# Summary

1	listing also attain	_
1.	Introduction	
	Types of absorption chillers	5
	Working principle Water/Lithium bromide type absorption chillers classification	
	Double effect cycle	
	Chemicals	-
	General considerations	Page 10
2.	Available solution	Page 12
3.	Product range - General overview	Page 13
4.	5G Small series	Page 15
5.	5G Twin series	Page 23
6.	HD 10, SD 10, ED 10 and GD 10 series	Page 31
7.	HS/SS series	Page 39
8.	2G/2B series	Page 47
9.	2D series	Page 55
10.	2V series	Page 61
11.	EJ series	Page 67
12.	High efficiency Chiller/Heater	Page 73
13.	3B/3D series Triple effect	Page 79
14.	Heat pumps	Page 85
15.	Low temperature machines	Page 91
16.	References	Page 96

Conventional, mechanical compression refrigeration is used in many different ways and is well proven, with a good support network of suppliers and maintenance companies. It is unlikely that absorption cooling will replace conventional systems on a large scale, but there are many applications where it can offer an environmentally and economically superior alternative. Generally speaking, absorption cooling is worth considering if one of the following factors apply:

• There is a cogeneration plant and it is not possible to use all the available heat, or there is a new cogeneration plant under design.

- Waste heat is available
- A low cost source of fuel is available (for example gas)
- Plant boiler efficiency is low due to a poor load factor (particularly in summer)
- It is not possible to satisfy the electrical load of the plant
- The site is particularly sensitive to noise and vibrations.

• The site needs more cooling but has an electrical load limitation that is expensive to overcome, and there is an adequate supply of heat.

In short, absorption cooling will find its application when a source of free or low cost heat is available, and/or if there are objections to the use of conventional refrigeration.

#### TYPES OF ABSORPTION CHILLERS

There are several types of absorption chillers; the two basic ones are:

1. Lithium bromide/water systems

2. Ammonia/water systems

THERMAX absorption chillers belong to the first category: water is the refrigerant and lithium bromide is the absorbent.

#### WORKING PRINCIPLE

Absorption chillers operate on the basis of three well known physical phenomena:

A. When a liquid evaporates (or boils) it absorbs heat, and when it condenses it gives up heat.

B. Boiling temperature of a liquid is a function of the pressure: as pressure decreases, boiling temperature decreases.

C. There are some pairs of chemicals that have a strong affinity to dissolve in one another.

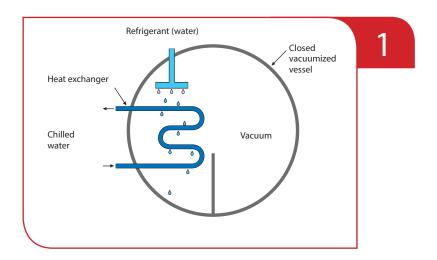
In a conventional mechanical vapour compression cycle; the refrigerant evaporates at a low pressure producing cooling. This is then compressed in a mechanical compressor to a higher pressure, where it condenses. In most machines on the market the compressor is powered by an electric motor.

In an absorption chiller the evaporator and condenser are essentially the same, but a chemical absorber and a thermal generator replace the compressor but with a pump to provide pressure change. As a pump requires much less power than a compressor; electrical power consumption is much lower.

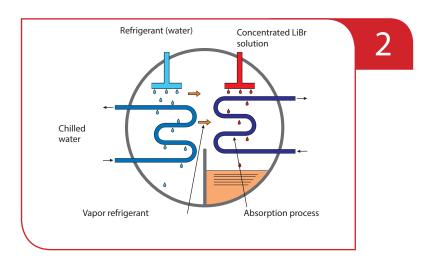
Let's see how the physical basics illustrated above are used in an absorption chiller.

