

# TOPAZ

## ADIABATIC COOLER

### CONTENT

Page

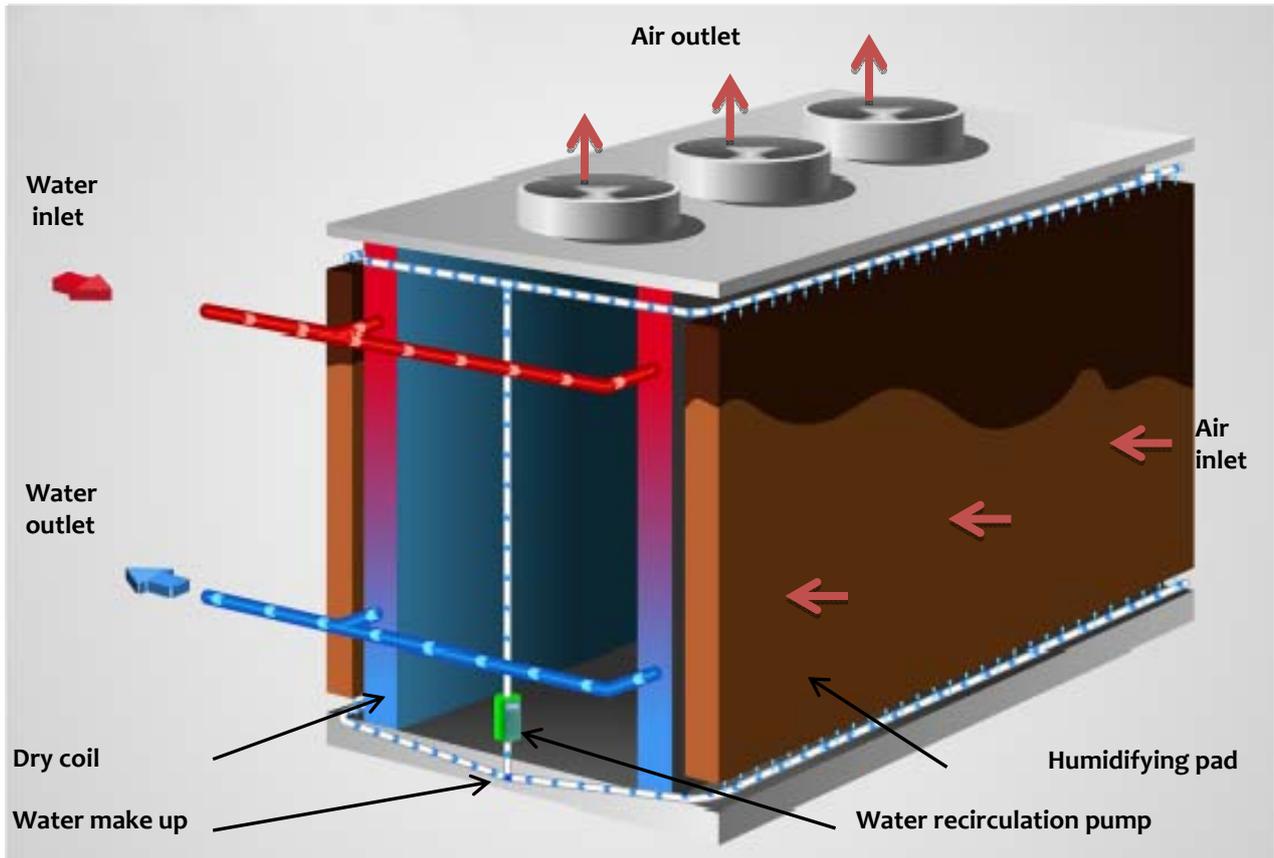
Principle and operation	2
General description and benefits	3
Manufacturing details – Options	4-6
Drawings and dimensions	7
On site lay-out	8
Technical description	9-10

# TOPAZ Principle and operation

## Principle

The **TOPAZ** adiabatic cooler is a heat exchanger; calories / heat are rejected to atmosphere. The TOPAZ adiabatic cooler is a combination of dry cooler with an adiabatic precooling section: this precooling section lowers ambient air temperature by evaporating water which is passed over the cooling / humidifying pads, specially designed for this purpose.

