KH and KHIM

JACIR
Cooling for life

Open cooling tower
Open hybrid cooling tower

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Technical documentation

LE 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.

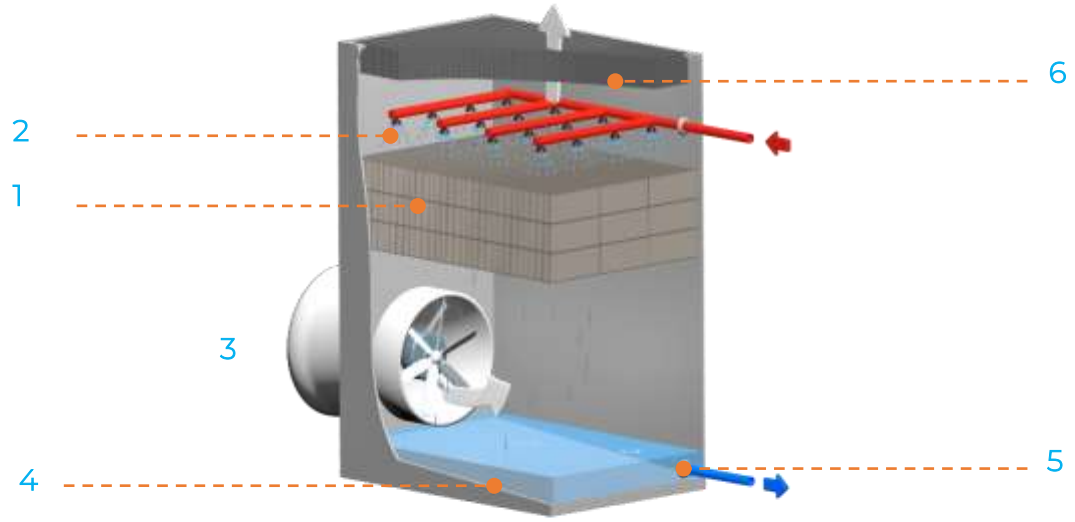
STRONG BENEFITS KH – KHIM RANGE

∞ 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.

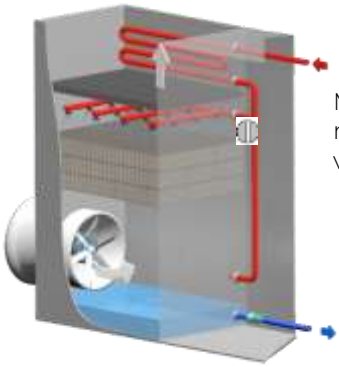
Then the water is sucked through the strainer (5). Drift eliminators (6) located at air outlet reduces drifts losses.

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.

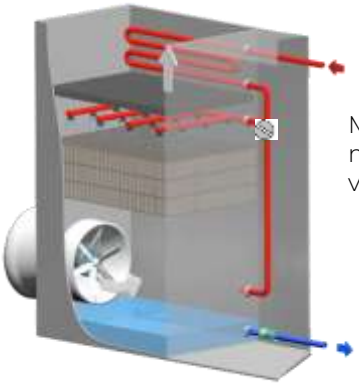
Therefore, the combination of the air desaturation by air outlet warming up, and the reduction of the water spray on the packing, ensures the complete plume suppression. Beyond the plume suppression itself, this system can provide water savings up to 80 % and is an ultimate obstacle to the drifts.
This 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:



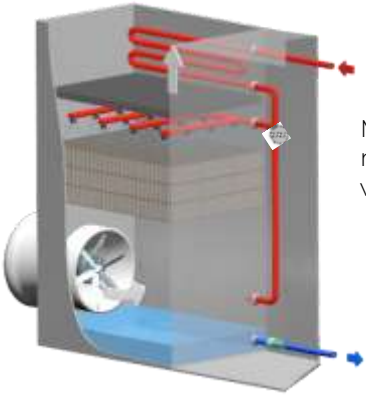
Dry operation: WINTER

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.

