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.

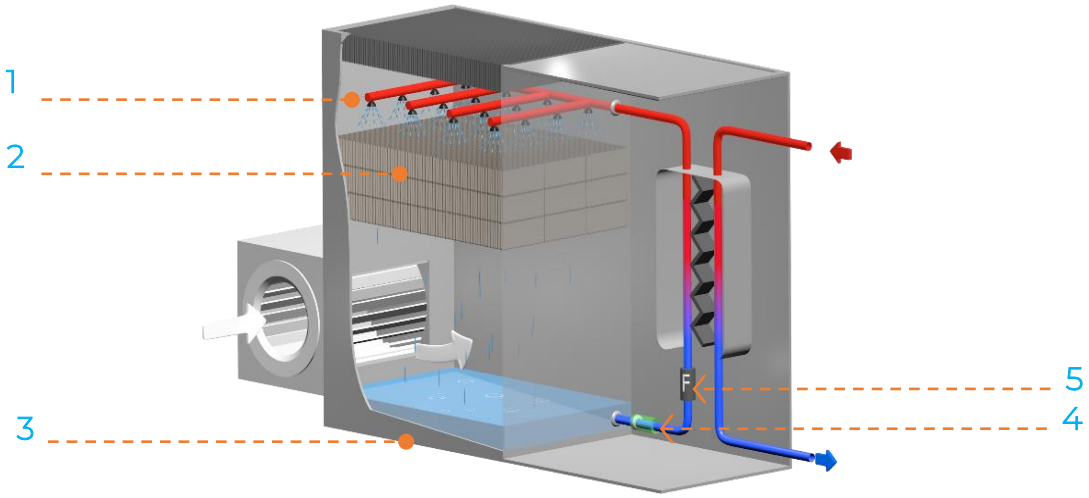
STRONG BENEFITS OF THE KSF - KSFIM

∞ 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.

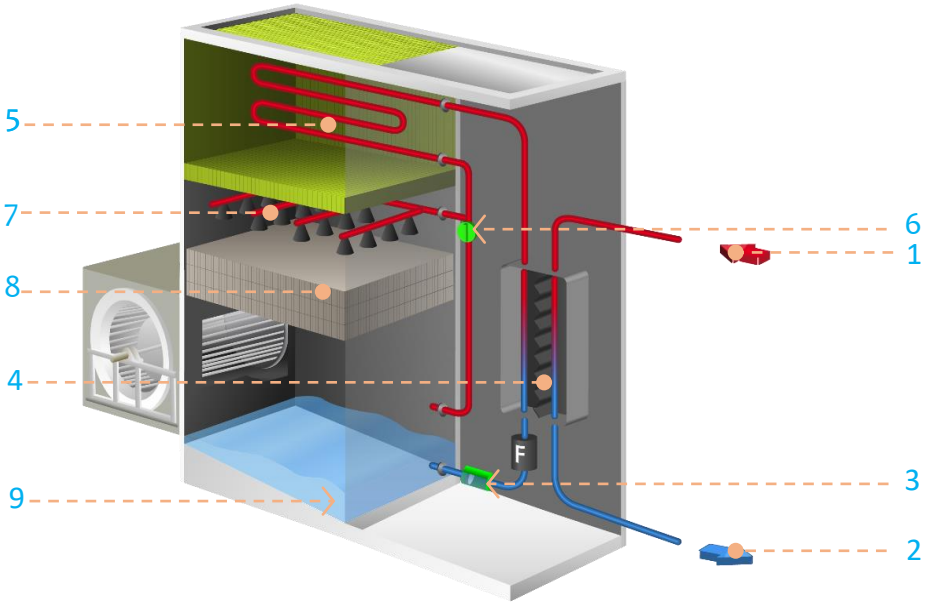
Because of the superficial tension created by the exchange surface, the water equally flows down along the whole height of the so extended exchange surface.
Cooled by the forced air, the water falls by gravity to the inclined basin (3) located on the bottom of the tower.

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.

