

KH Series

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Open circuit Cooling tower : KH Series

JACIR – Air Traitement

With more than 50 years experience, our company:

- has gained a great deal of experience in aerualics, acoustics and water cooling towers.
- has invested in detailed research and development in order to propose technical solutions according to the environmental protection.
- today is the European leader thanks to its technology beyond market requirements.

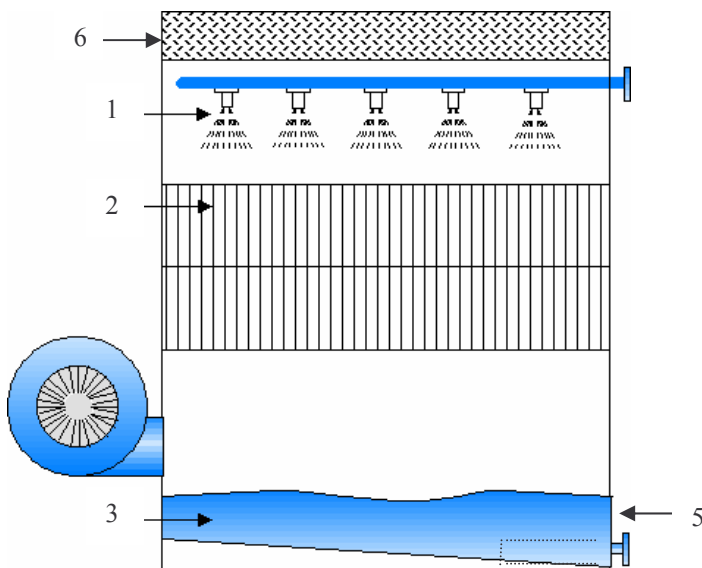
BENEFITS OF THE KH SERIES

- **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.
- **ANTICORROSION COATING :** Casing of tower is made in galvanised or in option stainless steels 304 L or 316 L, seamless assembly.
- **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 1700 mm.
- **FLEXIBILITY :** Possible delivery in parts to assemble directly on site.
- **DELIVERY IN MODULES :** Easy handling and transport.
- **SILENCE :** Compared with induced draft towers, the KH are low sound towers in standard, can be improved according to the requirement.

Open circuit Cooling Tower Principle : KH Series

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 (2) by low pressure water distribution nozzles (1).

Blown by the fan, 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 (3) at the bottom of the tower. Then it leaves the basin through the strainer (5). Drift eliminators (6) are located on the top of the tower, at the air outlet.

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 - AIR TRAITEMENT** can supply much quieter tower than a dry cooler.

Manufacturing details : KH Series

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.

KH tower casing

Self-supporting rigid panels, with 2 or 4 folds on the four sides, (designed by **Jacir - Air Traitement**) allows exceptional tightness even with stainless steel plates and make further sound attenuation very easy.

Towers are assembled with tight stainless steel rivets (uniform and high-capacity locking).

There is no welding and no bolting for the panels assembly (the ones in contact with water) ; a highly tightening seal ensures the close fit between the panels.

As standard model, the panels are in galvanised steel 2 mm thick ZENDZIMIR process 275 gr / m² (galvanised plates are protected by the zinc oxidation on the surface).

Stainless steel is optional, 304 L or 316 L : KXH series.

Inclined and plane basin

- It has a high water capacity in order to offer a high thermal and water treatment inertia. For example, the maximum volume of a KH 2030 is 10 m³ minimum. In order to reduce the bacteria growth :
- The inclined and plane basin allows an **easy and complete drain**.
- There is no welding and no screws for panel assembly on surfaces in contact with the water.

3 types of basin are available :

- standard basin (B)
- high water capacity basin (BGC)
- collecting basin (water passing through) : BR.

On the utilities panel of the basin are located :

- overflow connection in PP, with PP flange
- drain connection,
- float valve or electrical solenoid make up water system as an option,
- water outlet through a removable strainer (in stainless steel or PP) with an oversized flange to eliminate cavitations, with a perforated steel plate,
- large access door(s) to the basin : (540 mm x 540 mm),
- options: electrical heater of 230 V or 400 V and waterproof thermostat with separate bulb. For automatic control of the electrical resistance, suitable contactors must be selected.