## 1. Introduction

1. Assume a tube bundle within a closed vessel. In these tubes there is water flowing that needs to be chilled. In the vessel surrounding the tube bundle there is a vacuum. As mentioned previously; as the pressure decreases the boiling point of water also decreases. If the vacuum inside the vessel is 0.8kPa then water will boil at approximately 3,7°C. If we spray water onto the outside of the tube bundles then this spray of water will evaporate on contact, as long as the water in the tube is above 3,7°C. When this water spray evaporates it removes heat from the water flowing inside the tubes. This produces a cooling effect. This section of the vessel is called the EVAPORATOR

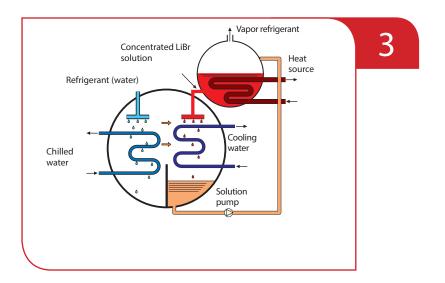


2. In reality, the above process will stop working very quickly if this vessel fills with water vapor. As more of the spray begins to evaporate then the vapor will linger in the vessel which increases the overall pressure. As this pressure builds, the boiling temperature also increases. This is until this spray is no longer evaporating on contact with the tube bundle. Once the spray stops evaporating you will lose the cooling effect. This issue is solved using lithium bromide. Lithium bromide has a great affinity to water as it is a hydroscopic compound (it attracts water). If there is another spray of lithium bromide within the same vessel then this lithium bromide will absorb water vapour building up inside the shell. This means that the pressure inside the vessel will stay constant and allows the cooling process to continue. The reaction between lithium bromide and water is exothermic which means heat is generated. This heat must be removed from the system, so there is a second tube bundle in the vessel which has a cooling water flow inside. This keeps the temperature inside the vessel constant. The section of the vessel with this second tube bundle is called the ABSORBER.



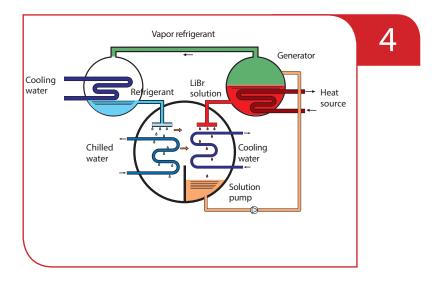
- 3. The hygroscopic properties of lithium bromide are not constant. It depends on two factors.
- a) Temperature the affinity between lithium bromide and water increases as the temperature decreases.
- b) Concentration when the quantity of the salt in the solution decreases the hydroscopic strength also decreases.

In the vessel, the temperature is kept low by the cooling water flowing through the absorber, this takes care of point a. For point b it becomes more complex. When the lithium bromide solution becomes more dilute as it absorbs more water vapor then it becomes less effective. To regain this strong hydroscopic effect, we need to increase the concentration of the lithium bromide solution. This is done with the heat source used to drive the chiller - it will boil the water vapour out of the solution which leads to an increase in the concentration. The vessel where this takes place is called the GENERATOR. The generator has a tube bundle inside where the heat source flows through (hot water, steam, exhaust gas etc). The dilute lithium bromide solution is then sprayed onto these tubes, once the spray hits the bundle it will evaporate the water which leaves the concentrated solution to sit at the bottom of the vessel. This concentrated solution is then sent to the ABSORBER to be used again.

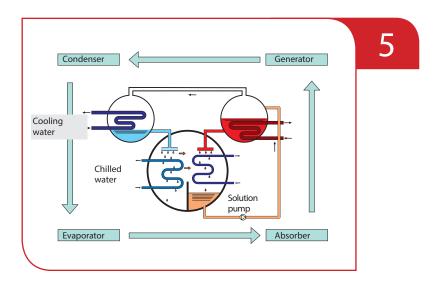


4. In the generator; as the water is being boiled out of the dilute solution it becomes water vapor in the vessel. This water needs to be condensed back to a liquid so it can be reused as refrigerant. This is done in another heat exchanger called the CONDENSER. The water vapor comes into contact with a tube bundle with the cooling water flowing inside (same cooling water used in absorber). The water vapor then condenses and flows back into the evaporator to be used as the refrigerant. This means that machines two working liquids are both closed loop systems.