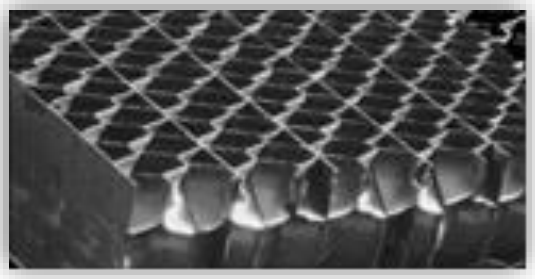
Water distribution

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.



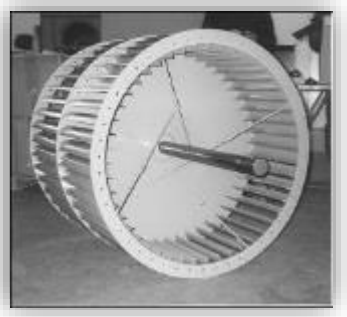
Fans

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.

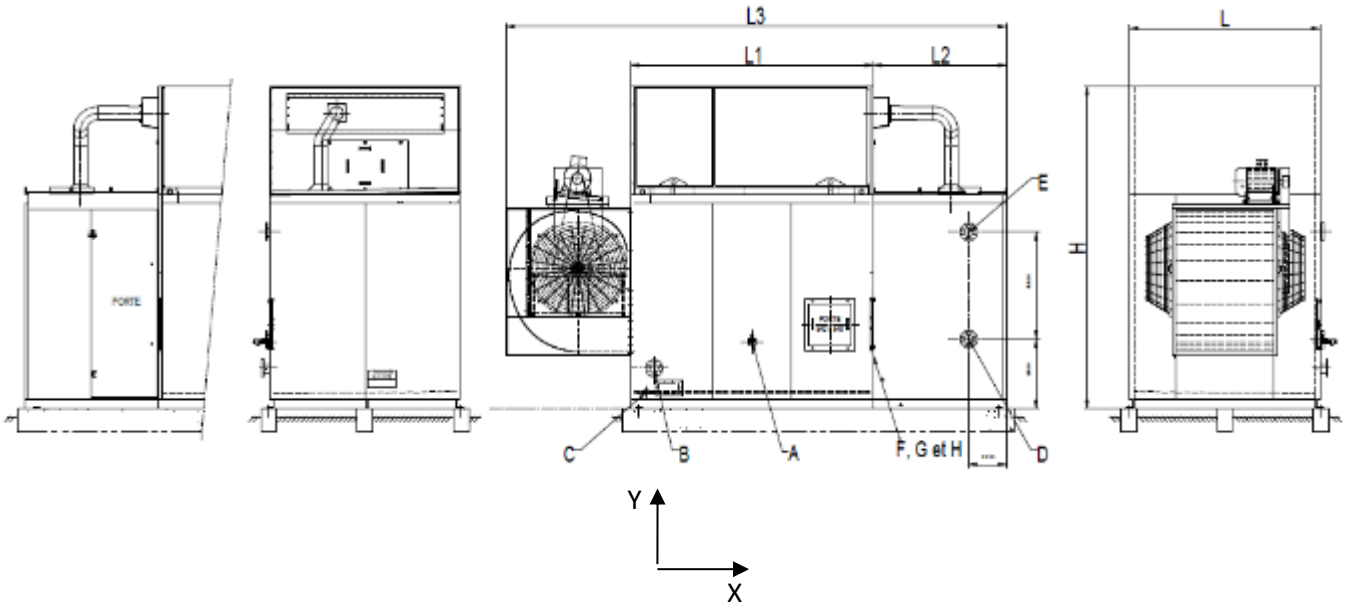
IB SOUND ATTENUATED CLOSED COOLING TOWER