Accessibility

If there are sound baffles, plumeless tube coil or outlet air duct, large access doors (540 x 390 mm) are 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 selected, an additional middle casing is supplied, fitted with access doors (540 X 390 mm); it is located between the tube coil and the drift eliminators.

Water distribution

Water distribution is made of PP pipes through highly efficient water distributors. The nozzles made of polyamide 6 (PA6) 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 operate under low pressure to reduce drifts : 0.8 mWC.

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. A double row type is supplied if a plume suppression coil option is selected.

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 galvanised steel (option stainless steel). 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. As an option, Jacir – Air Traitement can provide a blade non freezing device, economical and maintenance free. A fan bearing lubrication line is extended on the fan stack. It is made in Rilsan.

Standard motor

- asynchronous three-phases motor,
- 1500 rpm,
- 230 / 400 V up to 5,5 kW,
- 400 / 690 V above 5,5 kW,
- 50 Hz,
- IP55,
- direct connection to terminal box,
- coupling motor to fan by multiple belts.

Sound – attenuation : 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.

Connections :

For stainless steel towers, the flanges up to DN 150 are in ss 304, pressed and seamless sheet PN 10 DIN 2642. Flanges of DN 200 and above are in reinforced PP. Galvanised tower are supplied with flanges in galvanised steel, whatever the diameter. The overflow is in PP, whatever the selected material for the tower casing.

OPTIONS : KH Series

- 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,
- Electrical water level control (with electric-valve and input filter),
- Automated Inductive deconcentration (see DAi documentation),
- Discharge cone (increase of air outlet speed),
- 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.

