This technology proposed by JACIR has been deeply researched in partnership with the CETIAT for over 40 years, and has offered the opportunity to file innovating patents.
Their design makes access and cleaning very easy and ensures performance durability.

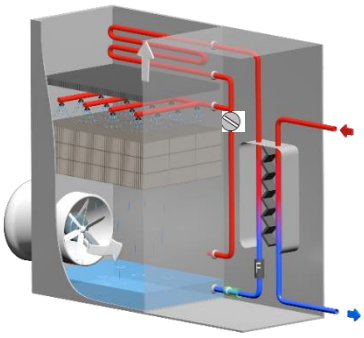
Open hybrid cooling tower operation:



Dry operation: WINTER

The by-pass valve is totally open, so the whole water flow leaves directly the tube coil to the basin: there is no water spray on the packing, no water evaporation, so no water consumption.

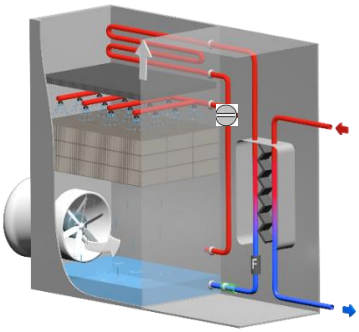
The whole power can be dissipated through the plume suppression coil.



Wet / dry operation: MID SEASON

When the dry cooling in not powerful enough part of the water flow goes to the spraying system thanks to the by-pass valve. A temperature probe (option) located in the water outlet send the information to the regulator monitoring the valve. So only the minimum water quantity is sprayed on the packing. This cooling mode lowers the water / air exchange and optimize the power evacuated in the dry coil.

According to the ambient conditions, 30 to 70% of the power can be dissipated in dry mode



Wet operation: SUMMER

If necessary, the bypass valve is totally closed: the water leaves the tube coil, and can be totally sprayed over the packing.

This water is first cooled by sensitive heat, then by latent heat (evaporation on the exchange surface).

In wet operation, 5 to 10 % of the power is dissipated by the finned tube coil.

Manufacturing details KHF-KHFIM

Casing structure

Self-supporting rigid panels, with 2 or 4 folds on the four sides, (JACIR design) allowing sound attenuation casing addition if required. Thanks to this technology, we can offer cooling towers with an extremely low sound level.
Towers are assembled with waterproof stainless-steel rivets (uniform, high-capacity locking).
There is no welding on assembled panels for the parts in contact with water; a high covering seal ensures the close fit between the panels.
Hydraulic connections are made of the same material as the cooling tower casing

As standard model, the panels are in galvanised steel mm2 thick ZENDZIMIR process 275 gr / m² (galvanised plates are protected by the zinc oxidation on the surface).

X-STEEL stainless steel is proposed as an option (corrosion resistance higher than AISI 316).

Sloped and flat basin

It has a high-water capacity in order to offer a high thermal and water treatment inertia. For example, the volume of a KH 2030 is 10 m3 minimum.

3 types of basins are available:
- standard basin (B)
- high water capacity basin (BGC)
- collecting basin (water passing through): BR.

The sloped and plane basin allows an easy and complete drain.

On the utilities panels of the basin are located:
- An overflow and PP flange,
- Drain below the lower level of the basin and Power-flow access enabling to quickly and completely evacuate all sludge and other accumulated parts in the bottom of the casing using simple water spray
- Make up water by float valve or electro valve as an option,
- Water outlet through a removable strainer (stainless steel or PEHD according DN) with a flange oversized to eliminate cavitation, with a perforated steel plate,
- Large access door(s) to the basin (990 x 540 mm)
- Option: electrical heater of V 230 or V 400 and waterproof thermostat with separate bulb. For automatic resistance control, suitable contactors must be provided.

Exchange surface: FREEFILM

The exchange surface, also called packing or infill is made of vacuum pressed PVC sheets.
This material is non-putrescible, long lasting, also offers the following benefits:

- Very low pressure drop, so low power consumption thanks to the vertical channels,
- High thermal efficiency,
- Highly resistant to fouling thanks to large size channels: 20 mm.
- Can be used up to 55 °C as standard, and up to 80 °C as option with PP or ABS material
- is resistant to chemicals.

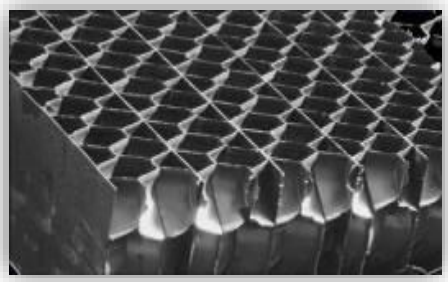
Water distribution

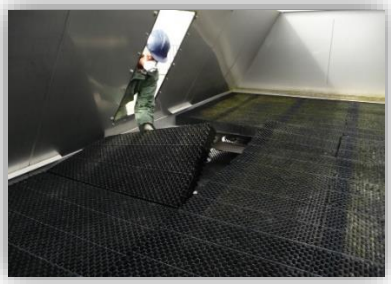
The water nozzles are widely sized to avoid any clogging, even in case of high suspended solids content.
Water distribution is made of PP pipes through highly efficient water distributors.
These nozzles made of PP distribute the water uniformly on the whole exchange surface and operate under low pressure to reduce drifts (0.8 mWC).
The very low drift losses (8 kPa) considerably reduce the risk of bacteriological contamination: indeed, low pressure creates heavier droplets, so less drifts out the cooling tower.

Drifts eliminators

Highly efficient, drift eliminators are made of PP sheets and prevent the water from being sprayed out of the tower: the drift is 0.01 % maximum of the re-circulating water flow. This value has been certified by independent third part.

Ultraviolet resistant, they are easy to remove from the top in order to access to the distributors and to the exchange surface.





Fans

JACIR design, the axial fan is adjustable stand still type. The number of blades and the material (aluminium, FRP option) are selected according to the thermal and sound requirements.

The inlet cones are made of polyester. Their calyx shape drastically improves the fan efficiency. The bearings are self-aligning, lubricated in our factory and to be regularly lubricated.

The shaft is supported by two bearings. A fan bearing lubrication line made of copper is extended on the fan stack and allows a simple and quick maintenance without any removal.

The fan stack is made of X-STEEL stainless steel, 316L AISI stainless steel option, with sloped bottom to avoid water losses and any freezing risk..

The fan stack is warmed by the water inside the cooling tower.

All the mechanical components to be maintained are located at man height, out of the wet air flow.

Standard motors

- IE3 asynchronous three-phases motor,
- 1500 rpm,
- 230 / 400 V up to 5.5 kW,
- 400 / 690 V,
- Hz 50,
- IP55 (possible open sky operating),
- F/B class,
- Direct connection to terminal box

Accessibility

As standard model, the basin is equipped with a large access door mm 990 x 540 mm, and a Power Flow access mm 260x110: located under the bottom level of the basin, it allows a fast complete drain and an easy cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

Two large access doors in the same material as the cooling tower casing (990 x 540mm) are installed: the first one on the bottom casing, and the second one on the upper part casing. These large access doors allow quickly removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

If there are sound baffles or outlet air duct, large access doors (540 x 390 mm) are provided.
In the case a plume suppression coil is installed, an additional middle casing is supplied located between the coil and the drift eliminators, and fitted with at least one access door of 540 x 390 mm.

Integrated exchanger room to the cooling tower

Made of galvanized steel in standard, self-supporting stiff panels equipped with an access door (2100 x 600 mm) with key lockers. The panels can be disassembled, and all components are designed for easy access and maintenance. As a standard, the exchanger room is equipped with automatic presence detection lightening.

Plate heat exchanger

It is protected from weather conditions inside its dedicated room.

User's connection is directly fixed outside the room to facilitate connection with primary circuit, with only two connections: inlet and outlet located either in the cooling tower axe or perpendicularly.

It does not require antifreeze protection: in case of electrical stop, the water-cooling tower circuit automatically drains by gravity down the basin, protecting by the way plates and gaskets of the plate heat exchanger.

For easy re-assembly, Jacir selects with symmetrical plates and clipped gaskets.

Heat exchanger pump

Protected against freezing by a patented thermostatic valve: no electrical tracing need. A water level switch is included and a pump frequency drive is also proposed as an option.

Pressure manometers

Installed before and after the pump, and also before water distribution piping.

FRC centrifugal filter

Located at the basin outlet, a 5 mm filtration strainer is installed. A FRC centrifugal filter chosen in the same material as the piping (galvanized or 304 – 316L stainless steel options) is located at the plate exchanger inlet.

It offers the following characteristics:

∞ 100 % of the cooling tower flow is filtered continuously every minute: very high efficiency at 60 µm for all elements with density superior to 1,

∞ Automatic cleaning inductive blow down of water circuit.

The evaporative circuit remains clean and avoids Legionella growth

Non-freezing plume suppression coil - JACIR patent

As a standard model, the stainless-steel headers are totally removable for access and complete cleaning of both tubes and headers. This “cover” type configuration protects the coil from accidental damage related to possible freeze-over. Two air vents secure the freezing risk. The tubes are assembled in a triangular pitch, in copper (Stainless steel option), outside diameter 16 mm, and 0.5 mm thick. The fins are in copper.

The fin pitch is 3 mm in standard. A monitored valve adjusting the water flow sprays over the infill, associated to the plume coil.

As soon as ambient conditions are met, this system makes it possible to operate significant water saving by cooling the water in the dry mode, rather than spraying and evaporating it.

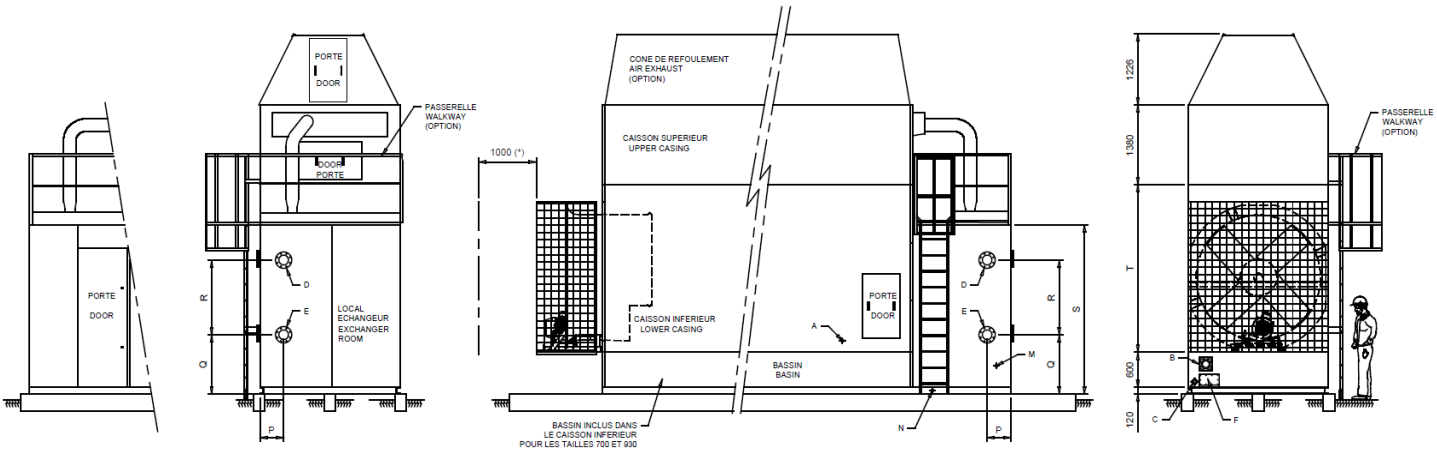
OPTIONS

- Non-freezing plume suppression coil system (see KHFIM series),
- X-STEEL stainless steel (resistance to corrosion superior to AISI 316L),
- Non-freezing heater with thermostat
- Fan frequency drive,
- Water level control with electric-valve and input filter,
- Automatic Inductive BLOW DOWN,
- All accessories made of stainless steel (wheel, plume suppression coil, etc.),
- Discharge cone (increase of air outlet speed with lower sound radiation and recycling),
- Available air pressure for connection to the duct,
- Equipment delivered in parts, ready to be assembled,
- Assembly on site by our experimented technicians,
- Ladders and walkways

Technical characteristics KHF

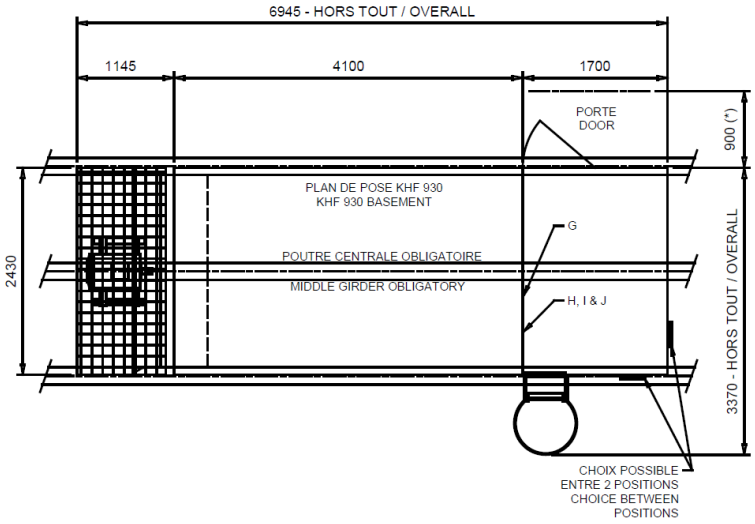
KHF Range	CLOSED COOLING TOWER KHF WITH BASIN							
	Heat power ref. (1) average [kW]	Fans Qty	Outlet air flow rate [m3/h]	Heat power [kW]	Sound level (2) at 20 m [dB(A)]	Weight Empty (incl casings, air exhaust and PHE) [kg]	Weight full (incl casings, air exhaust and PHE) [kg]	Overall dimensions [mm]
KHF 700	770	1	100 000	15	65	4815	9140	H = 5 000 L = 5 945 l = 2 430
KHF 930	1100	1	130 000	22	66	5345	10 985	H = 5 000 L = 6 945 l = 2 430
KHF 1165	1400	1	160 000	30	66	6095	13 200	H = 5 000 L = 7 945 l = 2 430
KHF 1450	1700	1	205 000	30	67	6650	13 200	H = 5 000 L = 8 140 l = 3 000
KHF 1740	2000	1	250 000	37	67	7175	17 950	H = 5 200 L = 9 140 l = 3 000
KHF 2030	2400	1	290 000	45	67	7875	20 435	H = 5 200 L = 10 140 l = 3 000
KHF 2320	2800	1	330 000	55	67	8860	23 220	H = 5 200 L = 11 140 l = 3 000

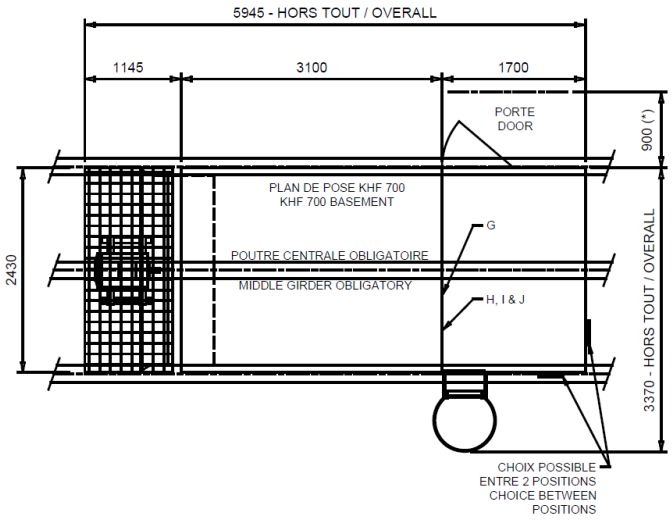
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side.

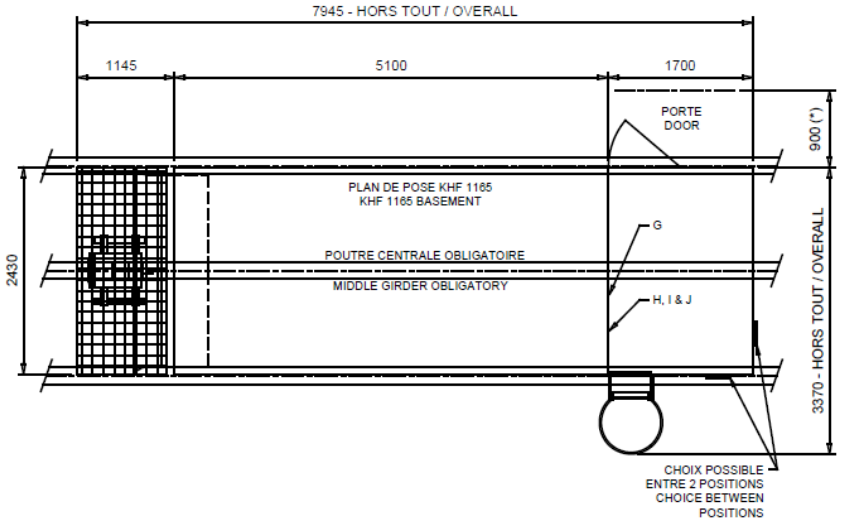


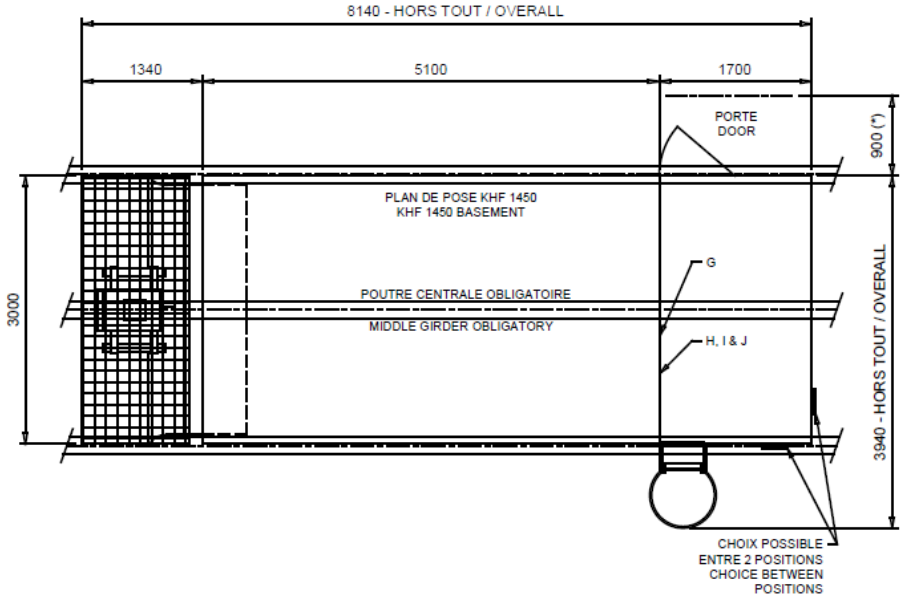
A APPOINT D'EAU - ROBINET A FLOTTEUR OU ELECTROVANNE (OPTION)
MAKE UP WATER - FLOAT VALVE OR ELECTROVALVE (OPTION)
B TROP-PLEIN - BRIDE DN 100
OVERFLOW - FLANGE DN 100
C VIDANGE - G 2" FEMELLE
DRAIN - G2" FEMALE
D ENTREE EAU CHAUDE - BRIDES DN 150 (SELON DEBIT)
HOT INLET WATER - FLANGES DN 150 (ACCORDING TO WATER FLOW)
E SORTIE EAU FROIDE - BRIDES DN 150 (SELON DEBIT)
COLD OUTLET WATER - FLANGES DN 150 (ACCORDING TO WATER FLOW)
F TRAPPE DE VIDANGE BASSIN "POWER FLOW"
DRAIN BASIN DOOR "POWER FLOW"
G RESISTANCE ANTI-GEL AVEC THERMOSTAT (DANS LOCAL ECHANGEUR)
WATER HEATER WITH THERMOSTAT (INSIDE ROOM EXCHANGER)
H, I 2 CONTACTEURS (NIVEAU HAUT / BAS) (OPTION - DANS LOCAL ECHANGEUR)
2 SWITCHS (LEVEL HIGH / LOW) (OPTION - INSIDE ROOM EXCHANGER)
J 1 CONTACTEUR (SECURITE MANQUE D'EAU) (OPTION - DANS LOCAL ECHANGEUR)
1 SWITCH (WATER LEVEL SECURITY) (OPTION - INSIDE ROOM EXCHANGER)
M SORTIE DECONCENTRATION
OUTLET DECONCENTRATION
N SORTIE EXOGEL + VIDANGE POMPE
EXOGEL + PUMP DRAIN OUTLET

Drawings and Dimensions KHF

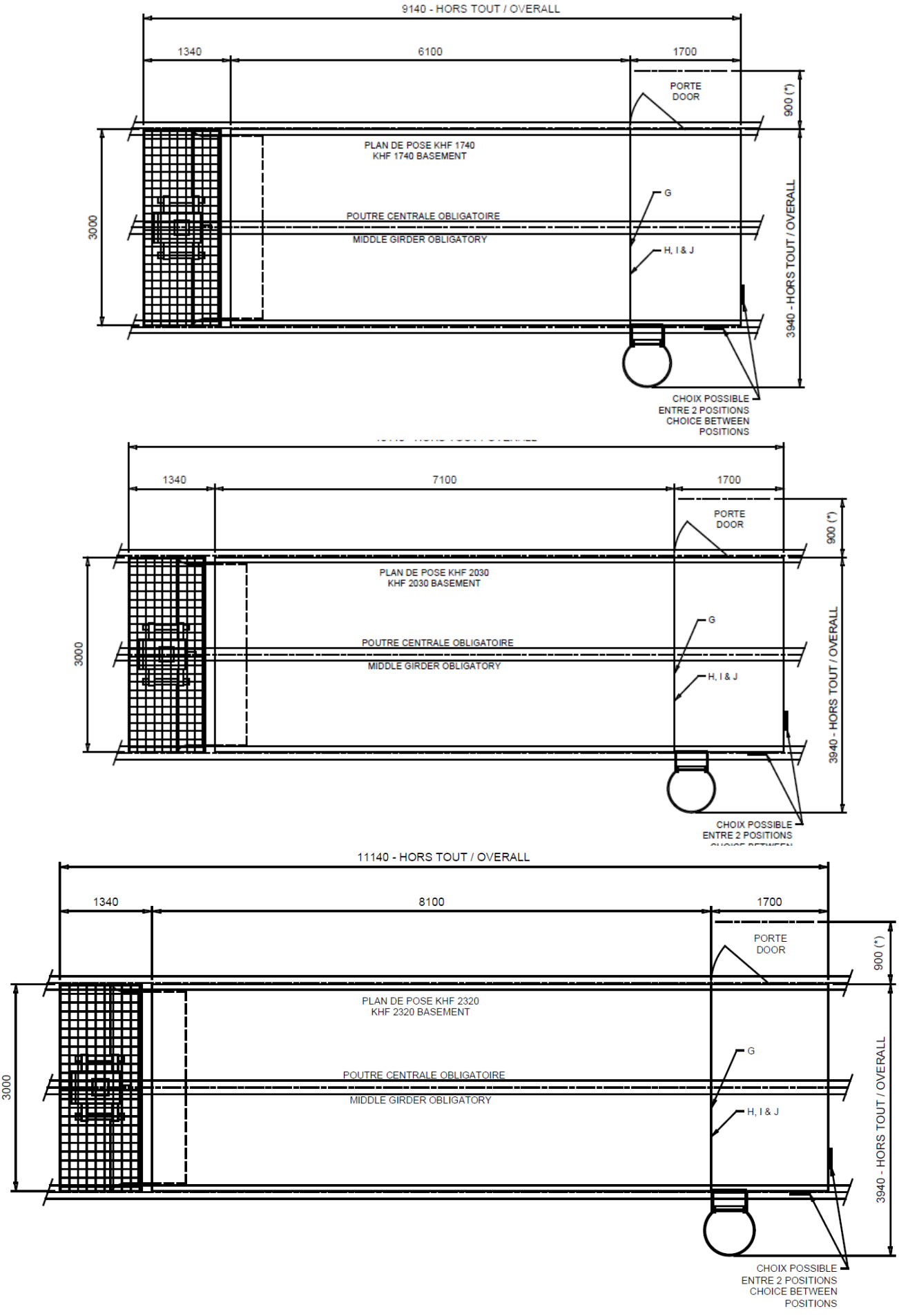








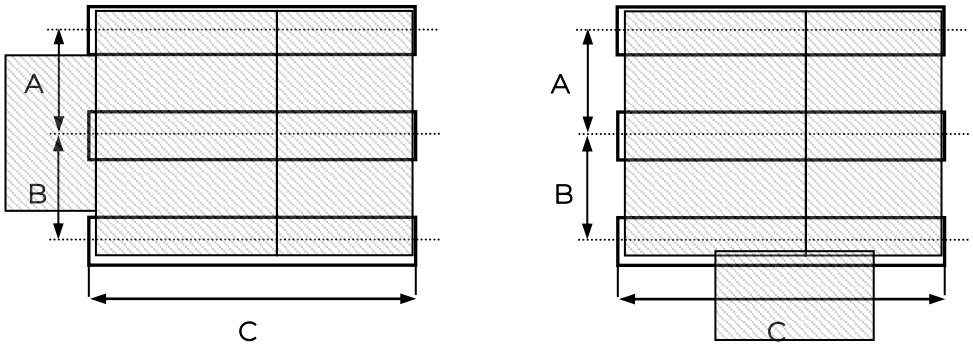
Drawings and Dimensions KHF



Support KHF and KHFIM

KHF and KHFIM cooling tower ranges can stand on a concrete base or on steel frame beams (customer supply).
Check that the ground can stand the operating load, and that surface or supports are flat and horizontal.

Quantity and position of concrete or metallic beams (customer supply) for cooling towers with basin



	Concrete beams of steel frame support[qty]	Distance between beams under basin A & B [mm]	Length superior to C [mm]
KHF 700	3	1 190	5 950
KHF 930		1 190	6 950
KHF 1175		1 190	7 950
KHF 1450		1 475	8 150
KHF 1740		1 475	9 150
KHF 2030		1 475	10 150
KHF 2320		1 475	11 150

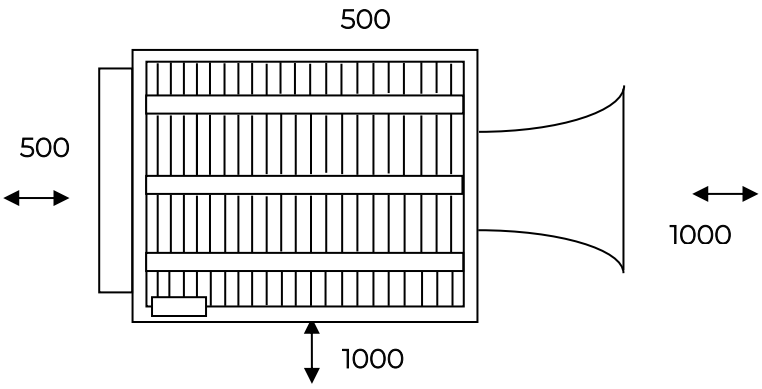
Choice of location KHF and KHFIM

Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings. This could create a risk of a « re-circulation »; the air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower.

In any case, the free access on the four sides of the tower must be secured to ensure that the fans are supplied correctly with air and that there is proper access for installation and maintenance.

If these rules are not applied, it is inevitable that the cooling tower will not operate properly

Recommended minimum free access (mm) for standard cooling towers: Top view

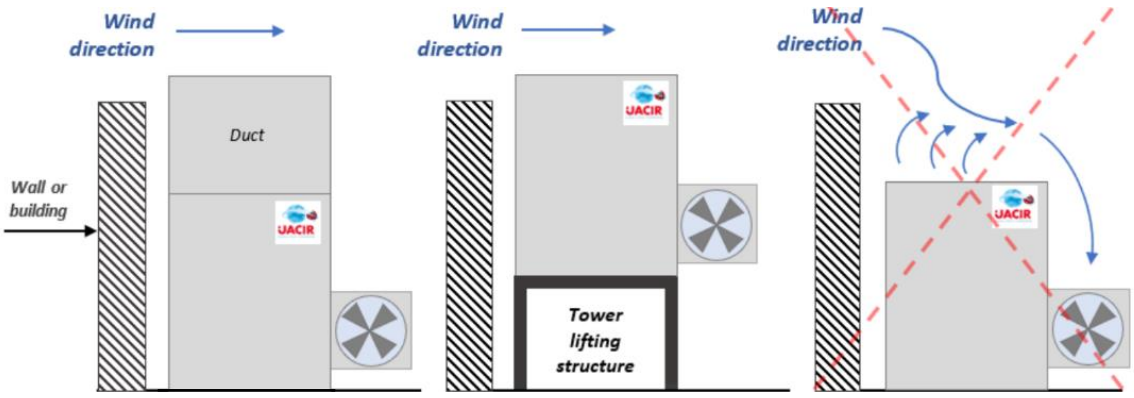


Do not hesitate to consult JACIR for advice.

Layout example:

The location choice for tower installation must follow these recommendations:

- The air intake area must always be kept free of any major obstruction.
  => The obstacle-free distance to be kept around each air inlet is shown on the overall plan and is approximately 1 metre (unless otherwise stated).
- The air discharge must not be disturbed either by direct obstacles.
  =>The installation of acoustic baffles or ducts must be approved by JACIR's Technical Department.
- The risk of hot air being blown back (at tower outlet) to the air intake area must be prevented.
  => The direction of the prevailing wind and the proximity of surrounding buildings (possibly generating risks of back-flow) are elements to be considered.



WATER EVAPORATION

Consumption by evaporation is approximately 1.7 kg/h per 1 000 kcal/h.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible).
There are three available solutions according to the case:

1- Continuous blow down

Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.

The blow down flow rate can be calculated using the formula: [100 S / (M - S)] % of the make-up water in which:
S: Salinity of the make-up water compensating for evaporation.
M: Maximum acceptable salinity level of water in circuits.

Example:
Salinity of make-up water = HT 20°
Maximum acceptable salinity = HT 40°

100 x 20 / (40 - 20) = 100 % make-up water flow rate

Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).
Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous blow down

The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- JACIR Automated Inductive Blow down

Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level. See separate documentation. (see separate documentation).

WATER TREATMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly. If the water contains a significant amount of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10 % of the recycled water flow.
If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.
In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to prevent these organisms from developing.
Water treatment should be undertaken by a specialized Company.
PREVENTS THE RISK OF LEGIONNAIRES' DISEASE (See separate documentation).

Technical prescription KHF

Evaporative cooling tower, high efficiency closed circuit with forced axial fans, KHF ..... JACIR type, designed for a glycol free operation during freezing period.....

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Tower casing, sloped and plane bottom basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive, if necessary, a double casing later on.
Stainless steel rivets with uniform and high-capacity locking will be used for assembly.

The cooling tower casing will be assembled without any bolting or welding for the parts in contact with water; a special designed high covering seal ensure waterproofing between the panels.
The basin will be equipped with a rectangular access door (990 x 540 mm), with a floating valve that can easily be adjusted, a drain, an overflow and an anti-cavitation strainer.
The sloped bottom of the basin will allow a complete and easy drain thanks to the POWER FLOW drain hole located under the lowest part of the basin in order to ease the cleaning. The size of this opening will be 260x110 mm.

3 types of basins will be available in option:

- Standard basin (B) or,
- High water capacity basin (BGC) or,
- Collecting basin: water passing through (BR).

The high capacity will increase inertia and water treatment system efficiency.

Casing

The cooling tower panels casing will be made of:

- As a standard, galvanized steel 2 mm thick ZENDZIMIR process 275 gr/m² (galvanized plates are protected by the zinc oxidation on the surface) or,
- Option, X-STEEL stainless steel for its long-lasting properties, water saving and easy cleaning.

Accessibility

As a standard, the basin will be delivered with access door(s) sized 990 x 540 mm, and a POWER FLOW access 260 x 110 mm allowing express draining and cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

Two large doors sized 990 x 540 mm in the same material as the cooling tower casing will also be provided: the first one will be located on the bottom casing, and the second one on the upper part casing. These large access doors will allow quick removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

Fans

The axial fans will be adjustable stand still type. The number of blades and the material will be selected according to the thermal and sound requirements. The inlet cones will be made of polyester. Their calyx shape drastically will improve the fan efficiency. The fan stack will be made of X-STEEL stainless steel. All the mechanical components to be maintained will be located at man height, out of the wet air flow. A fan guard, installed with hinges will make the access to the tower safe.

As an option, a blade non-freezing device may be installed, economical and maintenance free. A fan bearing lubrication line (Rilsan) will be extended on the fan stack.

Motor(s) and transmission(s)

IE3 asynchronous three-phases motor(s) closed type with ventilated case with a power maximum of kW....., rpm ....., IP55 protected, class F/B.
V-belts, selected for 150 % of nominal power, will be used for transmission.

Water distribution

Water distribution will be made of PP pipes through highly efficient water distributors. These nozzles made of PP will distribute the water uniformly on the whole exchange surface and will operate under low pressure to reduce drifts (0.8 mWC). They will be widely sized to avoid any clogging, even in the case of high suspended solids content.

Exchange surface

The exchange surface FREEFILM will be made of vacuum pressed PVC sheets for a water temperature up to 55 °C as a standard. Highly resistant to fouling thanks to large size 20 mm vertical channels the FREEFILM will offer a low pressure drop.

Drift eliminators

Highly efficient certified, the PP sheets drift eliminators will prevent the water from being sprayed out at the outlet tower. Ultraviolet resistant, they will be easy to remove from the top in order to access to the distributors and to the exchange surface if needed. The drift will be 0.01 % maximum of the re-circulating water flow.

Integrated exchanger room

The stainless-steel plate heat exchanger will be imperatively protected from bad weather in its dedicated room: self-supporting galvanized structure (20/10e minimum) paint coating as a standard. This integrated exchanger room with removable panels for easy maintenance will be equipped with a large access door sized 2100 x 600 mm as a standard.
The plate heat exchanger connection will be provided outside the room by 2 flanges.

The plate heat exchanger will be equipped with gaskets and symmetric plates.

Connections

A stainless-steel strainer and a cleanable filter (on large size exchanger room only) will secure the proper water filtration before the inlet to the plate heat exchanger. The water circulation inside the system will be secured by a pump. This pump will be protected against freeze by a thermostatic valve.

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection. As standard, a low-level switch will avoid the start of the pump and will protect the water heaters in case of “too low” water level.

Pressure meters for control will be located before and after the pump, and before the water distribution header. They will secure a constant control of the system. A blow down hole with setting valve will be provided, and an electro valve as an option.

The servitudes panels will include a high-level switch, a drain hole and a water make up.

Exchanger pump

Protected from freezing thanks to a patented thermostatic valve, the pump will not need any electrical tracing. A safety level switch will be provided to protect from cavitation.

Connections

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection.
The servitudes panels will include a high-level switch, a drain hole and water make up.

Options

A water treatment may be integrated, as an option, as well as an integrated blow down inside in the exchanger room (see separate documentation), pump or / and fan frequency drive, a non-freezing heater with thermostat, Water level control with electric-valve and input filter, EFFI-SILENT sound abatement for basin, and all accessories made of stainless steel (fan casing, wheel, plume suppression coil, etc.).
The cooling tower will be delivered in parts, ready to be assembled, or assembled on site by our experimented technicians.

Technical prescription KHFIM

Evaporative cooling tower, high efficiency closed circuit with forced axial fans, KHFIM ..... JACIR type, designed for a glycol free operation during freezing period.....

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Tower casing, sloped and plane bottom basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive, if necessary, a double casing later on.
Stainless steel rivets with uniform and high-capacity locking will be used for assembly.

The cooling tower casing will be assembled without any bolting or welding for the parts in contact with water; a special designed high covering seal ensure waterproofing between the panels.
The basin will be equipped with a rectangular access door (990 x 540 mm), with a floating valve that can easily be adjusted, a drain, an overflow and an anti-cavitation strainer.
The sloped bottom of the basin will allow a complete and easy drain thanks to the POWER FLOW drain hole located under the lowest part of the basin in order to ease the cleaning. The size of this opening will be 260x110 mm.

3 types of basin will be available in option:
- Standard basin (B) or,
- High water capacity basin (BGC) or,
- Collecting basin: water passing through (BR).

The high capacity will increase inertia and water treatment system efficiency.

Casing

The cooling tower panels casing will be made of:
- As a standard, galvanized steel 2 mm thick ZENDZIMIR process 275 gr/m² (galvanized plates are protected by the zinc oxidation on the surface) or,
- Option, X-STEEL stainless steel for its long-lasting properties, water saving and easy cleaning.

Accessibility

As a standard, the basin will be delivered with access door(s) sized 990 x 540 mm, and a POWER FLOW access 260 x 110 mm allowing express draining and cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

Two large doors sized 990 x 540 mm in the same material as the cooling tower casing will also be provided: the first one will be located on the bottom casing, and the second one on the upper part casing. These large access doors will allow quick removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

Fans

The axial fans will be adjustable stand still type. The number of blades and the material will be selected according to the thermal and sound requirements. The inlet cones will be made of polyester. Their calyx shape drastically will improve the fan efficiency. The fan stack will be made of X-STEEL stainless steel. All the mechanical components to be maintained will be located at man height, out of the wet air flow. A fan guard, installed with hinges will make the access to the tower safe.

As an option, a blade non-freezing device may be installed, economical and maintenance free. A fan bearing lubrication line (Rilsan) will be extended on the fan stack.

Motor(s) and transmission(s)

IE3 asynchronous three-phases motor(s) closed type with ventilated case with a power maximum of kW....., rpm ....., IP55 protected, class F/B.
V-belts, selected for 150 % of nominal power, will be used for transmission.

Water distribution

Water distribution will be made of PP pipes through highly efficient water distributors. These nozzles made of PP will distribute the water uniformly on the whole exchange surface and will operate under low pressure to reduce drifts (0.8 mWC). They will be widely sized to avoid any clogging, even in the case of high suspended solids content.

Exchange surface

The exchange surface FREEFILM will be made of vacuum pressed PVC sheets for a water temperature up to 55 °C as a standard. Highly resistant to fouling thanks to large size 20 mm vertical channels the FREEFILM will offer a low pressure drop.
This exchange surface will be integrated into a self-supporting 20/10th galvanised sheet metal in double fold on the 4 sides.

Drift eliminators

Highly efficient certified, the PP sheets drift eliminators will prevent the water from being sprayed out at the outlet tower. Ultraviolet resistant, they will be easy to remove from the top in order to access to the distributors and to the exchange surface if needed. The drift will be 0.01 % maximum of the re-circulating water flow.