# 1. Introduction



5. Basic working cycle for a single effect absorption chiller.



#### WATER/LITHIUM BROMIDE TYPE ABSORPTION CHILLERS CLASSIFICATION

It is useful and common practice to divide absorption chillers into categories in different ways: by the type of heat source and by the number of effects.

Type of heat source

Heat is generally supplied to the absorption unit as one of the following:

- hot water
- steam
- directly burning fuel (direct fired)
- exhaust gases

Single, Double and Triple effect machines.

In the market it is possible to purchase single and double effect machines. Triple effect units have been launced recently. Double effect machines are more efficient than single effect, but also cost more.

The choice between triple, double and single effect chillers is based on the temperature of the heat source.

Also, for each type of machine you can have single or twin stage evaporatior/absorber. This isn't to be confused with single and double effect.

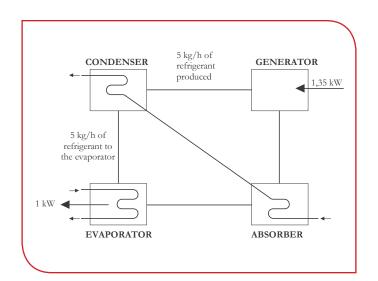
Below is a simplified scheme showing the different heat sources (and their temperatures) with the number of effects.

Hot water	from 75°C to 150°C single effect, from 150°C a 185°C double effect, from 185°C to 240°C triple effect
Steam	from 50 to 350 kPa (g) single effect, from 400 to 1000 kPa (g) double effect, from 1200 to 2500 kPa (g) triple effect
Direct fired	double effect
Exhaust gases	double effect/ triple effect

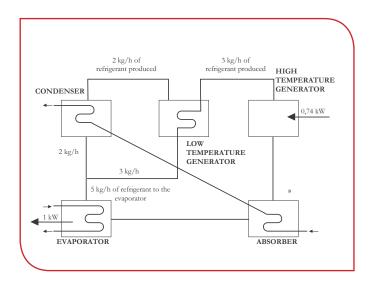
#### DOUBLE EFFECT CYCLE

8

The cycle shown in the previous segment refers to a single effect machine. It can be well illustrated by the following scheme:



In a hot water fired single effect machine you need approximately 5kg/h of refrigerant to evaporate in the evaporator to produce 1kW of cooling. This means the generator should recieve enough heat to boil 5kg/h of refrigerant to supply the evaporator. When this available heat source is very hot it causes the refrigerant water vapor to also be extremely hot. This temperature can be so high that the vapor can be used to boil the dilute solution a second time. This is what happens in a double effect chiller - there are two generators boiling the dilute solution. In one generator it is the heat source flowing through the tube bundle and in the second it is the water vapour from the first generator flowing through the tube bundle.



In the above diagram you will see that in the first generator (high temperature) there is only 3kg/h of refrigerant generated. The remaining 2kg/h of refrigerant are generated by the waste heat inside the unit from the high temperature generator. So a double effect machine requires less primary energy to produce the same chilled water capacity. So its efficiency is higher than the single effect chiller.

In double effect machines; the generator makes it possible to design different working cycles as it is possible to modify the flow direction from one generator to the other. We have parallel, series or reverse cycles. The main features of each cycle are described in the description of each model series.

#### CHEMICALS

Lithium Bromide (LiBr)

Lithium bromide is a salt with similar properties of sodium chloride (NaCl), the common salt. When salt is left in a high humidity atmosphere it becomes sticky because it is absorbing water from the air. Lithium bromide has the same properties but its absorption power is 17 times stronger than sodium chloride. For salt solutions the higher the concentration and lower the temperature the stronger its absorbing power.