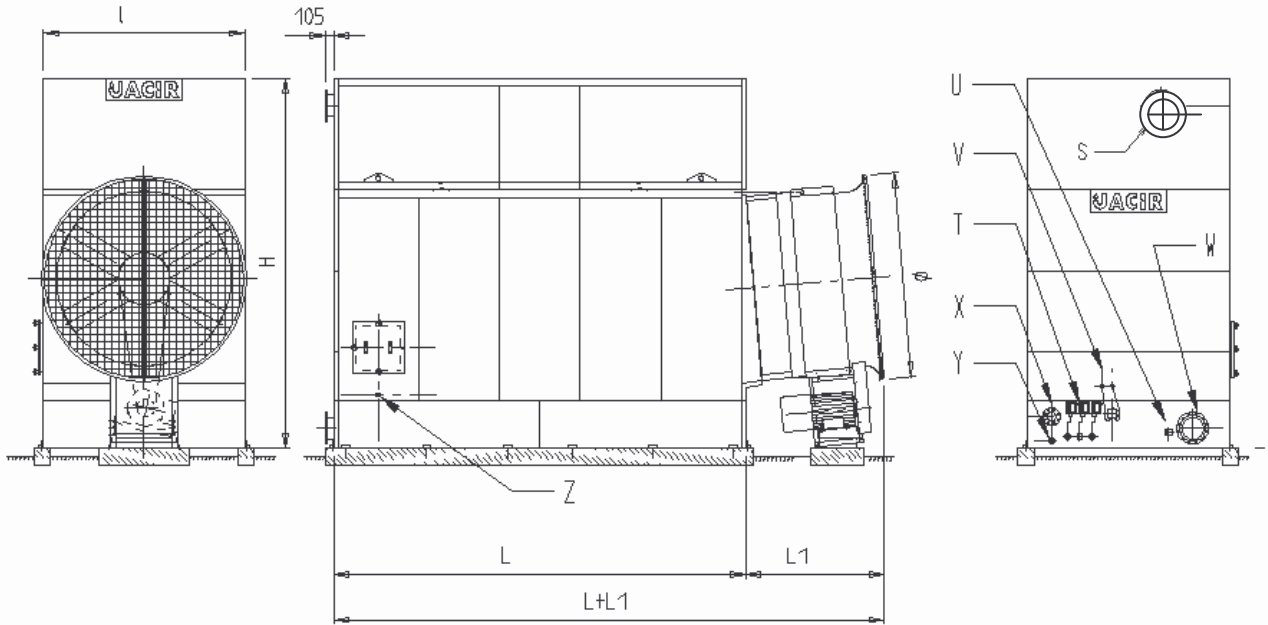
Technical Characteristics: RH Series

	Water flow rate (m ³ /h)	Dimensions (mm)				Weight (kg)				Heater (kW)	φ Fan (m)	Fan motor power (kW)		Sound pressure at 20 m (dB(A)) *	
		L + L1	I	H Without basin	H With basin	Empty		Full				1 speed 1500 tr/mn	2 speeds 1500/ 1000 tr/ mn		
						With basin	Witho ut basin	With basin	Witho ut basin						
KH 720 QK 110	72 à 216	4795	2500	4280	4780	2800	2540	8800	3800	10	1.80	11	11 / 3.7	64	
KH 720 QK 150						3400	3050	10700	4750			15	15 / 5		
KH 960 QK 150	96 à 288	5795		3980	4580	4250	3650	13250	5750			2.15	18.5	18.5 / 6.5	65
KH 960 QK 185													22	22 / 7.5	
KH 960 QK 220													18.5	18.5 / 6.5	
KH 1200 QK 185	120 à 360	6816		4180	4780	4850	3950	15800	6500			2.45	22	22 / 7.5	
KH 1200 QK 220											30		30 / 9		
KH 1200 QK 300											18.5		18.5 / 6.5		
KH 1450 QK 185	145 à 435	6940		4200	4800	5500	4700	18500	7750		2.75	22	22 / 7.5	67	
KH 1450 QK 220												30	30 / 9		
KH 1450 QK 300			37							42 / 14					
KH 1740 QK 220	175 à 525	7920	4480	5080	6400	5400	21500	8900	2.75	30	30 / 9	68			
KH 1740 QK 300										37	42 / 14				
KH 1740 QK 370										45	52 / 19				
KH 2030 QK 300	203 à 609	8970													
KH 2030 QK 370															
KH 2030 QK 450															

(*) in 4 directions at 1.5 m height, in free field.

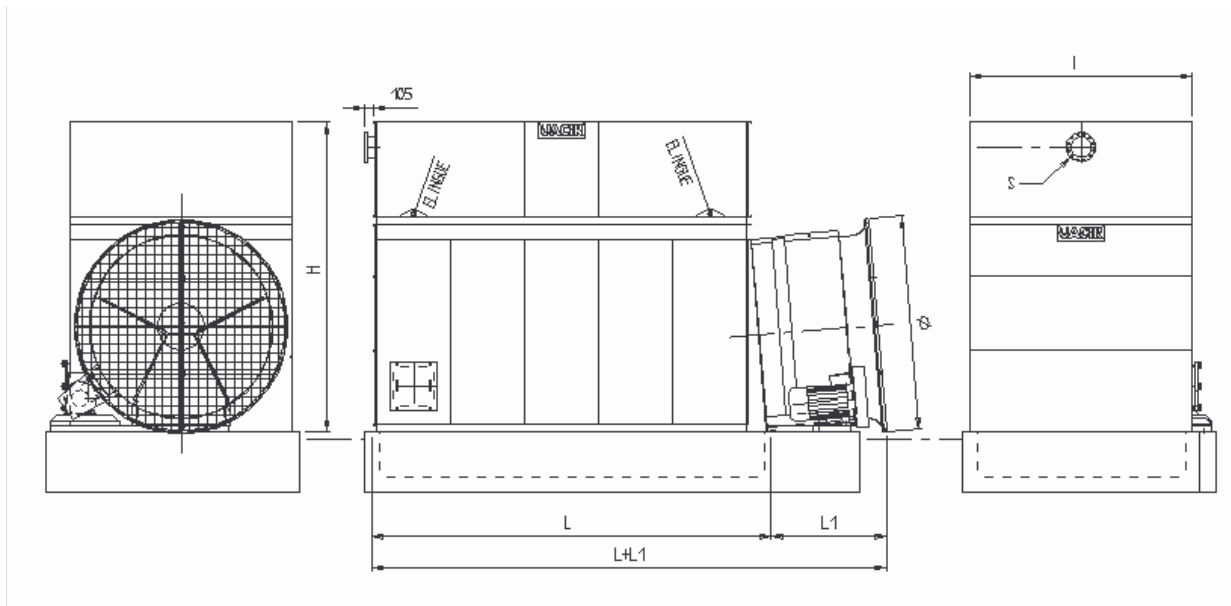
BR = Collecting Basin BGC = Large capacity basin (add 600 mm to H)