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

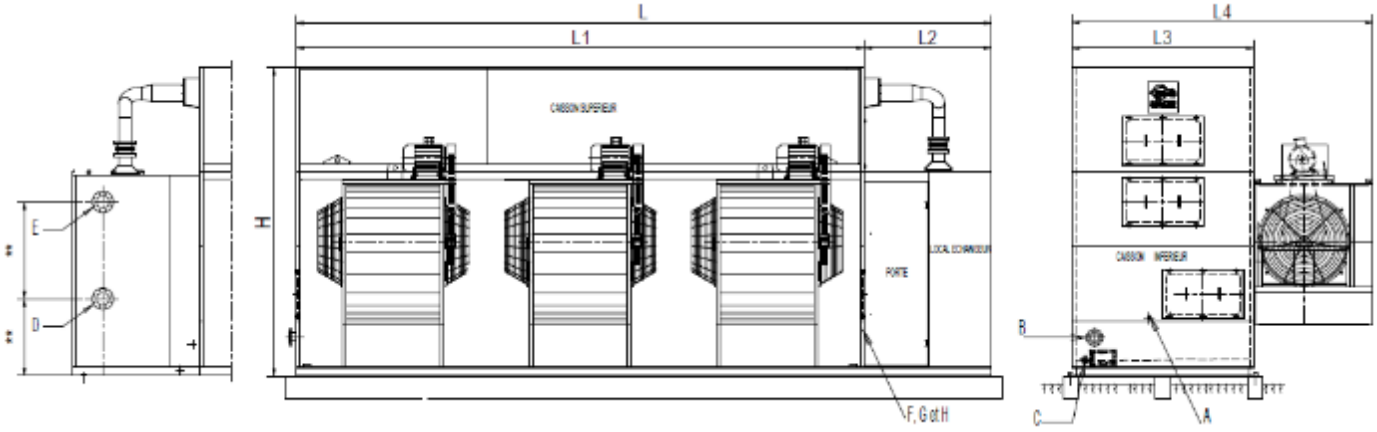
KS 700 without sound attenuation, or with standard IB sound attenuation



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

HYBRID CLOSED COOLING TOWER WITHOUT SOUND ATTENUATION

KSFIM 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]
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

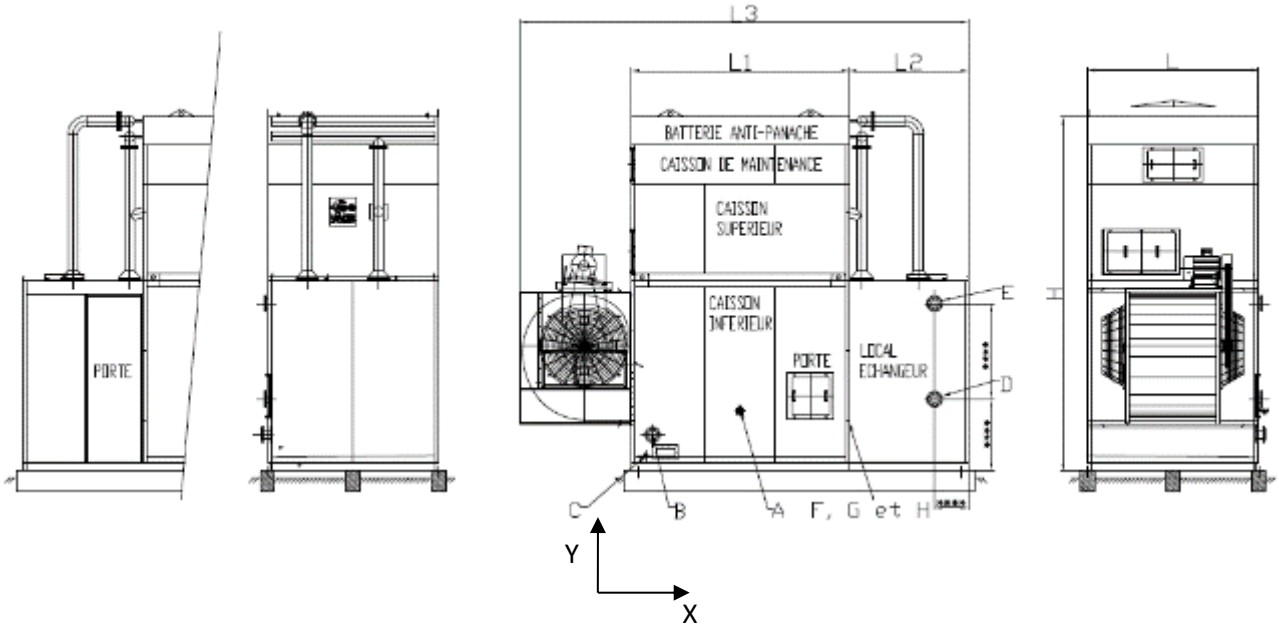
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level : average pressure level (Lp) in free field in 4 directions at 1.5m high.
Nota: for higher power, towers can be added side by side.