## Adiabatic cooler operation



## **Dry mode**

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

## **Adiabatic mode**

- When cooling in dry mode is not effective and the ambient temperature reaches a predetermined set point, the pads are saturated with water from the sump.
- The ambient air is cooled by evaporation when passing through the pads.
- This pre-cooled air then passes through the tube coils and cools the fluid.
- The water which has not been evaporated on the pads is collected in a stainless steel collector and then flows to sump. As an option, it can be re-circulated with the make-up water from the sump to be re-distributed over the pads. The water saving is then significant and does not require water treatment, it is without risk of Legionella.

# TOPAZ General description and benefits

## Range

TOPAZ is available in a range of 7 different duties.

## General description

The TOPAZ adiabatic cooler range includes:

- Two vertical heat exchanger tube coils,
- Two cooling / humidifying pads for pre cooling by evaporation,
- Asynchronous motors: one per fan combined with Variation Speed Drive,
- A low noise axial fan set,

The water distribution system for pre-cooling is as follows:

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

## Benefits

- No drift,
- No water spray in airflow,
- Elimination of legionella risk,
- High air pressure drop available,
- The coils have been tested and their thermal performance have been certified,
- No external fouling of the tube coils : extended life expectancy,
- No thermal performance decrease,
- No water treatment required,
- Easy maintenance due to vertical H shape of the tube coils : full access through the central door,
- Low operating costs,
- Very low water consumption,
- Optimized power consumption,
- Made in France.

# TOPAZ manufacturing details

## Tube coils

In standard configuration, the coils are made of copper and the aluminium fins are epoxy coated. Tubes are expanded through the fins to ensure both optimized mechanical resistance and thermal conductivity.

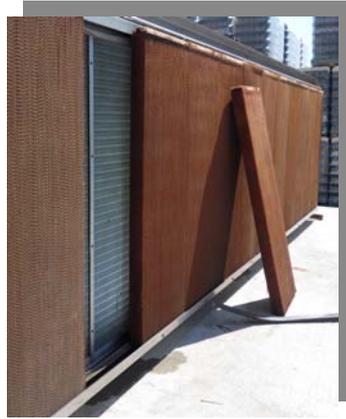
The tube thickness is 0.32 mm for T2 and T3 series, and 0.35 mm for T4 series and more.

The fin pitch is 2.1 mm.

This large fin pitch offers good resistance against scaling of the exchange surfaces.

The coils are hydraulically tested to 22 Bar as standard.

The coils have been tested and their thermal performance have been certified.



Selected to simplify maintenance, the media pads are not directional.

It is easy to disassemble the cooling / humidifying pads, without tools or special access requirements.

## Water distribution

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

The water distribution channels are entirely enclosed on the top in X-STEEL stainless steel or 316l and do not require any pressure to operate. They are located outside the airflow and distribute water evenly onto the pads, in full safety. Their “U” shape makes internal cleaning very easy, without any tools, handles are provided to aid removal.

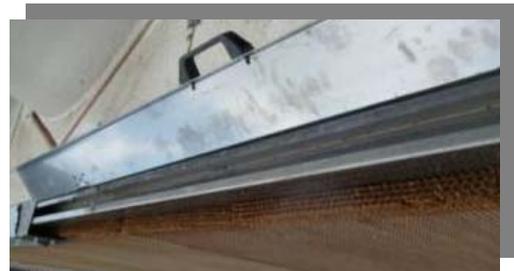
## Pre-cooling by evaporation

The evaporation section is used to precool the ambient inlet air.

The cooling / humidifying media covers the whole air inlet section, on both sides of the unit.

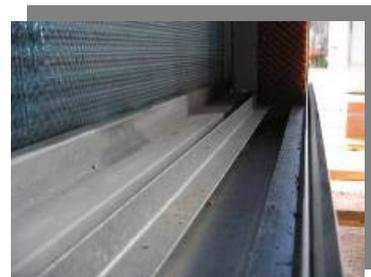
The design and the choice of materials have proven to give best efficiency and long operating life, both in urban and industrial environments.

The cooling / humidifying pads are made of special cellulose, chemically treated to avoid moisture and to improve water absorbing characteristics.



X-STEEL stainless steel or 316L channels collect the water which has not been evaporated.

The water is then evacuated or can be sent to the sump for recirculation by means of a pump.



Collected water can be re-circulated without any bacteriological risk (temperature is below the level for bacterial growth): the water consumption is then divided by a factor of 3.