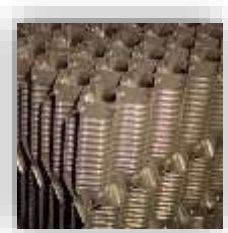
For automatic resistance control, suitable contactors must be provided.

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 58 °C as standard, and up to 80 °C as option with pvc or ABS material is resistant to chemicals,
- Fire classification M2, self-extinguishing.



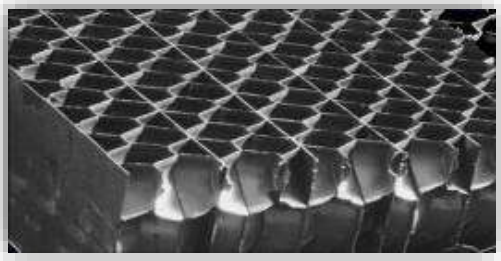
Water Distribution

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.

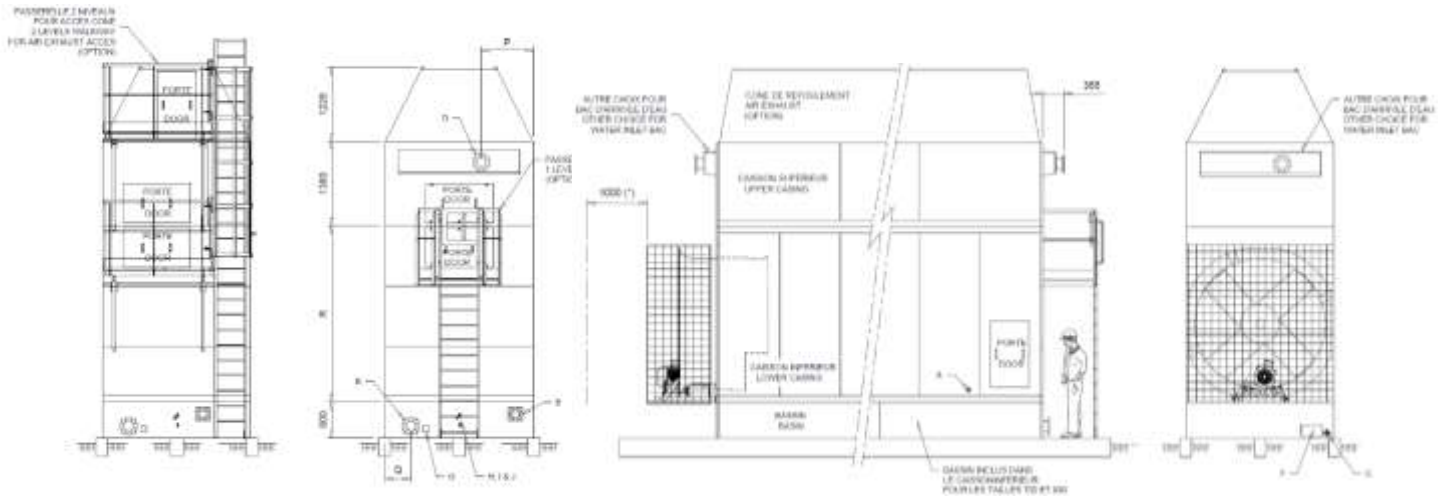
Technical chracteristics KH

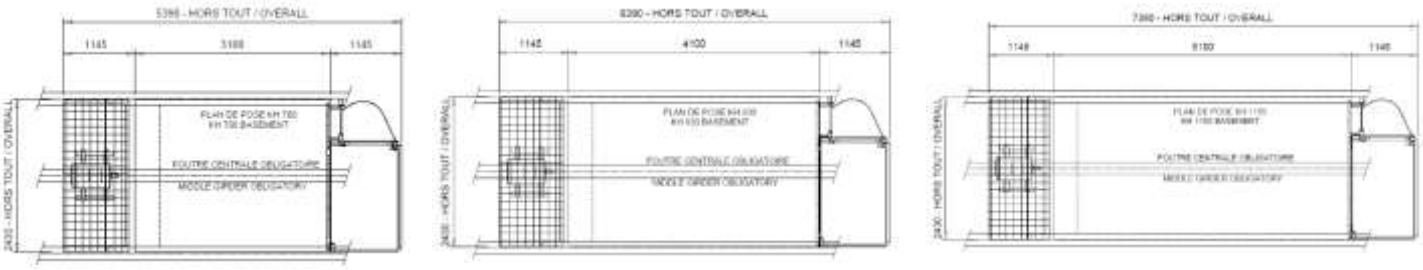
KH Range	OPEN COOLING TOWER WITH BASIN							
	Heat power ref. (1) average [kW]	Fans Qty	Outlet air flow rate [m3/h]	Heat power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty (without air exhaust) [kg]	Weight full (without air exhaust) [kg]	Overall dimensions (without air exhaust) [mm]
KH 700	1100	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

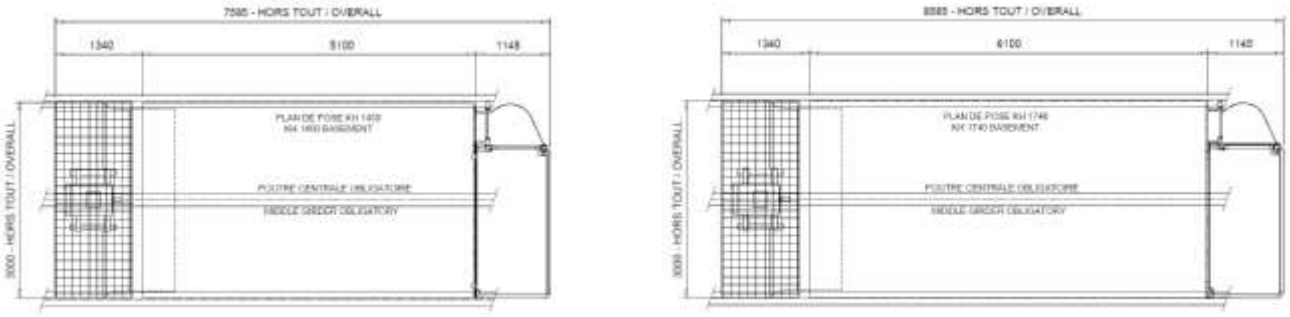
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side.

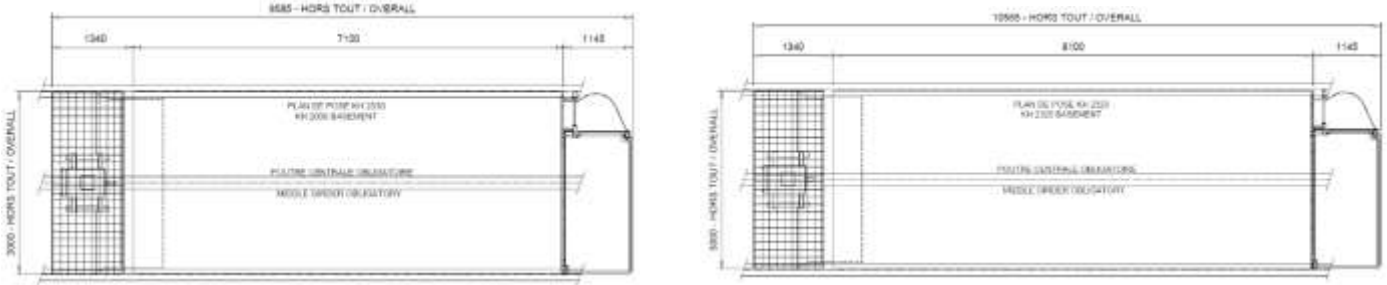
			KH 700	KH 930	KH 1175	KH 1450	KH 1740	KH 2030	KH 2320
A	Water make up or electro-valve as option	DN	male – DN according thermal data						
B	Overflow	DN	100						
C	Drain (female)	''	2''						
D	Water inlet	DN	According water flow						
E	Water outlet	DN	According water flow						
F	Power Flow cleaning basin hatch	mm	110 x 260						
CR	Air exhaust cone (option)	Kg	185	225	260	280	325	360	450