HYBRID CLOSED COOLING TOWER IB SOUND ATTENUATED

KSFIM 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]
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



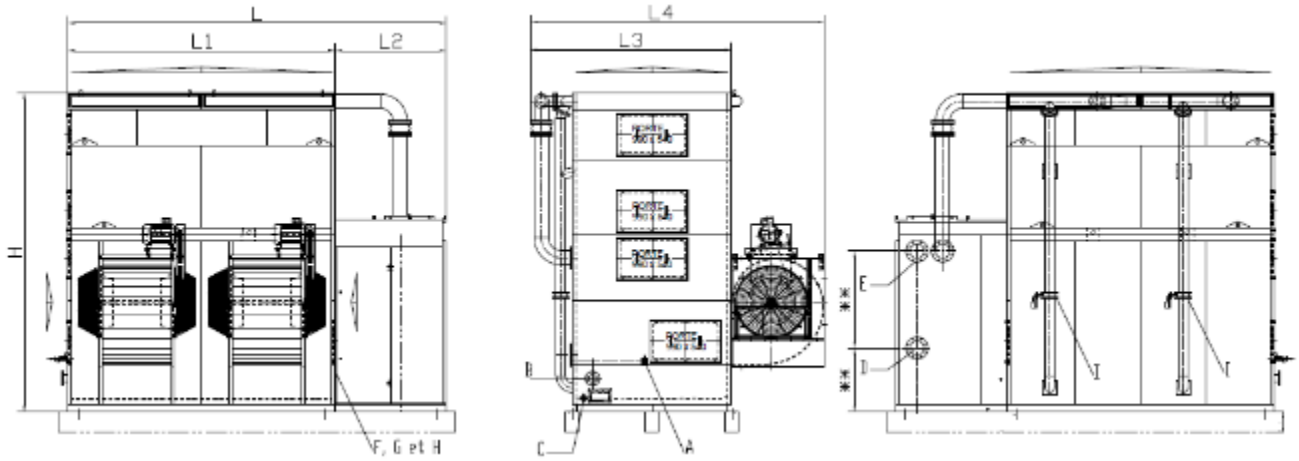
KSFIM RANGE

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)											

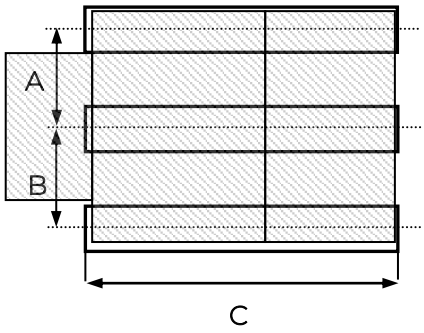
*: According to thermal data
**: According plume suppression coil type
***: According selected servitudes

Support KSF and KSFIM

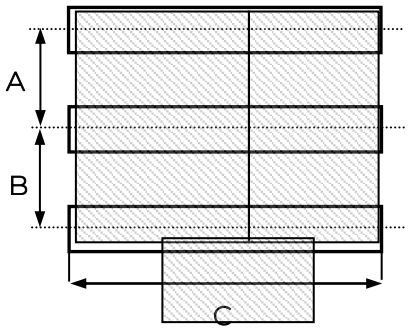
KSF and KSFIM cooling tower ranges can stand on a concrete base or on steel frame beams (customer supply).
Check that the ground can stand the operating load, and that surface or supports are flat and horizontal.