The water is sent to a covered X-STEEL stainless steel or 316L sump: a level switch and one or two pumps are added, according to the model.



The system includes a drain valve that automatically opens to dump the water from the sump if the cooling section has been used during the previous 24 hours.

A drying cycle is incorporated which will drain the sump completely and will dry the pads and other items which come into contact with water by running the fans at high speed. This function minimises bacteria growth potential and prolongs pad life.

### Motor fan sets

The motor fan sets draw the air through the pads, then through the tube coils. Asynchronous motors are directly coupled to axial fans. This combination offers both power efficiency and optimized sound level. The motor fan coupling is direct and requires no maintenance.

The blades are made of aluminum, and the hub is made of steel, the blade angle adjustment is made stand still.

As an option, sound attenuators can be provided to significantly reduce the sound levels.



### Permanent magnet motors (optional)

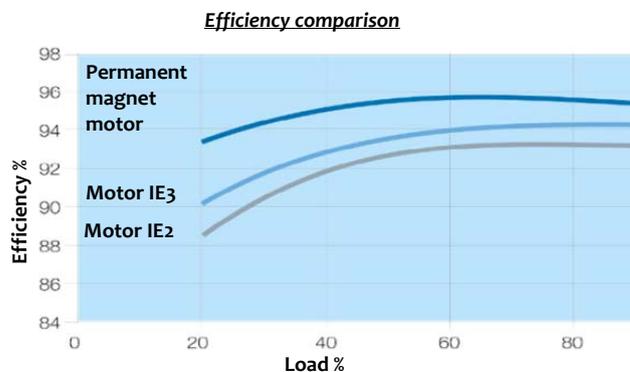
The TOPAZ adiabatic cooler is a cutting edge technology and shows exceptional performance (efficiency over IE3). They are IP 55 insulation class, 380/ 400 V.



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

The magnets create their own magnetic field without induced power. The motor runs cooler, is smaller and lighter and has maintenance and handling benefits. Also, a lower temperature means long-lasting bearings (grease nipples directly on the motor), and insulation materials.

These motors have a low carbon footprint => power savings.



Values for indication only

### Control panel with automaton

The TOPAZ range is totally « Plug and Play »: the Siemens automaton equipped with HMI (Human Machine Interaction) as a standard, allows frequency drive and precooling operation controls without opening the electrical panel: It has an external screen for full safe maintenance.

## Intelligent access

The TOPAZ adiabatic cooler has been design with two main goals: thermal performance and ease of maintenance.

Therefore, the following technical features are incorporated: “H” orientation of the tube coils offers an ideal geometry for complete access to the motors, fans and the internal finned tube coils, over the whole height of the cooler.



So it can be operated safely, without the use of specifically trained operators.

Here are some functions of the automaton:

- Integral control of the time chip,
- Memory saving in case of power failure,
- Liquid crystal display showing multiple lines of main parameters and alarms,
- Interface for the user in order to readjust settings,
- Analogue outlet for fan speed control with frequency drive, installed as standard,
- Digital monitoring including: pumps, drain valve, water / sump make up valve, drain and dry mode controls,
- Security password to protect all set data.

Communication modes are optional: Ethernet, Modbus, LON, or Bacnet.

## Frequency drive

Installed as a standard across the whole range, there is one frequency drive per motor. Permanent magnet motor directly coupled to axial fan and regulated by the frequency drive offers the best efficiency.



TOPAZ is equipped with an automated roller shutter door without doorstep. The motor/fan set is removable and can be extracted from inside for maintenance. Accordingly, lifting equipment\*, safety guards or walkways are not necessary to carry out maintenance.