Integrated exchanger room

The stainless-steel plate heat exchanger will be imperatively protected from bad weather in its dedicated room: self-supporting galvanized structure (20/10e minimum) paint coating as a standard. This integrated exchanger room with removable panels for easy maintenance will be equipped with a large access door sized 2100 x 600 mm as a standard.
The plate heat exchanger connection will be provided outside the room by 2 flanges.

The plate heat exchanger will be equipped with gaskets and symmetric plates.

Connections

A stainless-steel strainer and a cleanable filter (on large size exchanger room only) will secure the proper water filtration before the inlet to the plate heat exchanger. The water circulation inside the system will be secured by a pump. This pump will be protected against freeze by a thermostatic valve.

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection. As standard, a low-level switch will avoid the start of the pump and will protect the water heaters in case of “too low” water level.

Pressure meters for control will be located before and after the pump, and before the water distribution header. They will secure a constant control of the system. A blow down hole with setting valve will be provided, and an electro valve as an option.

The servitudes panels will include a high-level switch, a drain hole and a water make up.

Exchanger pump

Protected from freezing thanks to a patented thermostatic valve, the pump will not need any electrical tracing. A safety level switch will be provided to protect from cavitation.

Plume suppression battery and modulating valve (Jacir patent)

As standard, the stainless-steel headers will be fully removable for full access and cleaning. This "covered" configuration will protect the battery from accidental damage due to possible freezing. Two air vents will ensure frost control. The tubes, arranged in a triangular pitch, will be made of copper, 0.5mm thick, 16mm diameter. As an option, they can be made of stainless steel. The fins shall be of epoxy coated aluminium, copper or stainless-steel option. The pitch shall be 3mm as standard. A motorised valve to regulate the watering of the packing will be associated with the battery. As soon as climatic conditions permit, the installation will generate substantial water savings by evacuating the heat in the dry battery rather than by evaporation. The battery will allow the nominal power to be evacuated without plume up to 2°C and 80% humidity.

Connections

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection.
The servitudes panels will include a high-level switch, a drain hole and water make up.

Options

A water treatment may be integrated, as an option, as well as an integrated blow down inside in the exchanger room (see separate documentation), pump or / and fan frequency drive, a non-freezing heater with thermostat, Water level control with electric-valve and input filter, EFFI-SILENT sound abatement for basin, and all accessories made of stainless steel (fan casing, wheel, plume suppression coil, etc.).
The cooling tower will be delivered in parts, ready to be assembled, or assembled on site by our experimented technicians.

JACIR
Cooling for life

KBH

Concrete cooling towers forced draft axial fan

Flow rates: from 250 to 2 000m³/h/cell

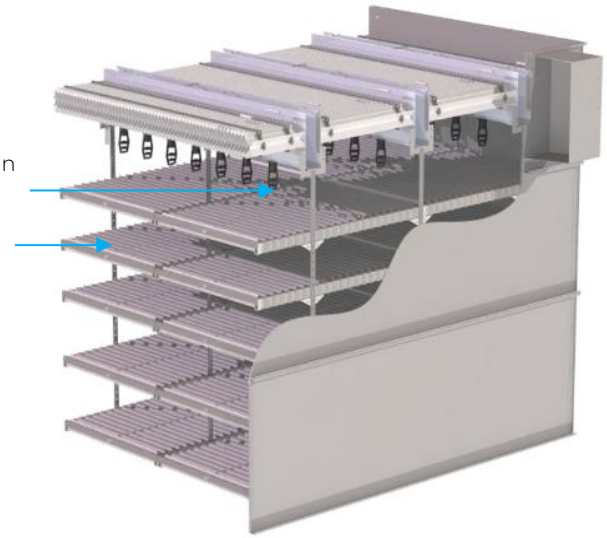
- Infill: FREEFILM

Commercial Documentation

FABRIQUE EN FRANCE
NF 38-424
La FRENCH FAB

Know-how and innovative technology

The KBH series combine both high efficiency of the exchange surface and water spray system with extreme simplicity for the construction and the maintenance by complete extraction of all the internals.



Infill: FREEFILM

The exchange surface, or infill is made of vacuum pressed PVC sheets.

This material is non-putrescible, long lasting, also offers the following benefits:

- Has a very low pressure drop, so low power consumption thanks to the vertical channels,
- Has a high thermal efficiency,
- Is highly resistant to fouling thanks to large size channels: 12 or 20 mm,
- Can be used up to 55°C as standard, and up to 80°C as option with PP or ABS material,
- Is resistant to chemicals.

Water distribution

The water is distributed by polypropylene pipes, and by polyamide nozzles especially designed to achieve an optimal distribution through the whole air section. So, the complete surface of the infill is watered. These nozzles operate under low pressure (0.8 mCE), in order to low pumping head and to distribute large size drops, which prevents the drift from getting out of the cooling tower.

Tower casing

It is in concrete. From the fan arrangement, it results very simple and low-cost civil works: the casing consists in four smooth walls with a square opening for the fan connection. The forced draft design does not require any louvers, has no light entering in the basin and no water lost in windy conditions. The design of the infill secures very short time for installation and for cleaning by simple IN/ OUT lifting.

Environment protection

Sound attenuation:

The KBH cooling towers are initially low sound. In addition, their design makes it possible to select the right fan orientation towards the most favourable direction. To improve even more the sound performances, we can offer additional sound attenuation, adjustable according to the sound level to reach : fan speed reduction, low sound fans, sound attenuators in the basin, fan housing, air outlet cone with sound attenuating material.

Sound and energy savings

The forced draft axial fans are particularly efficient, with a very low absorbed power. In addition, the coupling by gear box makes it easy to select the best ratio efficiency/ sound power level and mechanical resistance. At man chest, those fans are located in the dry air flow, and out of the basin and are inserted in a stainless-steel fan stack with inclined bottom. They are provided with fan guards.

Options

Frequency converter, two speed motor, Automatic Deconcentration by Induction (Dai), explosion proof motors, site erection, plume suppression coil, etc.

JACIR
Cooling for life

KBH

Open circuit cooling tower

Technical Documentation

CONTENT Page(s)

La FRENCH FAB

JACIR

With more than 60 years' experience, our company:

- Has gained a great deal of experience in aeraulic, acoustics and water-cooling towers.
- Has invested in detailed research and development in order to propose technical solutions according to the environmental protection.
- Is the European leader thanks to its technology beyond market requirements.

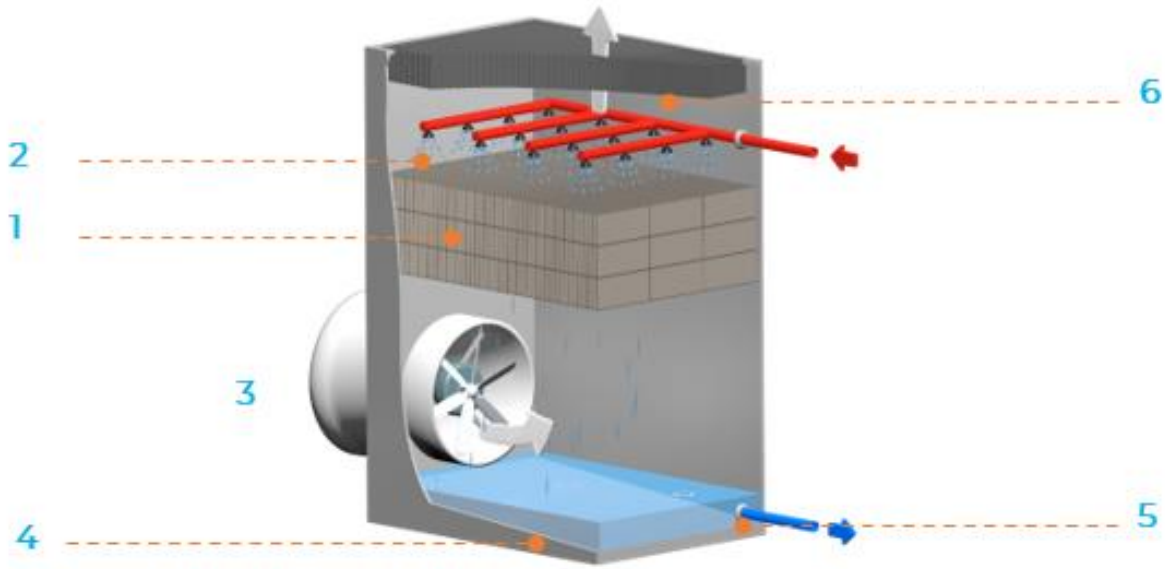
STRONG ADVANTAGES OF THE KBH

∞ EXCHANGE SURFACE	High efficiency, with low fouling and low pressure drop characteristics thanks to vertical channels; It can be used up to 55 °C as standard, up to 80°C in option.
∞ CASING DESIGN	Casing of tower is made in concrete: high mechanical resistance. Very simple design for fast and economical installation
∞ EASY MAINTENANCE	The exchange surface is assembled in a simple piece. It can be inserted and removed for complete cleaning in few hours. The fan is at man chest.
∞ ASSEMBLY/TRANSPORT	The exchange surface is assembled in factory, in reduced volume for a standard transport. A simple lifting will expand it into final position down to the cell.
∞ SILENCE	Compared with induced draft towers, the RBH are low sound towers in standard, can be improved according to the requirement.

Open circuit cooling tower principle KBH

A cooling tower is a heat exchanger, which enables water to be cooled through direct contact with air. The heat transfer from the water to the air is carried out partly by sensible heat transfer, but mainly by latent heat transfer (evaporation of part of the water into the air), which makes it possible to reach cooling temperatures lower than ambient temperatures.

Operation:



The hot water to be cooled is pumped to the top of the tower through pipes. This water is divided and distributed over the heat exchange surface (1) by low pressure water distribution nozzles (2).

Blown by the fan (3), the fresh air enters into the lower section of the unit and escapes through the upper section after being heated and saturated by passing through the wetted heat exchange surface.

As a result of surface tension, due to the exchange surface, the water spreads in uniform way, falls down the whole height. The exchange surface is then increased.
The water, cooled thanks to forced ventilation, falls into the inclined basin (4) at the bottom of the tower.

Then the water is sucked through the strainer (5). Drift eliminators (6) located at air outlet reduces drifts losses.

Benefits of cooling towers compared with dry coolers :

Energy savings

- Chillers, condensers associated to a cooling tower will be cooled at a lower temperature and then will have a better cooling capacity. Their efficiency is higher.

- Seven to ten times more air must be blown in a dry cooler, which means a lot of fans and electric motors. So, the electrical consumption is about 40% higher.

- A tower costs 30 to 50% of the price of a dry cooler for a same evacuated power.

- A 1°C increase of the ambient air has direct effect on the performance of dry air cooler, while the efficiency of a cooling tower will not be as much affected as the wet bulb has not fluctuated in the same way

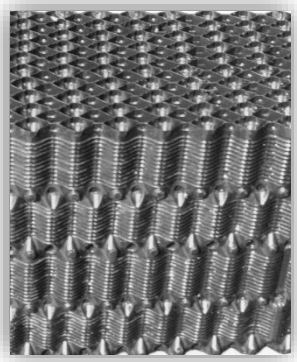
Noise reduction

Jacir can supply much quieter tower than a dry cooler.

Exchange surface: FREEFILM

The exchange surface, or infill is made of vacuum pressed PVC sheets. This material is non-putrescible, long lasting, also offers the following benefits:

- Has a very low pressure drop, so low power consumption thanks to the vertical channels,
- Has a good thermal efficiency,
- Is highly resistant to fouling thanks to large size channels: 12 or 20 mm.
- Can be used up to 55 °C as standard, and up to 80 °C as option with PP or ABS material
- Is resistant to chemicals.



Tower casing

It is in concrete, from a very simple design: it consists in 4 smooth walls, with one square opening for the fan stack; the benefits are the very simple civil works, and very smooth surface without areas that could enhance bacteria development and make the cleaning simple and efficient. Jacir supply the guide lines for the civil works with loads.
Large access doors to the basin are provided for cleaning.

Accessibility

The access to the mechanical parts can be done without any lifting equipment, and by the opening of the fan guard.
The exchange surface can be inserted and removed by simple lifting, without any disassembly so installation and maintenance time are very limited: for cleaning, it is just necessary to lift down the internal in a single piece on a support.

Water distribution

Water distribution is made of PP pipes through high efficiency water distributors. The nozzles made of polyamide distribute the water uniformly on the whole exchange surface. They operate at low pressure: 0.8 mWC. These nozzles are screwed to the distribution pipes, for easy maintenance and strong mechanical resistance.
The water nozzles are widely sized to avoid any clogging, even in the case of high suspended solids content.

Drift eliminators

Highly efficient, they prevent the water from being sprayed out of the tower. Ultraviolet resistant, they are easy to remove from the top in order to access to the distributors and to the exchange surface. They are made of PVC or PP blades with a pitch of 25 or 45 mm.

Fans

The axial fans are adjustable stand still type.
The number of blades and the material are selected according to the thermal and sound requisition. The inlet cones are made of polyester. Their calyx shape drastically improves the fan efficiency.
The fan stack is made in stainless steel, has an inclined bottom to avoid water losses and potential freezing. The fan stack is permanently warmed up by the water flow inside the tower. All the mechanical components to be maintained are located at man chest, out of the wet air flow. A fan guard, installed with hinges makes the access to the tower safe. The support for the mechanics is made in galvanised steel.

Standard motor

- Asynchronous three-phases motor,
- 1500 rpm,
- 230 / 400 V,
- 45 to 75 kW,
- 50 Hz,
- IP55 (possible open sky operating),
- Direct connection to terminal box,
- Coupling to parallel shafts gear box, with lubrication line out of the fan stack

Additional sound-attenuation

Decrease or variation of fan speed, polyester blades. In order to even improve the sound attenuation, a water fall sound attenuation, a fan housing and an air out let cone with sound attenuating material can be provided.

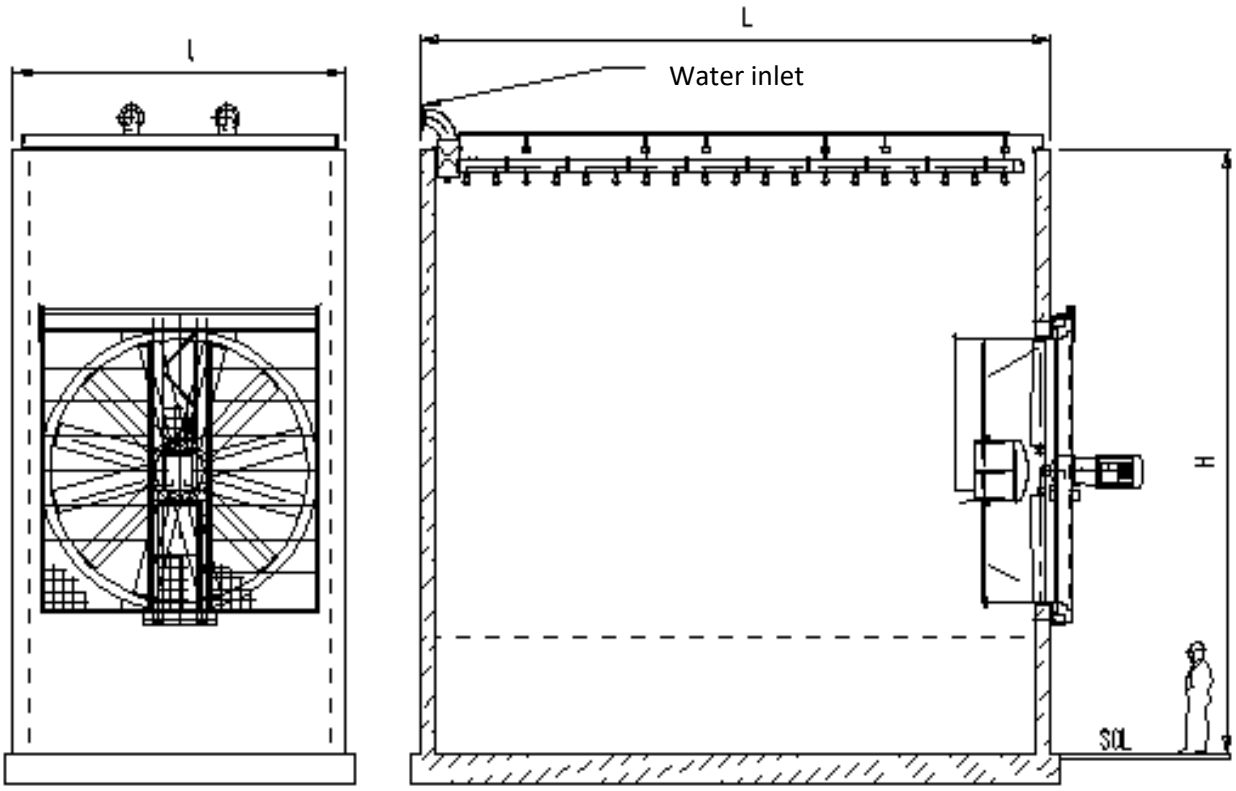
OPTIONS

- Plume suppression system,
- Two - speed motor (Dahlander type –1500/750 rpm, separate wiring or PAM –1500/1000 rpm),
- Frequency controller,
- Automated Inductive deconcentration (see DAi documentation),
- Discharge cone (increase of air outlet speed and safety for access to the water distribution pipes),
- Fan housing,
- Assembly on site by experimented technicians from our factory,
- Fan bearing lubrication line (Rilsan), extended on the fan stack.

Technical characteristics KBH

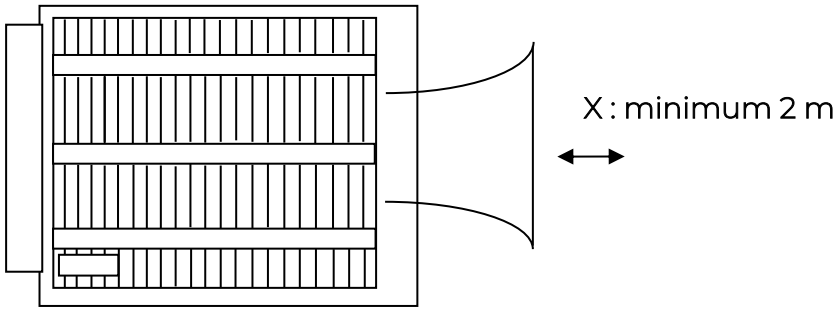
KBH serie	Water flow rates (m3/h)	External dimensions (m)			ϕ fan (mm)	Motor power (kW)
		L	l	H over basin (for 2m packing)		
KBH 2520	250 à 750	7	3.6	7.8	3080	45 à 75
KBH 2800	280 à 840	7	4	7.8		
KBH 4500	450 à 1350	9	5	9.23	4320	
KBH 5000	500 à 1500	10	5	9.23		
KBH 5500	550 à 1650	11	5	9.73		
KBH 6500	650 à 1950	13	5	9.73		

Drawings and dimensions KBH



Choix de l'emplacement KBH

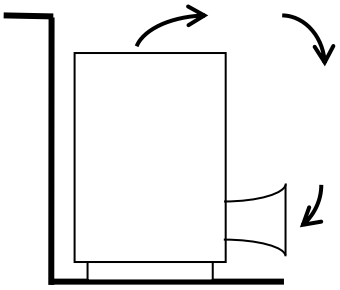
Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings.
This could create a risk of a « re-circulation »; the air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower.
In any case, the free access must be secured to ensure that the fans are supplied correctly with air and that there is proper access for installation and maintenance.
If these rules are not applied, it is inevitable that the cooling tower will not operate properly.



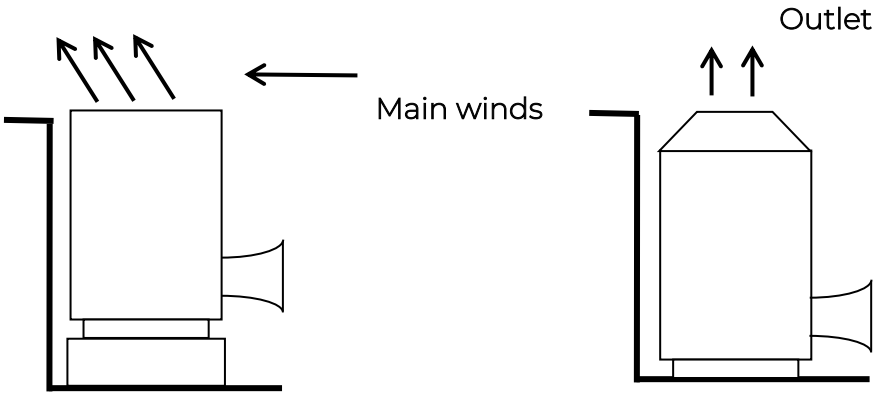
Contact us for layout advices

Exemples d'implantation :

NO



YES



WATER EVAPORATION

Consumption by evaporation is approximately 1.7kg/h per 1 000kcal/h.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible).
There are three possibilities to choose according to the case:

1- Continuous blow down

Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.

The blow down flow rate can be calculated using the formula: [100 S / (M - S)] % of the make-up water in which:
S: Salinity of the make-up water compensating for evaporation.
M: Maximum acceptable salinity level of water in circuits.

Example:
Salinity of make-up water = HT 20 ° F
Maximum acceptable salinity = HT 40 ° F
100 x 20 / (40 - 20) = 100 % make-up water flow rate
Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).

Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous blow down

The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- JACIR Automated Inductive Blow down

Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level. See separate documentation.

WATER TREATMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly. If the water contains a significant amount of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10% of the recycled water flow.
If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.
In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to prevent these organisms from developing.

Water treatment should be undertaken by a specialized Company.
PREVENTS THE RISK OF LEGIONNAIRES' DISEASE: see separate documentation

Prescription KBH

Evaporative water-cooling tower, modular with a forced draft axial(s) fan(s), JACIR, KBH .....

Thermal characteristics

The thermal power to be dissipated will be .....kW for conditions between ...°C and .....°C with a wet bulb of..... °C at air inlet.

Sound characteristics

The sound pressure level of the tower will not exceed.... dB (A) at ..... meters in free field over 4 directions. To achieve it, the tower has one of the following types of soundproofing devices : fan motor speed decrease, polyester blades, sound attenuating coating on fan casing, air outlet cone.

Accessibility

The access to the mechanical parts will be at man chest through the fan guard with hinges.
The exchange surface will be inserted and removed by single lifting, without any disassembly. Installed on the ground, the water distribution and the packing will be totally accessible for complete cleaning. The single piece internals assembly will drastically reduce installation and maintenance times.

Infill: FREEFILM

It is made of vacuum pressed PVC sheets for 55 °C water as standard; it is in PP or ABS up to 80 °C. Once assembled, it shows vertical channels of 12 or 20 mm to avoid fouling and to allow low pressure drop.

Water distribution

Water distribution is made of PP pipes through highly efficient water distributors. The nozzles made of polyamide distribute the water uniformly on the whole exchange surface. These nozzles are screwed to the distribution pipes, for easy maintenance and strong mechanical resistance. They will operate under low pressure: 0.8 mWC ; this will lower pumping head and create large size drops, so low drift out of the tower.
The water nozzles are oversized to avoid any clogging, even in the case of high suspended solids content.

Tower casing

It will be built by the customer, with the guide lines provided by Jacir. It will be in armed concrete, minimum 250mm thick, with square openings for the fan.

Fans

The axial fans will be adjustable stand still type. The inlet cones will be made of polyester. Their calyx shape drastically will improve the fan efficiency. The fan stack will be made in stainless steel 304 L (option 316L), with an inclined bottom, a 304 L disc, and warmed up by the water inside the tower. All the mechanical components to be maintained will be located at man chest, out of the wet air flow. A fan guard, installed with hinges will make the access to the tower safe.

Electric motor and coupling

The motor is a closed type with ventilated case with a power of kW....., rpm ....., IP55 protected class F. Gear box will be used for the transmission.

JACIR
Cooling for life

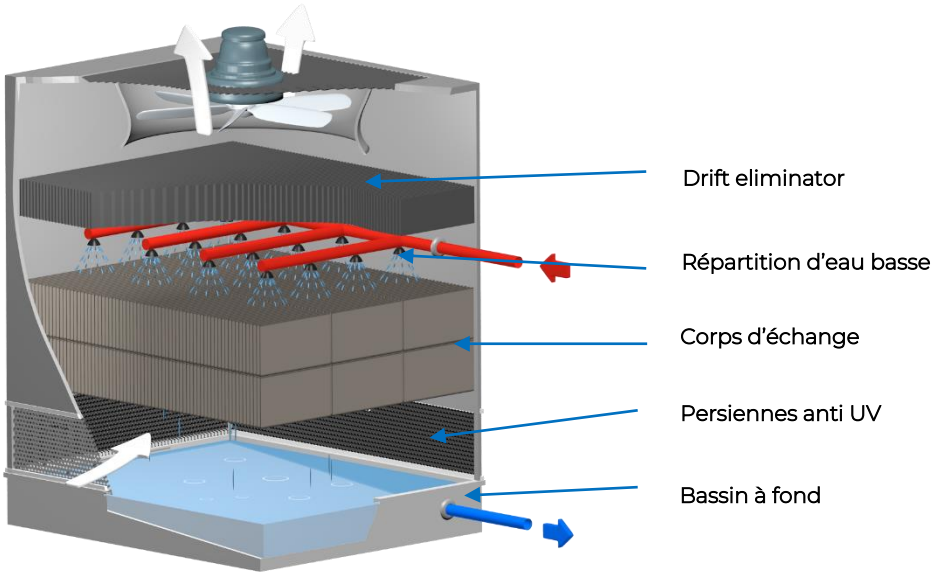
VAP

Simple & clean

Commercial Documentation

- Exceptional lifetime
- Simplified maintenance
- Complete disassembly and cleaning
- Direct coupling fan/motor
- In conformity with NF E 38-424 standard

VENTILATEUR ASPIRANT POLYESTER : SERIE VAP



Anti-legionella conception

Casing

It is made of self-supporting Fiber Reinforced Polyester panels. All the steel parts for the assembly are inserted into the polyester. The corrosion resistance is absolute. A special care is given to the internal surface, to make it smooth to slow biofilm growth.

Accessibility

A large door, opening the tower on its whole height gives a full access to safely control, remove all the internals. Sun ray proof louvers can be easily removed, to give access inside the basin. The cleaning is then very simple and efficient.

Mechanical coupling

In order to reduce operation and maintenance costs, and to improve reliability, the coupling of the fan to the motor is direct; no belt, no gear. In that way, Jacir has chosen low speed motor with direct fan coupling.

Exchange surface

The packing is made of PP, and provides the maximum exchange surface, this material is long lasting, has good resistance to temperature (70°c continuous), and can be handled easily. Range of operation up to 100°C upon request (optional).

Basin

The VAP can be delivered with or without polyester basin. It is made in one or two parts, assembled with external flanges to avoid bolting in contact with water. In that way, the biofilm growth is slowed. To secure the circuit cleanness, the complete drain of the basin is easy thanks to the slope and to the drain outlet, located at the lowest part of the basin. Sun ray proof louvers prevent both splash out and direct UV rays inside the basin to slow down bacteria growth.

Water distribution

It is made of high-density Polyethylene pipes fitted with low pressure nozzles. Their design secures even water splash on the whole section of the packing. The large diameter nozzles (12 to 32 mm) are highly resistant to clogging and generate mainly large size drops. These drops are less sensitive to drift. Therefore, the bacteriological contamination risk is reduced.

Options

X-STEEL casing (VAPX), basin, louvers, grid below the packing for internal access, water heater with thermostat, frequency convertor, HDPE counter flanges, caged access ladder, FREEFILM packing: high resistance PVC film with 20mm vertical channels etc...

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Cooling for life

VAP

Induced draft polyester open cooling tower

Technical Documentation

CONTENTS

La FRENCH FAB

JACIR

With more than 60 years' experience, our company:

∞ Has invested in detailed research and development in order to propose technical solutions according to the environmental protection.

∞ Is today the European leader thanks to its technology beyond market requirements.

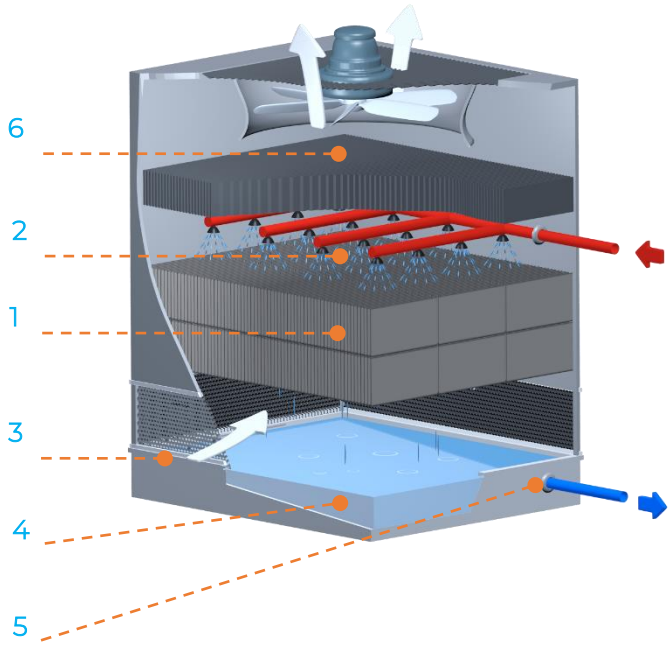
STRONG POINTS OF POLYESTER COOLING TOWER: VAP series

∞ DESIGN	Simple and robust with strong efficiency.
∞ POLYESTER CONSTRUCTION	Self-supporting FRP casing, absolute corrosion resistance, SILVER-STEEL stainless steel sheet metal or optional X-STEEL grade (corrosion resistance greater than 316L).
∞ TRANSMISSION	Direct coupling: without maintenance.
∞ INFILL SUPPORT	X-STEEL stainless-steel.
∞ EASY MAINTENANCE	Large access door on the whole height of the tower, sloped basin for a complete drain, no mechanical transmission
∞ INFILL	Packing is made of high efficiency PP film and easy to clean. It has an excellent resistance to temperature (75°C in continuous) and till 95°C an option.
∞ ELECTRICAL POWER	Induced draft axial fan with high performance.
∞ INSTALLATION	Single part, single lift, with "plug and play" hydraulics and electrical connections.

Open circuit cooling tower principle VAP series

A cooling tower is a heat exchanger which enables water to be cooled through direct contact with air. The heat transfer from water to air is carried out partly by sensible heat transfer, but mainly by latent heat transfer (evaporation of part of the water into the air), which makes it possible to reach cooling temperatures lower than ambient temperatures.

Operation of a wet air cooler



The hot water to be cooled is pumped to the top of the tower through pipes. This water is divided and distributed over the heat exchange surface (1) by water distribution nozzles (2).

Blown by the fan (3), the fresh air enters into the lower section of the unit and escapes through the upper section after being heated and saturated by passing through the wetted heat exchange surface.

As a result of surface tension, due to the exchange surface mesh, the water spreads in uniform way, falls down the whole height. The exchange surface is then increased.

The water, cooled thanks to the mechanical ventilation, falls into the inclined basin (4) under the tower. It then flows through the streamer (5). Drift eliminators (6) are installed at air outlet in order to limit the drift.

Energy savings

- Chillers, condensers associated to a cooling tower will be cooled at a lower temperature and then will have a better cooling capacity. Their efficiency is higher.
- Seven to ten times more air must be blown in a dry cooler, which means a lot of fans and electric motors. So, the electrical consumption is about 40% higher.
- A tower cost is 30 to 50% that of a dry cooler for a same evacuated power.
- A 1°C increase of the ambient air has direct effect on dry air cooler's performance, while the efficiency of a cooling tower will not be as much affected as the wet bulb has not fluctuated in the same way.

Manufacturing details VAP series

Casing

The casing is made of self-supporting white Fiber Reinforced Polyester panels. All the steel parts for the assembly are moulded into the polyester.

The widespread use of plastics gives VAP exceptional corrosion resistance and significantly reduces maintenance costs. The lightness of plastics simplifies support structures and lifting operations. The aesthetically attractive design of the VAP makes it easy to integrate into the sophisticated architecture of a building, whether it is placed on the ground or on the roof.

Accessibility

In standard, the VAP towers are delivered with a large access door, made in the same material as the casing: polyester. It is very light, and opens on the whole height of the tower, to all the internals. So the inspection, removal, and cleaning operations are very simple and easy.

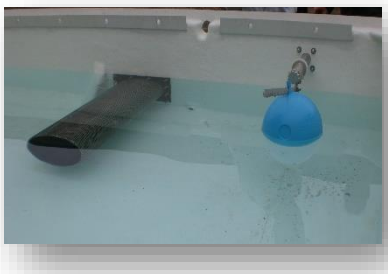
Sloped basin

The VAP can be delivered with or without polyester basin. It is made in one or two parts, assembled with external flanges to avoid bolting in contact with water.

The following connections are provided:

- Water outlet on the side or on the bottom,
- Spout overflow,
- Make up float valve,
- Complete drain flange, at the lowest part of the basin slope.

To secure the circuit cleanness, and no water stagnation, the complete drain of the basin is easy thanks to the slope and to the drain outlet, located at the lowest part of the basin. After drain, the bacteriological growth (Legionella) is impossible when the tower is stopped.
Concrete basin is possible: on the customer scope according to civil work guides lines and loads supplied by Jacir.



As an option, galvanized steel, Silver Steel casing or X-Steel stainless steel (for superior corrosion resistance compared to 316L) are also available: VAPX series.

Option VAPX

Delivered in two pre-assembled parts for the higher dimensions, it is equipped with a POWER FLOW (260x110mm) drain located at the lowest part of the inclined basin to enable the complete drain of the basin.

Louvers

Fitted on stainless steel supports and made of polypropylene, sun ray proof louvers prevent both splash out and direct UV rays inside the basin.

Their double direction honeycomb shape prevents the entrance of particles in the air inlet. So, they help for a better control of bacteria growth.

The louvers are very fast and easy to be removed for complete access to the basin.

Exchange surface: EFFI-PACK infill

The exchange surface made of thermoformed and welded polypropylene sheets is resistant to chocs and offers a large available surface lowering the fouling risks. The PP infill also offers the following benefits:

- High temperature resistance (75°C continuous),
- Highly efficient extended surface,
- Easy maintenance,
- High resistance to chemical agents,
- Range of operation up to 95°C on demand (option).

As an option, the infill Freefilm is also available: made of vacuum pressed PVC sheets, this material is non-putrescible, long lasting, also offers the following benefits:

- Very low pressure drop, so low power consumption thanks to the vertical channels,
- Highly resistant to fouling thanks to large size channels: 20mm for industry application,
- Can be used up to 55°C as standard. For higher temperatures involving specific designs: 70°C as option, PVC or ABS material,
- High thermal efficiency,
- Highly resistant to chemical agents,
- Suspended solids allowed: 80ppm,
- X-STEEL packing support as a standard.

Water distribution

The water distribution is essential for optimized safe performance of the cooling tower.

Water enters a PEHD header, and then high-density Polyethylene pipes fitted with low pressure nozzles (8kPa). Their design secures even water splash on the whole section of the packing. These large diameter (12 to 32 mm) nozzles are highly resistant to clogging (even in the case of many suspended solids) and generate mainly large size drops. These drops being less sensitive to drift the bacteriological contamination risk is therefore reduced.

The pipes are connected to the header with efficient gaskets, and can be easily and entirely removed, without tools, saving maintenance costs and time while ensuring the sustainability of performance.

Drift eliminators

Highly efficient, they prevent the water from being sprayed out of the tower and are easily removable and handy thanks to the handles designed for that purpose.

These drift eliminators are made of corrugated PVC blades, and have a certified efficiency of 0.01% minimum.

This efficiency has been certified by an independent external body (EUROVENT).

Motor-fan unit

L'équipement mécanique est monté sur un châssis en acier galvanisé à chaud qui prend appui sur l'enveloppe du réfrigérant. Il est disposé suivant un axe vertical et comprend : un ventilateur axial à pales réglables à l'arrêt en alu en standard, et FRP en option ; d'un moteur électrique à vitesse lente :

- Asynchronous motor,
- 500 to 750 rpm,
- IP 55 insulation, F class, special imprégnation spéciale against moisture (tropicalization).

The fan is directly coupled to the motor shaft; this avoids the use of belts or gears, and reduces maintenance time and costs. Safety is secured by a stainless-steel grid at the top of the cooling tower.

Delivery and erection

VAP cooling towers are factory assembled and delivered on site, ready to be connected. All the VAP cooling towers may be delivered with or without basin. Concerning locations installations with difficult access, VAP can also be delivered not assembled.

VAP cooling towers with FRP basin can be installed on a concrete surface or on a steel structure. Low weight of used materials allows a light supporting structure.

In case the cooling tower is delivered not assembled, the erection remains easy self-made on site.

Connections

Once the cooling tower is erected, all piping must be connected: hot water inlet, make up water, cold water outlet and overflow are supported separately from the cooling tower. Water inlet and outlet connections flanges are in PP strengthened by fiberglass

Overflow is equipped by threshold overflow. Make up water is connected by thread tip. Electrical connections are made on the motor connection box.