Drawings and Dimensions KH









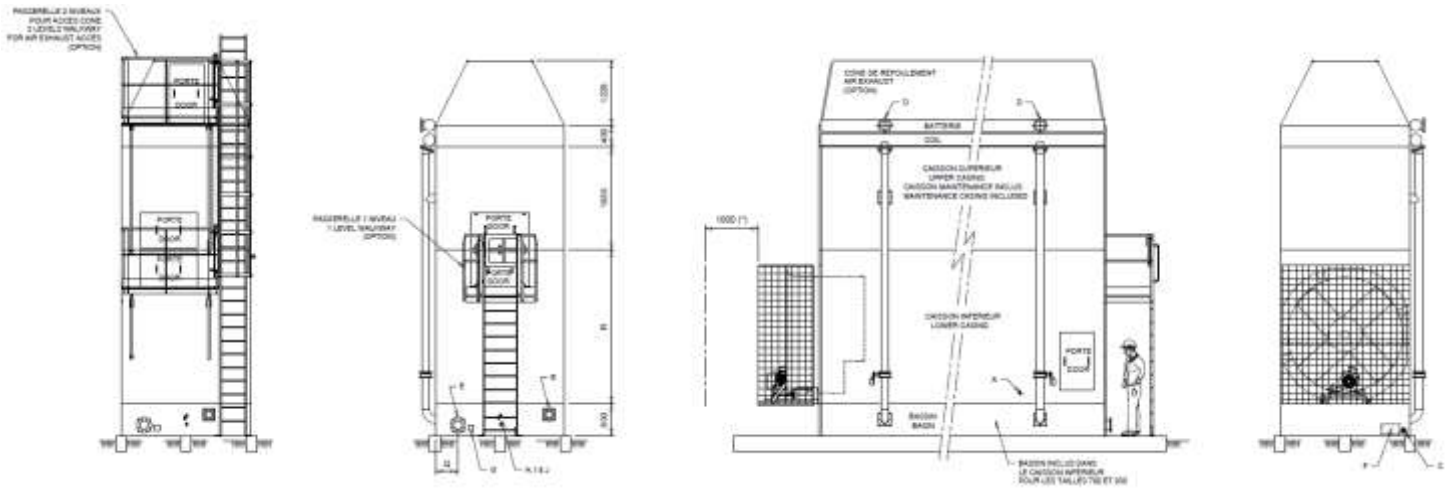
Technical characteristics KHIM

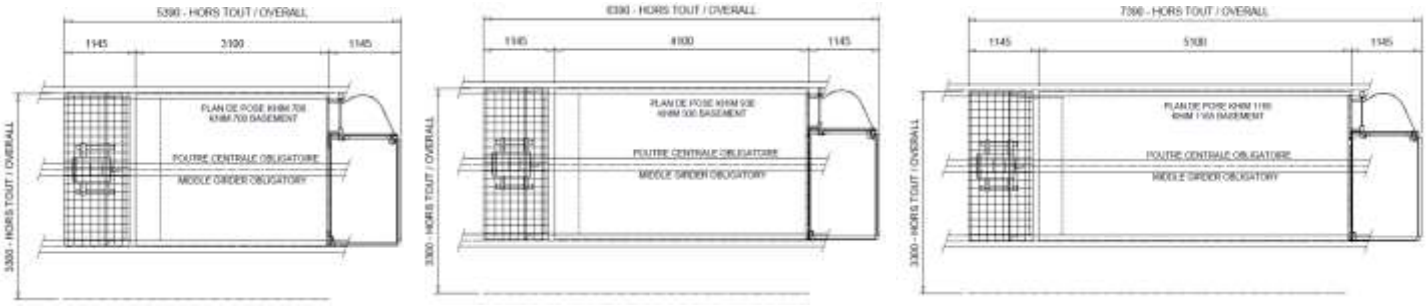
KHIM Range	HYBRID OPEN COOLING TOWER							
	Heat power ref. (1) average [kW]	Fans Qty	Outlet air flow rate [m3/h]	Heat power [kW]	Sound level (2) at 20 m [dB(A)]	Weight empty (without air exhaust) [kg]	Weight full (without air exhaust) [kg]	Overall dimensions (without air exhaust) [mm]
KHIM 700	1100	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