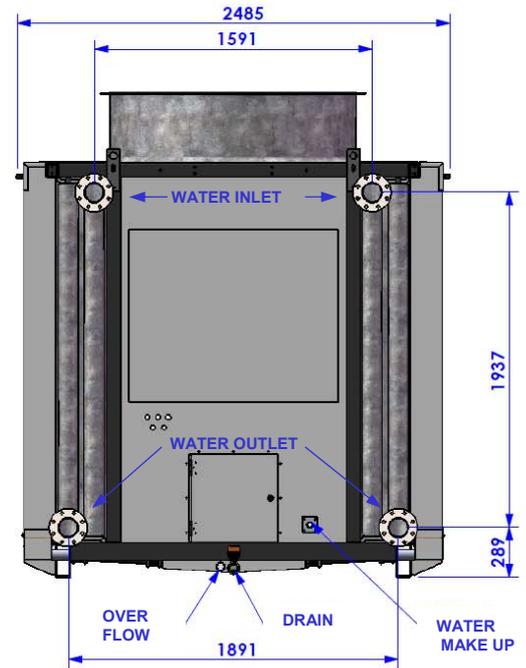
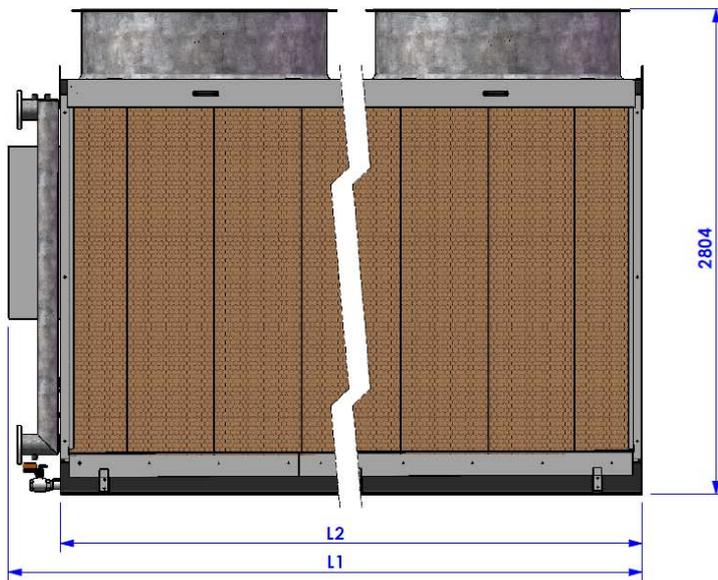
\*As an option; a hydraulic lifting table allows removal of the motor/fan set in complete safety, without means of other lifting equipment. Also, easy handling of the humidifying pads is possible, without any lifting/ handling tools.



## Support and casing

Strong structure, the TOPAZ range support is made of hot dip galvanized steel. The external sides and inside floor of the unit are made of X-STEEL stainless steel or 316L.

# TOPAZ Drawings and dimensions



TOPAZ range	Models	T2A	T2B	T3A	T3B	T4A	T4B	T5B
Nominal capacity <sup>1</sup>	kW	342	418	515	628	674	824	1043
Motor-fans	Qty / kW	2 x 6.5	2 x 6.5	3 x 6.5	3 x 6.5	4 x 6.5	4 x 6.5	5 x 6.5
Fan diameter	mm	1400						
Motor absorbed power	kW	10	10	15	15	20	20	25
Water recirculation pump installed power	Qty / kW	1 x 1.2	1 x 1.2	1 x 1.2	1 x 1.2	2 x 1.2	2 x 1.2	2 x 1.2
Inlet/outlet water connections	DN	65	65	100	100	100	100	100
Make up water flow (max) <sup>2</sup>	m <sup>3</sup> /h	0.5	0.5	0.7	0.7	1	1	1.2
Make up water connection (threaded male)	inches (mm)	1" (26 x 34)						
Drain connection (threaded female)	inches (mm)	1" 1/4 (33 x 42)						
Over flow connection	inches (mm)	2" (50 x 60)						
Overall dimensions L1	mm	3642	3642	5251	5251	6907	6907	8518
Frame support dimensions L2	mm	3265	3265	4875	4875	6530	6530	8140
Weight empty	kg	1800	2035	2715	3185	3575	4230	5000
Weight in operation	kg	2330	2670	3430	4040	4450	5285	6255
Sound level <sup>3</sup>	dBA	55	55	56	56	57	57	58

Notes : 1. Based on condensing temperature of 37°C/32°C and design ambient 32°C/21°C (dry / wet bulb)