OPTIONS

- X-STEEL stainless steel casing (higher resistance to corrosion than 316L): VAPX series,
- SILVER-STEEL casing: VAPX series,
- Fan blades in polyester,
- High temperature infill (95°C),
- FREEFILM Packing (not EUROVENT certified),
- Basin and louvers,
- Grating walkway bellow the infill,
- Non-freezing heater with thermostat,
- Variable frequency drive,
- Counter flanges,
- High temperature resins for casing (80°C),
- Safety water switch (vibrating blade),
- Material delivered not factory pre-assembled,
- Erection on site by skilled technicians from our factory
- Access ladder to motor-fan unit (galvanized steel),
- Stainless steel (304,316) motor fan support

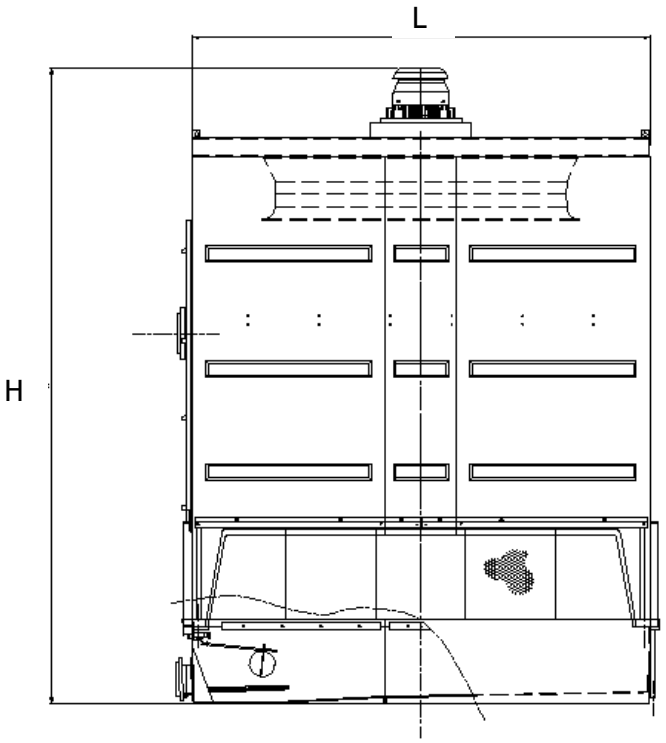
Technical characteristics VAP

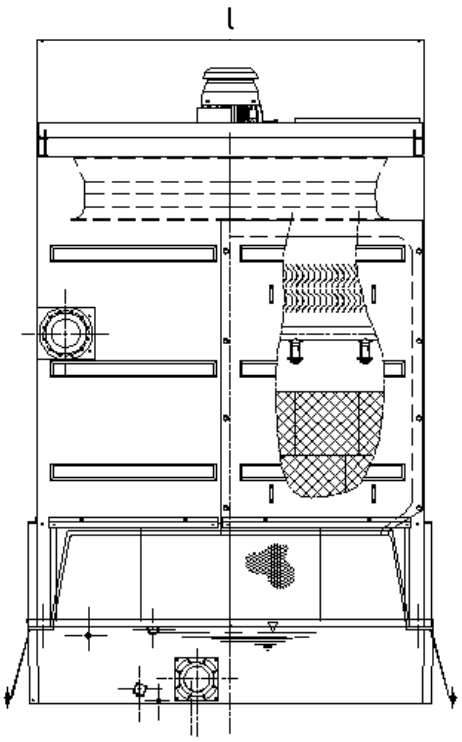
	VAP (X) 24-24D MA	VAP (X) 24-24 MA	VAP (X) 29-24 MA	VAP (X) 30-30 MA	VAP (X) 35-30 MA	VAPX 35-35 MA		VAPX 40-40 MA	VAPX 45-45 MA
Single speed motor									
Installed power (kW)	11	11	15	18,5	22	22	30	37	45
Speed (tr/min)	725	725	725	580	485	485	485	430	375
Absorbed power (kW)	6.2	10.3	13.8	16.8	19.4	19.1	23.9	24.4	30.6
Fan									
Diameter (mm)	1695	1695	1695	1990	2220	2415	2415	2725	3030
Sound level at 20 m (dBA)* Values± 2 dB(A)	67	67	67	68	68	68	69	70	71
Connections									
Water inlet (DN) / quantity	200 / 1	200 / 1	200 / 1	250 / 1	250 / 1	250/1	250/1	250/2	250/2
Water outlet (DN)** / quantity	200 / 1	200 / 1	225 / 1	225 / 1	225 / 1	250/1	250/1	250/2	250/2
Make up water on float valve (DN)	1''	1''	1''	1'' ¼	1'' ¼	1 ¼	1 ¼	1 ¼	1 ¼

* : Free field at 1.5m of the ground

** : Water outlet on the basin side, forced flow (if gravity outlet, diameter depends on the flow rate

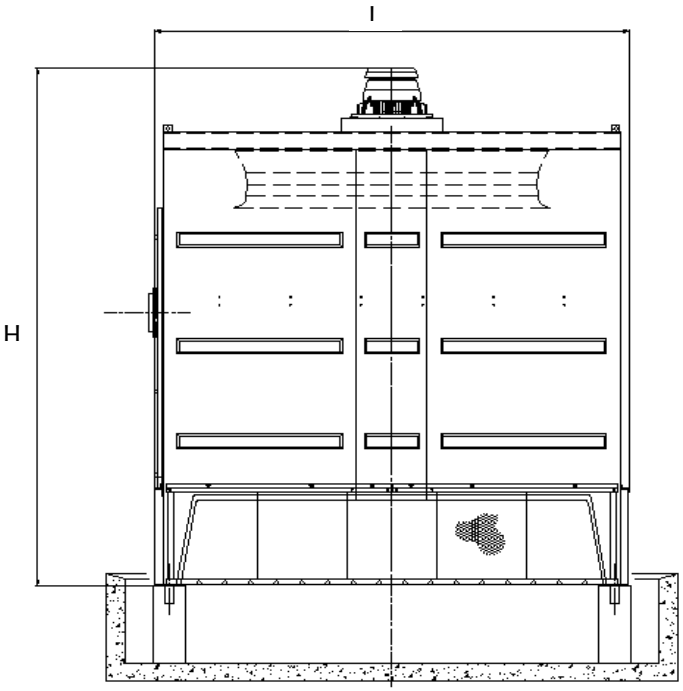
Drawings and Dimensions VAP with basin

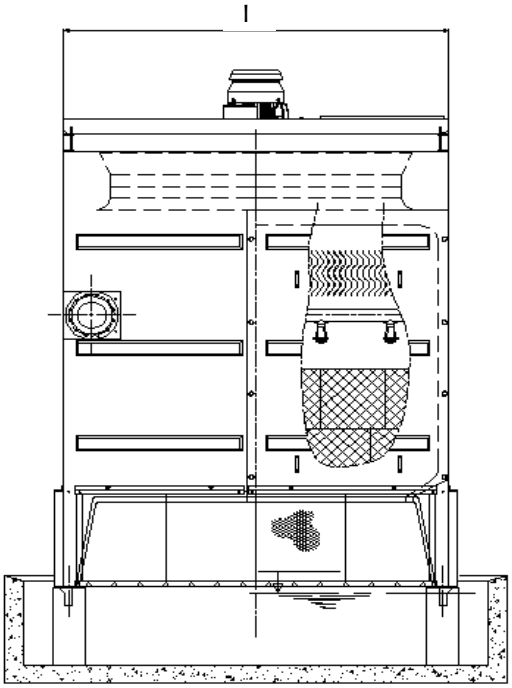




		VAP (X) 24-24D MA	VAP (X) 24-24 MA	VAP (X) 29-24 MA	VAP (X) 30-30 MA	VAP (X) 35-30 MA	VAPX 35-35 MA		VAPX 40-40 MA	VAPX 45-45 MA
L (mm)		2510	2510	3060	3150	3700	3740	3740	4255	4755
l (mm)		2510	2510	2510	3150	3150	3740	3740	4255	4755
H (mm)		4710	4710	4790	4940	4940	5080	5080	5900	5830
Shipping weight (kg)	Polyester	1300	1300	1550	2150	2360				
	Inox						3555	4055	5550	6600
Operating weight (kg)	Polyester	4280	4280	5345	7300	8380				
	Inox						9050	9550	12250	14400

Drawings and Dimensions VAP without basin (concrete basin– customer supply)





		VAP (X) 24-24D MA	VAP (X) 24-24 MA	VAP (X) 29-24 MA	VAP (X) 30-30 MA	VAP (X) 35-30 MA	VAPX 35-35 MA		VAPX 40-40 MA	VAPX 45-45 MA
L (mm)		2490	2490	3040	3130	3630	3770	3770	4230	4755
l (mm)		2490	2490	2490	3130	3130	3770	3770	4230	4755
H (mm)		4160	4160	4240	4340	4340	4480	4480	5120	5075
Shipping weight (kg)	Polyester	1150	1150	1350	1900	2050				
	Inox						3000	3500	4650	5500
Operating weight (kg)	Polyester	1560	1560	1855	2580	2850				
	Inox						3600	4100	6050	6900

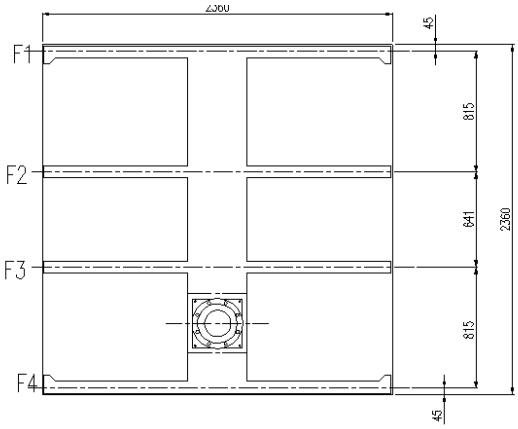
Support VAP

VAP cooling towers can stand on a concrete base or on steel frame beams (customer supply). Check that the ground can stand the operating load, and that surface or supports are flat and horizontal.

Quantity and position of concrete or metallic beams (customer supply)

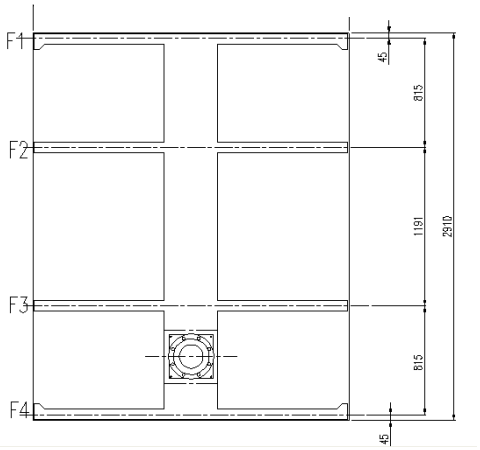
SUPPORT VAP 24-24 and VAP 24-24D

→ 4 BEAMS



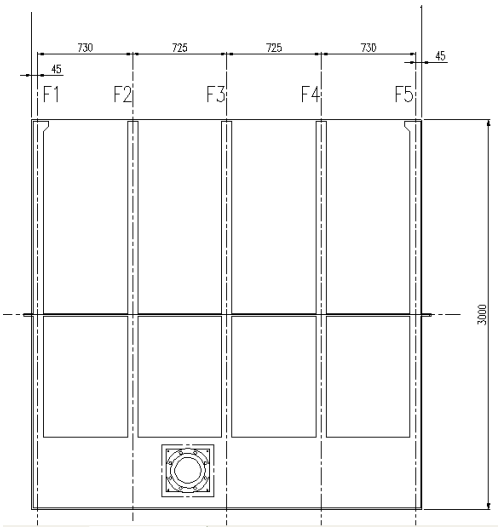
SUPPORT VAP 29-24

→ 4 BEAMS



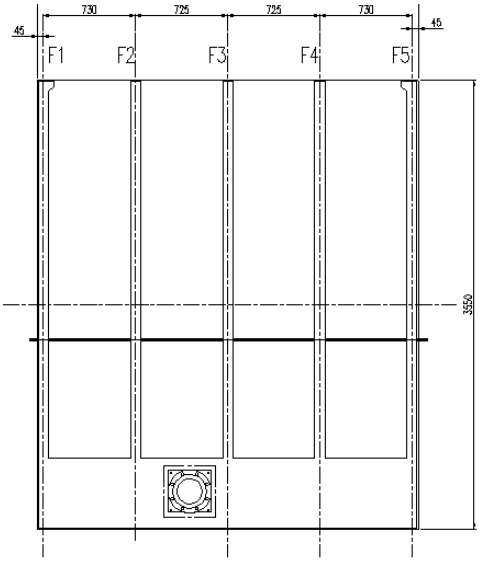
SUPPORT VAP 30-30

→ 5 BEAMS



SUPPORT VAP 35-30

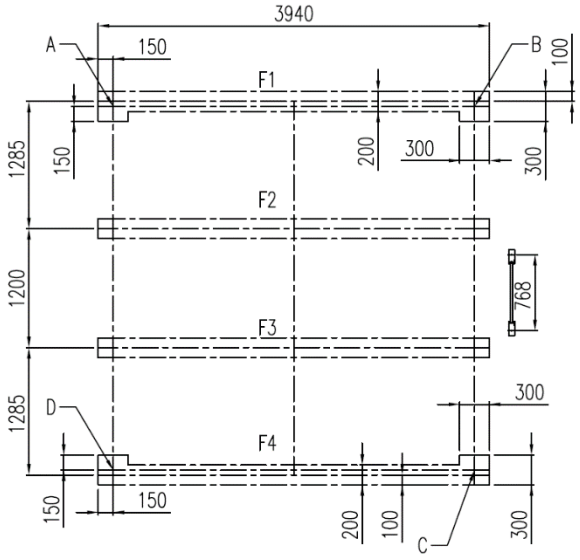
→ 5 BEAMS



Support VAP

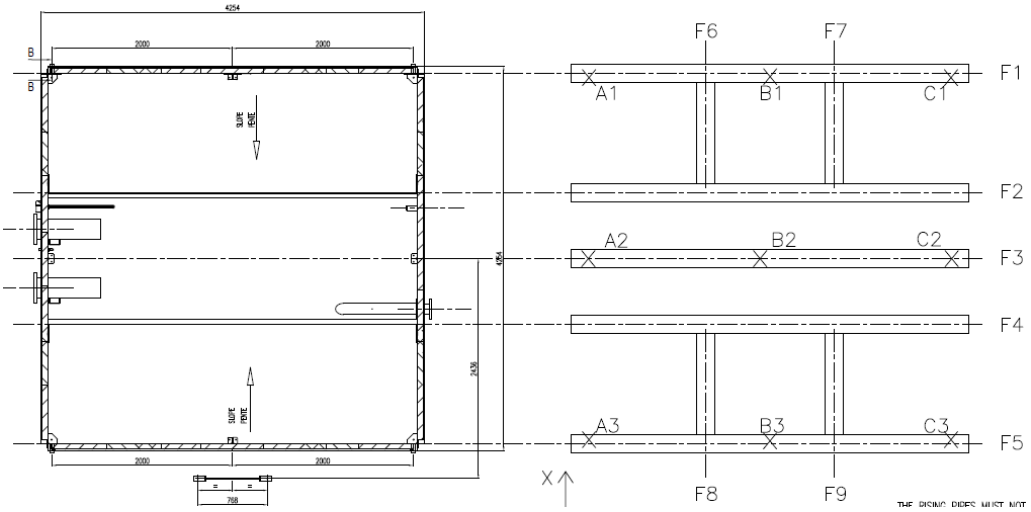
SUPPORT VAP 35-35

→ 4 BEAMS (F)



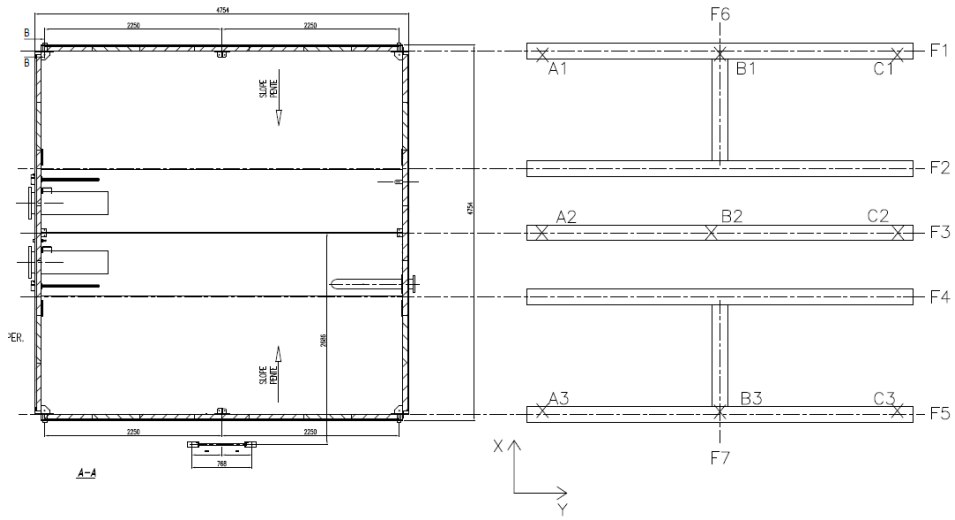
SUPPORT VAP 40-40

→ 9 BEAMS (F)



SUPPORT VAP 40-40

→ 7 BEAMS (F)



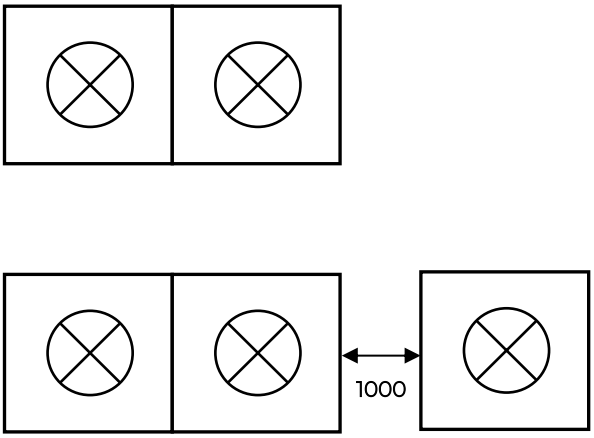
Choice of location VAP series

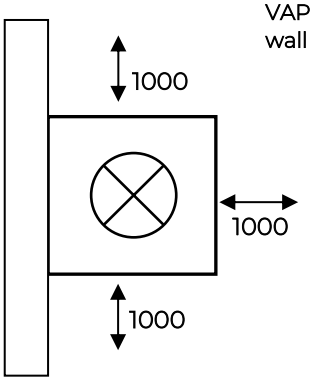
Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings. This could create a risk of a « re-circulation »; the air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower.

In any case, the free access on the four sides of the tower must be secured to ensure that the fans are supplied correctly with air and that there is proper access for installation and maintenance.

If these rules are not applied, it is inevitable that the cooling tower will not operate properly.

Recommended minimum free access (mm): Top view

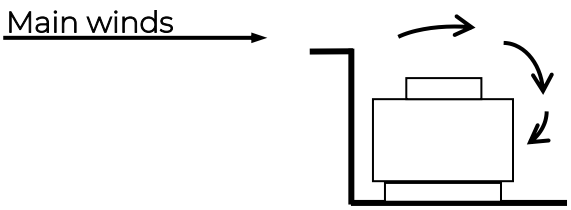




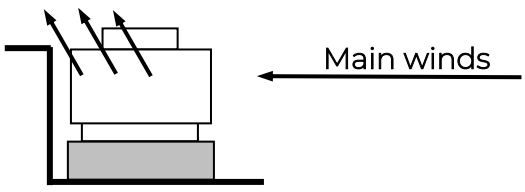
Do not hesitate to contact us for any advice

Layout examples:

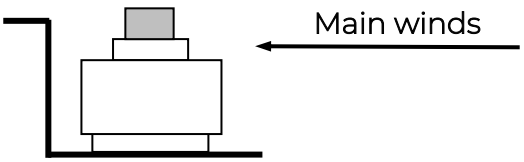
NO



YES



Positionner un socle
pour élever le rejet d'air de la tour



Positionner un cône de refoulement
pour élever le rejet d'air de la tour

WATER EVAPORATION

Consumption by evaporation is approximately kg/h 1,7 per kcal/h 1 000.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible). There are three possible mitigation process according to the case:

1- Continuous blow dow
Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.

The blow down flow rate can be calculated using the formula: [100 S / (M - S)] % of the make-up water in which:
S: Salinity of the make-up water compensating for evaporation.
M: Maximum acceptable salinity level of water in circuits.

Example :
Salinity of make-up water = HT 20 ° F
Maximum acceptable salinity = HT 40 ° F
100 x 20 / (40 - 20) = 100 % make-up water flow rate

Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).
Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous blow down

The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- JACIR Automated Inductive deconcentration device without maintenance

Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level.
(See separate documentation).

WATER TREATMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly.
If the water contains a significant amount of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10 % of the recycled water flow.
If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.
In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to stop these organisms from developing.

Water treatment should be undertaken by a specialized Company.

PREVENTS THE RISK OF LEGIONNAIRES' DISEASE: See separate documentation

Prescription VAP

Evaporative induced draft polyester cooling tower, designed and manufactured by Jacir, VAP..... Thermal performance will be previously EUROVENT CTI certified and compliant to December 2020 NF E 38-324 standard.

Thermal characteristics

The heat power will be ..... kW for conditions between .....°C to .....°C with a wet bulb of..... °C at air inlet.

Tower casing and basin

The casing will be made of self-supporting white Fiber Reinforced Polyester panels. The metallic corner angles and all the steel parts for the assembly will be moulded into the polyester.

VAP will be equipped by a large access door in standard made in the same material as the casing; it will be very light, and will opens on the whole tower height, giving access to all the internals. So, inspections, removal, and cleaning will be very simple and easy.

On the basin will be installed an easy to adjust float valve, a complete drain flange at the lowest part of the basin slope, a spout overflow, a no-cavitation's strainer located on the side or on the bottom, and sun ray proof louvers. preventing both from splash out and from direct UV rays.

Infill

The EFFI-PACK exchange surface will be made of thermoformed and welded Polypropylene sheets, will be resistant to chocks and will offer a large available surface. This system will ensure fouling risks reduction.

Water distribution

Water will be distributed first by a header and then by distribution pipes, all in PEHD. These distribution pipes will be fitted with high efficiency polypropylene low pressure nozzles. The nozzles will distribute water on exchange surface in a uniform way and operate under very low pressure (8kPa) by a large water flow (diameter from 12 to 32 mm).

Drift eliminators

Highly efficient, they will prevent the water from being sprayed out of the tower and will be easily removable and handy. These drift eliminators will be made of PVC waved blades, and will have an efficiency of 0.01% minimum of the flow when water is in recirculation.
This efficiency is certified by an independent external body (EUROVENT).

Motor-fan unit

Mechanical equipment will be installed on hot dip galvanized steel frame which will take support on the whole cooler casing. It will be arranged according to a vertical axis and includes: an aluminium axial fan with variable pitch at stand-still and a low-speed motor:

- Asynchronous motor,
- 500 to 700 rpm,
- IP 55 insulation, F class, special impregnation against moisture (tropicalization).

The fan will be directly coupled to the motor shaft; avoiding the use of belts or gears.

Connections

Once the cooling tower is erected, all piping will be connected: hot water inlet, make up water, cold water outlet and overflow, the whole supported separately from the cooling tower. Water inlet and outlet connections flanges will be in PP strengthened by fiberglass. Overflow will be equipped by threshold overflow. Electrical connections will be made on the motor connection box.

Delivery and erection

VAP cooling towers will be factory assembled and delivered on site, ready to be connected.
All the cooling towers may be delivered with or without basin.
Concerning locations installations with difficult access, VAP may be delivered not assembled.

VAP cooling towers with basin may be installed on a concrete surface or on a steel structure. Low weight of materials will allow a light supporting structure.
In case of cooling tower delivered not assembled, the erection will remain easy on site by the customer when bolting all elements together.

Prescription VAPX

Evaporative induced draft polyester cooling tower, designed and manufactured by Jacir, VAP..... Thermal performance will be previously Eurovent CTI certified and compliant to December 2020 NF E 38-324 standard.

Thermal characteristics

The heat power will be ..... kW for conditions between .....°C to .....°C with a wet bulb of..... °C at air inlet.

Tower casing and basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive, if necessary, a double casing later on.

Stainless steel rivets with uniform and high-capacity locking will be used for assembly.
The cooling tower casing will be assembled without any bolting or welding for the parts in contact with water; a special designed high covering seal ensure waterproofing between the panels.

On the basin will be installed a float valve easy to adjust, a complete drain flange (260x110 mm) at the lowest part of the basin slope (POWER FLOW), a spout overflow, a none cavitation's strainer located on the side or on the bottom, sun ray proof louvers preventing both from splash out and from direct UV rays.

Casing structure

The cooling tower panels casing will be made of:

- galvanized steel 2 mm thick ZENDZIMIR process 275 gr/m² (galvanized plates are protected by the zinc oxidation on the surface) or,
- option SILVER-STEEL casing or,
- option X-STEEL stainless steel (corrosion resistance higher than 316L) for its long-lasting properties, water saving and easy cleaning.

Infill

The EFFI-PACK exchange surface will be made of thermoformed and welded Polypropylene sheets, will be resistant to chocks and will offer a large available surface. This system will ensure fouling risks reduction.

Water distribution

Water will be distributed first by a header and then by distribution pipes, all in PEHD. These distribution pipes will be fitted with high efficiency polypropylene low pressure nozzles. The nozzles will distribute water on exchange surface in a uniform way and operate under very low pressure (8kPa) by a large water flow (diameter from 12 to 32 mm).

Drift eliminators

Highly efficient, they will prevent the water from being sprayed out of the tower and will be easily removable and handy. These drift eliminators will be made of PVC waved blades, and will have an efficiency of 0.01% minimum of the flow when water is in recirculation.
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Motor-fan unit

Mechanical equipment will be installed on hot dip galvanized steel frame which will take support on the whole cooler casing. It will be arranged according to a vertical axis and includes: an aluminium axial fan with variable pitch at stand-still and a low-speed motor:

- Asynchronous motor,
- 500 to 700 rpm,
- IP 55 insulation, F class, special impregnation against moisture (tropicalization).

The fan will be directly coupled to the motor shaft; avoiding the use of belts or gears.

Connections

Once the cooling tower is erected, all piping will be connected: hot water inlet, make up water, cold water outlet and overflow, the whole supported separately from the cooling tower. Water inlet and outlet connections flanges will be in PP strengthened by fiberglass. Overflow will be equipped by threshold overflow. Electrical connections will be made on the motor connection box.

Delivery and erection

VAP cooling towers will be factory assembled and delivered on site, ready to be connected. All the VAP cooling towers may be delivered with or without basin. Concerning locations installations with difficult access, VAP may be delivered not assembled.

VAP cooling towers with basin may be installed on a concrete surface or on a steel structure. Low weight of materials will allow a light supporting structure. In case the cooling tower will be delivered not assembled, the erection will remain easy on site by the customer when bolting all elements together.

JACIR
Cooling for life

TEC

Sliding casing cooling tower

Water flow rate: from 250 to 10 000 m3/h

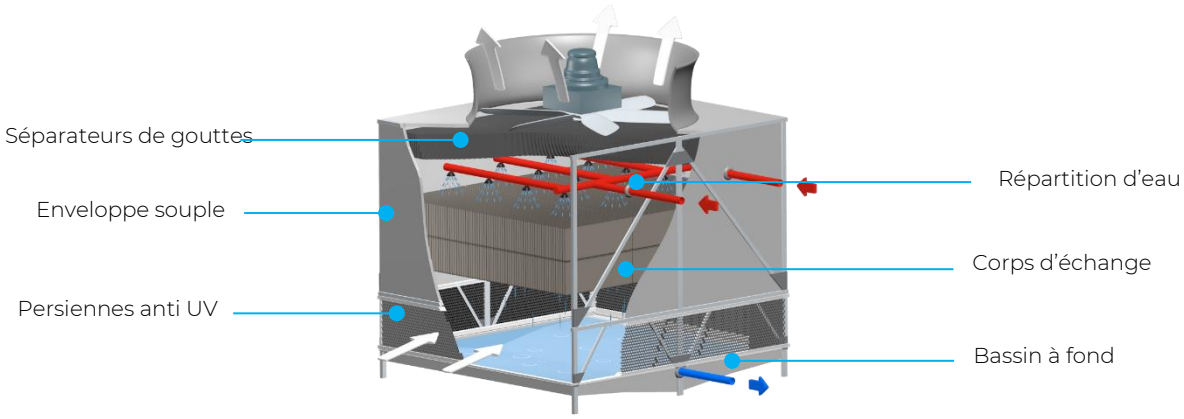
Power: 1 450kW to 58 000kW

Commercial Documentation

- Corrosion free materials
- Exceptional long-lasting
- Easy maintenance
- Totally accessible for cleaning

FABRIQUE EN FRANCE
NF 38-424
La FRENCH FAB

Sliding casing cooling tower: TEC serie



Casing

The casing is designed in stitch of fiberglass high density weaved (900 gr / m2) with a perfectly smooth and resistant PVC coating. It is hanged on stainless steel rolling rails on 2 sides for very fast and complete opening and a closure.

Access

The complete opening on its 2 adjacent sides allows access to all internals of the cooling tower in order to inspect and/or remove the components. Safe access to motor fan set is possible from the inside or in option by external walkways at the top of the unit.

Mechanical coupling

Ultimate industrial application for intensive 24/24 operation, motor fan coupling is ensured by a parallel shaft gear box. Easily accessible for drain and oil level control.

FREEFILM: exchange surface

Installed on FRP support beams, it is made of PVC sheets of 20 mm large section channels shaped to ease the cleaning. It is adapted for a water temperature use up to 55 °C, and as an option up to 70 or 80 °C. This design combines both extended high efficiency exchange surface with high clogging and fouling resistance.

Factory assembled Construction

The TEC structure is totally non-corrodible, made of composite pultruded beams and assembled with stainless steel X-STEEL plates.

The TEC range modules are pre-assembled in factory in order to reduce erection time on site.

Basin

The TEC range may be supplied with an optional FRP basin. It is made of two or three parts assembled with stainless steel bolts.

The central slope and the drain outlet located at the lowest part of the basin makes easier and complete draining and cleaning.

Sun ray proof louvers prevent both from splash out and direct UV rays inside the basin to limit bacteria growth.

Water distribution

Water distribution is ensured with high density polyethylene pipes fitted with low pressure nozzles. Their design secures an even watering on the whole section of the packing. The large diameter nozzles are highly resistant to clogging and generate mainly large size drops. These drops are less sensitive to drift. Therefore, the bacteriological contamination risk is significantly reduced.

Options

Basin, louvers, water heater with thermostat, frequency drive, Polyethylene counter flanges, sound attenuation (s), caged access ladder, casings also available in galvanized steel, stainless steel X-STEEL or FRP.

JACIR
Cooling for life

TEC

Sliding casing cooling tower

Technical Documentation

CONTENT

La FRENCH FAB

JACIR

With more than 50 years' experience, our company:

∞ Has invested in detailed research and development in order to propose technical solutions in accordance with environmental protection through unequalled realizations and patents.

∞ Is totally the European leader thanks to its technology beyond market requirements.

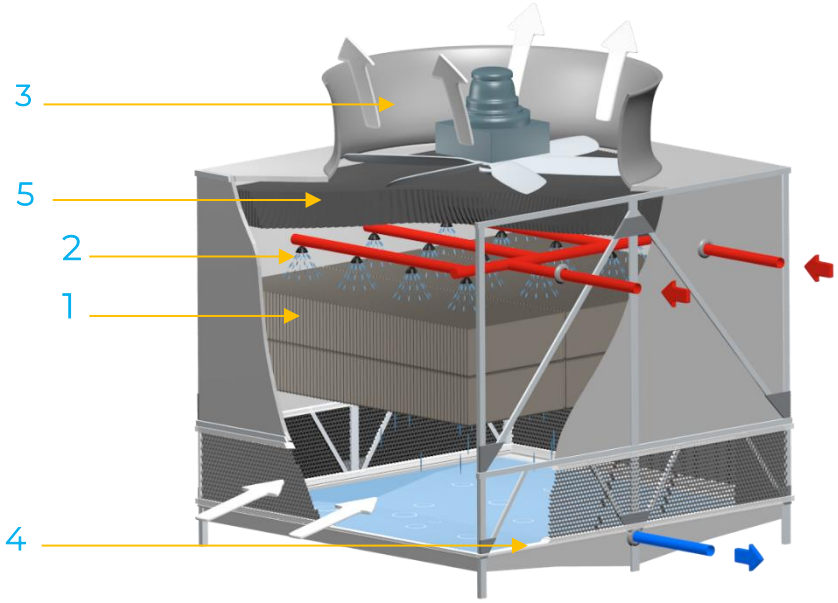
STRONG BENEFITS OF TEC SERIES

∞ DESIGN	Simple and strong with high efficiency.
∞ CONSTRUCTION	Self-supporting structure, non-corrodible, made of composite pultruded beams, absolute resistance to corrosion.
∞ TRANSMISSION	Direct: no maintenance
∞ INFILL SUPPORT	Supports made of composite beams.
∞ EASY MAINTENANCE	Sliding sides for easy access on the whole width and height of the cooling tower, sloped basin for complete drain, no mechanical coupling.
∞ EXCHANGE SURFACE	FREEFILM: made of PVC high-efficiency and very resistant to clogging, with low-pressure drop. It may be used until 55°C in standard.
∞ ELECTRICAL POWER	Axial induced draft fans at low speed and high efficiency.
∞ INSTALLATION	Factory pre-assembled modules, single lift, and "Plug and Play" system for hydraulics and electrical connections.

Principle and operation TEC

A cooling tower is a heat exchanger, which enables water to be cooled through direct contact with air. The heat transfer from the water to the air is carried out partly by sensible heat transfer, but mainly by latent heat transfer (evaporation of part of the water into the air), which makes it possible to reach cooling temperatures lower than ambient temperatures.

Operation mode:



The hot water to be cooled is pumped to the top of the tower through pipes.

This water is divided and distributed over the heat exchange surface (1) by polypropylene water distribution nozzles (2).

Blown by the fan (3), the fresh air enters into the lower section of the unit and escapes through the upper section after being heated and saturated by passing through the wetted heat exchange surface.

As a result of surface tension, due to the exchange surface mesh, the water spreads in uniform way, falls down the whole height. The exchange surface is then increased.

The water, cooled thanks to the mechanical ventilation, falls into the inclined basin (4) under the tower. It then flows through the streamer. Drift eliminators (5) are installed at air outlet in order to limit the drift.

Manufacturing details TEC

Access

The TEC range casing is specially designed in stitch of high density weaved fiberglass (900 gr / m2) with a perfectly smooth and resistant PVC coating.

The sliding casing is hanged on stainless steel rolling rails on 2 adjacent sides and is equipped with reinforced adjustable strap. This design allows an easy access on the whole height of the tower, to all the internals. So, the inspection, removal, and cleaning are very simple and easy.

FRAP, galvanised steel or X-STEEL stainless steel coatings are also available as an option.

Thanks to an attractive design, the TEC range can be very easily integrated into buildings environment, placed on the ground or building top.

Casing structure

The TEC structure composed by composite pultruded beams and assembled with stainless steel X-STEEL plates is totally corrosion free.

Very low weight tower, it can be easily and economically lifted and supported.

Sloped basin

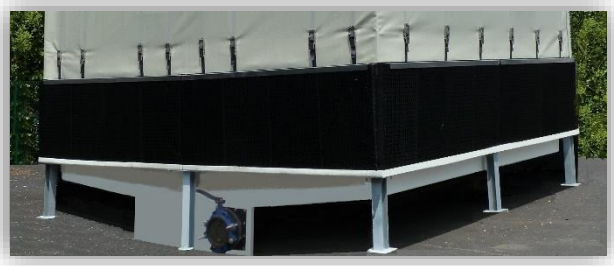
The TEC range is equipped with and independent basin, made of FRP, into two or three perfectly waterproof parts assembled with stainless steel bolts.

This basin is equipped with the following connections:

- Make up float valve system,
- Complete drain flange, at the lowest part of the central basin slope.

The slope of the basin facilitates its drain and cleaning. Bacteria's growing (Legionella) is by the way impossible inside the basin during cooling tower stop for maintenance.

The TEC range may also be equipped with a concrete basin (customer supply).



Louvers

Fixed on their support in X-STEEL stainless steel, the louvers made of polypropylene prevent from water splash out of the basin

The louvers removal is very easy and gives a complete access to the basin.

The double direction shape prevents the entrance of sun rays and particles in the air inlet. So, they help for a better control of bacteria growth.

Infill FREEFILM

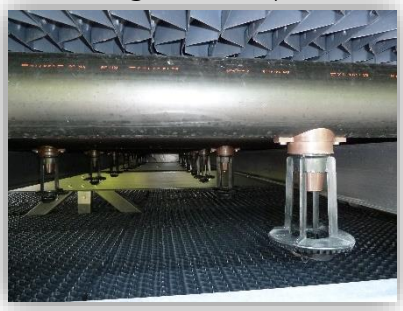
The exchange surface, also named packing or film, is made of PVC glued sheets.

This material is very resistant and offers the following benefits:

- Low pressure drop thanks to vertical channels, so low electrical absorbed power,
- High fouling resistance thanks to large size channels: 20 mm for industrial applications,
- Operation up to 55°C in standard. For higher temperatures or other water quality characteristics, others options are available: PVCC or ABS sheets to be used up to 70 and 80 °C,
- High thermal efficiency,
- High resistance to chemicals,
- Maximum Total Suspended Solids: 80ppm,
- Packing supports in composite pultruded profiles,
- Good fire resistance: M1.

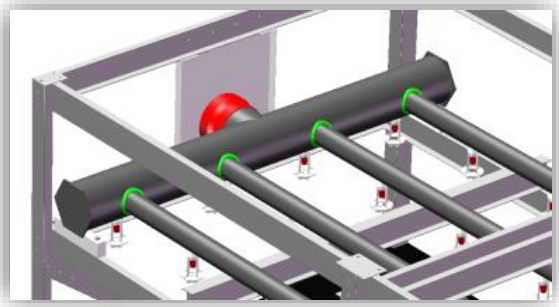
Water distribution

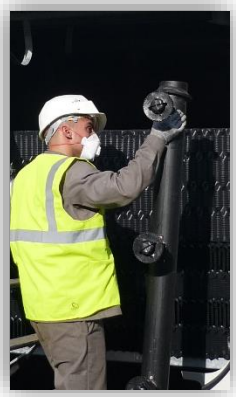
The water distribution is essential for optimized safe performance of the cooling tower. Water enters in a PEHD header. These water distribution pipes are equipped with high efficiency low pressure nozzles made of polypropylene. Nozzles are installed with gaskets to make easier and faster their removal. The nozzles design secures water distribution on the whole packing surface, under low pressure (8kPa). This low pressure allows mainly large size and weight of drops which are less sensitive to drift.



The large diameter nozzles (12 to 32 mm) are highly resistant to clogging, even in case of numerous suspended solid particles.

The water distribution system is totally removable by simply efficient gaskets in order to clean all the elements and reduces by the way times and costs maintenance, while ensuring long lasting performances.



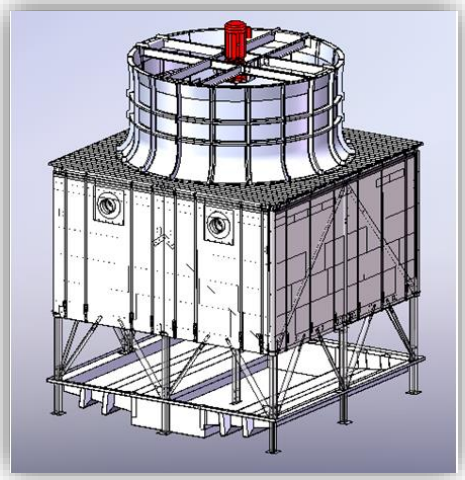


Drift eliminators

High efficient certified, they prevent the water from being sprayed out of the cooling tower and are easily removable.