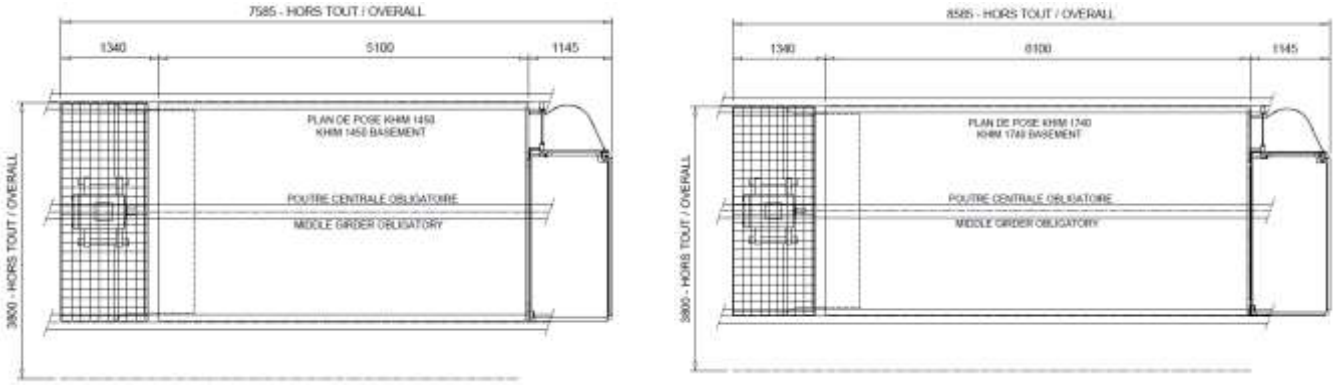
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side.

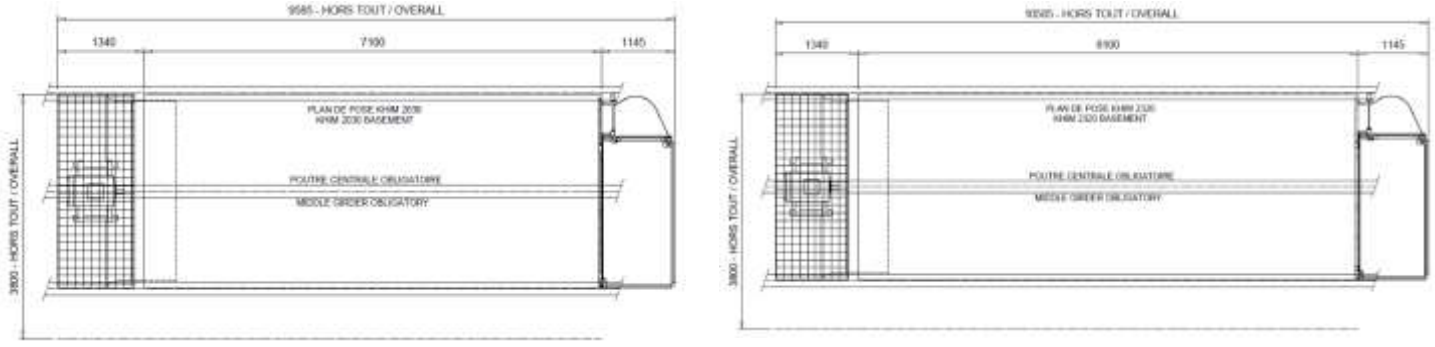
			KHIM 700	KHIM 930	KHIM 1175	KHIM 1450	KHIM 1740	KHIM 2030	KHIM 2320
A	Water make up or electro-valve as option	DN	male – DN according thermal data						
B	Overflow	DN	100						
C	Drain (female)	''	2''						
D	Water inlet	DN	According water flow						
E	Water outlet	DN	According water flow						
F	Power 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