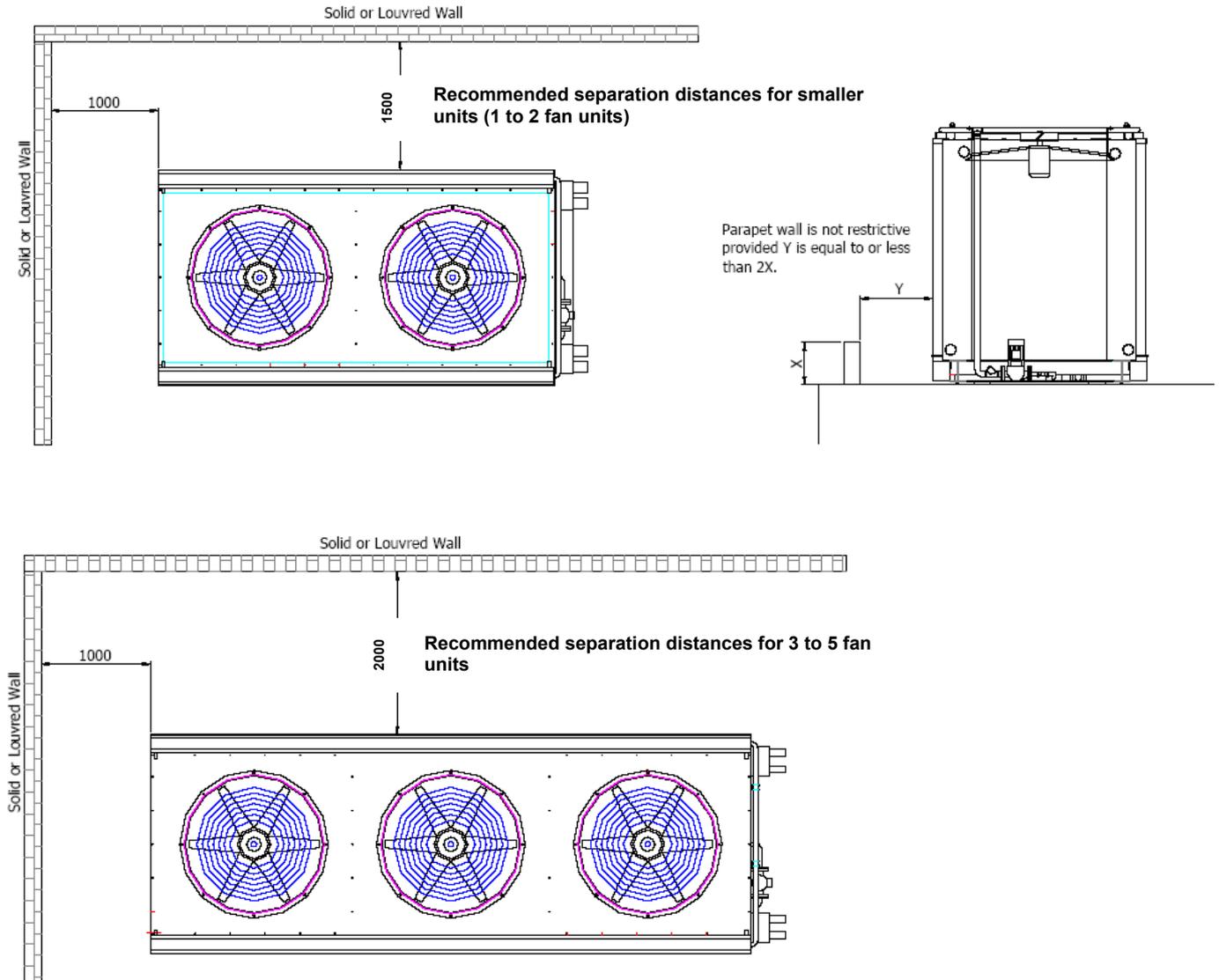
2. Based on ambient conditions 31°C/21°C (dry/wet bulb)

3. Sound pressure level Lp at 15 m in free field, in most silent direction of the unit (+/- 2 dBA).

## TOPAZ on site lay-out

In order to achieve optimum thermal performance, the **TOPAZ** adiabatic cooler must be installed according to the following criteria:

- Sufficient space left on both sides of the machine: minimum 1,5 m (2 to 3 fans) and minimum 2 m (4 to 5 fans) as per the sketches below; this will ensure that air will enter the coils efficiently to cool the fluid.
- In the case of a multiple cooler installation, it is important to consider the main wind direction; in order to avoid recirculation.
- The air outlet should be free from any obstacle.



When **TOPAZ** units are located adjacent to buildings, walls or enclosures, the top of the fan discharge casing must be aligned with or higher than any adjacent structure.

Special care must be taken to avoid recycling of warm saturated discharge air by drifting into any ventilation inlets located nearby.