These drift eliminators are made of corrugated PVC blades and have an efficiency 0.01% minimum.

Motor-fan set



Mechanical equipment is installed on hot dip galvanized steel frame settled on fan stack casing.

FRP fan stack is then installed at the top of the cooling tower according to vertical axis and is composed with:

- Axial fan with stand still adjustable blades made of aluminum in standard (FRP as an option),
- Low speed electrical motor IE2 (8 poles), IP 55 insulation, F class, special impregnation against moisture (tropicalization).

Ultimate industrial application for intensive 24/24 operation, motor fan coupling is ensured by a parallel shaft gear box. Easily accessible for drain and oil level control.

Connections

Once the cooling tower is erected, all piping must be connected: hot water inlet, make up water, cold water outlet and overflow are supported separately from the cooling tower.

Water inlet and outlet connections flanges are in PP strengthened by fiberglass.

Overflow is equipped by threshold overflow.

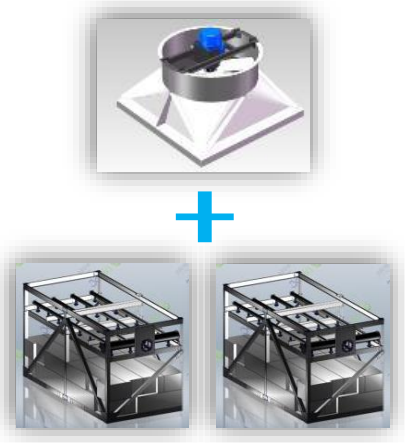
Make up water is connected by thread tip.

Electric connections are made on the motor's connection box.

Delivery and installation on site

The modules of the TEC range are factory pre-assembled to reduce erection times on site.

In case the cooling tower is delivered not assembled, erection remains easily done by the customer.



All the TEC cooling towers may be supplied with or without basin. Basins can be installed on a concrete surface or on a steel structure.
Low weight of used materials allows a light supporting structure.

OPTIONS

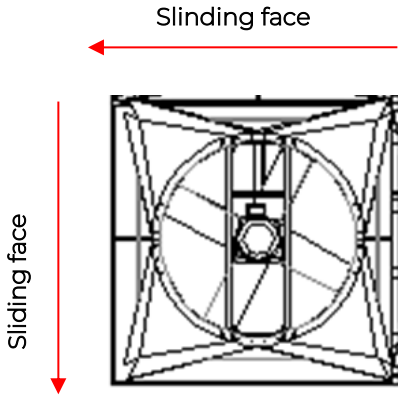
- High temperature infill (70°C),
- Basin and louvers,
- Walkway below the infill,
- Non-freezing heater with thermostat,
- Frequency drive (included with silent version),
- PEHD Counter flanges,
- High temperature resins (80°C),
- Safety water level switch (vibration blades),
- Non factory pre-assembled delivery,
- Erection on site by skilled technicians from our factory,
- Access ladder to motor fan (galvanized steel),
- Motor-fan support in stainless steel (304, 316L), or galvanized steel with Epoxy paint,
- Galvanized steel casing
- FRP casing,
- X-STEEL stainless steel casing (corrosion resistance higher than 316L).

Technical characteristics TEC

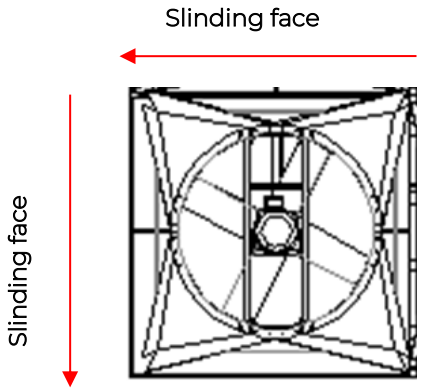
TEC serie	TEC 48-48	TEC 48--72
Motor		
Installed power x quantity (kW)	1 x 37	1 x 55
Fan		
Diameter (mm)	3658	3658
Connections		
Water inlet (DN) x quantity	250 x 2	250 x 3
Water outlet (DN)* x quantity	200 x 2	200 x 3
Make-up water on float valve (DN)	1'' ¼	1'' ½
Sound data**		
At 10m dB(A)	76	77
At 20m dB(A)	70	71
Sound power (Lw)	100	101

Sound attenuation as an option: silent blade and water fall attenuators: acoustic level on demand.
*Lateral water outlet non gravity (if gravity outlet, the diameter depends on water flow).
** (+/- 2 dBA), value average in 4 directions.

TEC 48-48

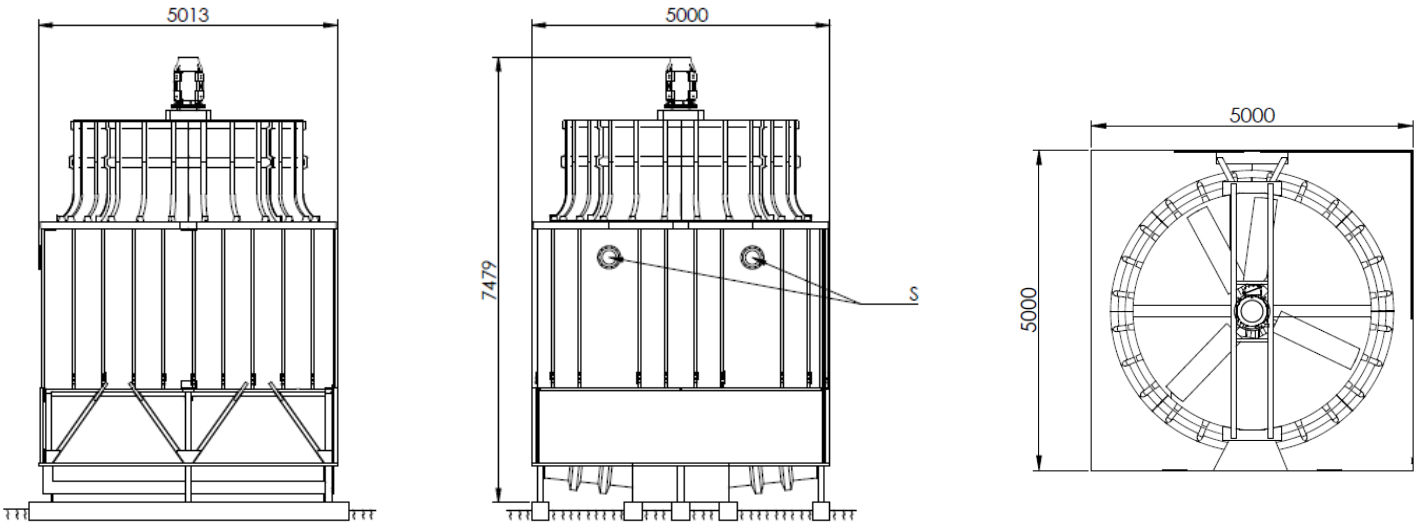


TEC 48-72



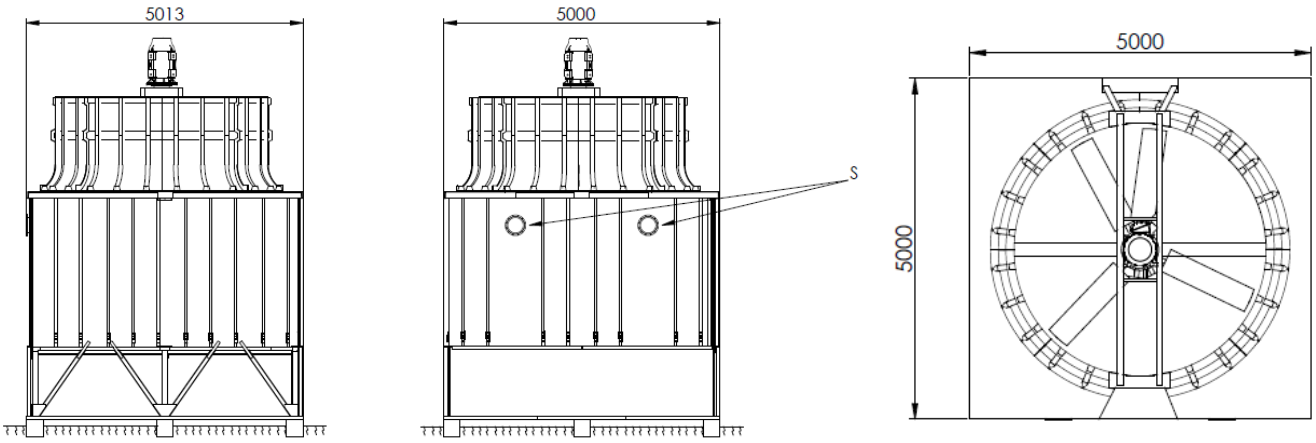
Drawings and dimensions TEC 4848 with FRP basin

TEC serie	TEC 48-48
S: hot water inlet (DN)	250
Weight empty (kg)	4 650
Weight in charge (kg)	10 600



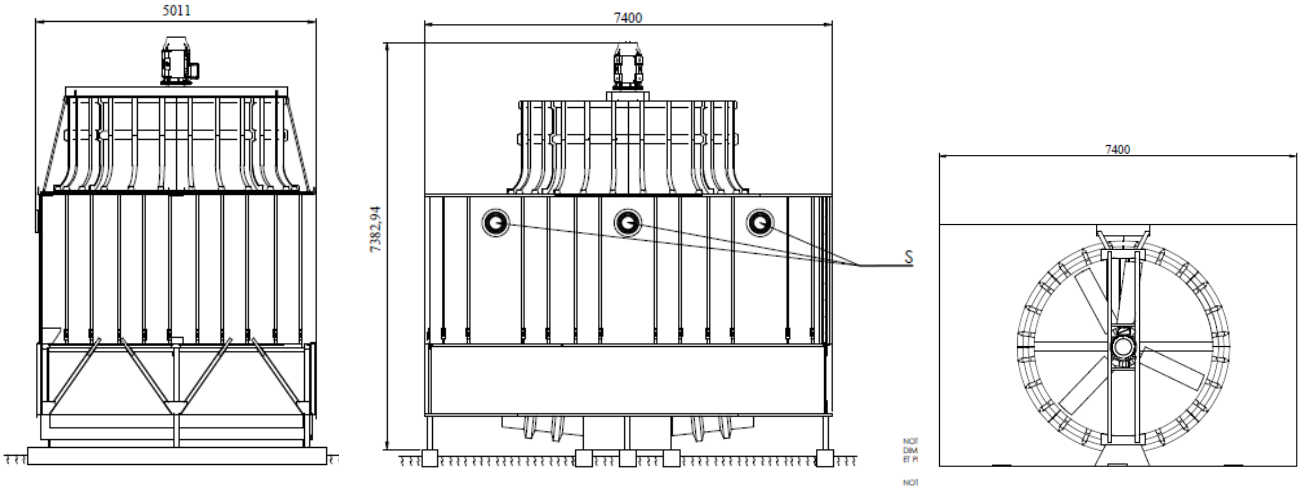
Drawings and dimensions TEC 4848 without basin

TEC serie	TEC 48-48
S: hot water inlet (DN)	250
Weight empty (kg)	3 750
Weight in charge (kg)	6 250



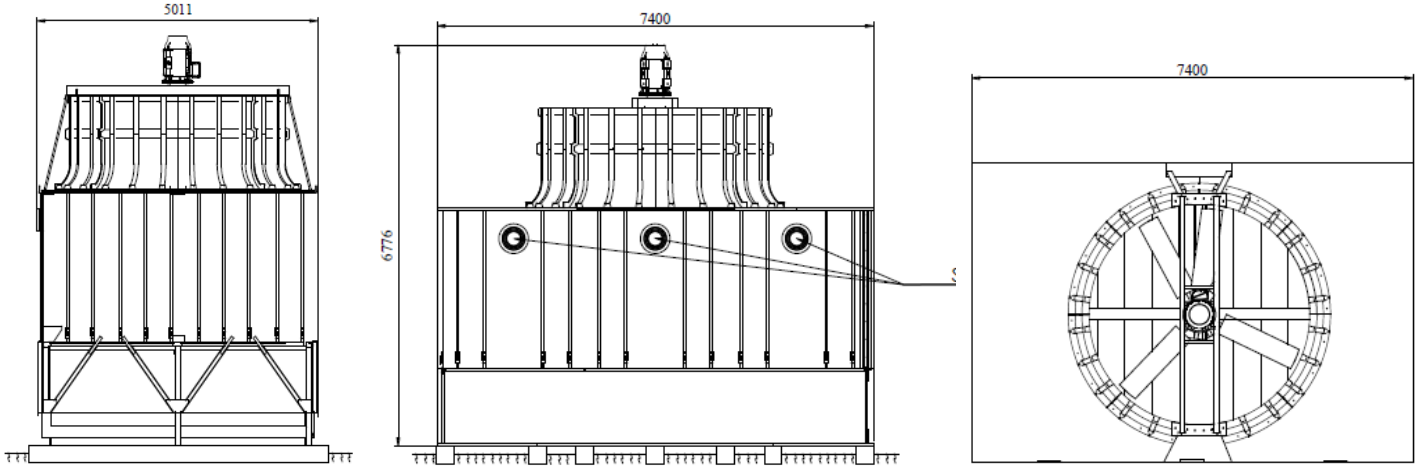
Drawings and dimensions TEC 4872 with FRP basin

TEC serie	TEC 48-48
S: hot water inlet (DN)	250
Weight empty (kg)	6 750
Weight in charge (kg)	16 150



Drawings and dimensions TEC 4872 without basin

TEC serie	TEC 48-48
S: hot water inlet (DN)	250
Weight empty (kg)	5 450
Weight in charge (kg)	9 200



Support TEC

TEC range cooling towers can stand on a concrete base or on steel frame beams (customer supply).
Check that the ground can stand the operating load, and that surface or supports are flat and horizontal.

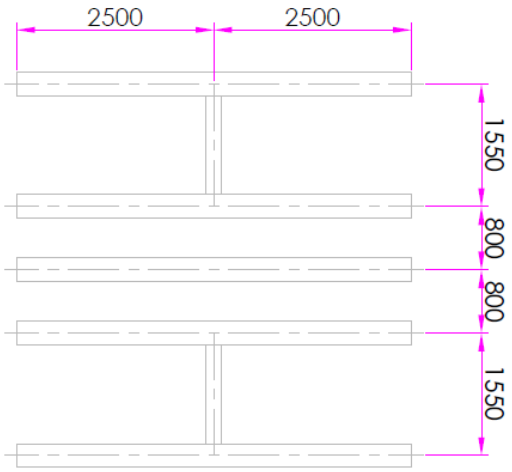
FRP basin

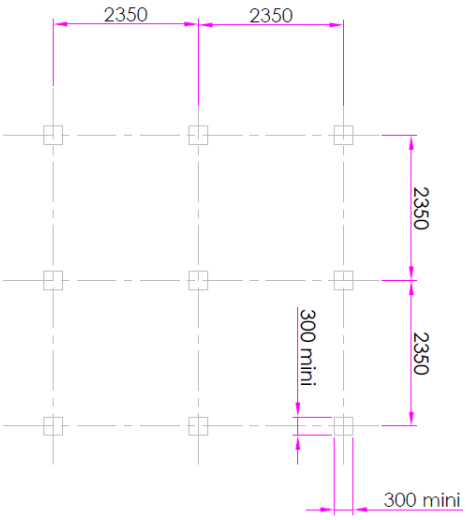
Quantity and steel support position (customer supply)

Sans bassin

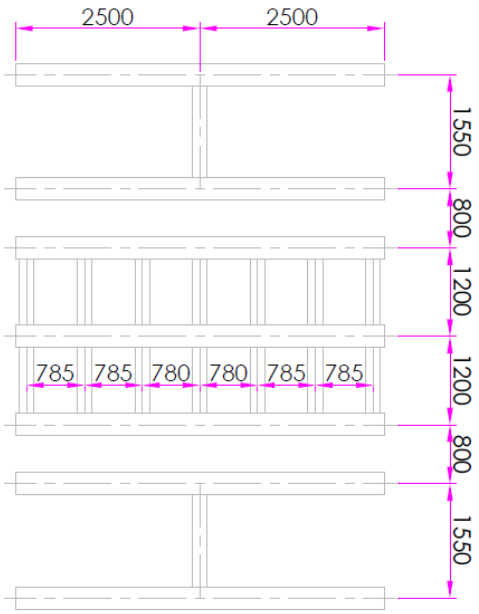
Without basin concrete supports (customer supply)

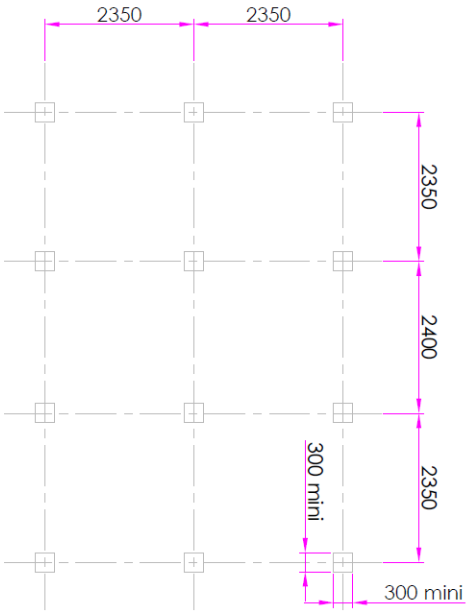
TEC 48-48





TEC 48-72



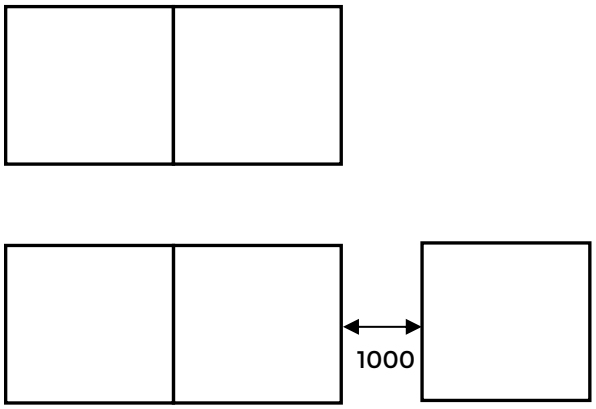


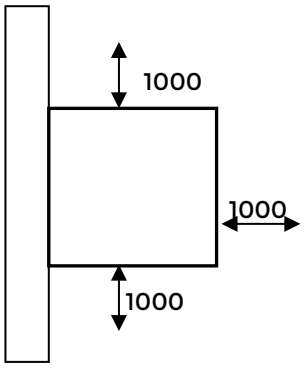
Layout RH

Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings. This could create a risk of a « re-circulation ». The air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower.

In any case, the free access on the four sides of the tower must be secured to ensure that the fans are supplied correctly with air and that there is proper access for installation and maintenance.If these rules are not applied, it is inevitable that the cooling tower will not operate properly.

Recommended minimum free access (mm): Top views

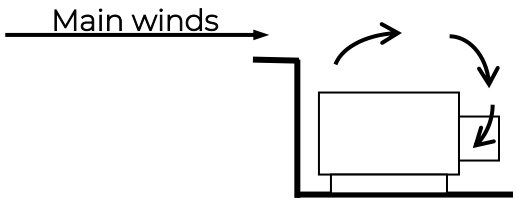




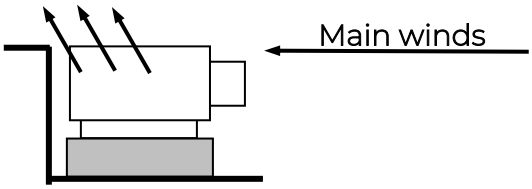
Do not hesitate to contact us for any advice

Setting out examples

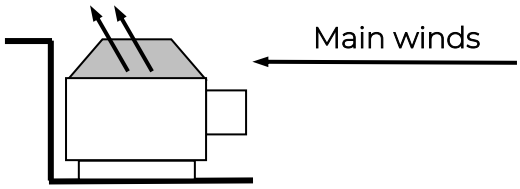
TO AVOID



SOLUTIONS TO FORECAST



Install a base in order to up the air outlet of the tower



Install a cone in order to up the air outlet of the tower

WATER EVAPORATION

Consumption by evaporation is approximately 1.7kg/h per 1 000kcal/h.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible).
There are three possibilities to choose according to the case:

1- Continuous blow down

Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.

The blow down flow rate can be calculated using the formula: [100 S / (M - S)] % of the make-up water in which:
S: Salinity of the make-up water compensating for evaporation.
M: Maximum acceptable salinity level of water in circuits.

Example:
Salinity of make-up water = HT 20 ° F
Maximum acceptable salinity = HT 40 ° F
100 x 20 / (40 - 20) = 100 % make-up water flow rate
Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).

Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous blow down

The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- JACIR Automated Inductive Blow down

Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level. See separate documentation.

WATER TREATMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly. If the water contains a significant amount of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10% of the recycled water flow.
If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.
In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to prevent these organisms from developing.

Water treatment should be undertaken by a specialized Company.
PREVENTS THE RISK OF LEGIONNAIRES' DISEASE: see separate documentation

Prescription TEC

Evaporative cooling tower, equipped with sliding casing, induced draft, axial fans, designed by JACIR, type TEC .....

Thermal characteristics

The heat power is ..... kW for conditions between .....°C to .....°C with a wet bulb of..... °C at air inlet.

Tower casing and sloped basin

The casing will be designed with stitch of fiberglass weaved at high density with a perfectly smooth and resistant PVC coating. The flexible casing will be fixed to trolleys on 2 adjacent sliding faces on the whole height of the tower. Self-supporting structure will be made of composite pultruded profiles and assembled with stainless steel X-STEEL plates and will be totally non corrodible.

The TEC range will offer an easy complete access to all internals components for inspection, removal and cleaning through 2 faces.

The basin will be realized in Fiber Reinforced Polyester strengthened by fiberglass and will be equipped with float valve easy to adjust, a complete drain flange at the lowest part of the basin slope, a none cavitation's strainer and sun ray proof louvers.

Infill

FREEFILM: it will be made of PVC glued sheets with vertical channels, for an operation up to 55°C in standard; VCC or ABS as an option up to 80°C.

Once assembled, it will be large size channels sections of 20mm, avoiding fouling and offering low pressure drop.

Water distribution

Water will be distributed first by a header and then by distribution pipes, all in PEHD. These distribution pipes will be equipped with high efficiency polypropylene low pressure nozzles.

The nozzles will distribute the water on exchange surface in a uniform way, and will operate under low pressure (8kPa) by a large water flow (diameter from 12 to 32 mm).

Drift eliminators

Highly efficient, they will prevent the water from being sprayed out of the cooling tower (drift) and will be easily removable and handy.

Made of PVC waved blades, drift eliminators will have an efficiency of 0.01% of the flow when water is in re-circulation.

Motor-fan group

The cooling tower design will be a single fan type.
The mechanical equipment will be installed on hot dip galvanized steel frame, directly coupled on its fan stack, and will take support on the cooling tower casing.

It will be arranged according a vertical axis and will be composed with a low-speed axial fan with adjustable blades at stop, and one motor ensured by parallel shaft gear box.

- IE3 asynchronous motor
- IP 55 insulation,
- F class
- Special impregnation against moisture (tropicalization).

Delivery and erection on site

The modules of the TEC cooling tower will be factory pre-assembled, and will be delivered with / without basin.

Connections

Once the cooling tower will be is erected, all piping will be connected: hot water inlet, make up water, cold water outlet and overflow, the whole supported separately from the cooling tower.

Water inlet and outlet connections flanges will be in PP strengthened by fiberglass.

Electrical connections are made on the motor connection box.

JACIR
Cooling for life

RC

Open circuit cooling tower
Centrifugal fan

Water flow range from 15 to 310m³/h

- X-STREAM for heavy duty waters

Commercial Documentation

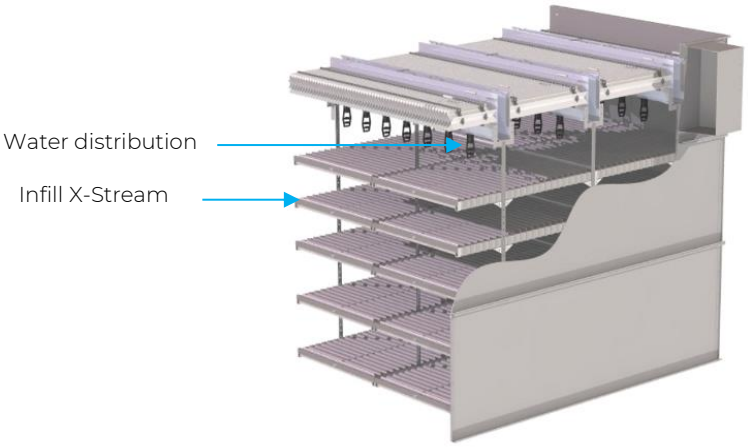
FABRIQUE EN FRANCE
NF 38-424
La FRENCH FAB

Heavy duty open cooling tower: RC SERIE

Casing structure

The self-supporting panels made of galvanized steel as a standard have been twice or 4 times folded over the 4 sides (JACIR design) allowing sound attenuation casing with very low sound levels, also proposed in SILVER STEEL or X-STEEL stainless steel in option. The water tightness between the panels is ensured by a special designed high covering seal and stainless-steel rivets. This JACIR design gives extremely rigid panels once assembled, ensure unique strength and waterproof cooling towers.

As a standard, a large door (1290 x 640 mm) in the same material as the cooling tower is provided to allow quickly access or removal of the drift eliminators, nozzles, exchange surface and water distribution pipes.



Basin

The basin has been designed to take into account the needs and inertia of the installation. In order to reduce bacteria growth, panel's assembly has been realised without any bolts or screws for the parts in contact with water. The sloped and flat basin is equipped with a drain and a POWER FLOW hatch, both located under the lower level of the basin, enabling a quick and complete drain of all sludge or other accumulated parts during cleaning maintenance. The basin is also equipped with integrated access door (540 x 990 mm) to ease maintenance.

Water distribution

Water is distributed by PP pipes or by steel open air channels. They are installed with PP nozzles especially designed to achieve an optimal distribution through the whole air section, and with large water nozzles to avoid clogging even in the case of high suspended solids content. These nozzles operate under low pressure, in order to low pumping head and to distribute large size drops, which prevents the drift from getting out of the cooling tower.

Exchange surface

The infill is made of PP blades. They equally spread the water along the blades, into drops down to the lower blades' layers. The cooling occurs during the drops fall between the blades' layers; therefore, this exchange surface is highly resistant to clogging. It can be used for water with solids content up to 400 ppm. By thermal expansion, the X–STREAM is self-cleaning in the case of water with high salts content.

Motor fan set

The centrifugal fans specially designed and manufactured by Jacir, have continuously been perfected over the years. The impeller is a double side air inlet type. Polyester air inlet ducts are profiled to optimise air suction and allow impeller removal. Located in the dry air flow and outside the tower basin, motor fan set is protected from corrosion by a baked epoxy coating. The elliptical scroll is made of X-STEEL stainless steel.

Options

- IB sound attenuation without increase power consumption,
- ICV / ICVK or special sound attenuation levels
- X-TRACT system Jacir innovative Patent specifically designed to facilitate installation and maintenance operations: infill, water distribution, drift eliminators and outlet cone are completely removed in one unique craning, allowing then easy cleaning at ground level and a free access to cooling tower internals.

Other options

Internal ladders, two speed motors, electro valve driven by level switch, automatic inductive blow down, frequency drive device, fan regulation thermostat, safety water level, all accessories in X-Steel stainless steel, on site erection and / or supervision etc.

JACIR
Cooling for life

RC

Cooling tower – Heavy duty water
Centrifugal fans

Technical Documentation

CONTENT Page(s)

La FRENCH FAB

JACIR

With more than 60 years' experience, our company:

∞ Has invested in detailed research and development in order to propose technical solutions in accordance with environmental protection through unequalled realizations and patents.

∞ Is today the European leader thanks to its technology beyond market requirements.

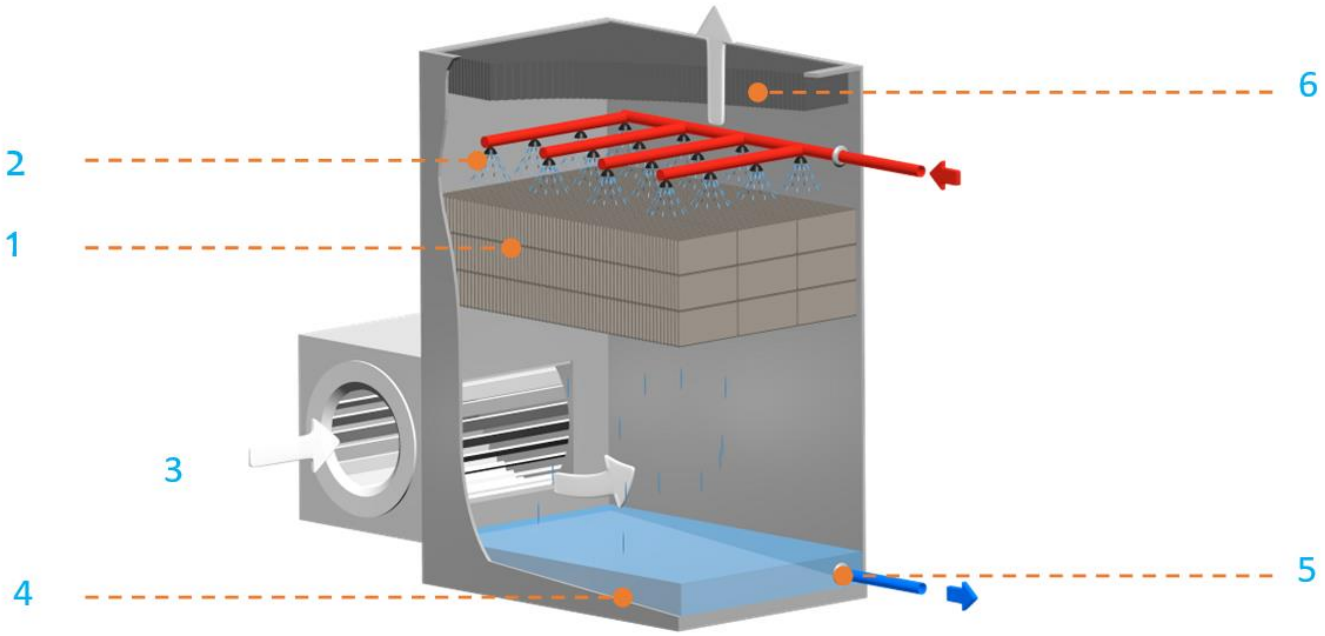
BENEFITS OF RC

∞ EXCHANGE SURFACE	High efficiency, with low fouling and low pressure drop characteristics, especially designed for water with high suspended solids content. It can be used up to 100°C as standard.
∞ SILENCE	Very low sound towers in standard, can be improved according to the requirement.
∞ ANTICORROSION COATING	Casing of tower is constructed in seamless galvanized steel, stainless 304L or 316L in option.
∞ EASY MAINTENANCE	Large access doors, fan outside of the tower and at man chest, inclined and plane basin for a complete drain.
∞ FLEXIBILITY	Possible delivery in parts to assemble directly on site.
∞ DELIVERY IN MODULES	Easy handling and transport.

Open circuit cooling tower principle RC

A cooling tower is a heat exchanger, which enables water to be cooled through direct contact with air. The heat transfer from the water to the air is carried out partly by sensible heat transfer, but mainly by latent heat transfer (evaporation of part of the water into the air), which makes it possible to reach cooling temperatures lower than ambient temperatures.

Operation:



The hot water to be cooled is pumped to the top of the tower through pipes. This water is divided and distributed over the heat exchange surface (1) by low pressure water distribution nozzles (2).

Blown by the fan (3), the fresh air enters into the lower section of the unit and escapes through the upper section after being heated and saturated by passing through the wetted heat exchange surface.

As a result of surface tension, due to the exchange surface, the water spreads in uniformly, falling down the whole height. The exchange surface is then increased.

The water, cooled thanks to forced ventilation, falls into the inclined basin (4) at the bottom of the tower to be sucked through the strainer (5). Drift eliminators (6) located at air outlet reduces drifts losses.

Benefits of cooling towers compared with dry coolers:

Energy savings

- Chillers, condensers associated to a cooling tower will be cooled at a lower temperature and then will have a better cooling capacity. Their efficiency is higher.

- Seven to ten times more air must be blown in a dry cooler, which means a lot of fans and electric motors. So, the electrical consumption is about 40% higher.

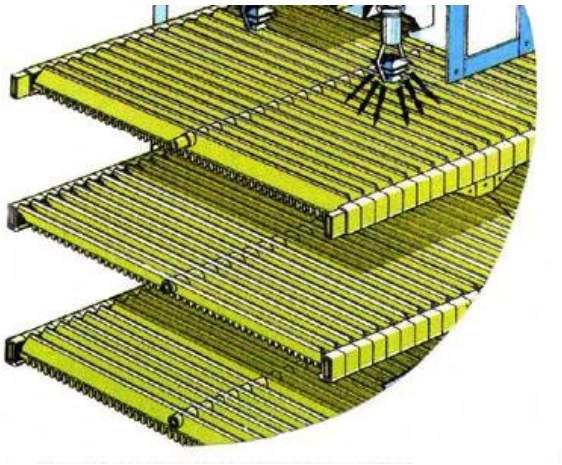
- A tower costs 30 to 50% of the price of a dry cooler for a same evacuated power.

- A 1°C increase of the ambient air has direct effect on the performance of dry air cooler, while the efficiency of a cooling tower will not be as much affected as the wet bulb has not fluctuated in the same way

Noise reduction

JACIR can supply much quieter tower than a dry cooler.

Exchange surface: X-STREAM



It is made of PP blades. They equally spread the water along the blades, into drops down to the lower blades' layers. The cooling occurs during the drops fall between the layers; therefore, this exchange surface is highly resistant to clogging. It can be used for water with solids content up to 400 ppm. In the case of waters with high salts content, the X–STREAM is self-cleaning by thermal expansion.

Tower casing

Self-supporting rigid panels, with 2 or 4 folds on the four sides, (designed by Jacir) allows sound absorption casing.
Thanks to this technology, we can offer cooling towers with an extremely low sound level.
Towers are assembled with waterproof stainless-steel rivets (uniform and high-capacity locking).
There is no welding during assembly; a high covering seal ensures the close fit between the panels.
As standard model, the panels are in galvanised steel mm2 thick ZENDZIMIR process 275gr/m² (galvanised plates are protected by the zinc oxidation on the surface).
Stainless steel is optional, 304L (1.4301) or 316L (1.4404): RXC series.

Inclined and plane basin

It has a high-water capacity in order to offer a high thermal inertia. For example, the maximum volume of a RC 2950 is 6 m3 minimum. The inclined basin allows an easy and complete drain. No welding and no screws for panel assembly on surfaces in contact with the water.

On the utility panel of the basin are installed:

- An overflow connection,
- A drain connection,
- A float valve or electrical solenoid make up water system as an option,
- A water outlet through a removable strainer (in stainless-steel) with a flange, oversized to eliminate cavitations, with a perforated steel plate,
- A large access door for nozzles for basin (540 mm x 540 mm),
- Options: electrical heater of V 230 or V 400 and waterproof thermostat with separate bulb.

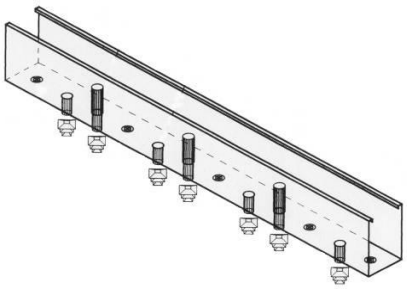
For automatic control of resistance, suitable contactors must be provided

Accessibility

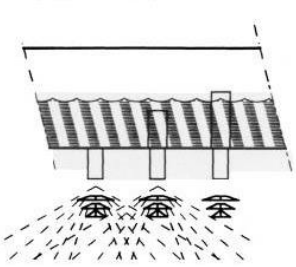
If there are sound baffles, plumeless tube coil or outlet air duct, large access doors (540 x 540mm) are provided. These access doors are used to remove easily the drift eliminators, nozzles, exchange surface and water distribution pipes. An additional middle casing water is supplied as an option, fitted with access doors (540 x 540mm); it is located between the tube coil and the drift eliminators.

Water distribution

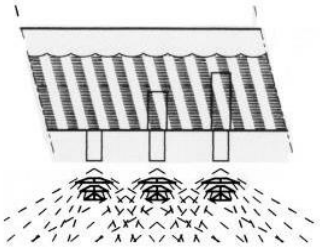
Water distribution is made of PP pipes (10 series) or of open-air steel channels (20 and above series). They are installed with PP nozzles especially designed to achieve an optimal distribution through the whole air section, and with large water nozzle to avoid clogging even in the case of high suspended content. These nozzles operate under low pressure (0 to 0.3mWC), in order to low pumping head and to distribute large size drops, which prevents the drift from getting out of the cooling tower. In the case of distribution channels, Jacir has engineered a design to combine original high performance with major flow rate fluctuations: nozzles are fed by different water inlets in the channels.



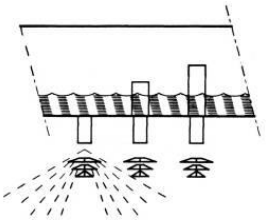
Variable flow gravity water distribution



Minimum flow rate operating



Hal flow rate operating



Full flow rate operating

Drift eliminators

Highly efficient, they prevent the water from being sprayed out of the tower. Ultraviolet resistant, they are easy to remove from the top in order to access to the distributors and to the exchange surface. They are made of PVC or PP blades, special type in the case of the plume suppression coil option is selected.

Fans

The centrifugal fans are specially designed and manufactured by JACIR. The impeller is a double side air inlet type. The air inlet ducts are removable to access to the impeller, and are made of polyester. Their shape noticeably improves the performances of the fans.

The bearings are self-aligning, lubricated in our factory and to be regularly lubricated thanks to a copper deported line lubrication as a standard for a simple and quick maintenance without any removal. Each shaft is supported by two bearings. There is one motor per fan. The volutes side-plates are used to fix the motor support. This design prevents the belts from producing a slapping effect.

Trapezoidal pulleys and V-belts transmission are used. Tension is applied to the belts by tipping the motor seat, for easy adjustment. The impeller is treated and protected by a baked EPOXY coating. The volute is made of stainless steel.

Complete stainless-steel impeller design can be selected as an option.