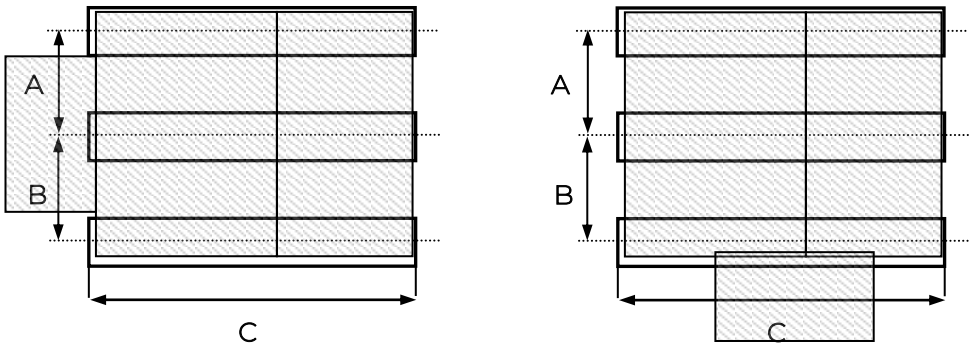


Support KH and KHIM

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

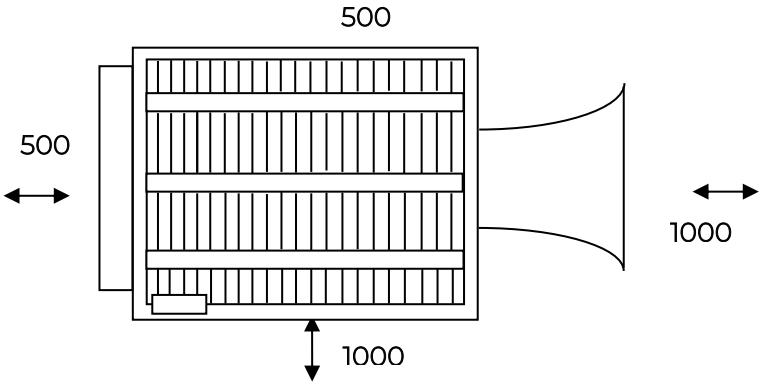
Choice of location KH and KHIM

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.

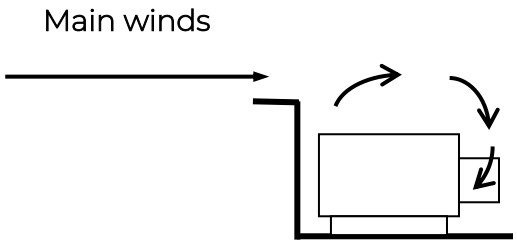
If these rules are not applied, it is inevitable that the cooling tower will not operate properly

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

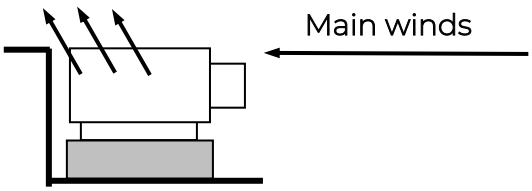


Layout examples

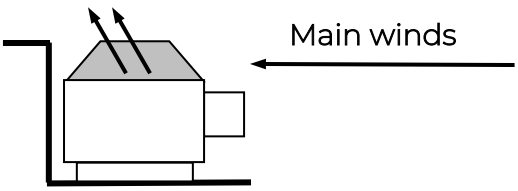
NO



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 58 °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.

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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.).
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