Consider and allow for future expansion.

Design pipework with some flexibility to allow for vibration, expansion and contraction.

The dimensions given are minimum recommendations only.

For unusual requirements or detailed recommendations on location, please consult **Jacir**.

# Prescription TOPAZ

High performance adiabatic cooler, **JACIR** brand, **TOPAZ.....** Series will be designed to operate with a glycol content of ....%.

## **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. Glycol concentration will be ....%

## **Sound level characteristics**

The sound pressure level will not be greater than ... dB(A) at... meters, in free field, in the quietest direction.

## **Tube coils**

Tube Coils will be made of copper tubing and aluminium fins, epoxy coated. Tubes will be seamless and expanded through the fins to secure a mechanical resistance and optimized thermal conductivity.

The tubes thickness will be 0.32mm for T2 and T3 range, and 0.35mm for T4 and more. The fin pitch will be 2.1 mm. The coils will be tested hydraulically to 22 Bar.

Thermal performance of the coils will have been Eurovent certified.

The headers will be installed on a single side of the unit to make the internal access easier by a large access door and will be equipped with an automated roller shutter door, without doorstep for ease of use.

The coils will be vertically installed, in “H” configuration, in order to allow full access to the internal sides of the coils and to the mechanics.

## **Pre cooling by evaporation**

The cooling/ humidifying pads will cover the whole air inlet section, on the two sides of the unit.

The pads will be made of cellulose, chemically treated in order to avoid moisture and to improve its absorbing characteristics. The media pads are not directional, so that any side can be used.

Removal of the pads is simple and does not require tools and lifting equipment.

## **Water distribution**

Air precooling will be activated when the outlet temperature is higher than the set point.

The water distribution channels are designed for easy cleaning and will be made of X-STEEL stainless steel or 316L, without external pressure regulation, and out of air flow. They will distribute the water evenly on the pads, in full safety.

In order to significantly reduce water consumption in adiabatic mode, the X-STEEL stainless steel or 316L headers will collect the non-evaporated water. The water will be sent to a stainless steel sump, with an installed a level switch and one or two pumps.

The system will include a drain valve, which will be automatically activated on a daily cycle.

A full drain cycle, combined with full speed fan operation, will dry the parts in contact with the water.

The equipment will be factory assembled.

## **Motor fan sets**

The motor/ fan sets will be aligned in a single row at the top of the unit. They will draw the air through the pads and tube coils.

The motor/ fan sets will be completely removable from inside the unit for maintenance.

The axial fans will operate at low speed to combine optimized efficiency and low sound level performance.

The blades will be aluminium and the hub will be made of steel. The blade angle will be adjustable.

The fan/ motor coupling will be direct, requiring no maintenance.

The additional air pressure drop available will be ..... Pa.

## **Permanent magnet motors (optional)**

High efficiency permanent magnet motors, specially developed to minimise power consumption will be supplied with an inverter / frequency drive as standard. They will be IP 55 insulation class, 380/ 400 V, and fitted with greased bearings for continuous operation.

## **Inverter / Frequency drive**

An inverter / frequency drive will be installed on the whole adiabatic cooler range as standard.

## **Control panel with automaton**

Siemens automaton will control fan speed and will activate the pre cooling mode.

The TOPAZ cooler will be delivered totally plug and play, different communication languages as an option, and will be equipped with HMI (Human Machine Interaction), external screen on the control panel for safe maintenance.

Functions of the automaton will be as follows:

- Integral control of the chip with clock.
- Memory saved record in case of power failure
- Liquid Crystal Display, multiple lines for main parameters and alarms.
- Interface for the user in order to read settings.
- Analogue output for fan speed control with frequency drive, installed as standard.
- Digital monitoring including: pump, drain valve, and water make up valve for the sump
- Water collectors, drain control and dry operation
- Security password to protect all set data

Following information will be available as standard: General default, pad humidification setting, drain valve position, water make up valve's position, and reading of frequency drive.

## **Support frame and casing**

Support and casing will be rigid and strong, made of galvanized steel.

All metallic parts in contact with water, as well as the internal floor will be in X-STEEL stainless steel or 316L.

Internal access for unit maintenance and motor/ fan set removal will be via an automated roller shutter door and without any doorstep for ease of access. Access to the pump(s) will also be via the above.