Standard motor

- Asynchronous three-phases motor,
- 1500 rpm,
- 230 / 400 V up to 5,5 kW,
- 400 / 690 V above 5,5 kW,
- Hz 50,
- IP55 (possible open sky operating),
- direct connection to terminal box;

Sound attenuation (2 options):

IB sound attenuation

The air inlet sound attenuators consist in a fan housing by self-supporting stiff panels, double folded on the 4 sides, internally coated with sound attenuating material.
Complete front opening inspection doors for maintenance are provided.
Air outlet, sound attenuator includes a cone, coated with acoustic foam.

Special NR 30 sound attenuation

As IB sound attenuation. In addition are installed easily removable high density rock wool sound baffles at both air inlet and outlet.
At the air inlet, the rock wool is coated by a fibre glass layer. At the air outlet, is added a stainless-steel grid. An extra rock wool double coating of the casing is available to reach the required sound level.

OPTIONS

- Plume suppression system,
- Stainless steel 304L or 316L,
- Electric heater with thermostat,
- Two - speed motor (Dahlander type –1500/750 rpm, separate wiring or PAM –1500/1000 rpm),
- Frequency controller,
- Water level control with solenoid valve (with electric-valve and input filter),
- Automatic Inductive deconcentration (see AiD documentation),
- Fired polyester powder protection for all parts that are not in contact with the water,
- All stainless-steel fittings (fan casing, wheel, plumeless battery, etc.),
- Discharge cone (increase of air outlet speed),
- Air filtration (fan covering + filters),
- Air pressure available for connection to the duct,
- Control panel,
- Equipment delivered in parts, ready to be assembled,
- Assembly on site by experimented technicians from our factory,
- Anti-vibrations supports,
- Fan bearing lubrication line (Rilsan), extended on the fan stack.

Caractéristiques Techniques RC

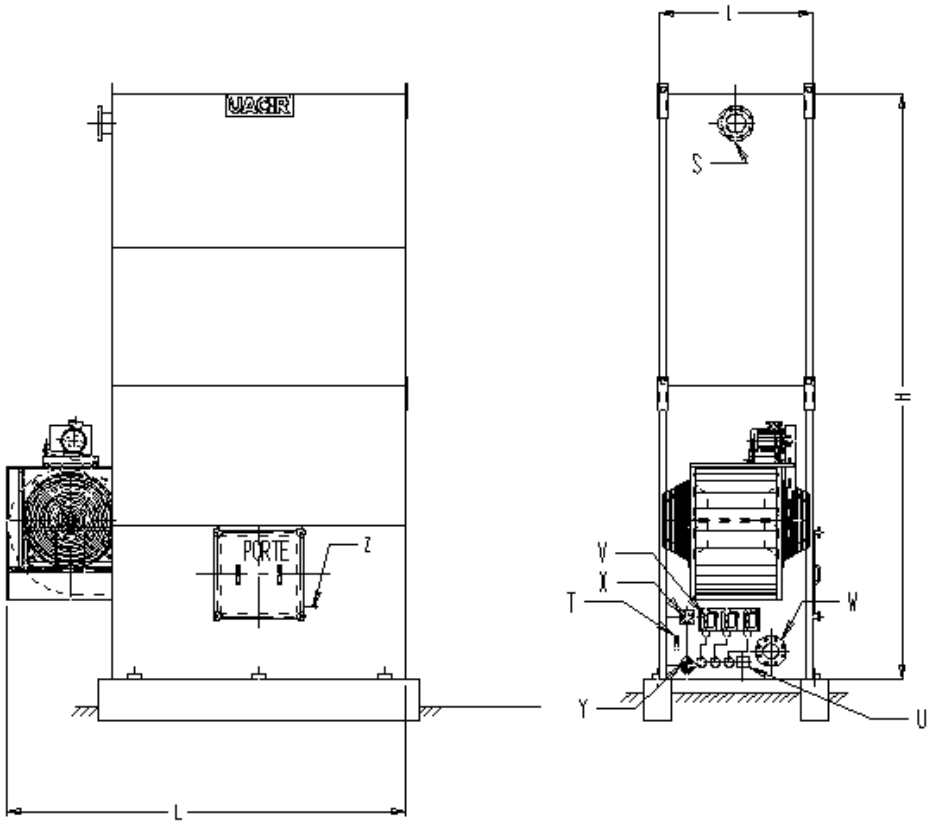
TOWER WITHOUT SOUND ATTENUATION

RC serie		Distribution	Dimensions (mm)			Weight (kg)		Heater power (m)	Fan diameter (m)	Motor					Fan speed (rpm)	Sound level at 20m
										Qty	Installed power (kW)		Absorbed power (kW)			
			L	l	H	Empty	Full				1 speed	2 speeds	1 speed	2 speeds		
10 SERIES	RC 510-21F315-22B	PIPES	1395	1100	2600	310	650	2	0,315	1	2,2		2		994	49
	RC 510-37I315-22B				4200	450	760									
	RC 910-37H500-30B		1795	1100	4200	640	1190	2	0,5	1	3		2,7		507	51
	RC 910-50L500-30B				5500	785	1335									
	RC 1210-37H500-30B		2062	1100	4200	730	1348	2	0,5	1	3				507	51
	RC 1210-37H500-40B										4					
	RC 1210-50L500-30B				5500	1070	1688				3					
	RC 1210-50L500-40B										4					
	RC 2010-37H630-40B		3070	1100	4200	1060	2090	3	0,63	1	4				379	55
	RC 2010-37H630-55B										5,5					
	RC 2010-50L630-40B				5500	1290	2320				4					
	RC 2010-50L630-55B										5,5					
	RC 2410-37H630-55B		3470	1100	4200	1350	2600	3	0,63	1	5,5		4,9		379	55
	RC 2410-37H630-75B										7,5	7,5 / 2,5	6,8	6,8 / 2	406	
	RC 2410-37H630-90B										9	10 / 3	8,3	8,3 / 2,5	426 / 280	
	RC 2410-50L630-55B				5500	1600	2850				5,5		4,9		379	
	RC 2410-50L630-75B										7,5	7,5 / 2,5	6,8	6,8 / 2	406	
	RC 2410-50L630-90B										9	10 / 3	8,3	8,3 / 2,5	426 / 280	
	RC 2910-43H710-75B		4090	1100	4700	1450	2950	3	0,71	1	7,5	7,5 / 2,5	6,8	6,8 / 2	403 / 269	55
	RC 2910-43H710-90B										9	10 / 3	8,3	8,3 / 2,5	426 / 280	
	RC 2910-43H710-110B										11	11 / 4,8	9,3	9,3 / 2,8	454 / 303	
	RC 2910-56L710-75B				6000	1750	3250				7,5	7,5 / 2,5	6,8	6,8 / 2	403 / 269	
	RC 2910-56L710-90B										9	10 / 3	8,3	8,3 / 2,5	426 / 280	
	RC 2910-56L710-110B										11	11 / 4,8	9,3	9,3 / 2,8	454 / 303	
20 AND + SERIES	RC 1720-47I710-75	OPEN AIR CHANNELS	2940	2450	5200	1950	3760	6	0,71	1	7,5	7,5 / 2,5	6,8	6,8 / 2	363 / 242	55
	RC 1720-47I710-90										9	10 / 3	8,3	8,3 / 2,5	388 / 259	
	RC 1720-47I710-110										11	11 / 4,8	9,3	9,3 / 2,8	417 / 278	
	RC 1720-60L710-75				6500	2300	4110				7,5	7,5 / 2,5	6,8	6,8 / 2	363 / 242	
	RC 1720-60L710-90										9	10 / 3	8,3	8,3 / 2,5	388 / 259	
	RC 1720-60L710-110										11	11 / 4,8	9,3	9,3 / 2,8	417 / 278	
	RC 2420-47I900-110		3935	2450	5200	2480	5550	10	0,9	1	11	11 / 4,8	9,3	9,3 / 2,8	290 / 193	56
	RC 2420-47I900-150										15	16 / 5,3	12,7	12,7 / 3,8	327 / 218	
	RC 2420-47I900-185										18,5	18 ,5 / 6	15,5	15,5 / 4,6	348 / 232	
	RC 2420-60L900-110				6500	2850	6700				11	11 / 4,8	9,3	9,3 / 2,8	290 / 193	
	RC 2420-60L900-150										15	16 / 5,3	12,7	12,7 / 3,8	327 / 218	
	RC 2420-60L900-185										18,5	18 ,5 / 6	15,5	15,5 / 4,6	348 / 232	
	RC 3024-47J1000-185		4694	2500	5200	3400	7200	10	1	1	18,5	18,5 / 6	15,5	15,5 / 4,6	291 / 193	57
	RC 3024-47J1000-220										22	24 / 7,5	18,7	18,7 / 5,6	307 / 205	
	RC 3024-47J1000-300										30	30 / 9	25,5	25,5 / 7,6	349 / 233	
	RC 3024-60N-1000-185				6500	3500	9200				18,5	18,5 / 6	15,5	15,5 / 4,6	291 / 192	
	RC 3024-60N-1000-220										22	24 / 7,5	18,7	18,7 / 5,6	307 / 205	
	RC 3024-60N-1000-300										30	30 / 9	25,5	25,5 / 7,6	319 / 233	
	RC 2440-47I900-110D		3935	4450	5200	4200	11450	10	2 x 0,9	2	2 x 11	2 x (11 / 4,8)	2 x 9,3	2 x (9,3 / 2,8)	290 / 193	59
	RC 2440-47I900-150D										2 x 15	2 x (16 / 5,3)	2 x 12,7	2 x (12,7 / 3,8)	327 / 218	
	RC 2440-47I900-185D										2 x 18,5	2 x (18 ,5 / 6)	2 x 15,5	2 x (15,5 / 4,6)	348 / 232	
	RC 2440-60L900-110D				6500	4850	12100				2 x 11	2 x (11 / 4,8)	2 x 9,3	2 x (9,3 / 2,8)	290 / 193	
	RC 2440-60L900-150D										2 x 15	2 x (16 / 5,3)	2 x 12,7	2 x (12,7 / 3,8)	327 / 218	
	RC 2440-60L900-185D										2 x 18,5	2 x (18 ,5 / 6)	2 x 15,5	2 x (15,5 / 4,6)	348 / 232	
	RC 2950-56J1000-185D		4594	5450	6200	6300	17100	10	2 x 1	2	2 x 18,5	2 x (18,5 / 6)	2 x 15,5	2 x (15,5 / 4,6)	291 / 193	60
	RC 2950-56J1000-220D										2 x 22	2 x (24 / 7,5)	2 x 18,7	2 x (18,7 / 5,6)	307 / 205	
	RC 2950-56J1000-300D										2 x 30	2 x (30 / 9)	2 x 25,5	2 x (25,5 / 7,6)	349 / 233	
	RC 2950-70M1000-185D				7600	7200	18000				2 x 18,5	2 x (18,5 / 6)	2 x 15,5	2 x (15,5 / 4,6)	291 / 192	
	RC 2950-70M1000-220D										2 x 22	2 x (24 / 7,5)	2 x 18,7	2 x (18,7 / 5,6)	307 / 205	
	RC 2950-70M1000-300D										2 x 30	2 x (30 / 9)	2 x 25,5	2 x (25,5 / 7,6)	319 / 233	

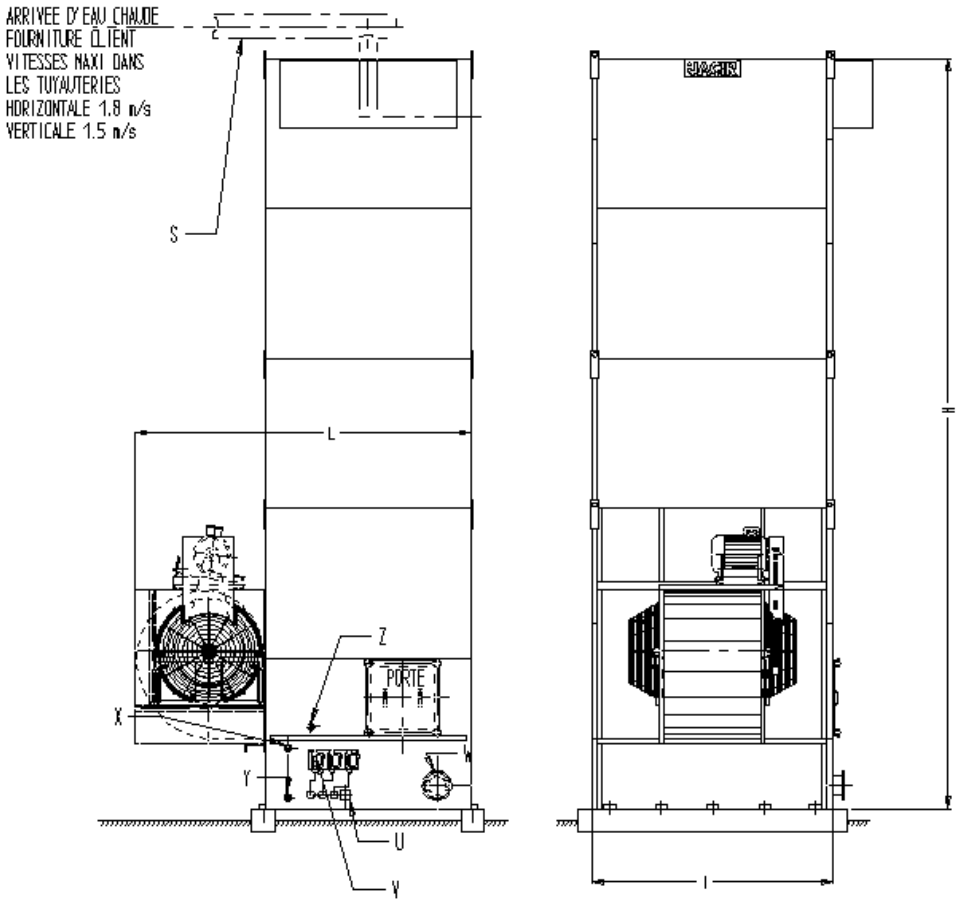
Caractéristiques Techniques RC insonorisation IB

RC serie		TOWER WITH IB SOUND ATTENUATION														
		Distribution	Dimensions (mm)			Weight (kg)		Heater power (m)	Fan diameter (m)	Motor					Fan speed (rpm)	Sound level at 20m
										Qty	Installed power (kW)		Absorbed power (kW)			
			L	l	H	Empty	Full				1 speed	Empty	Full	2V		
20 AND + SERIES	RC 3024-47J1000-185	OPEN AIR CHANNELS	1300	2500	6400	4200	8000	10	1	1	18,5	18,5 / 6	15,5	15,5 / 4,6	291 / 193	51
	RC 3024-47J1000-220										22	24 / 7,5	18,7	18,7 / 5,6	307 / 205	
	RC 3024-47J1000-300										30	30 / 9	25,5	25,5 / 7,6	349 / 233	
	RC 3024-60N-1000-185				7700	4300	10000				18,5	18,5 / 6	15,5	15,5 / 4,6	291 / 192	
	RC 3024-60N-1000-220										22	24 / 7,5	18,7	18,7 / 5,6	307 / 205	
	RC 3024-60N-1000-300										30	30 / 9	25,5	25,5 / 7,6	319 / 233	
	RC 2440-47I900-110D		5000	4450	6400	5300	12550	10	2 x 0,9	2	2 x 11	2 x (11 / 4,8)	2 x 9,3	2 x (9,3 / 2,8)	290 / 193	53
	RC 2440-47I900-150D										2 x 15	2 x (16 / 5,3)	2 x 12,7	2 x (12,7 / 3,8)	327 / 218	
	RC 2440-47I900-185D										2 x 18,5	2 x (18 ,5 / 6)	2 x 15,5	2 x (15,5 / 4,6)	348 / 232	
	RC 2440-60L900-110D				7700	5950	13200				2 x 11	2 x (11 / 4,8)	2 x 9,3	2 x (9,3 / 2,8)	290 / 193	
	RC 2440-60L900-150D										2 x 15	2 x (16 / 5,3)	2 x 12,7	2 x (12,7 / 3,8)	327 / 218	
	RC 2440-60L900-185D										2 x 18,5	2 x (18 ,5 / 6)	2 x 15,5	2 x (15,5 / 4,6)	348 / 232	
	RC 2950-56J1000-185D		5500	5450	7400	7600	18400	10	2 x 1	2	2 x 18,5	2 x (18,5 / 6)	2 x 15,5	2 x (15,5 / 4,6)	291 / 193	54
	RC 2950-56J1000-220D										2 x 22	2 x (24 / 7,5)	2 x 18,7	2 x (18,7 / 5,6)	307 / 205	
	RC 2950-56J1000-300D										2 x 30	2 x (30 / 9)	2 x 25,5	2 x (25,5 / 7,6)	349 / 233	
	RC 2950-70M1000-185D				8800	8500	19300				2 x 18,5	2 x (18,5 / 6)	2 x 15,5	2 x (15,5 / 4,6)	291 / 192	
	RC 2950-70M1000-220D										2 x 22	2 x (24 / 7,5)	2 x 18,7	2 x (18,7 / 5,6)	307 / 205	
	RC 2950-70M1000-300D										2 x 30	2 x (30 / 9)	2 x 25,5	2 x (25,5 / 7,6)	319 / 233	

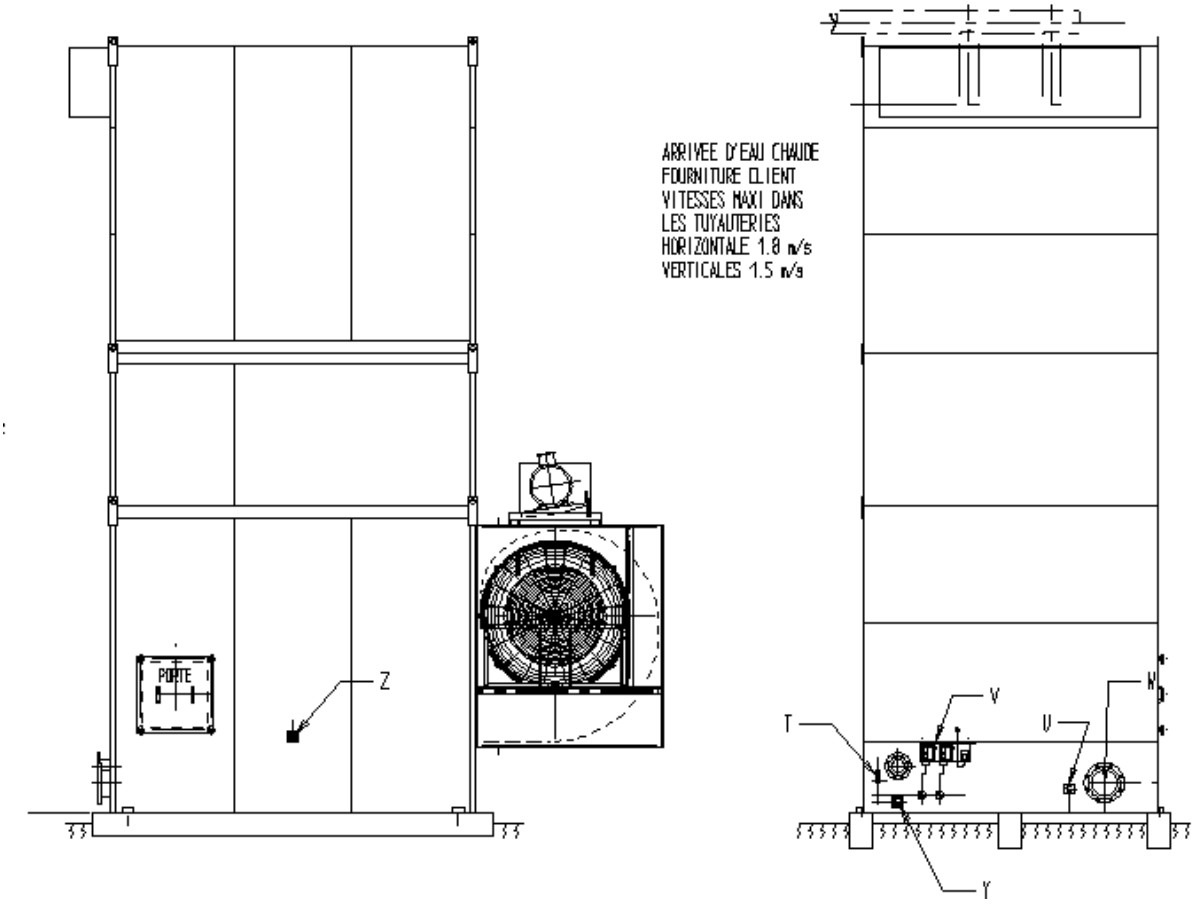
Plans RC 510–910-1210-2010-2410-2910



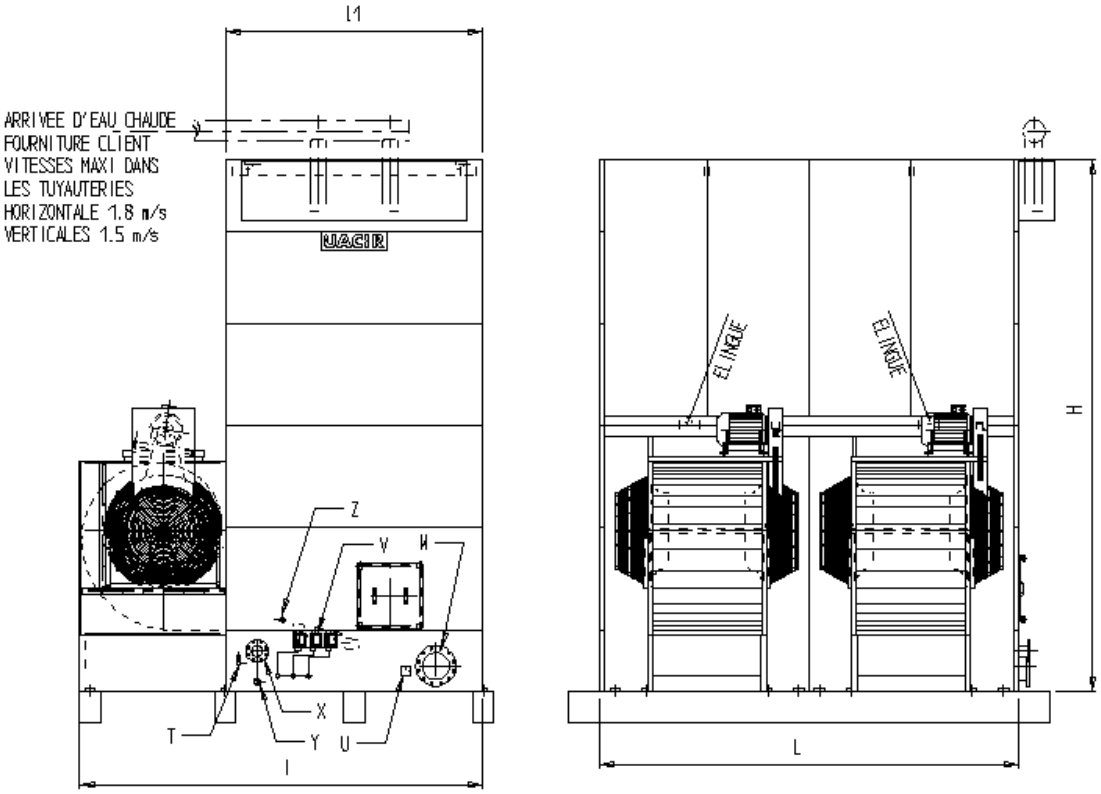
Plans RC 1720-2420



Plans RC 3024



Plans RC 2440-2950



Dimensions RC

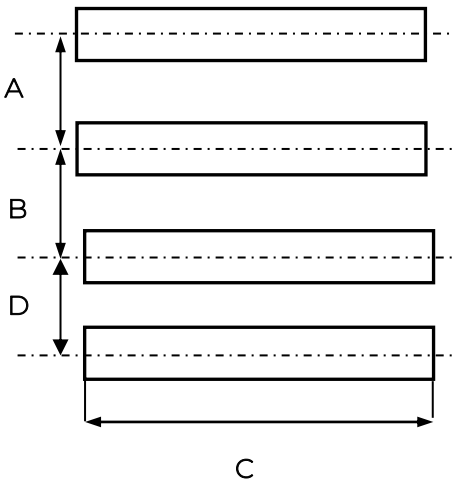
				Z	X	U	Y	W	S	
				Float valve (male)	Overflow *	Electrical heater	Drain (female)	Water outlet*	Water inlet*	Water level balance (option)
	L	l	H	DN	DN	(option)	DN	DN	DN	DN
RC 510-21F315-22B	1395	1100	2600	15	50		50	50	50	50
RC 510-37I315-22B			4200	15	50		50	50	50	50
RC 910-37H500-30B	1795	1100	4200	20	50		50	100	100	100
RC 910-50L500-30B			5500	20	50		50	100	100	100
RC 1210-37H500-30B	2062	1100	4200	20	50		50	100	100	100
RC 1210-37H500-40B				20	50		50	100	100	100
RC 1210-50L500-30B			5500	20	50		50	100	100	100
RC 1210-50L500-40B				20	50		50	100	100	100
RC 2010-37H630-40B	3070	1100	4200	20	50		50	100	100	100
RC 2010-37H630-55B				20	50		50	100	100	100
RC 2010-50L630-40B			5500	20	50		50	100	100	100
RC 2010-50L630-55B				20	50		50	100	100	100
RC 2410-37H630-55B	3470	1100	4200	20	50		50	150	125	150
RC 2410-37H630-75B				20	50		50	150	125	150
RC 2410-37H630-90B				20	50		50	150	125	150
RC 2410-50L630-55B			5500	20	50		50	150	125	150
RC 2410-50L630-75B				20	50		50	150	125	150
RC 2410-50L630-90B				20	50		50	150	125	150
RC 2910-43H710-75B	4090	1100	4700	20	50		50	150	125	150
RC 2910-43H710-90B				20	50		50	150	125	150
RC 2910-43H710-110B				20	50		50	150	125	150
RC 2910-56L710-75B			6000	20	50		50	150	125	150
RC 2910-56L710-90B				20	50		50	150	125	150
RC 2910-56L710-110B				20	50		50	150	125	150
RC 1720-47I710-75	2940	2450	5200	20	50		50	150		150
RC 1720-47I710-90				20	50		50	150		150
RC 1720-47I710-110				20	50		50	150		150
RC 1720-60L710-75			6500	20	50		50	150		150
RC 1720-60L710-90				20	50		50	150		150
RC 1720-60L710-110				20	50		50	150		150
RC 2420-47I900-110	3935	2450	5200	32	100		50	200		200
RC 2420-47I900-150				32	100		50	200		200
RC 2420-47I900-185				32	100		50	200		200
RC 2420-60L900-110			6500	32	100		50	200		200
RC 2420-60L900-150				32	100		50	200		200
RC 2420-60L900-185				32	100		50	200		200
RC 3024-47J1000-185	4694	2500	5200	40	50		50	200		200
RC 3024-47J1000-220				40	50		50	200		200
RC 3024-47J1000-300				40	50		50	200		200
RC 3024-60N-1000-185			6500	40	50		50	200		200
RC 3024-60N-1000-220				40	50		50	200		200
RC 3024-60N-1000-300				40	50		50	200		200
RC 2440-47I900-110D	3935	4450	5200	32	100		50	250		250
RC 2440-47I900-150D				32	100		50	250		250
RC 2440-47I900-185D				32	100		50	250		250
RC 2440-60L900-110D			6500	32	100		50	250		250
RC 2440-60L900-150D				32	100		50	250		250
RC 2440-60L900-185D				32	100		50	250		250
RC 2950-56J1000-185D	4594	5450	6200	40	100		50	300		300
RC 2950-56J1000-220D				40	100		50	300		300
RC 2950-56J1000-300D				40	100		50	300		300
RC 2950-70M1000-185D			7600	40	100		50	300		300
RC 2950-70M1000-220D				40	100		50	300		300
RC 2950-70M1000-300D				40	100		50	300		300

(*) Les connections de diamètre inférieur ou égal à DN 50 : femelle ; au-delà : raccordement par bride.

Support RC

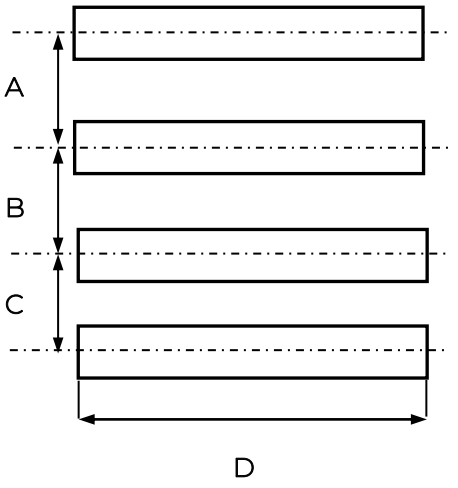
Our cooling towers can stand on the ground or on a concrete ground, but we recommend to install them on concrete or steel longitudinal beams.
Check that the ground can stand the operating load, and that the surface or supports are flat.

Quantity and position of supports (customer supply) without sound attenuation



	Qty	Distance between supports under basin A [mm]	Distance between supports under basin B [mm]	Length C [mm]	Dsitance between supports under basin D [mm]
RC 510	2	630		1300	
RC 910		1130		1200	
RC 1210		1130		1500	
RC 2010				2300	
RC 2410				2700	
RC 2910				3200	
RC 1720		1830		2300	
RC 2420	3	1265	1265	2300	
RC 3024		1265	1265	3300	
RC 2440	4	1265	1265	4300	1320
RC 2950		1515	1515	5300	1480

Quantity and position of (customer supply) with IB sound attenuation



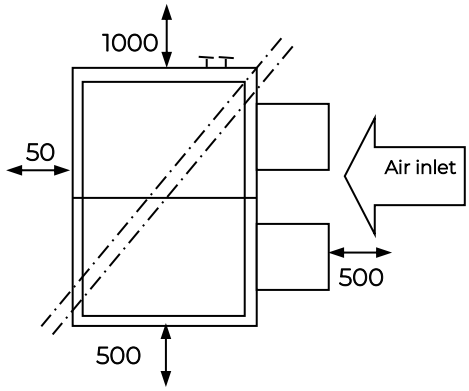
	Qty	Distance between supports under basin A [mm]	Distance between supports under basin B [mm]	Length C [mm]	Dsitance between supports under basin D [mm]
RC 510	4				
RC 910					
RC 1210					
RC 2010					
RC 2410					
RC 2910					
RC 1720					
RC 2420					
RC 3024		1256	1250	2506	3300
RC 2440		1656	850	2506	4300
RC 2950		1956	1050	2506	5300

Layout RC

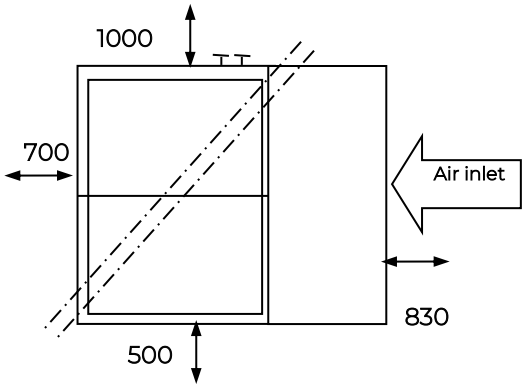
Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings. This could create a risk of a « re-circulation »; the air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower.
In any case, the free access on the four sides of the tower must be secured to ensure that the fans are supplied correctly with air and that there is proper access for installation and maintenance.
If these rules are not applied, it is inevitable that the cooling tower will not operate properly.

Recommended minimum free access (mm) for standard cooling towers: Top view

Tower without sound attenuation



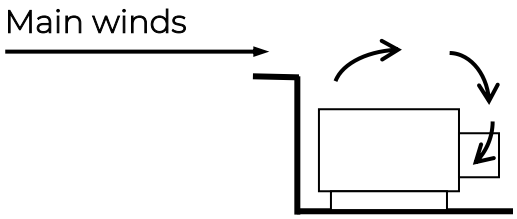
Tower with IB or special sound attenuation



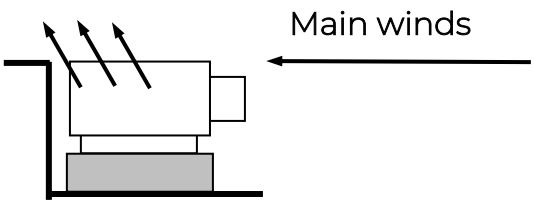
Do not hesitate to contact us for any advice

Layout examples:

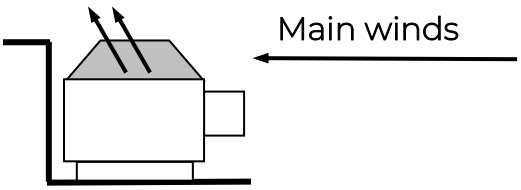
NOT TO DO:



TO DO:



Install a base in order to
up the cooling tower



Install a cone in order to
up the air outlet of the cooling tower

WATER EVAPORATION

Consumption by evaporation is approximately 1.7kg/h per 1 000kcal/h.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible).
There are three possibilities to choose according to the case:

1- Continuous blow down

Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.

The blow down flow rate can be calculated using the formula: [100 S / (M - S)] % of the make-up water in which:
S: Salinity of the make-up water compensating for evaporation.
M: Maximum acceptable salinity level of water in circuits.

Example:
Salinity of make-up water = HT 20 ° F
Maximum acceptable salinity = HT 40 ° F
100 x 20 / (40 - 20) = 100 % make-up water flow rate
Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).

Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous blow down

The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- JACIR Automated Inductive Blow down

Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level. See separate documentation.

WATER TREATMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly. If the water contains a significant amount of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10% of the recycled water flow.
If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.
In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to prevent these organisms from developing.

Water treatment should be undertaken by a specialized Company.
PREVENTS THE RISK OF LEGIONNAIRES' DISEASE: see separate documentation

Prescription RC

Evaporative cooling tower, high efficiency open circuit with forced centrifugal fans, RC ..... JACIR type,

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Sound level characteristics

The sound pressure level will not exceed.... dB (A) at ..... meters in free field over 4 directions. To ensure this, the tower is equipped with one of the following types of soundproofing devices:

- IB sound attenuation without baffles at air inlet, and with outlet cone coated with acoustic foam. Fan housing.

- Special sound attenuation with parallel baffles both at air inlet and outlet, and with 50mm thick high density rock wool double casing, covered by 1.2 mm thick steel sheet.

Infill: X – STREAM

It will be made of 2mm thick PP toothed blades, with 66 mm high. They will equally spread the water along the blades, into drops down to the lower blades' layers. The cooling occurs during the drops fall between the layers; therefore, this exchange surface will be highly resistant to clogging. It can be used for water with solids content up to 400 ppm. In the case of waters with high salts content, the X-STREAM will be self-cleaning by thermal expansion.

Tower casing and inclined plane basin

These will be made of single, self-supporting sheet steel panels twice or 4 times folded on the 4 sides.
Side panels will be designed to be able to receive a double casing if necessary.
Stainless steel rivets with a high locking capacity will be used for assembly. Elastomer gaskets are used, without any mastic sealing.
The basin will be fitted with an inspection door (540 X 540 mm), floating valve that can easily be adjusted, a drain, an overflow and an anti-cavitations strainer.
The tank is inclined and plane so that all the water can be replaced easily and the cleaning is simple: the drain hole bottom is lower than the lowest part of the basin in order to secure 100 % drain. Height between basin bottom and the infill is 920mm for easy access.

Accessibility

In case of sound baffles, plumeless tube coil or outlet air duct, large inspection doors (540 x 540mm) to nozzles and basin will be installed in order to remove easily pipes, nozzles and packing. For maintenance, an additional casing will be provided, located between the plume suppression coil and the drift eliminators, with an access door.

Water distribution

Water will be distributed by PP pipes (10 series) or by steel open air channels (20 series). They will be installed with PP nozzles especially designed to achieve an optimal distribution through the whole air section, and with large water nozzle to avoid clogging even in the case of high suspended content. These nozzles will operate under low

Fans

The low-pressure centrifugal fan(s) with forward inclined blades and double air inlet will be placed in the dry air flow, outside the basin and at man's height for easier access for disassembly and maintenance.
The polyester volute shall be profiled to optimise air intake and removable to simplify maintenance.
The impeller will be coated by baked-on EPOXY. The volute is made of X-STEEL stainless steel. Optional stainless steel impeller construction is available.
Each fan will be coupled to its own motor.

Electric motor(s) and coupling

The IE3 three-phase asynchronous motor(s) shall be of the enclosed ventilated type with a maximum power of ..... kW, ... rpm, IP55 protection, class F/B. The transmission will be ensured by V-belts sized up to 150% of the nominal power.

Steel structure

The tower will be made of:

- Zendzimir process galvanised metal (2 mm thick) at 275 gr/m² with finishing ZINCALU paint applied to the external sides after assembly,
- Stainless-steel 304 L (1.4301) or 316 L (1.4404) metal for long life, water savings and high-pressure machine cleaning,
- Galvanized steel 275 gr/m² with baked EPOXY paint for all tower parts not in contact with water.

JACIR
Cooling for life

RH

Forced draft axial fan

Commercial Documentation

Water flow rates from 70 to 660m³/h/cell

- Infill: X-STREAM for heavy duty waters

FABRIQUE EN FRANCE
NF 38-424
La FRENCH FAB

Heavy duty open cooling tower: RC SERIE

Casing structure

All the panels are folded twice or 4 times at the 4 sides of the panels. This design secures extremely rigid sheets which, once assembled, provide an unequalled sturdiness and tightness to our towers.

Inclined and plane large capacity basin

The basin incorporated to the tower has been designed for long thermal inertia to compensate the process thermal fluctuations. The basin is inclined and plane to secure a complete and clean drain. Large access doors are provided: 540 x 540mm. Finally, all the connections are located on the same panel (overflow, drain, make up water supply, electrical heater ...).

To avoid bacteriological growth, the assembly of the panels is made without any welds and without screws on the parts in contact with water.

Water distribution

Water is distributed by steel open air channels. They are installed with PP nozzles especially designed to achieve an optimal distribution through the whole air section, and with large water nozzles to avoid clogging even in the case of high suspended solids content. These nozzles operate under low pressure, in order to low pumping head and to distribute large size drops, which prevents the drift from getting out of the cooling tower.