Drawings and Dimensions : KH Series Tower with basin



	W water outlet	X over flow	Y drain	S water inlet	Z make up
	DN	DN	DN	DN	DN
KH 720	200	100	50	200	32
KH 960	250	100	50	250	32
KH 1200	250	100	50	250	32
KH 1450	300	100	50	250	40
KH 1740	300	100	50	300	40
KH 2030	300	100	50	300	40

Drawings and Dimensions : KH Series Tower without basin

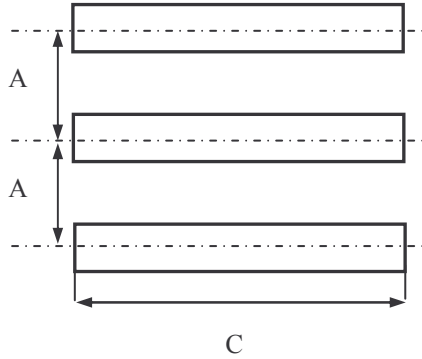


Support : KH Series

Our cooling towers can stand on the ground or on a concrete ground, but we recommend to install them on a concrete longitudinal beams or on a steel support beams.

Check that the ground can stand the operating load, and that the surface or supports are flat.

Quantity and position of concrete supports or steel beams (customer supply) without sound attenuation



	Qté	Distance between beams under the basin A [mm]	Mminimum length C [mm]
KH 720	3	1250	3100
KH 960			4100
KH 1200			5100
KH 1450	3	1515	5400
KH 1740			6400
KH 2030			7400

Layout : KH Series

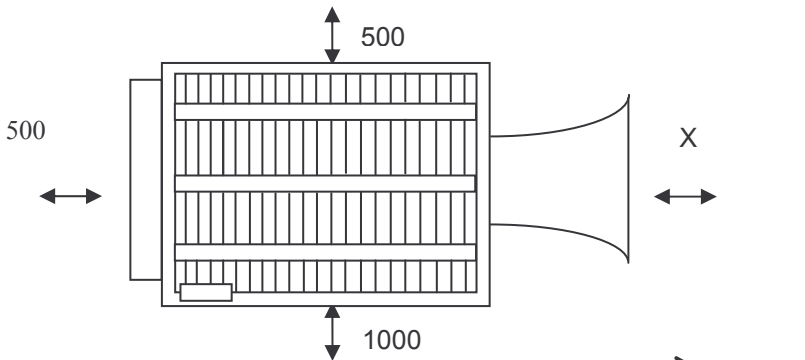
Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings.

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.



	Distance X (mm)
KH 720	1800
KH 960	1800
KH 1200	2100
KH 1450	2700
KH 1740	2700
KH 2030	2700

NO

YES

Install a base to up the tower

Install a cone in order to up the air outlet

Water Treatment : KH Series

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
 $100 \times 20 / (40 - 20) = 100$ % 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 - AIR TRAITEMENT Automated Inductive Deconcentration device

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 : KH Series

Evaporative water cooling tower, modular with a forced draft axial fan, **JACIR – AIR TRAITEMENT, KH series.....**

Thermal characteristics

The heat power will bekW for conditions between ...°C and°C with a wet bulb of..... °C at air inlet.

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 6 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 operate at low pressure (0.8 mWC) to reduce pumping head and drifts.

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.

For further sound attenuation, 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. Elastomere 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-cavitations strainer.

The basin will 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 1700 mm for easy access.

The basin will be :

- standard basin (B) or
- high water capacity basin (BGC) or
- collecting basin (water passing through) : BR.

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 :

Special sound attenuation : 50 mm thick high density rock wool double casing, covered by 1.2 mm thick steel sheet.

Accessibility

In case of sound baffles, plume less tube coil or outlet air duct, large inspection doors (540 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 540 X 390 mm.

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 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 – Air Traitement will be able to provide a blade non freezing device, economical and maintenance free. A fan bearing lubrication line will be extended on the fan stack. It will be made in Rilsan.

Electric motor 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

There is no welding and no screw for the assembly of panels in contact with water ; water tightness between panels is ensured by a high tightness seal in EPDM. The tower will be made of:

- a) Zenzimir process galvanised metal (2 mm thick) at 275 gr/m² with finishing ZINCALU paint applied to the external sides after assembly,
- b) Stainless steel 304 L (1.4301) or 316 L (1.4404) metal for long life, water savings and high pressure cleaning.



Represented by...