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

KSF 700



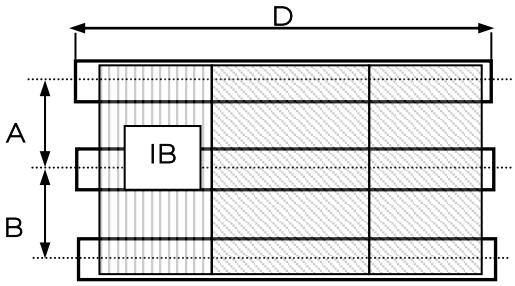
Others KSF



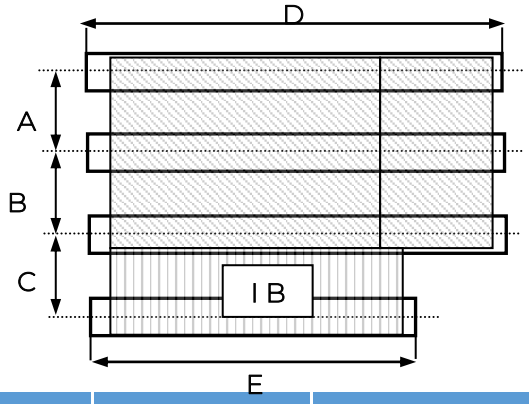
	Qty	Distance between beams under basin A [mm]	Distance between beams under basin B [mm]	Length superior to C [mm]
KSF 700	3	1 230	1 230	4 800
KSF 930		1 230	1 230	5 800
KSF 1165		1 230	1 230	6 800
KSF 1450		1 230	1 506	6 800
KSF 1750		1 230	1 230	9 300
KSF 2175		1 230	1 506	9 300

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

KSF 700



Autres KSF



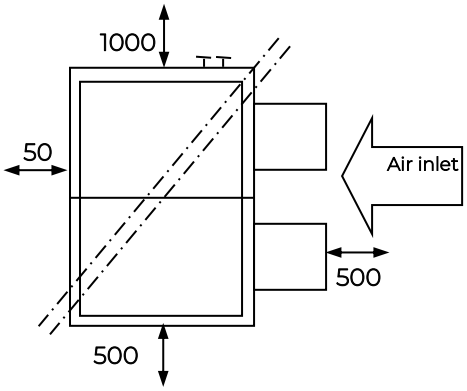
	Qty	Distance between beams under basin A [mm]	Distance between beams under basin B [mm]	Distance between beams under basin C [mm]	Length superior to D [mm]	Length superior to E under fans [mm]
KSF 700 IB	3	1 256	1 256		7 100	
KSF 930 IB	4	1 656	850	2 506	5 600	4 100
KSF 1165 IB		1 656	850	2 506	6 600	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

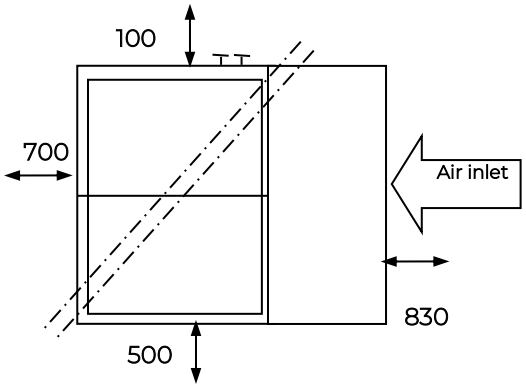
Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings. This could create a risk of a « re-circulation »; the air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower.
In 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



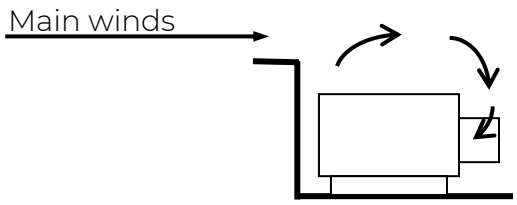
Sound attenuated cooling tower



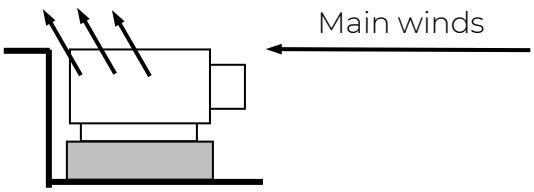
Do not hesitate to contact us for any advice

Lay-out examples:

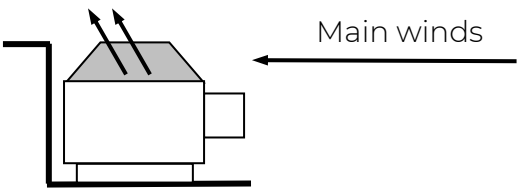
NO



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.
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. 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).