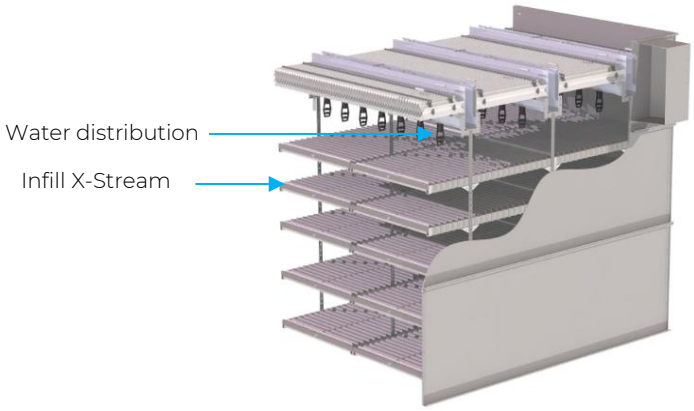
Infill: X-STREAM

It is made of PP blades. They equally spread the water along the blades, into drops down to the lower blades' layers. The cooling occurs during the drops fall between the blades' layers; therefore, this exchange surface is highly resistant to clogging. It can be used for water with solids content up to 400 ppm. By thermal expansion, the X–STREAM is self-cleaning in the case of waters with high salts content.

Anti-corrosion protection

2 options:

- Gr / m² 275 galvanized sheets coated outside with zinced paint. All the sheets are folded onto the outside of the tower in order to ensure that the inside of the tower is completely protected by the zinc coating.
- Stainless steel sheets (304 L or 316 L): RXH series.



Environment protection

Sound attenuation:

The RH cooling towers are initially low sound. In addition, their design makes it possible to select the right fan orientation towards the most favourable direction. To improve even more the sound performances, the followings options can be selected:

- Special sound attenuation, adjustable according to the sound level to reach: fan speed reduction, low sound fans, baffles at inlet, whole tower casing attenuation, air outlet cone with sound attenuating material.
-

Plumeless system (Jacir system)

Options:

- Plume reduction system,
- Plume suppression system,
- 30% to 50% water savings.

Sound and energy savings

The axial fans are particularly efficient, with a very low absorbed power. In addition, the belt coupling makes it easy to select the best ratio efficiency/ power level. Those fans are located in the dry air flow, at man chest, and out of the basin. Fan guards are provided together with inlet cone.

Options

Automatic Deconcentration by Induction (DAi), frequency converter, support beams, level switch with electro valve, control panel, explosion proof motors, fan non-freezing device, site erection, ...

JACIR
Cooling for life

RH

Open circuit cooling tower

Technical Documentation

CONTENT

La FRENCH FAB

JACIR

With more than 60 years' experience, our company:

∞ Has invested in detailed research and development in order to propose technical solutions in accordance with environmental protection through unequalled realizations and patents.

∞ Is today the European leader thanks to its technology beyond market requirements.

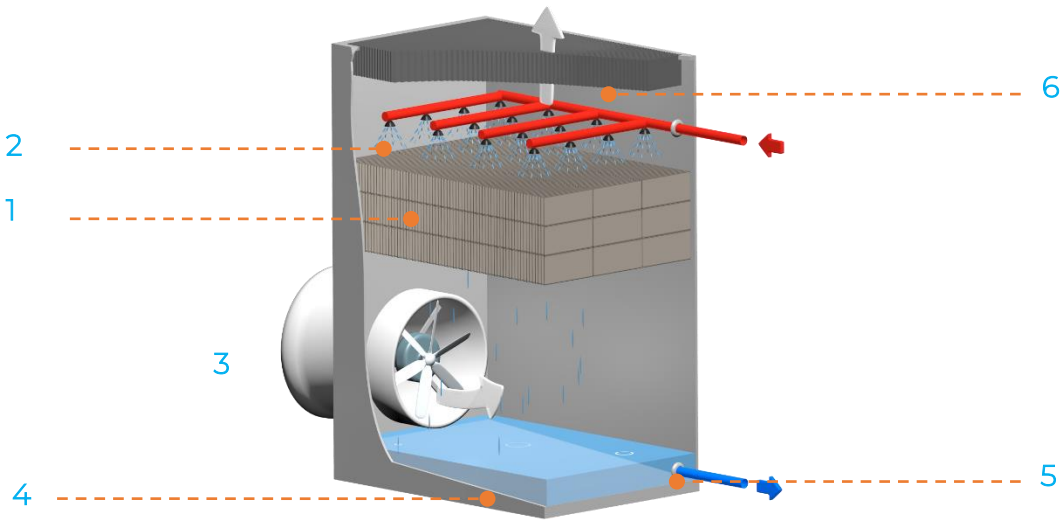
STRONG ADVANTAGES OF THE RH

∞ EXCHANGE SURFACE	High efficiency, with low fouling and low pressure drop characteristics, specially designed for water with high suspended solids content and self-cleaning. It can be used up to 100 °C as standard.
∞ ANTICORROSION COATING	Casing of the tower is made in galvanized or stainless-steel X-STEEL as an option, seamless.
∞ EASY MAINTENANCE	Large access doors, fan outside of the tower and at man chest, inclined and plane basin for a complete drain. Height inside the basin and under the infill is minimum 1425mm.
∞ FLEXIBILITY	Possible delivery in parts to assemble directly on site.
∞ DELIVERY IN MODULES	Easy handling and transport.
∞ SILENCE	Compared with induced draft towers, the RH are low sound towers in standard, can be improved according to the requirement.

Open circuit cooling tower principle RH

A cooling tower is a heat exchanger, which enables water to be cooled through direct contact with air. The heat transfer from the water to the air is carried out partly by sensible heat transfer, but mainly by latent heat transfer (evaporation of part of the water into the air), which makes it possible to reach cooling temperatures lower than ambient temperatures.

Operation:



The hot water to be cooled is pumped to the top of the tower through pipes. This water is divided and distributed over the heat exchange surface (1) by low pressure water distribution nozzles (2).

Blown by the fan (3), the fresh air enters into the lower section of the unit and escapes through the upper section after being heated and saturated by passing through the wetted heat exchange surface.

As a result of surface tension, due to the exchange surface, the water spreads in uniform way, falls down the whole height. The exchange surface is then increased.
The water, cooled thanks to forced ventilation, falls into the inclined basin (4) at the bottom of the tower.

Then the water is sucked through the strainer (5). Drift eliminators (6) located at air outlet reduces drifts losses.

Benefits of cooling towers compared with dry coolers:

Energy saving

- Chillers, condensers associated to a cooling tower will be cooled at a lower temperature and then will have a better cooling capacity. Their efficiency is higher.

- Seven to 10 times more air must be blown in a dry cooler, which means a lot of fans and electric motors. So, the electrical consumption is about 40% higher.

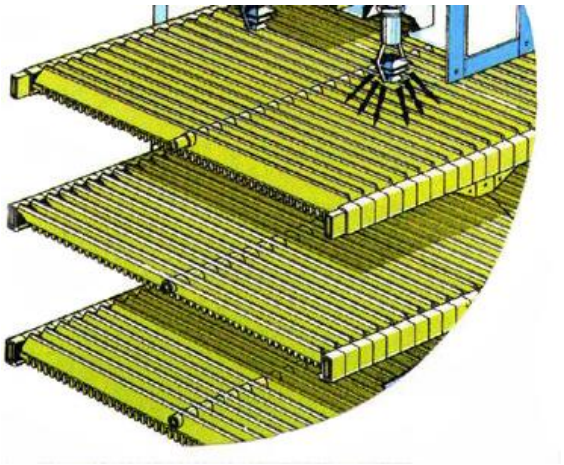
- A tower costs 30% to 50% of the price of a dry cooler for a same evacuated power.

- A 1°C increase of the ambient air has direct effect on the performance of a dry air cooler, while the efficiency of a cooling tower will not be as much affected as the wet bulb has not fluctuated in the same way.

Noise reduction

Jacir can supply much quieter tower than a dry cooler.

Exchange surface: X-STREAM



It is made of PP toothed blades. They equally spread the water along the blades, into drops down to the lower blades' layers. The cooling occurs during the drops fall between the blades' layers; therefore, this exchange surface is highly resistant to clogging. It can be used for water with solids content up to 400ppm. In the case of waters with high salts content, the X-STREAM is self-cleaning by thermal expansion.

Tower casing

Self-supporting rigid panels, with 2 or 4 folds on the four sides, (designed by Jacir) allows exceptional tightness, even with stainless-steel plates.
Towers are assembled with waterproof A2 stainless-steel rivets (uniform and high-capacity locking). There is no welding during assembly; a high covering seal ensures the close fit between the panels.
As standard model, the panels are in galvanized steel 2mm thick Zendzimir process 275gr/m² (galvanized plates are protected by the zinc oxidation on the surface).
Stainless-steel is optional, X-STEEL or 316L: RXH serie.

Inclined and plane basin

It has a high-water capacity in order to offer a high thermal inertia. For example, the maximum volume of a RH8029 is 12m³ minimum. The inclined and plane basin allows an easy and complete drain. No welding and no screws for panel assembly on surfaces in contact with the water.

On the utility panel of the basin are installed:

- An overflow connection,
- A drain connection,
- A float valve or electrical solenoid make-up water system as an option,
- A water outlet through a removable strainer (in stainless-steel) with a flange, oversized to eliminate cavitations, with a perforated steel plate,
- Large access door(s) for nozzles for basin (540 x 540mm),
- Options: electrical heater of 230V or 400V and waterproof thermostat with separate bulb. For automatic control of resistance, suitable contractors must be provided.

3 types of basins are available:

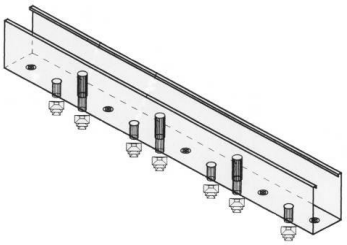
- Standard basin (B)
- High-water capacity basin (BGC)
- Collecting basin (water passing through) (BR)

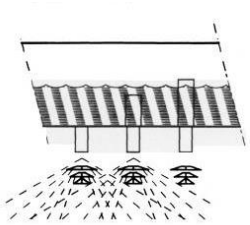
Accessibility

If there are sound baffles, plumeless tube coil or outlet air duct, large access doors (540 x 540mm) are provided. This access is used to remove easily the drift eliminators, nozzles, exchange surface and water distribution pipes. An additional middle casing is supplied as an option, fitted with access doors (540 X 540mm); it is located between the tube coil and the drift eliminators.

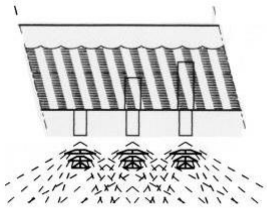
Water distribution

Water distribution is made of PP pipes (10 series) or of open-air steel channels (20 and above series). They are installed with PP nozzles especially designed to achieve an optimal distribution through the whole air section, and with large water nozzle to avoid clogging even in the case of high suspended content. These nozzles operate under low pressure (0 to 0.3 mWC), in order to low pumping head and to distribute large size drops, which prevents the drift from getting out of the cooling tower. In the case of distribution channels, Jacir has engineered a design to combine original high performance with major flow rate fluctuations: nozzles are fed by different water inlets in the channels.

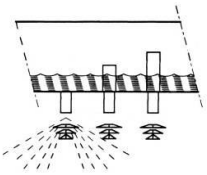




Minimum flow rate operating



Half flow rate operating



Full flow rate operating

Drift eliminators

Highly efficient, they prevent the water from being sprayed out of the tower. Ultraviolet resistant, they are easy to remove from the top in order to access to the distributors and to the exchange surface. They are made of PVC or PP blades, special type in the case of the plume suppression coil option is selected.

Fans

The centrifugal fans are specially designed and manufactured by Jacir. The impeller is a double side air inlet type. The air inlet ducts are removable to access to the impeller, and are made of polyester. Their shape noticeably improves the performances of the fans.
The bearings are self-aligning, lubricated in our factory and to be regularly lubricated. Each shaft is supported by two bearings. There is 1 motor for each fan.

The fan scroll side-plates are used to fix the motor support. This design prevents the belts from producing a slapping effect. Trapezoidal pulleys and V-belts transmission are used. Tension is applied to the belts by tipping the motor seat, for easy adjustment. The motor is located above the fan casing.

The fan is protected from corrosion by an ELASTAIR coating (thickness: 350-400 µm) ultra-violet proof. The impeller is treated and protected by a baked EPOXY coating.

A completely stainless-steel volute and impeller design can be selected as an option.

Standard motor

- Asynchronous three-phases motor,
- 1500 rpm,
- 230 / 400 V up to 5,5 kW,
- 400 / 690 V above 5,5 kW,
- Hz 50,
- IP55 (possible open sky operating),
- Direct connection to terminal box,

Sound attenuation (options) :
Special sound attenuation

Decrease of fan speed, polyester blades. In order to even improve the sound attenuation, the cooling tower casing can be coated with protected high density rock wool.

OPTIONS

- Internal ladders to ease cleaning,
- X-TRACT system: full and simple extraction of internals to be cleaned (cf SP_X-TRACT)
- Stainless steel X-STEEL or 316 L (1.4404),
- Electric heater with thermostat,
- Two - speed motor (Dahlander type –1500/750 rpm, separate wiring or PAM –1500/1000 rpm),
- Frequency controller,
- Water level control with solenoid valve (with electric-valve and input filter),
- Automated Inductive deconcentration (see DAi documentation),
- Discharge cone (increase of air outlet speed),
- Air filtration (fan covering + filters),
- Air pressure available for connection to the duct,
- Control panel,
- Equipment delivered in parts, ready to be assembled,
- Assembly on site by experimented technicians from our factory,
- Non freezing fan blade device,
- Anti-vibrations supports.

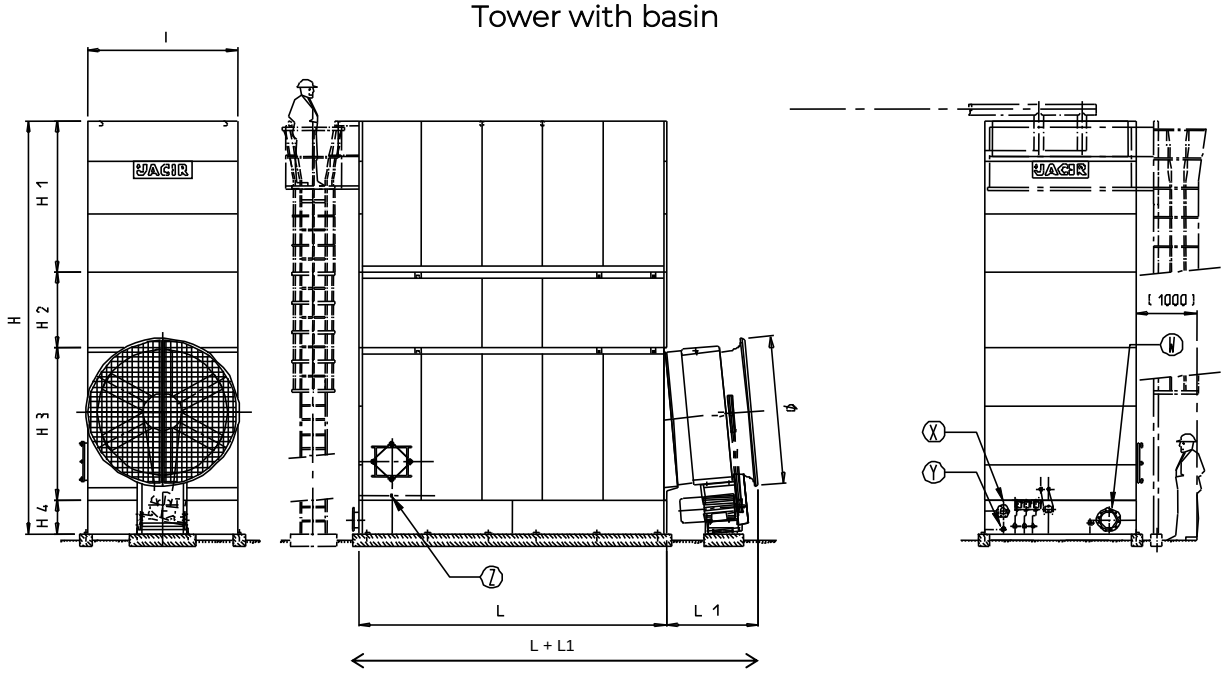
Technical characteristics

RH serie	Water flow rate (m3/h)	Dimensions (mm)				Weight (kg)				Water heater (kW)	ϕ fan (m)	Motor power (kW)				Sound level at 20 m (dB(A))*
						Empty		Full				Installed		Absorbed		
		L + L1	l	H without basin	H with basin	---	B	---	B			1 speed	2 speeds	1 speed	2 speeds	
RH 3017-47H140-110	51 à 153	4290	1800	5200	5200	2520	2700	3420	6200	10	1,40	11	11 / 3,7	9,5	9,5 / 4,2	63
RH 3017-60K140-110				6500	6500	2920	3100	3820	6620							
RH 3017 -47H140-150				5200	5200	2520	2700	3420	6200			15	15/ 5,5	12,7	12,7/ 3,8	
RH 3017 -60K140-150				6500	6500	2920	3100	3820	6620							
RH 3024-47H180-185	72 à 216	4685	2500	5200	5200	3200	3460	4450	8310	10	1,80	18,5	18,5 / 6	15,7	15,7 / 4,7	64
RH 3024-60K180-185				6500	6500	3740	4000	4990	8850							
RH 4024-47H180-185	96 à 288	5685	2500	5200	5200	3850	4200	5530	10680	10	1,80	18,5	18,5 /	15,7	15,7 / 4,7	65
RH 4024-47H180-220												22	22 / 7,5	18,7	18,7 / 5,6	
RH 4024-60K180-185				6500	6500	4570	4920	6250	11400			18,5	18,5 /	15,7	15,7 / 4,7	
RH 4024-60K180-220												22	22 / 7,5	18,7	18,7 / 5,6	
RH 5024-52H215-220	120 à 360	6816	2500	5200	5800	4750	5350	6850	13450	10	2,15	22	22 / 7,5	18,7	18,7 / 5,6	
RH 5024-52H215-300												30	30 / 9	24,7	24,7 / 7,3	
RH 5024-65K215-220				6500	7100	5670	6270	7770	14370			22	22 / 7,5	18,7	18,7 / 5,6	
RH 5024-65K215-300												30	30 / 9	24,7	24,7 / 7,3	
RH 5029-56H245-220	145 à 435	6940	3000	5600	6200	5800	6800	8340	17000	2 x 6	2,45	22	22 / 7,5	18,7	18,7 / 5,5	66
RH 5029-56H245-300												30	30 / 9	25,5	25,5 / 7,6	
RH 5029-56H245-370												37	42 / 14	31,5	31,5 / 9,3	
RH 5029-70K245-300				7000	7600	6840	7800	9380	18000			30	30 / 9	25,5	25,5 / 7,6	
RH 5029-70K245-370												37	42 / 14	31,5	31,5 / 9,3	
RH 6029-56H245-300	174 à 522	7940	3000	5600	6200	6400	7200	9400	18960	2 x 6	2,45	30	30 / 9	25,5	25,5 / 7,6	67
RH 6029-56H245-370												37	42 / 14	31,5	31,5 / 9,3	
RH 6029-56H245-450												45	52 / 19	38,3	38,3 / 11,5	
RH 6029-70K245-370				7000	7600	7620	8920	10680	29180			37	42 / 14	31,5	31,5 / 9,3	
RH 6029-70K245-450												45	52/ 19	38,3	38,3 / 11,5	
RH 7029-59I275-300	203 à 610	8960	3000	5900	6500	6600	7600	10500	21100	2 x 6	2,75	30	30 / 9	25,5	25,5 / 7,6	68
RH 7029-59I275-370												37	42 / 14	31,5	31,5 / 9,3	
RH 7029-59I275-450												45	52 / 19	38,3	38,3 / 11,5	
RH 7029-73L275-370				7300	8200	7800	8800	11300	22300			37	42 / 14	31,2	31,5 / 9,3	
RH 7029-73L275-450												45	52 / 19	38,3	38,3 / 11,5	
RH 8029- 59I305-370	232 à 696	10515	3000	5900	6500	8000	9150	13550	27350	10	3,05	37	42 / 14	31,5	31,5 / 9,3	
RH 8029- 59I305-450												45	52 / 19	38,3	38,3 / 11,5	
RH 8029- 59I305-550												55	52 / 19	46,8	46,8 / 14	
RH 8029- 73L305-450				7300	7900	9550	10700	15100	28900	10		45	52 / 19	38,3	38,3/ 11,5	
RH 8029- 73L305-550												55	52 / 19	46,8	46,8 / 14	
RH 8029- 87O305-450				8700	9300	11100	12250	16550	30450	10		45	52 / 19	38,3	38,3 / 11.5	
RH 8029- 87O305-550												55	52 / 19	46,8	46,8 / 14	

(*) in 4 directions
BR = Collecting Basin BGC = Large capacity basin (add 600 mm to H)

Drawings and Dimensions RH

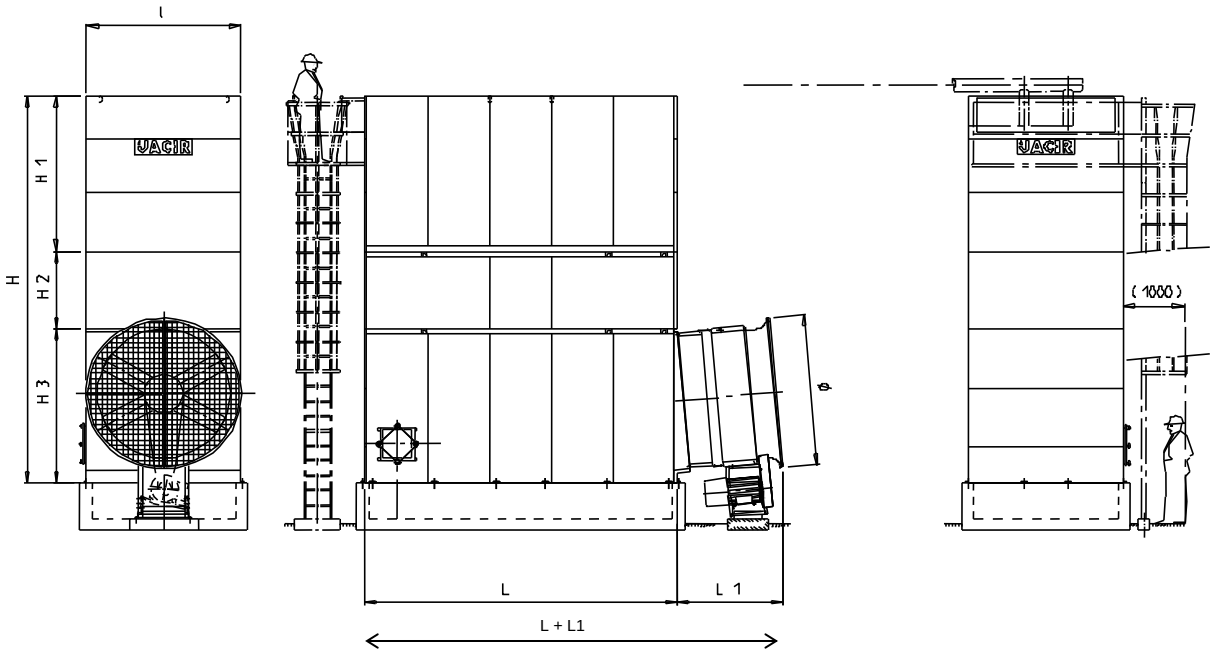
Tower with basin



	W water outlet [DN]	X overflow [DN]	Y drain [DN]	Z makeup water [DN]
RH 3017	200	100	50	32
RH 3024	200	100	50	32
RH 4024	250	100	50	32
RH 5024	250	100	50	40
RH 5029	300	100	50	40
RH 6029	300	100	50	40
RH 7029	300	100	50	40
RH 8029	350	100	50	40

Drawings and dimensions RH

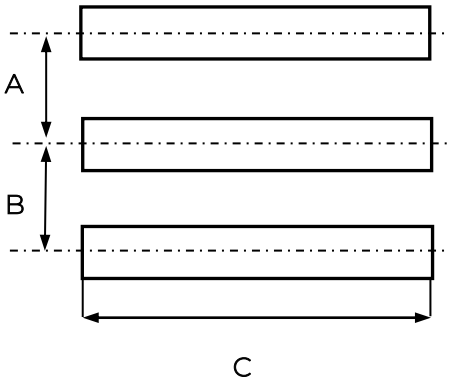
Tower without basin



Support RH

Our cooling towers can stand on the ground or on a concrete ground, but we recommend to install them on concrete or steel longitudinal beams.
Check that the ground can stand the operating load, and that the surface or supports are flat.

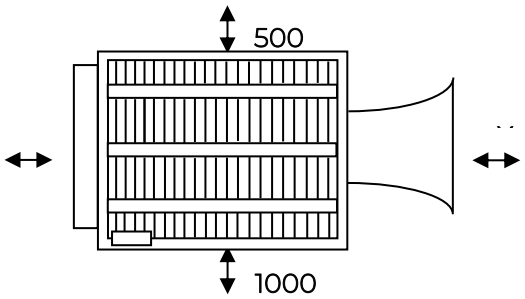
Quantity and position of supports (customer supply) without sound attenuation



	Qty	Distance between supports under basin A [mm]	Distance between supports under basin B [mm]	Minimum length C [mm]
RH 3017	2	1800		> 3100
RH 3024	3	1250	1250	> 3100
RH 4024		1250	1250	> 4100
RH 5024		1250	1250	> 5100
RH 5029		1500	1500	> 5400
RH 6029		1500	1500	> 6400
RH 7029		1500	1500	> 7400
RH 8029		1500	1500	> 9050

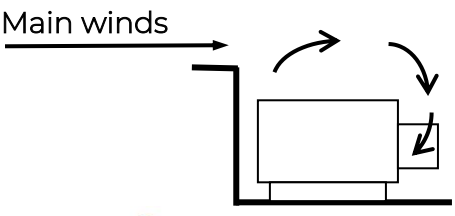
Layout RH

Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings.
This could create a risk of a « re-circulation »; the air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower. In any case, the free access on the four sides of the tower must be secured to ensure that the fans are supplied correctly with air and that there is proper access for installation and maintenance.
If these rules are not applied, it is inevitable that the cooling tower will not operate properly.

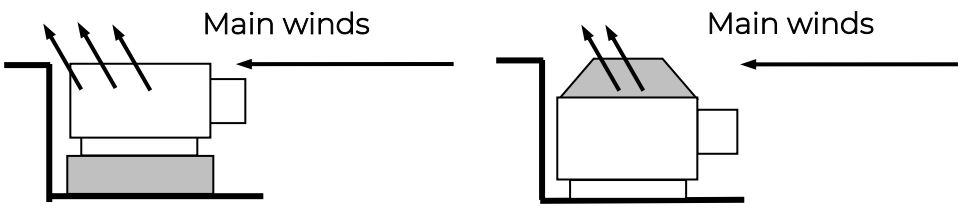


Model	Distance X (mm)
3017	1800
3024	1800
4024	1800
5024	2100
5029	2700
6029	2700
7029	2700
8029	2700

NO



YES



WATER EVAPORATION

Consumption by evaporation is approximately 1.7kg/h per 1 000kcal/h.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible).
There are three possibilities to choose according to the case:

1- Continuous blow down

Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.

The blow down flow rate can be calculated using the formula: [100 S / (M - S)] % of the make-up water in which:
S: Salinity of the make-up water compensating for evaporation.
M: Maximum acceptable salinity level of water in circuits.

Example:
Salinity of make-up water = HT 20 ° F
Maximum acceptable salinity = HT 40 ° F
100 x 20 / (40 - 20) = 100 % make-up water flow rate
Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).

Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous blow down

The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- JACIR Automated Inductive Blow down

Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level. See separate documentation.

WATER TREATMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly. If the water contains a significant amount of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10% of the recycled water flow.
If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.
In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to prevent these organisms from developing.

Water treatment should be undertaken by a specialized Company.
PREVENTS THE RISK OF LEGIONNAIRES' DISEASE: see separate documentation

Prescription RH

Evaporative cooling tower, high efficiency open circuit with forced centrifugal fans, RH ..... JACIR type,

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Sound level characteristics

The sound pressure level of the tower will not exceed.... dB (A) at ..... meters in free field over 4 directions. To achieve it, the tower has one of the following types of soundproofing devices:
Special sound attenuation: 50mm thick high density rock wool double casing, covered by 1.2mm thick steel sheet.

Infill: X – STREAM

It will be made of 2mm thick PP toothed blades, with 66 mm high. They will equally spread the water along the blades, into drops down to the lower blades' layers. The cooling occurs during the drops fall between the layers; therefore, this exchange surface will be highly resistant to clogging. It can be used for water with solids content up to 400 ppm. In the case of waters with high salts content, the X-STREAM will be self-cleaning by thermal expansion.

Tower casing and inclined plane basin

These will be made of single, self-supporting sheet steel panels twice or 4 times folded on the 4 sides.
Side panels will be designed to be able to receive a double casing if necessary.
Stainless steel rivets with a high locking capacity will be used for assembly. Elastomer gaskets will be used, without any mastic sealing.
The basin will be fitted with an inspection door (540 X 540 mm), floating valve that can easily be adjusted, a drain, an overflow and an anti-cavitation strainer.
The basin will be inclined and plane so that all the water can be replaced easily and the cleaning is simple: the drain hole bottom will be lower than the lowest part of the basin in order to secure 100 % drain. Height between basin bottom and the infill is 1425 mm for easy access.
The basin will be:

- Standard basin (B) or
- High water capacity basin (BGC) or
- Collecting basin (water passing through): BR.

Accessibility

In case of sound baffles, plume less tube coil or outlet air duct, large inspection doors (550 x 390 mm) to nozzles and basin will be installed in order to remove easily pipes, nozzles and packing. For maintenance, an additional casing will be provided, located between the plume suppression coil and the drift eliminators, with an access door 550 X 390 mm.

Water distribution

Water will be distributed by steel open air channels. They will be installed with PP several layers nozzles especially designed to achieve an optimal distribution through the whole air section, and with large water nozzle to avoid clogging even in the case of high suspended solids content. These nozzles operate under low pressure (0 to 0.3 mWC), in order to low pumping head and to distribute large size drops, which prevents the drift from getting out of the cooling tower.

Fans

The axial fans will be adjustable stand still type.
The number of blades and the material will be selected according to the thermal and sound requisition. The inlet cones will be made of polyester. Their calyx shape drastically will improve the fan efficiency. The fan stack will be made in the same material as the cooling tower in galvanised steel (option stainless steel). All the mechanical components to be maintained will be located at man chest, out of the wet air flow. A fan guard, installed with hinges will make the access to the tower safe. As an option, Jacir will be able to provide an anti-blade freezing device, economical and maintenance free. A fan bearing lubrication line is extended on the fan stack. It is made of Rilsan.

Electric motor(s) and coupling

The motor is a closed type with ventilated case with a power of kW....., rpm ....., IP55 protected class F. V-belts, selected for 150 % of nominal power, are used for transmission.

Steel structure

The tower will be made of:

- Zendzimir process galvanised metal (2 mm thick) at 275 gr/m² with finishing ZINCALU paint applied to the external sides after assembly,
- Stainless steel X-STEEL or 316 L (1.4404) metal for long life, water savings and high-pressure machine cleaning.

JACIR
Cooling for life

RBH

Concrete cooling towers forced draft axial fan

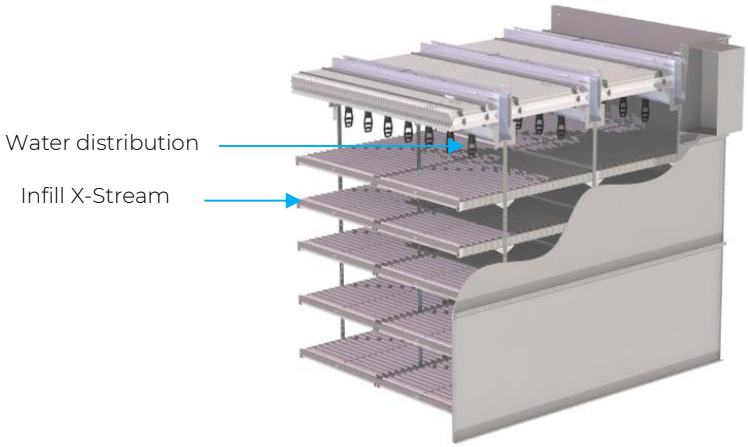
Flow rates: from 350 to 2000m³/h/cell

Commercial Documentation

- X-STREAM for heavy duty waters

FABRIQUE EN FRANCE NF 38-424
La FRENCH FAB

Heavy duty open cooling tower: RBH serie



Infill: X - STREAM

It is made of PP toothed blades. They equally spread the water along the blades, into drops down to the lower blades layers. The cooling occurs during the drops fall between the blades layers ; therefore, this exchange surface is highly resistant to clogging. It can be used for water with solids content up to 400 ppm. By thermal expansion, the X–STREAM is self-cleaning in the case of waters with high salts content.

Water distribution

Water is distributed by steel open-air stainless-steel channels. They are installed with PP nozzles especially designed to achieve an optimal distribution through the whole air section, and with large water nozzles to avoid clogging even in the case of high suspended solids content. These nozzles operate under low pressure by gravity, in order to low pumping head and to distribute large size drops, which prevents the drift from getting out of the cooling tower.

Tower casing

It is in concrete. From the fan arrangement, it results very simple and low-cost civil works: the casing consists in four smooth walls with a square opening for the fan connection. The forced draft design does not require any louvers, has no light entering in the basin and no water lost in windy conditions. The design of the infill secures very short time for installation and for cleaning.

Environment protection

Sound attenuation:

The RBH cooling towers are initially low sound. In addition, their design makes it possible to select the right fan orientation towards the most favourable direction. To improve even more the sound performances, we can offer additional sound attenuation, adjustable according to the sound level to reach: fan speed reduction, low sound fans, fan housing, air outlet cone with sound attenuating material.

Sound and energy savings

The forced draft axial fans are particularly efficient, with a very low absorbed power. In addition, the coupling by gear box makes it easy to select the best ratio efficiency / sound power level and mechanical resistance. Placed at man chest, those fans are located in the dry air flow, and out of the basin and are inserted in a stainless-steel fan stack with inclined bottom. They are provided with fan guards

Options

Frequency converter, Automatic Deconcentration by Induction (Dai), frequency converter, support beams, level switch with electro valve, explosion proof motors, fan non-freezing device, site erection, etc.

JACIR
Cooling for life

RBH

Open circuit cooling tower

Technical Documentation

CONTENT

La FRENCH FAB

JACIR

With more than 60 years' experience, our company:

- Has gained a great deal of experience in aeraulic, acoustics and water-cooling towers.
- Has invested in detailed research and development in order to propose technical solutions according to the environmental protection.
- Is the European leader thanks to its technology beyond market requirements.

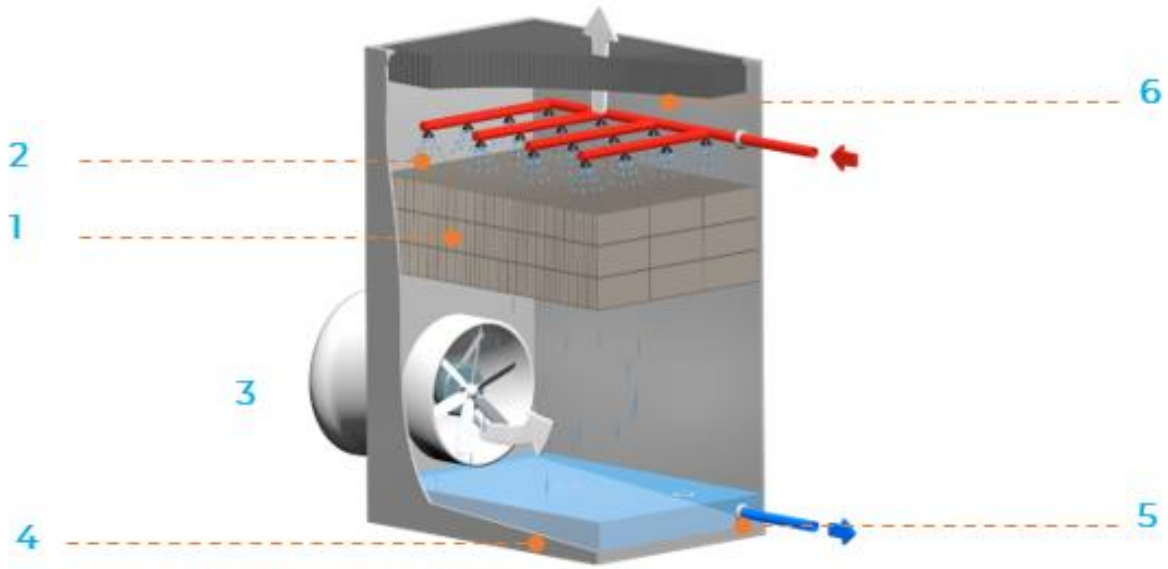
STRONG ADVANTAGES OF THE RBH

∞ EXCHANGE SURFACE	High efficiency, with low fouling and low pressure drop characteristics, especially designed for water with high suspended solids content and self-cleaning. It can be used for water up to 100°C as standard.
∞ CASING DESIGN	Casing of tower is made in concrete: high mechanical resistance. Very simple design for fast and economical installation
∞ EASY MAINTENANCE	The exchange surface is assembled in a simple piece. It can be inserted and removed for complete cleaning in few hours. The fan is at man chest.
∞ ASSEMBLY/TRANSPORT	The exchange surface is assembled in factory, in reduced volume for a standard transport. A simple lifting will expand it into final position down to the cell.
∞ SILENCE	Compared with induced draft towers, the RBH are low sound towers in standard, can be improved according to the requirement.

Open circuit cooling tower principle RBH

A cooling tower is a heat exchanger, which enables water to be cooled through direct contact with air. The heat transfer from the water to the air is carried out partly by sensible heat transfer, but mainly by latent heat transfer (evaporation of part of the water into the air), which makes it possible to reach cooling temperatures lower than ambient temperatures.

Operation:



The hot water to be cooled is pumped to the top of the tower through pipes. This water is divided and distributed over the heat exchange surface (1) by low pressure water distribution nozzles (2).

Blown by the fan (3), the fresh air enters into the lower section of the unit and escapes through the upper section after being heated and saturated by passing through the wetted heat exchange surface.

As a result of surface tension, due to the exchange surface, the water spreads in uniform way, falls down the whole height. The exchange surface is then increased.
The water, cooled thanks to forced ventilation, falls into the inclined basin (4) at the bottom of the tower.

Then the water is sucked through the strainer (5). Drift eliminators (6) located at air outlet reduces drifts losses.

Benefits of cooling towers compared with dry coolers :

Energy savings

- Chillers, condensers associated to a cooling tower will be cooled at a lower temperature and then will have a better cooling capacity. Their efficiency is higher.