Lithium molybdate

Lithium bromide is corrosive to metal in the presence of oxygen. As the absorption chiller is under vacuum there is almost no oxygen present inside the vessel. However it is possible, through maintenance works or operator error, for oxygen to enter the machine. So corrosion inhibitor is added to the internal solution, this inhibitor forms a hard productive layer on the internal metallic surfaces which protects against corrosion. When the layer is created it reduces the concentration of the inhibitor, so it is important to periodically analyse the internal solution to check the concentration of inhibitor present. Based on this analysis more corrosion inhibitor is added to keep the concentration at an optimal level. Excessive levels of molybdate are also to be avoided as it can affect the chillers performance.

#### Water

The refrigerant used in the absorption machines is water. The water has to be pure and without contaminants so we use distilled water.

Octyl alcohol

To increase the efficiency of the refrigerant a small amount of octyl alcohol is added to the internal solution. This increases the surface tension of the solution. This means the solution will stick to the tube bundles; increasing the heat and mass transfer and also reducing the splashing effect. Too much octyl alcohol will cause choking of the heat exchangers which reduces the capacity of the unit.

#### GENERAL CONSIDERATIONS

#### **Temperature limitation**

Lithium bromide/water units have a limitation on the chilled water temperature they can produce. For practical purposes, this is limited to 3,5-4°C. This limitation is due to water being used as refrigerant. As of now, THERMAX can offer a line of special designed machines where chilled water temperature can be reduced as low as -5°C under certain circumstances.

#### Heat rejection

Absorption chillers reject more heat into the atmosphere than conventional electrical chillers. This means that cooling towers/dry coolers will be larger. As a rule of thumb the heat that has to be dissipated is approximately 2,4 times the cooling capacity in single effect machines and 1,7 times in double effect machines.

The temperature of the cooling water circuit is very important. This is because the cooling water is used in the absorber to cool down the process, and then used in the condenser to condense the refrigerant. This means the absorption chillers are much more susceptible to changes in the cooling water flow and temperature. The lower the cooling water temperature the better, but there is a limitation as if it becomes too low we run the risk of crystallisation.

#### Crystallisation

Crystallisation has always been considered to be one of the major issues with the lithium bromide/water cycle. Advancements in PLC based control systems over the past 10 years have greatly reduced this phenomenon. However the reputation is still lingering so we should look at what crystallisation is.

#### What is crystallization?

In an absorption chiller we have a solution of water and salt. In a fixed temperature situation, if the water (solvent) is continuously removed from a solution, the solution becomes saturated. This means the solvent has reached its capacity to keep the salt in its dilute state. If we then continue to remove the water then the solution will begin to form particles. These particles are crystals which leads to the term crystallisation. So crystallisation is the appearance of the salt as a solid in its solution. It is formed based on the following:

- Temperature of the solution.
- Concentration of the solution.

For a particular solution, it is possible to draw a graph of temperature-vapour pressure at different concentrations. An example is shown below. In this graph a particular line called the "crystallisation line" is underlined: it shows the highest concentration that can be reached for every temperature: anything to the right of this line means the salt is in a solid state.

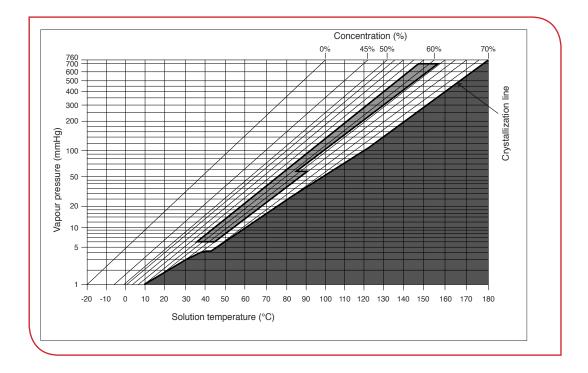
This graph shows a double effect machine internal cycle. As temperatures inside the machine changes the cycle moves around the graph: the temperatures and the concentration levels inside the machine have to stay behind the crystallisation line.