- Seven to ten times more air must be blown in a dry cooler, which means a lot of fans and electric motors. So, the electrical consumption is about 40% higher.

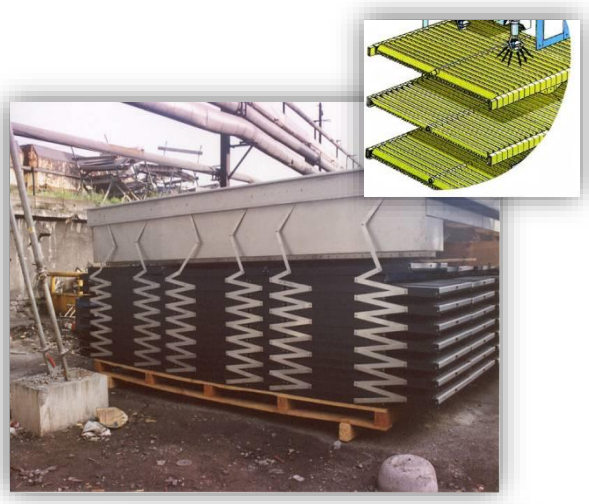
- A tower costs 30 to 50% of the price of a dry cooler for a same evacuated power.

- A 1°C increase of the ambient air has direct effect on the performance of dry air cooler, while the efficiency of a cooling tower will not be as much affected as the wet bulb has not fluctuated in the same way

Noise reduction

Jacir can supply much quieter tower than a dry cooler.

Exchange surface: X-STREAM



It is made of PP toothed blades. They equally spread the water along the blades, into drops down to the lower blades' layers. The cooling occurs during the drops fall between the blades' layers; therefore, this exchange surface is highly resistant to clogging. It can be used for water with solids content up to 400 ppm. In the case of waters with high salts content, the X–STREAM is self-cleaning by thermal expansion.

Tower casing

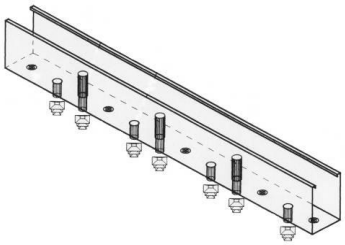
It is in concrete, from a very simple design: it consists in 4 smooth walls, with one square opening for the fan stack; the benefits are the very simple civil works, and very smooth surface without areas that could enhance bacteria development and make the cleaning simple and efficient. Jacir supply the guide lines for the civil works with loads.

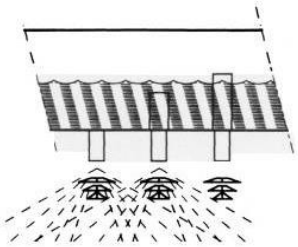
Accessibility

The access to the mechanical parts can be done without any lifting equipment, and by the opening of the fan guard.
The exchange surface can be inserted and removed by simple lifting, without any disassembly so installation and maintenance time are very limited : for cleaning, it is just necessary to lift down the internal in a single piece on a support..

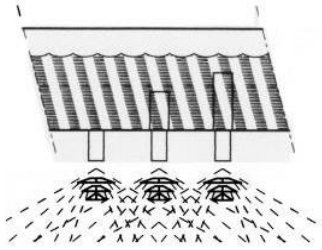
Water distribution

Water distribution is made of open-air stainless steel 304L channels (option 316L). They are installed with PP nozzles especially designed to achieve an optimal distribution through the whole air section, and with large water nozzle to avoid clogging even in the case of high suspended content. These nozzles operate under low pressure (0 to 0.3 mWC) by gravity, in order to low pumping head and to distribute large size drops, which prevents the drift from getting out of the cooling tower. Jacir has engineered a design to combine original high performance with major flow rate fluctuations: nozzles are fed by different water inlets in the channels.

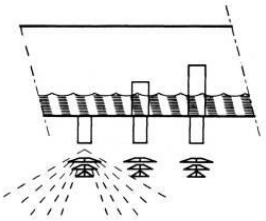




Minimum flow rate operating



Half flow rate operating



Full flow rate operating

Drift eliminators

Highly efficient, they prevent the water from being sprayed out of the tower. Ultraviolet resistant, they are easy to remove from the top in order to access to the distributors and to the exchange surface. They are made of PVC or PP blades with a pitch of 25 or 45 mm.

Fans

The axial fans are adjustable stand still type.
The number of blades and the material are selected according to the thermal and sound requisition. The inlet cones are made of polyester. Their calyx shape drastically improves the fan efficiency. The fan stack is made in stainless steel, has an inclined bottom to avoid water losses and potential freezing. The fan stack warmed up by the water inside the tower. All the mechanical components to be maintained are located at man chest, out of the wet air flow. A fan guard, installed with hinges makes the access to the tower safe

Standard motor

- Asynchronous three-phases motor,
- 1500 rpm,
- 230 / 400 V,
- 45 to 75 kW,
- 50 Hz,
- IP55 (possible open sky operating),
- Direct connection to terminal box,

Additional sound-attenuation

Decrease or variation of fan speed, polyester blades. In order to even improve the sound attenuation, a water fall sound attenuation, a fan housing and an air out let cone with sound attenuating material can be provided.

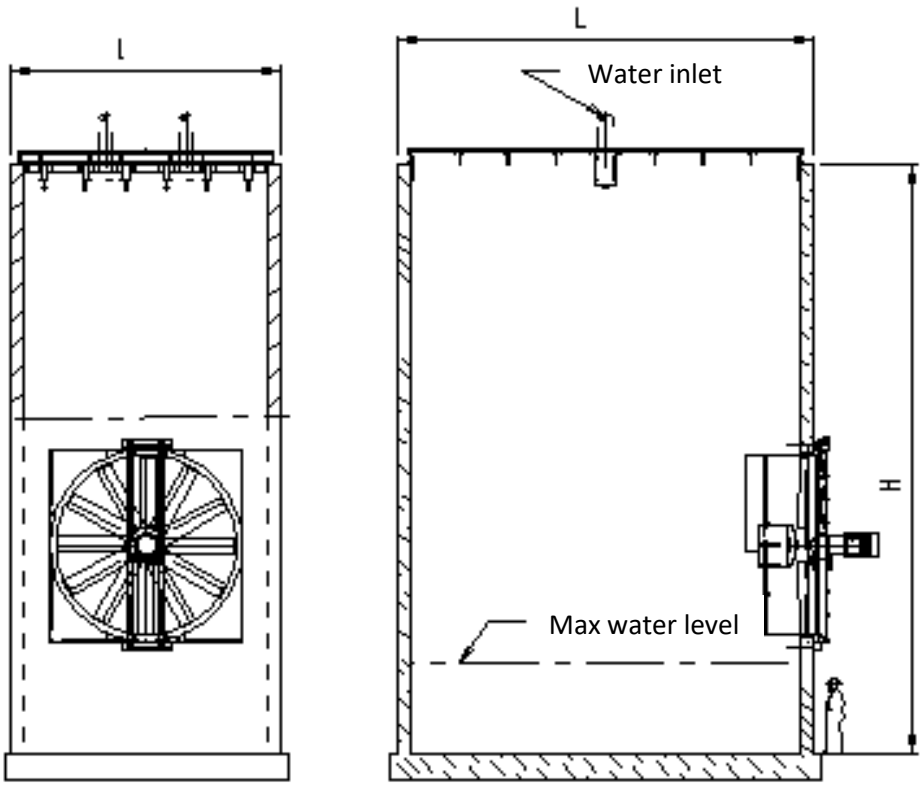
OPTIONS

- Plume suppression system,
- Stainless steel 304 L (1.4301) or 316 L (1.4404),
- Electric heater with thermostat,
- Two - speed motor (Dahlander type –1500/750 rpm, separate wiring or PAM –1500/1000 rpm),
- Frequency controller,
- Water level control with solenoid valve (with electric-valve and input filter),
- Automated Inductive deconcentration (see DAi documentation),
- Discharge cone (increase of air outlet speed and safety for access to the channels),
- Equipment delivered in parts, ready to be assembled,
- Assembly on site by experimented technicians from our factory,
- Fan bearing lubrication line (Rilsan), extended on the fan stack.

Technical characteristics RBH

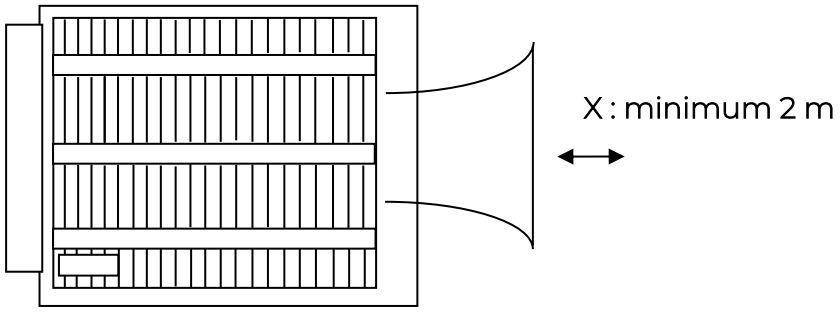
Série RBH	Water flow rates (m3/h)	External dimensions (m)			ϕ fan (mm)	Motor power (kW)
		l	L	H on basin		
RBH 7050	350 à 1050	5,55	7,55	8,8 à 12,4	3660 et 4250	45 à 75
RBH 8050	400 à 1200		8,55			
RBH 9050	450 à 1350		9,55			
RBH 10050	500 à 1500		10,55		4250	
RBH 11050	550 à 1650		11,55			
RBH 12050	600 à 1800		12,55			
RBH 13050	650 à 1950		13,55			

Drawings and dimensions RBH



Layout RBH

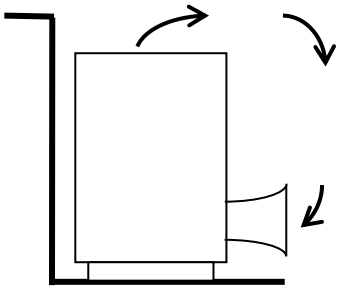
Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings.
This could create a risk of a « re-circulation »; the air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower.
In any case, the free access must be secured to ensure that the fans are supplied correctly with air and that there is proper access for installation and maintenance.
If these rules are not applied, it is inevitable that the cooling tower will not operate properly.



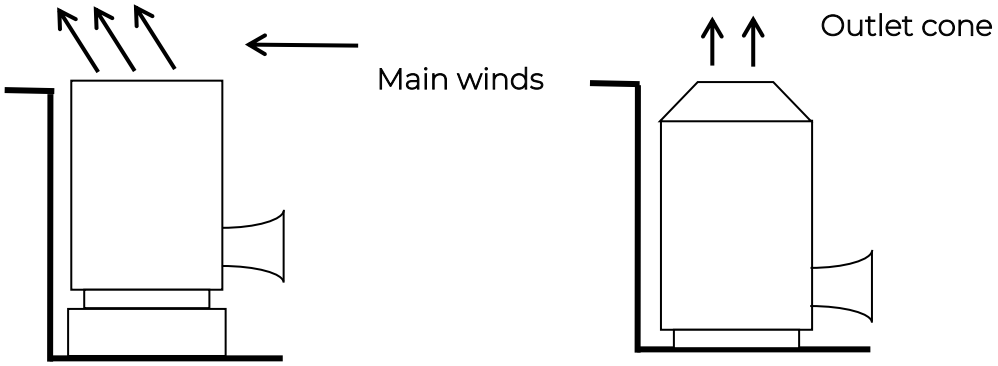
Contact us for layout advices

Layout examples :

NO



YES



WATER EVAPORATION

Consumption by evaporation is approximately 1.7kg/h per 1 000kcal/h.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible).
There are three possibilities to choose according to the case:

1- Continuous blow down

Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.

The blow down flow rate can be calculated using the formula: [100 S / (M - S)] % of the make-up water in which:
S: Salinity of the make-up water compensating for evaporation.
M: Maximum acceptable salinity level of water in circuits.

Example:
Salinity of make-up water = HT 20 ° F
Maximum acceptable salinity = HT 40 ° F
100 x 20 / (40 - 20) = 100 % make-up water flow rate
Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).

Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous blow down

The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- JACIR Automated Inductive Blow down

Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level. See separate documentation.

WATER TREATMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly. If the water contains a significant amount of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10% of the recycled water flow.
If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.
In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to prevent these organisms from developing.

Water treatment should be undertaken by a specialized Company.
PREVENTS THE RISK OF LEGIONNAIRES' DISEASE: see separate documentation

Prescription RBH

Evaporative water-cooling tower, modular with a forced draft axial(s) fan(s), JACIR, RBH .....

Thermal characteristics

The heat power will be .....kW for conditions between ...°C and .....°C with a wet bulb of..... °C at air inlet.

Sound characteristics

The sound pressure level of the tower will not exceed.... dB (A) at ..... meters in free field over 4 directions. To achieve it, the tower has one of the following types of soundproofing devices : fan motor speed decrease, polyester blades, sound attenuating coating on fan casing, air outlet cone.

Infill: X – STREAM

It will be made of 2 mm thick PP toothed blades, with 66 mm high and 2 mm thick. By drops slow down, they will equally spread the water along the blades, down to the lower blades' layers. The cooling will occur during the drops fall between the layers; therefore, this exchange surface will be highly resistant to clogging. The layer and blades pitches will be selected to secure a proper cooling of waters with solids content up to 400 ppm. In the case of waters with high salts content, the X-STREAM will be self-cleaning by thermal expansion.

Water distribution

Water will be distributed by steel open air channels. They will be installed with PP several layers nozzles especially designed to achieve an optimal distribution through the whole air section, and with large water nozzle of 3 cm minimum to avoid clogging even in the case of high suspended solids content.

These nozzles operate under low pressure (0 to 0.3 mWC) by gravity, in order to low pumping head and to distribute large size drops, which prevents the drift from getting out of the cooling tower.

Tower casing

It will be built by the customer, with the guide lines provided by Jacir. Il will be in armed concrete, 250 mm thick, with square openings for the fan.

Fans

The axial fans will be adjustable stand still type.
The number of blades and the material will be selected according to the thermal and sound requisition. The inlet cones will be made of polyester. Their calyx shape drastically will improve the fan efficiency. The fan stack will be made in stainless steel, with an inclined bottom, a 304 L disc, and warmed up by the water inside the tower. All the mechanical components to be maintained will be located at man chest, out of the wet air flow. A fan guard, installed with hinges will make the access to the tower safe.

Electric motor and coupling

The motor is a closed type with ventilated case with a power of kW....., rpm ....., IP55 protected class F. Gear box is used for the transmission.

Accessibility

The access to the mechanical parts will be at man chest through the fan guard with hinges.
The exchange surface will be inserted and removed by lifting, without any disassembly. This will drastically reduce installation and maintenance time.

SERVICE LOURD / HEAVY DUTY

Exemples d'utilisation pour les eaux chargées / Examples

LAITERIE
MILK PLANT

Présence de "Petit Lait" dans l'eau
WHEY content in the water

FONDERIE
FOUNDRY

Note :
Les lames en polypropylène sont restées propres malgré l'encrassement important

Blades remain clean even without maintenance

REFROIDISSEMENT DE VINASSES / VINASSES COOLING

Série **RIGINOX**

Etages de dispersion de gouttelettes montés sur glissières

Infill installed on rails for easy cleaning

HUILERIE / OIL

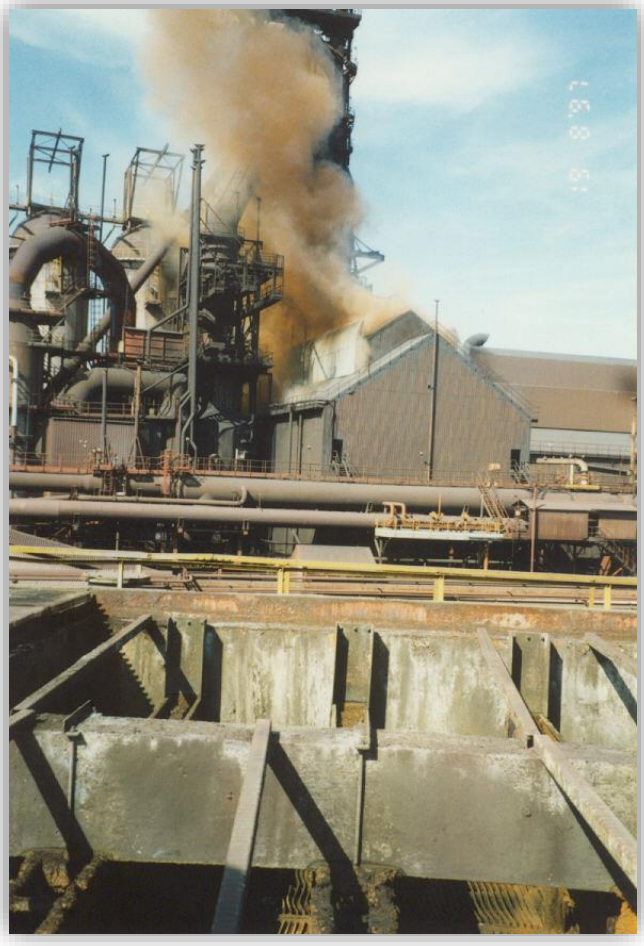
Refroidissement des eaux de Lavage des gaz de hauts-fourneaux

Cooling of high furnace waters

COCKERILL en Belgique / Belgium

Vue de dessus après 7 ans de fonctionnement sans aucun entretien

Top view after 7 years without maintenance



Après un sérieux nettoyage... Rien d'endommagé

After a drastic cleaning... nothing is damaged.

Exemple de la boue retirée dans une cellule d'environ 35 m²

Mud out of a 35 m^2 cell

Partie supérieure en cours de nettoyage

Upper part during cleaning

Partie inférieure nettoyée

Lower part after cleaning

Sans aucun changement de pièces, le système JACIR est de nouveau "bon pour le service"

Without any spare changed, Jacir system enables new start-up and safe operation

JACIR
Cooling for life

X - STEEL

Corrosion free solution for Cooling towers

PRODUCT SUPPORT

JACIR has selected a unique stainless steel, as a replacement of the 304L and 316L stainless steel for the casing of its cooling towers.

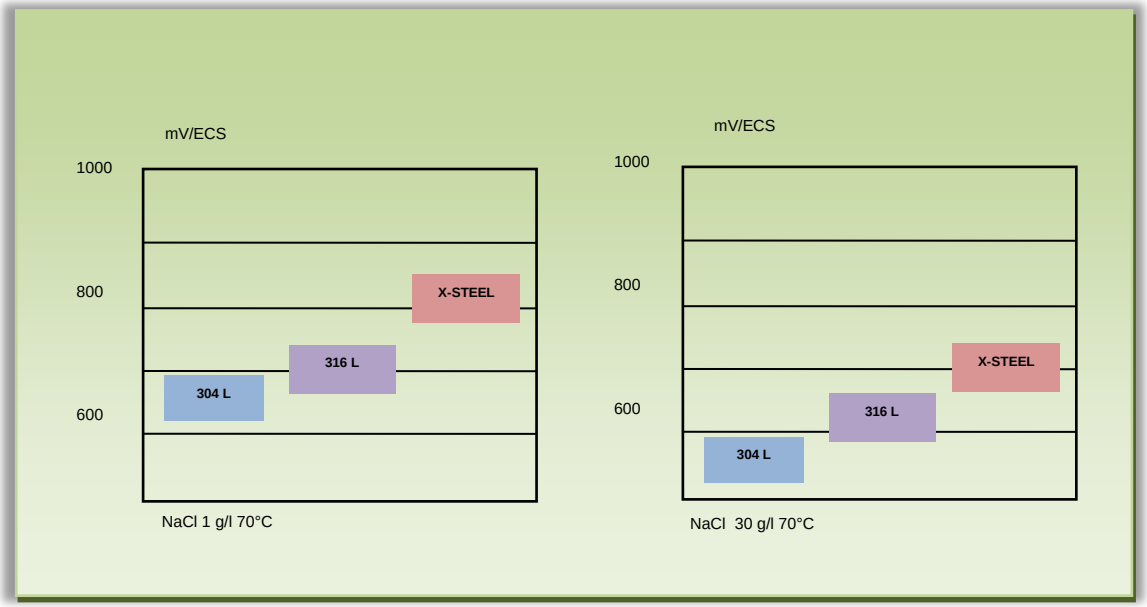
MADE IN FRANCE
FABRICATION FRANÇAISE

La FRENCH FAB

Composition

This stainless steel in 18 % of chromium and titanium + molybdenum, has characteristics of corrosion resistance higher to the ones of 316L: excellent resistance to formic, oxalic, acetic, lactic, phosphoric, citric acids, sodium chloride, chlorides, condensats of exhaust gas …

Thanks to its exceptional qualities, this material allows us to offer 10 years non pitting guarantee.



Nb. Après 2000 h de brouillard salin selon NFX 41002, X-STEEL à l'état 2B ou 2R ne présente aucune amorce de corrosion

Benefits

- ∞ Increase of the water treatment efficiency (concentration),
- ∞ Water savings: increase of concentration factor,
- ∞ Fight against the strengthened bacteriological proliferation: very smooth surface, resistance in the severe mechanical cleaning, absence of iron oxide, cleanliness and greater hygiene,
- ∞ Long lasting resistance characteristics

Applications

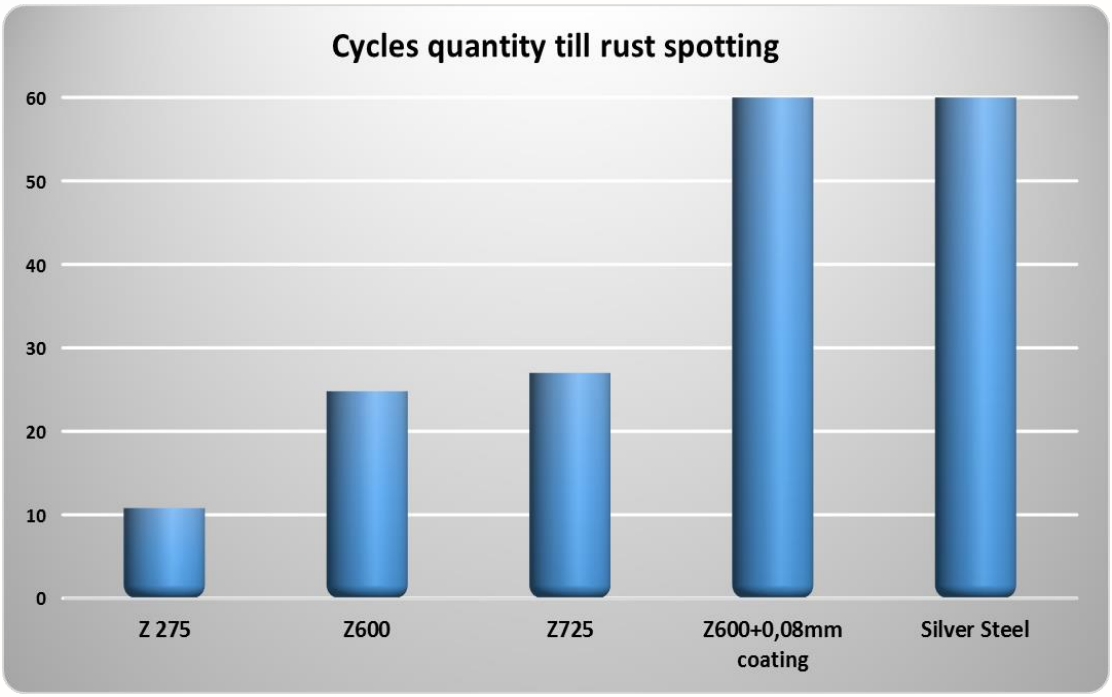
- ∞ Industrial and HVAC steel cooling towers,
- ∞ Clean or waste water,
- ∞ Cooling tower range : S-SF / ATM-CRF/ KS-KSF / KH-KHF / RC / RH / VAP-VAPF / DTC-DTCF.

JACIR
Cooling for life

SILVER STEEL

Efficient resistance to corrosion for cooling towers

PRODUCT SUPPORT



SILVER-STEEL is manufactured on a classic hot dip galvanized steel production line; and then dipped into a fusion bath of specific metallic chemical zinc composition which is enriched of aluminum and magnesium.

MADE IN FRANCE FABRICATION FRANÇAISE

La FRENCH FAB

Resistant product

- Corrosion resistance 10 times higher than galvanized steel's one.
- (10µm coating under 8 hours alternative cycles exposed to salt spray aging tests (5% of NaCl)/dry cycle/wet cycle)

Source Arcelor Mittal

Environmental product

- Lower zinc* run-off into the soils due to the rainfalls,
- Water consumption saving thanks to higher concentration rate,
- Lower run off due to purge drain
- No passivation needed unlike galvanized steel.

Source Arcelor Mittal

*Definition of dissolution rate: dissolution rate of outside environment material (g / m2 / year). In our case, it is about the on-surface zinc quantity affected by the precipitation.

Thanks to its exceptional qualities, this material allows us to offer as standard 5 years non perforation guarantee.

Applications

- Industrial and HVAC metallic cooling towers,
- Clean and heavy-duty waters,
- Ranges: S/SF – ATM/CRF - KS/KSF – KH/KHF – RC - RH.

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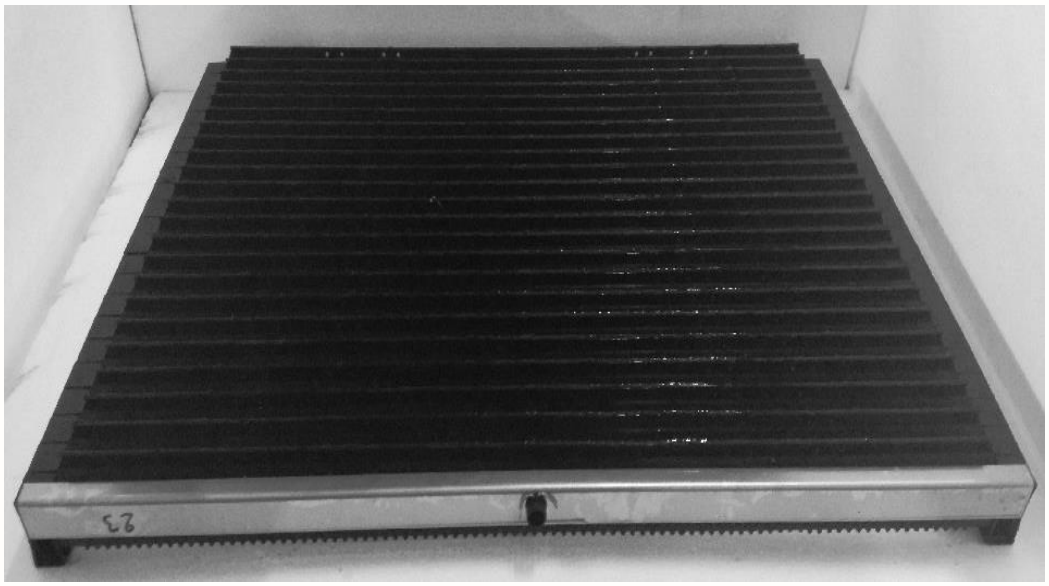
Cooling for life

X-STREAM

Infill



PRODUCT SUPPORT

MADE IN FRANCE
FABRICATION FRANÇAISE

La FRENCH FAB

Applications

- Very high suspended solids content
- Stell slag
- Paper mils
- Cement
- Sugar
- Oil

References

- TURBOMECA
- SOGEQUIP
- SAIPOL
- SEGEM
- EXONIA...

Characteristics

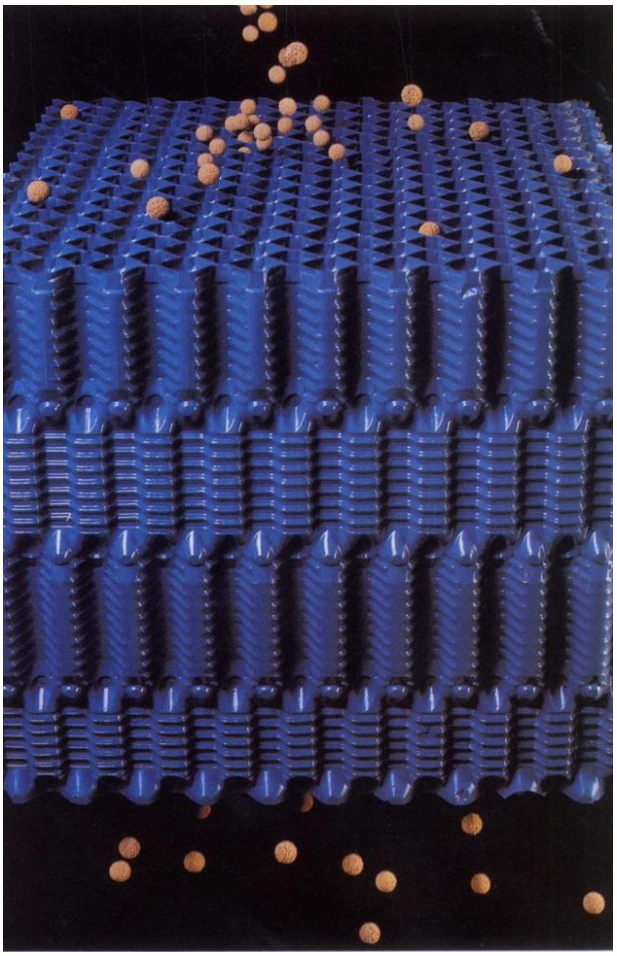
ASSEMBLY	MATERIAL	SUPPORT	TEMP. max	MES max	VERTICAL PITCH (mm)	HORIZONTAL PITCH (mm)	TOWERS
Stainless-steel hangers	PP + Stainless-steel	1 angle in stainless-steel 1 central pipe in PP 2 sides pipes in PP	80°C	400 ppm	200 à 500	32	RC RH RBH

Benefits

- Non scaling as self-cleaning by thermal expansion
- High efficiency even with major water flow fluctuations
- Water is equally spread during the controlled drops fall
- Highest available resistance to fouling
- Very simple assembly and disassembly

JACIR
Cooling for life

FREEFILM



PRODUCT SUPPORT

MADE IN FRANCE
FABRICATION FRANÇAISE

La FRENCH FAB

APPLICATIONS:

- ∞ Industrial water
- ∞ Car industry
- ∞ Power generation
- ∞ Chemical industry
- ∞ Agri-food

REFERENCES:

- ∞ PEUGEOT
- ∞ NESTLE
- ∞ ALSTOM
- ∞ SOLVAY
- ∞ GOODYEAR…

CHARACTERISTICS:

ASSEMBLY	MATERIAL	TEMP. max	MES ppm max	CHANNELS mm	TOWERS
Glued vacuum pressed sheets	PVC ABS	58 – 72 80°C	60 or 120	12 or 20	KS – VAP – RCM – RMP – KH - KBH

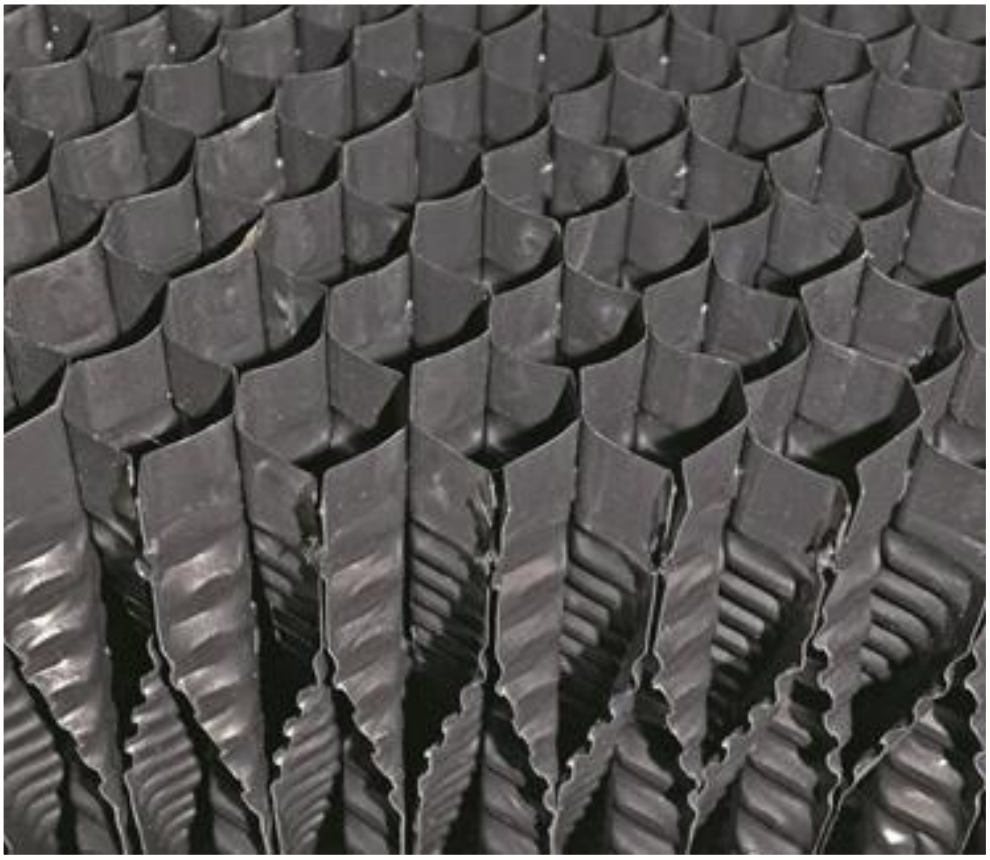
BENEFITS:

- ∞ Vertical channels without air direction change, low pressure
- ∞ Highly resistant to fouling
- ∞ Performance lasting
- ∞ Adjustable resistance: different thicknesses: 0.30mm, 0.35mm, and 0.50mm
- ∞ Fire classification M2, self-extinguishing.

JACIR
Cooling for life

EFFI-PACK

Infill



PRODUCT SUPPORT

La FRENCH FAB

Applications :

- Clean
- HVAC
- Power generation

Characteristics :

ASSEMBLY	MATERIAL	TEMP. max	MES ppm max	CHANNELS mm
Welded vacuum pressed sheets	PP	75 °C Option 95°C	70	According to thermal need

Benefits :

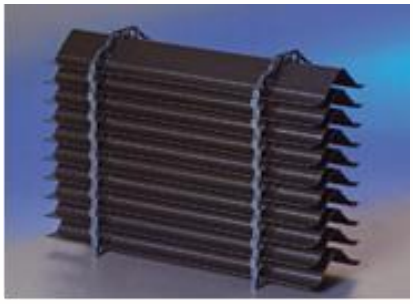
- Performance guaranteed
- Polypropylene non subject to crumbling
- Easy waste incineration without chore quality
- Food quality

JACIR
Cooling for life

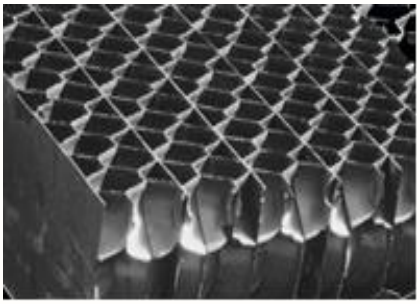
DRIFT ELIMINATORS

Efficiency : 99,99%

PRODUCT SUPPORT



LPPH



CPPH

LPVC 177/45

All JACIR cooling towers (open, closed, hybrid coolers) are fitted with drift eliminators. Those are one of the last physical obstacles to drift. From 3 to 5 directions changes are available.

Operation

The drift eliminators are selected according to criteria such as water temperature, compatibility with water quality and ambient air, air velocity, pressure drop of the exchange surface, etc... they combine light weight and mechanical resistance in order to secure an easy maintenance and long-lasting performances.

In addition, a special care is given to the installation of the different components to ease maintenance and efficiency. For example, an extra tightness all around the drift eliminators is provided in order to avoid preferential air flow around the cooling tower casing. The air speed through these eliminators is kept low enough to secure the efficiency.

TYPE	MODEL	ASSEMBLY	MATERIAL	Water TEMP. max
Blades	LPPH 160/33	Clipped spacers	PP	80 °C
	LPVC 177/45		PVC	60 °C
Sheets	CPPH 130/20	Welded	PP	80 °C

JACIR warrants that the drift rate is always lower of equal to 0.01% of the recirculating water flow rate*. This figure is in compliance with European regulations.

*: The performance of the drift eliminators can be guaranteed only if the equipment is in good condition, clean, properly installed and used in its nominal operation conditions. It is fundamental to use the original spare parts to keep the flow and pressure drops constant.

JACIR
Cooling for life

HUMIDIFYING PADS

PRODUCT SUPPORT

Evaporation surface is used for the pre-cooling of the air on the adiabatic cooler TOPAZ and ONYX

MADE IN FRANCE FABRICATION FRANÇAISE

La FRENCH FAB

Applications:

Adiabatic coolers for :

- Clean industrial waters
- HVAC

References:

- AIRBUS
- OI Manufacturing
- SOCLIMA...

Benefits:

The humidifying Pad covers the totality of the air inlet surfaces on both sides of the unit.

The design and the choice of materials demonstrated the excellent performance and the long lasting of this media, as well in urban zones as in industrial environment: made of cellulose fibers, chemically treated to prevent molds, it improves the absorbent characteristics and increase its lasting.

Selected to ease maintenance operations, the Pads may be reversed (inside/outside). Removing of humidifying Pads is extremely easy, without any tools or lifting.

The disassembly of the humidifying media is extremely easy, without tools or handling means.

JACIR
Cooling for life

FRC FILTER

PRODUCT SUPPORT

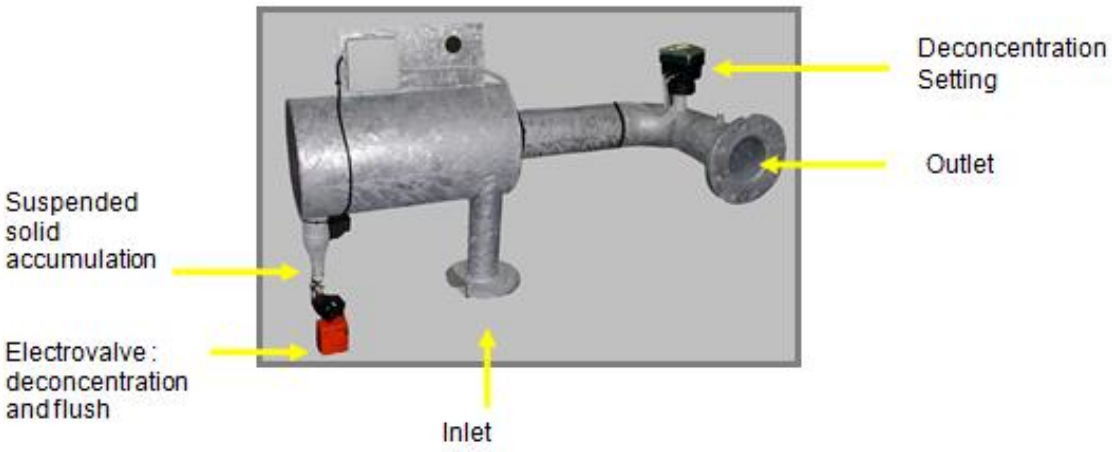
EFFICIENCY : 60µ

Integrated in standard in our CRF and KSF ranges series, the FRC filter is a simple and efficient weapon against Legionella

A closed cooling tower has a primary circuit (to the process), and a secondary circuit: the evaporative circuit. In contact with air, the evaporative circuit accumulates suspended solids. Because of the evaporation, this water, if there is no bleed off, concentrates the salts. In order to keep this secondary circuit clean, without manual maintenance, Jacir has invented the following FRC system:

The Jacir centrifugal filter can secure 3 functions:

- Secondary water circuit filtration by centrifugation,
- Qualitative deconcentration of the evaporative circuit,
- Automatic filter cleaning if joint to the automatic deconcentration.



In addition to the original fouling resistance of the exchanger (high water velocity), this equipment is designed to retain suspended solids in the water. Those are nourishment enhancing bacteriological growth. Its characteristics are:

- The whole water volume is recycled every 1.2 minutes
- Automatic cleaning during the automatic deconcentration by induction, and by timer
- No wear and tear parts or fouling: maintenance free
- Materials: galvanised or stainless steel according to the option.

JACIR
Cooling for life

NON FREEZING PLUME COIL

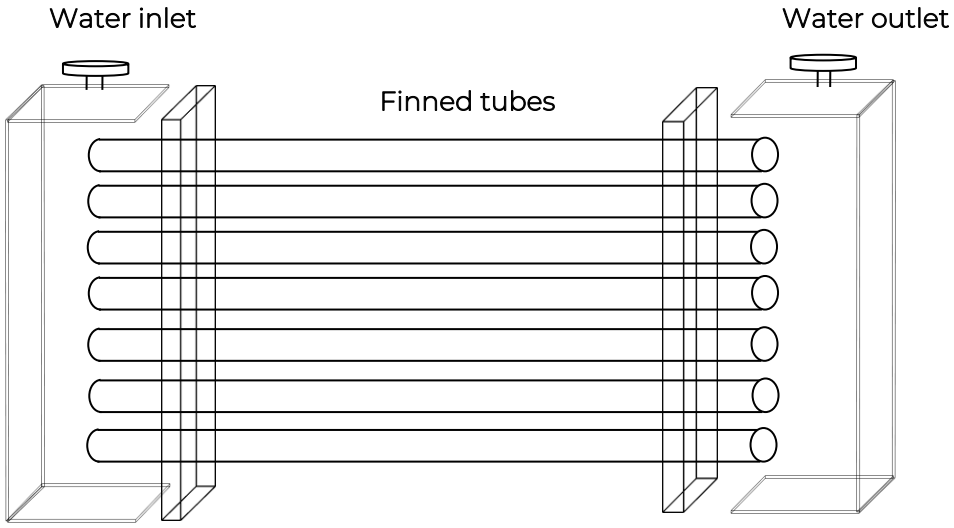
PRODUCT SUPPORT

Jacir patent n.051627

- No freezing risk of the coil
- Visual control
- Easy cleaning: access to the inside of tubes
- Anticorrosion resistance

La FRENCH FAB

The two stainless steel headers are totally removable for complete access and cleaning, for both headers and tubes. The “cover” type header design protects the coil from any damages for eventually freezing accident.



Benefits:

- No plume, until 2°C ambient and 80% relative humidity,
- Water savings till 80 %,
- Water treatment savings,
- Additional mechanical obstacle to drift: decrease of Legionella risk,
- The air drying reduces the drift propagation distance,
- High resistance to strong winter and maintenance conditions.

JACIR
Cooling for life

X-TRACT SYSTEM

PRODUCT SUPPORT

Cooling towers completely cleanable

MADE IN FRANCE
FABRICATION FRANÇAISE
La FRENCH FAB

OPERATION :

The X-TRACT system has been specifically designed to facilitate installation and maintenance operations. Infill, water distribution and drift eliminators are completely removed in one unique craning, allowing then easy cleaning at ground level and a free access to cooling tower internals.

APPLICATIONS :

- Industrial steel or concrete cooling towers
- Clean or clogging waters
- Ranges : RH – RBH – KH – KBH

BENEFITS :

- Easy and full cleaning of internals
- Low duration operation
- Work at ground level securely

JACIR
Cooling for life

PUMP FREQUENCY DRIVE

Closed cooling towers

PRODUCT SUPPORT

MADE IN FRANCE
FABRICATION FRANÇAISE

La FRENCH FAB

Report

The nominal climatic conditions defined for the sizing of a cooling tower are met less than 15 days a year.

So, a marginal reduction of the evaporative circuit flow rate allows a major decrease of the electric consumption during 95 % of time.

This electric consumption reduction is optimal when the variation is combined with a variation on the fan speed.

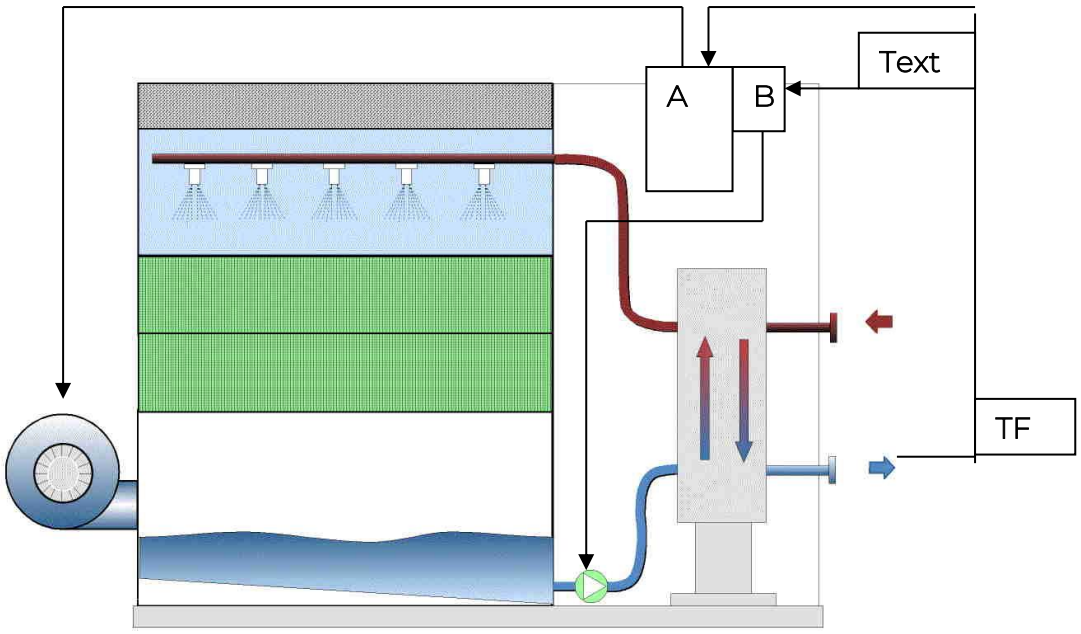
Solution

The pump frequency drive on a closed cooling tower.

Know-how

Optimization of speeds maintaining the turbulent regime on the exchange surfaces: preserves the cleanliness of the heat exchanger.

Operation



Legend

- A : frequency drive for fan
- TF : cold water temperature process side
- B : frequency drive for pump
- Text : outside ambient air temperature.

Two regulation levels

- Pump regulation only: when the outside temperature decreases, water flow reduces on the pump (the speed range is suited to maintain a turbulent regime)
- Pump and ventilation regulation: pump regulation is coupled with the one of the fans which is regulated by the cold-water temperature of the circuit process.

Practices

- Speed ranges factory-pre-set.
- Compact skid integrated into the room exchanger
- Possibility to adapt the variation to a specific requirement.
- Removable memory key reprogram according to the recorded model.

Benefits

- 50 % of energy saving on the annual consumption of the pump.
- Return on investment from 6 to 8 months.
- Built in and pre-cabled option: Plug and Play with regulation adapted to the operating mode (economic criteria water or electricity)
- Long life cycle of the pump and reduction of the maintenance costs bound to the wear parts.

JACIR
Cooling for life

POWER-FLOW

Access for complete basin cleaning

For a stronger hygiene

PRODUCT SUPPORT

Fully involved in the customer needs and in advance on legislation, JACIR has always been improving the products to ease operation and maintenance of its equipment.

MADE IN FRANCE
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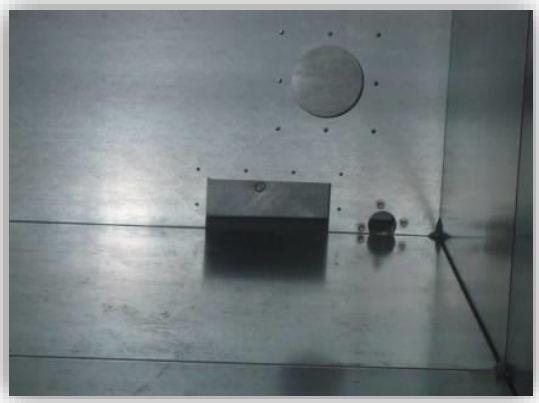
In standard on all cooling towers, the POWER-FLOW access is located under low level of the inclined basin to ease its cleaning during drain. This additional access to the standard draining DN50 is made of steel stainless X-STEEL dimensions mm 260 x 110.



BENEFITS:

- Express draining and cleaning of the bottom basin
- Shortening of the maintenance time and cost
- Fight against the bacteriological proliferation: very smooth surface, resistance in the severe mechanical cleaning: cleanliness and greater hygiene

APPLICATIONS:

- All industrial and HVAC metallic cooling towers ranges, in standard
- Clean and dirty waters
- Open, closed and hybrid cooling towers

JACIR
Cooling for life

COVER CLEAN

Water channels covers
For an increased hygiene

PRODUCT SUPPORT

Fully involved in the customer's needs and in advance on legislation, Jacir has always been improving the products to ease operation and maintenance of its equipment.

Objectif

Fight against bacteriological growth with direct UV radiation on the re-circulation water

Solution

As a standard on all our new cooling tower ranges equipped with distribution pipes channels (X-Stream RC & RH series), X-steel stainless steel covers with handles are installed. This cover protects the water from direct sun rays, with an easy and secured access for the cleaning.
This system is adaptable on existing cooling towers, in accordance with rules.

Accessibility

Grids in composite material allow safety for both workers and equipment.

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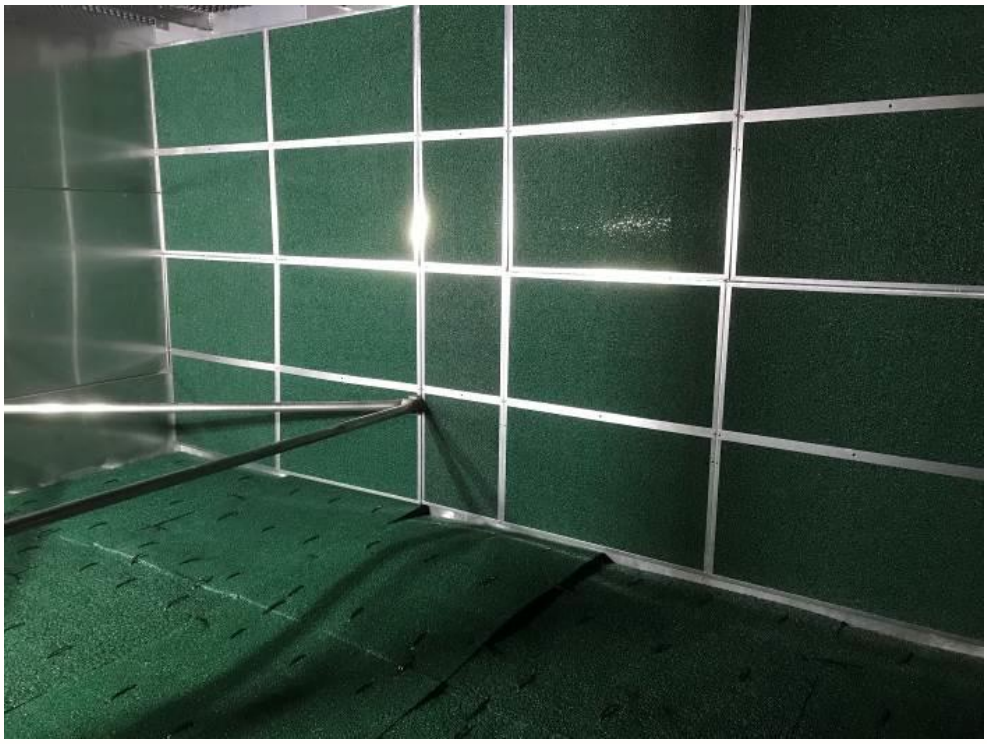
Cooling for life

EFFI-SILENT

Noise abatement for cooling towers basins



PRODUCT SUPPORT

Applications :

- ∞ Clean waters
- ∞ All cooling tower ranges

Characteristics :

ASSEMBLY	MATERIAL	TEMP. max CONTINUOUS	MES ppm max	FIBERS THICKNESS
Float set	Polypropylene	80°C	70	+/- 0,9mm

Benefits :

- ∞ Waterfall noise abatement mat, made of curved polypropylene: high resistance to impacts and UV rays
- ∞ Sound abatement from 3 to 4dBA according to cooling tower type
- ∞ High pressure cleaning
- ∞ 7 years average life cycle

SERVICES

Cooling Towers
Adiabatic Coolers & Condensers

JACIR

Cooling for life

Service Provision
HVAC & Industrial Applications

SERVICES

Replacement with original spare parts for all brands

Cleaning, descaling, and disinfection

Internal coating for metallic or concrete structures: blasting and coating resin

Plate heat exchanger maintenance

REVAMPING

Complete revamping of concrete, wooden or metallic cooling towers

Wooden structure and roof

PVC cladding

Concrete towers

Internals for Cooling Towers

MAINTENANCE CONTRACT FOR ADIABATIC COOLERS

Automaton device setting

Motor-fan control

Cleaning of medias

AUDIT - THERMAL DIAGNOSIS - TURNKEY

Diagnosis on site: technical recommendations

Performance testing

Complete operation management Turnkey service

Skills
& Experience

PERFORMANCE UPGRADE

+ Colder
+ More powerful
+ Quieter

SAFE ADIABATISATION FOR DRYS & CHILLERS

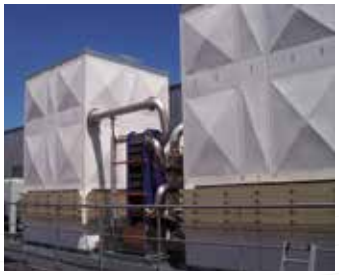
Boost your equipment performance

BoostCooler

Before | After

Before | After

TECHNICAL IMPROVEMENT



Evolution from an open circuit to a closed circuit

Full access for easy maintenance

Plume abatement

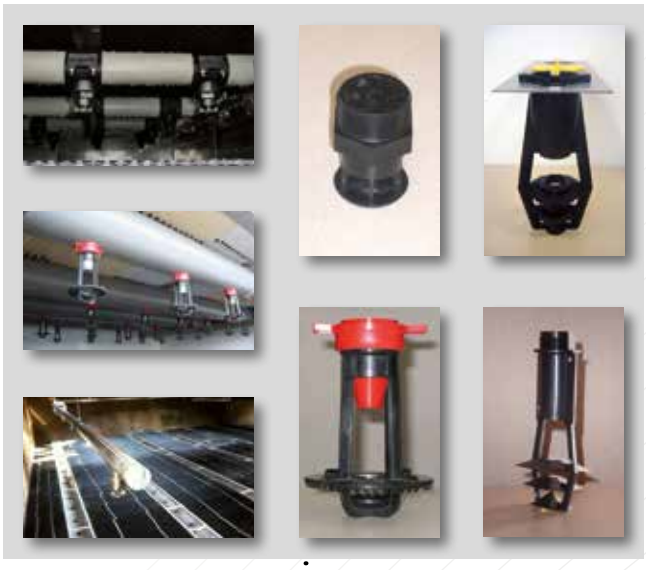
Slatted floor under the infill for easier and faster maintenance

ENERGY CONTROL

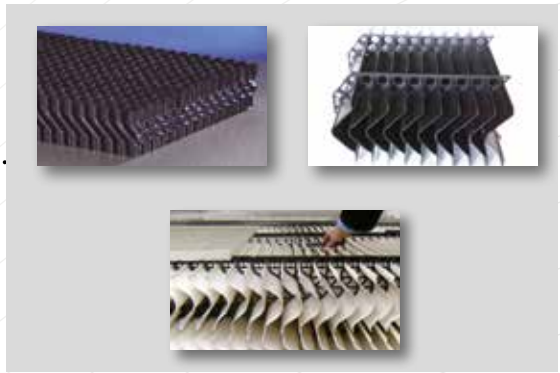
Permanent magnet motors and frequency drive device

Spare Parts

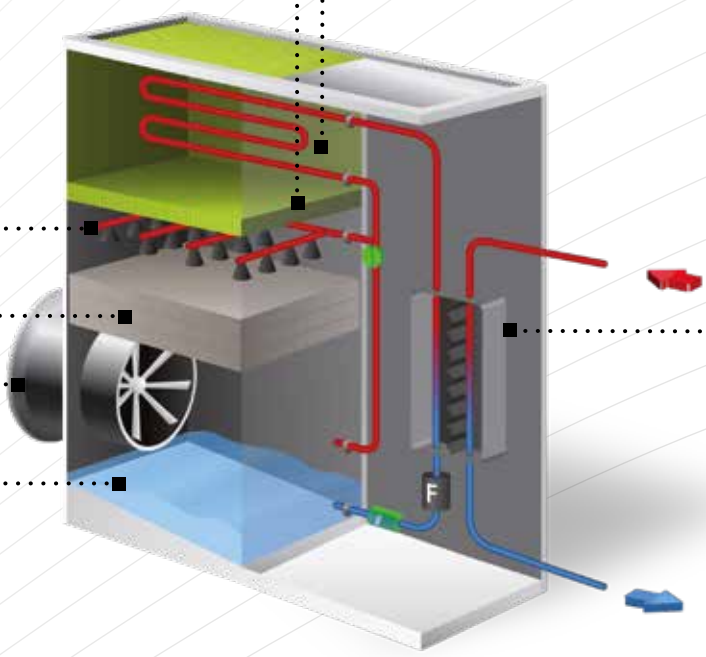
Water distribution and nozzles



Drift eliminators

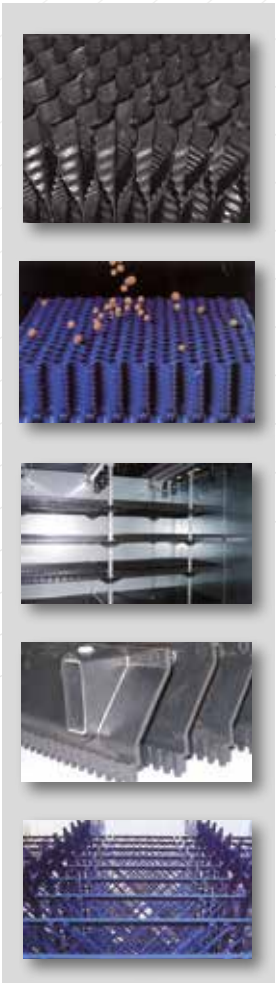


Plume abatement coil



Closed circuit plate heat exchanger

Infill



Basin accessories

Motors and fans

RENTAL

Cooling towers rental: turnkey service under 24 hours.

QUALIFICATIONS

- Chemical risks accreditation N1 & N2
- CACES aerial bucket
- Electrical risks accreditation B2VBR

CERTIFICATION

- Certification ISO 9001
- MASE - UIC

SECURITY

- Personal protective equipment
- Technicians trained for Legionnella awareness

JACIR designs and manufactures Cooling Towers, Adiabatic Coolers and Condensers in France. We have been delivering value to our clients accross the globe, for over 60 years.

Jacir provides support services using a dedicated team of technicians for revamping and upgrading our clients' cooling equipments. We deliver a complete range of components, comprehensive assistance and sustainable upgrades in accordance with all safety standards.

We are committed to offering you the best solutions to maintain reliability and optimise performance of your cooling equipment.

Understanding our clients' needs and applications, together with compliance with applicable standards, JACIR provides global expertise on all installed cooling equipment.

Renowned for our innovation, our dynamic and proactive R&D department ensures we provide the most current solutions to new and existing installed equipment, combining performance improvement with reduced maintenance costs, water and energy savings, whilst complying with Health & Safety regulations.

JACIR
Cooling for life

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Commercial and technical documentations are downloadable on our web site.

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IMPROVED ACCESSIBILITY

Time savings and reduced maintenance costs

Easy cleaning

Compliance with 2921 standard

PRODUCT SUPPORT

Large sliding door for access to the exchange surface, dispersers, droplet separators and motor-reducer-fan unit.

Attentive to the needs of operators and in compliance with regulations and standards in force, Jacir's Renovation and Environment Service innovates to facilitate both operation and maintenance of its Equipment.

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La FRENCH FAB

Installation of large X-STEEL stainless steel doors

Installation of large polyester doors

Increased accessibility

Creation of an internal platform at man height above the basin

Large sliding door for access to the exchange body, dispersers, droplet separators and the motor-reducer-fan unit

Benefits:

- ∞ Simplified, fast, drain-free and safe intervention
- ∞ No scaffolding
- ∞ Fight against bacteriological proliferation reinforced: cleanliness and hygiene increased

Applications:

- ∞ All ranges of industrial towers or in tertiary environment
- ∞ Metal cooling towers, concrete, wood, cladding, polyester
- ∞ Clean and laden waters
- ∞ Open or closed towers

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Cooling for life

NO MORE FAN COUPLING ON COOLING TOWERS

SUPPORT PRODUIT

A solution which secures the installation and reduces maintenance cost, 2 years guaranty

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FABRICATION FRANÇAISE

La FRENCH FAB

Permanent magnets motors :

Situation

The coupling system of motor to fan (belts and gear box) requires a drastic care for the good cooling of a process, particularly if they are located in the wet airflow.

The elimination of these critical parts decreases costs and maintenance operations while securing the reliability of the equipment.

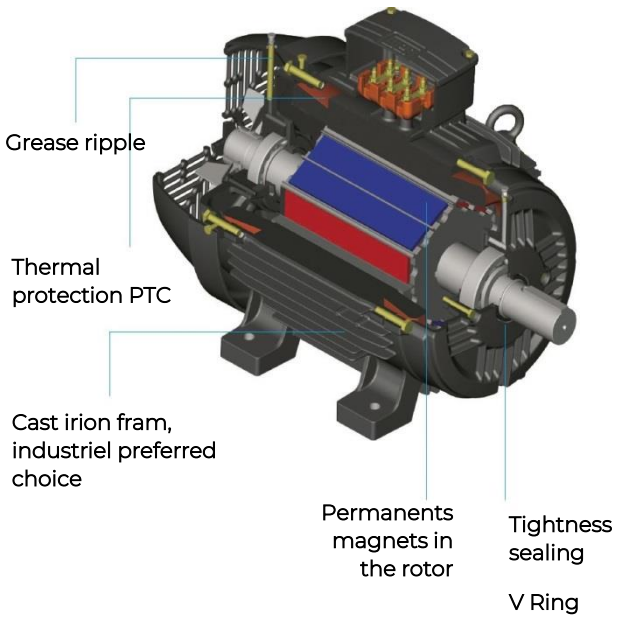
Solution

Replacement of gear box or belts by a permanent-magnet motor reduces significantly maintenance costs and handling operations.

Besides, this new generation of motors coupled with their frequency converters guarantees a much higher efficiency compared with asynchronous motors (minimum 3 %).

Technical specifications

- ∞ Integrated frequency drive
- ∞ Tropicalized motor
- ∞ IP 56



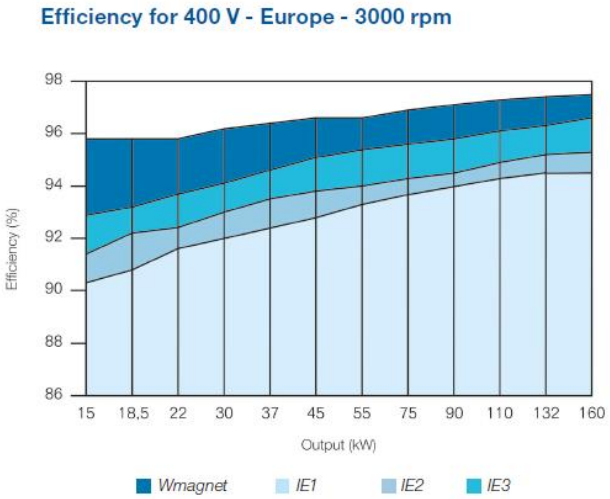
Applications

Installation on new cooling towers

Standard exchange on already built-in cooling towers

Adaptation to the hub of the existing fan

Turnkey service



Benefits

- ∞ Higher energy performance
- ∞ Zero maintenance (except bearings)
- ∞ No belts adjustment,
- ∞ No shaft alignment,
- ∞ No maintenance / drain of gear box
- ∞ Lower noise level

Communication protocols

- ∞ BACnet
- ∞ Metasys N2
- ∞ LonWorks
- ∞ Modbus-TCP
- ∞ DeviceNet
- ∞ EtherNet/IP
- ∞ PROFIBUS-DP
- ∞ LonWorks

SERVICES
BoostCooler J

Safe Adiabatic Cooling for Dry Coolers & Chillers

JACIR

Cooling for life

APPLICATIONS & EQUIPMENT

HVAC and Industry
Data Centres & Servers
Agri food Industry
Cold Storage
Supermarkets

Dry Coolers
Dry Sprayed
High / Low T°C Chillers
Rooftops

ISSUES & REQUIRED OUTCOME

Drop in Performance / COP drift

Direct water spray onto coils has caused scaling and damage: even on part time, scaling is unavoidable

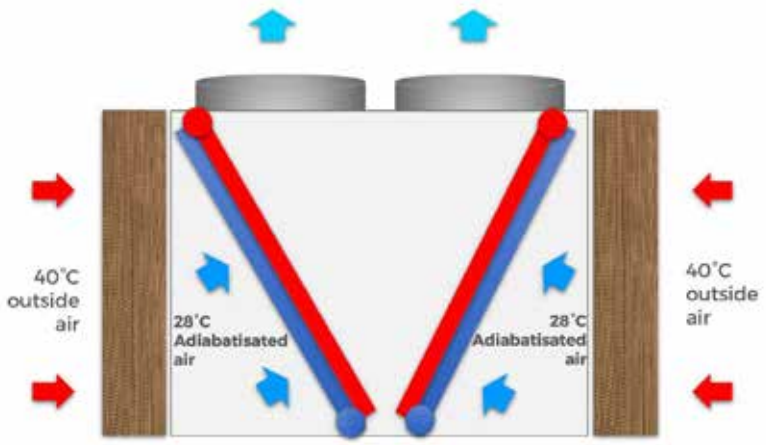
Non compliance with safety requirements (dangerous spraying)

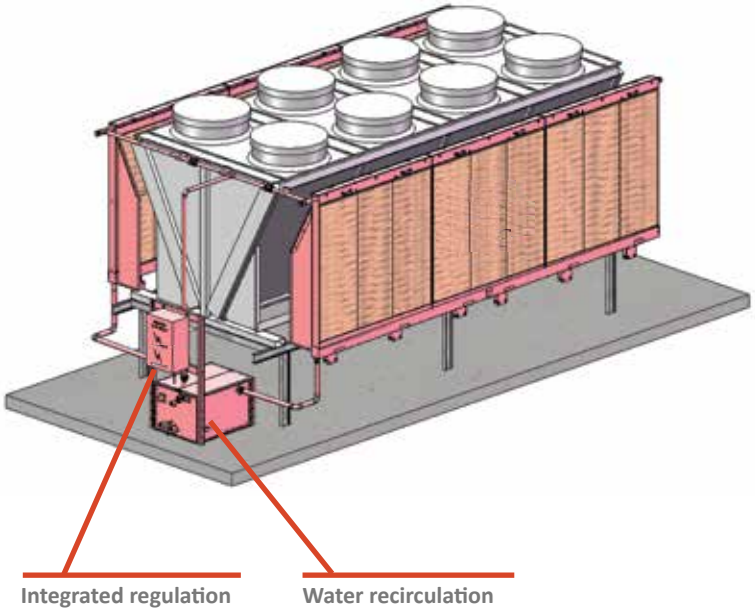
+ improved COP

+ energy and water savings

+ safe operation

OPERATION PRINCIPLE





Safe Adiabatic pre-cooling of the coils

The adiabatic cooling is a combination of a dry cooler and an adiabatic pre-cooling section: this pre-cooling section lowers the ambient air temperature by evaporating water, which is passed over humidifying Media, especially designed for this purpose. During adiabatic operation, the BoostCooler® system uses water evaporation to reduce the cold water temperature to below that of the ambient air.

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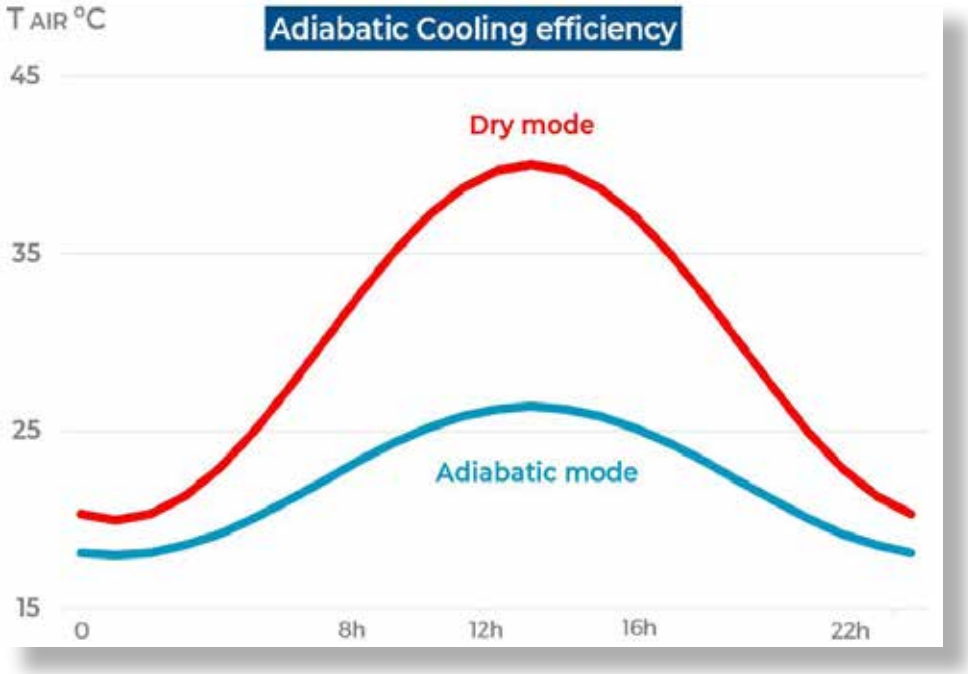
BENEFITS

Maintain cold water temperature during hot conditions

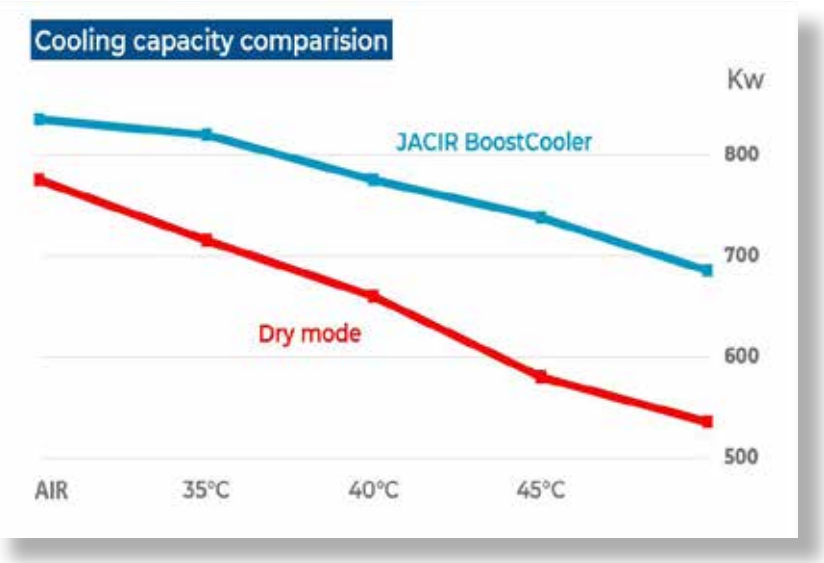
Increase in heat rejection

Zero drift guaranteed

- Performance maintained, even during heatwave
- Thermal performance increased
- Lower cold water temperature
- COP maintained
- Scaling of coils avoided
- No water treatment required
- No drift tested and verified



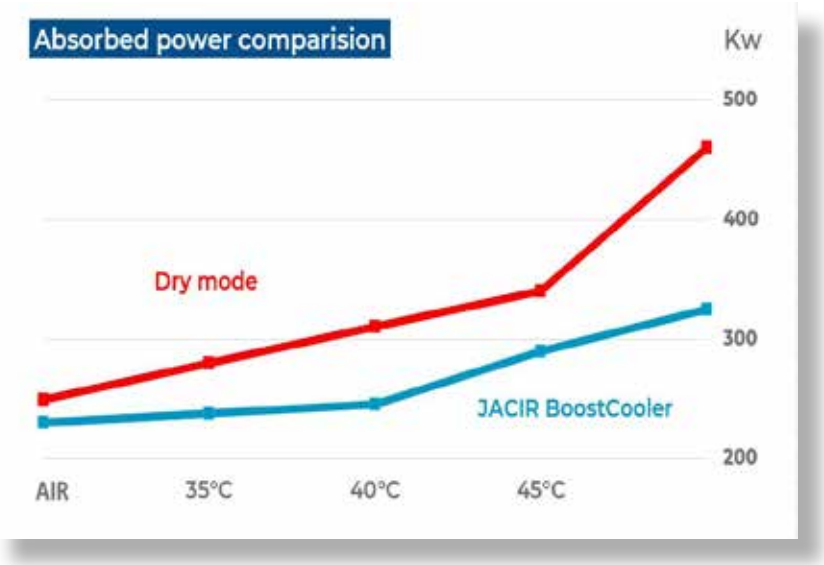
PERFORMANCE



Chiller group characteristics for the example:
Cold power : 700kW - length 7m
Water temperatures 7/12 °C - 35°C Ext.

Comparision of a chiller cooling capacity

Chiller cooling capacity increased.
Duty performance maintained,
even during heatwave.



Comparision of compressors absorbed power

Compressors operation, energy
and maintenance costs reduction.

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Cooling for life

Research Institute

2 Dry Coolers (L 9m each)

Initial performance

513 kW - 51/45°C @ 35°C Ext.

IMPROVEMENT

+ 6°C

Optimised performance BoostCooler

513 kW - 51/45°C @ 41°C Ext.

WATER SAVINGS: ALL INSTALLAT

Metal Industry

1 Dry Cooler (L 5m)

REFERENCES

IMPROVEMENT
+ 11°C

Initial performance
725 kW - 45/40°C @ 25°C Ext.

Optimised performance BoostCooler
725kW - 45/40°C @ 36°C Ext.

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Cooling for life

IONS INCLUDE WATER RECIRCULATION

Agri Food Production

2 Dry Coolers (L 10m each)

Initial performance

725 kW - 45/40°C @ 35°C Ext.

LOW CONDENSATION TEMP. 10°C

Optimised performance BoostCooler

725 kW - 35/30°C @ 35°C Ext.

WATER SAVINGS: ALL INSTALLAT

Data Centre

2 Dry Coolers (L 5.5m each)

IMPROVEMENT
+ 7°C

Initial performance
619 kW - 55/50°C @ 35°C Ext

Optimised performance BoostCooler
619 kW - 55/50°C @ 42°C Ext.

JACIR
Cooling for life

IONS INCLUDE WATER RECIRCULATION

Office Buildings

3 Dry Coolers (L 5m each)

Initial performance

530 kW - 40/35˚C @ 25˚C Ext.

IMPROVEMENT

+ 8°C

Optimised performance BoostCooler

530 kW - 40/35˚C @ 33˚C Ext.

WATER SAVINGS: ALL INSTALLAT

Soft Drinks Production

1 Chiller (L 13m)

Initial performance
1400 kW - 7/12°C @ 35°C Ext.

IMPROVEMENT
+ 7°C

Optimised performance BoostCooler
1400 kW - 7/12°C @ 42°C Ext.

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IONS INCLUDE WATER RECIRCULATION

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SERVICES TO ADIABATICS COOLERS

Anti-corrosion solution for cooling towers

PRODUCT SUPPORT

Attentive to the needs of operators, JACIR facilitates the maintenance and upkeep of its equipment.

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FABRICATION FRANÇAISE

La FRENCH FAB

Objective

- Secure thermal performance
- Prevent the risks of wear and tear of parts,
- Increase the longevity of your equipment,
- Reduce the overall cost of maintenance

Interior view of the equipment:

Great accessibility

Solutions

Put at your disposal the technical skills of our After-Sales & Renovation Service:

- Maintenance contract
- Manufacturer expertise
- Improved performance

Humidifier media

- Control
- Cleaning
- Replacement

Battery

- Endoscopic control
- Cleaning
- Replacement

Electrical cabinet

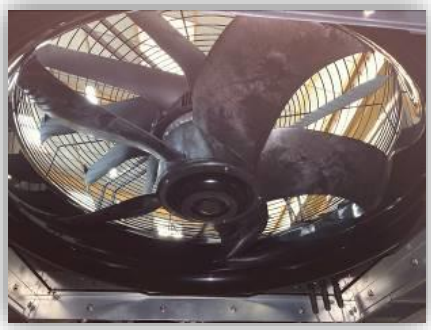
- Control
- Changing settings to decrease:
- Water consumption
- Electricity consumption
- The noise level

Motor-fan unit

- Control
- Electrical verification
- Replacement

Propeller

- Control
- Blades timing
- Replacement



Intelligent system for handling of motor-fan units

∞ MFU removal and reassembly kit

Silent at the pushback

∞ Improved performance: soundproofing