# 1. Introduction

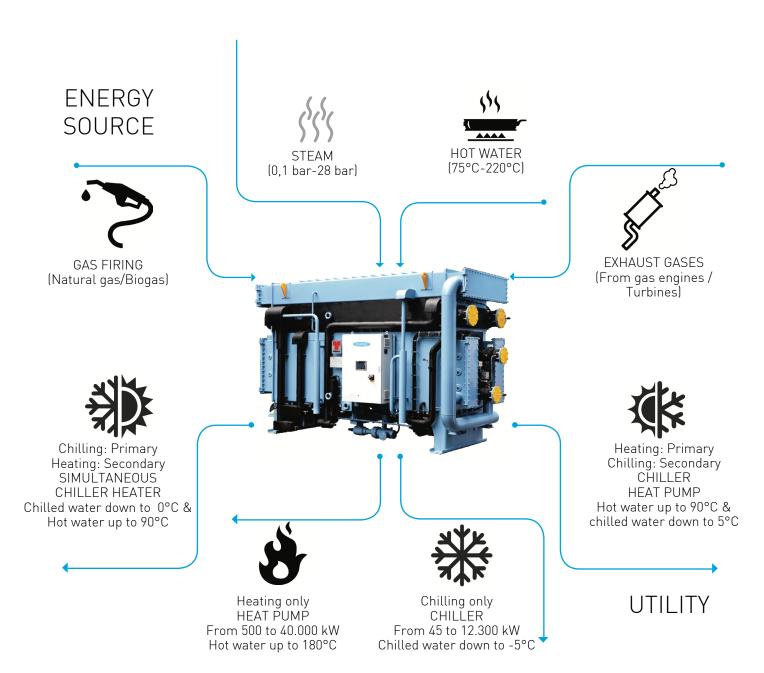
In an absorption chiller, crystallisation of the solution can occur due to one of these reasons or to a combination of them:

- a) Low cooling water inlet temperature.
- b) Insufficient vacuum inside the machine.
- c) Insufficient solution flow.
- d) Excessive generator heating.

Each machine is provided with several safeties in order to prevent the appearing of the crystallisation: all these applications are illustrated in each chiller series description.



2. Available solutions



## 3. Product range - General overview



SS/HS Series Capacity: from 350 to 12.300 kW Heat source: Steam (SS)/Superheated water (HS) Steam pressure: 0-3,5 bar g Superheated water temperature: 120-150°C COP: 0,7-0,75



2B series Capacity: from 176 to 12.300 kW Heat source: Steam Steam pressure: 4-10 bar g COP: 1,4



3B Series Capacity: from 176 to 5.300 kW Heat source: Steam Steam pressure: 12-25 bar g COP: 1,6-1,9



5G Series Capacity: from 45 to 5.800 kW Heat source: Hot water Hot water temperature: 75-120°C COP: 0,75-0,8



2G Series Capacity: from 176 to 12.300 kW Heat source: Superheated water Superheated water temperature: 140-180°C COP: 1,4



3G Series Capacity: from 176 to 5.300 kW Heat source: Superheated water Superheated water temperature: 180-240°C COP: 1,6-1,9



2V Series Capacity: from 176 to 10.500 kW Heat source: Natural gas/Biogas} COP: 1,4



2D Series Capacity: from 176 to 12.300 kW Heat source: Exhaust gases Exhaust gases temperature: 250-600°C COP: 1,4



Heat pump - TYPE I Capacity: from 500 to 40.000 kW Heat source: Steam/Hot water/ Natural Gas/Exhaust gases COP: 1,7-1,85



Heta pump - TYPE II Capacity: from 500 to 15.000 kW Hea source: Steam/Hot water COP: 0,45-0,47

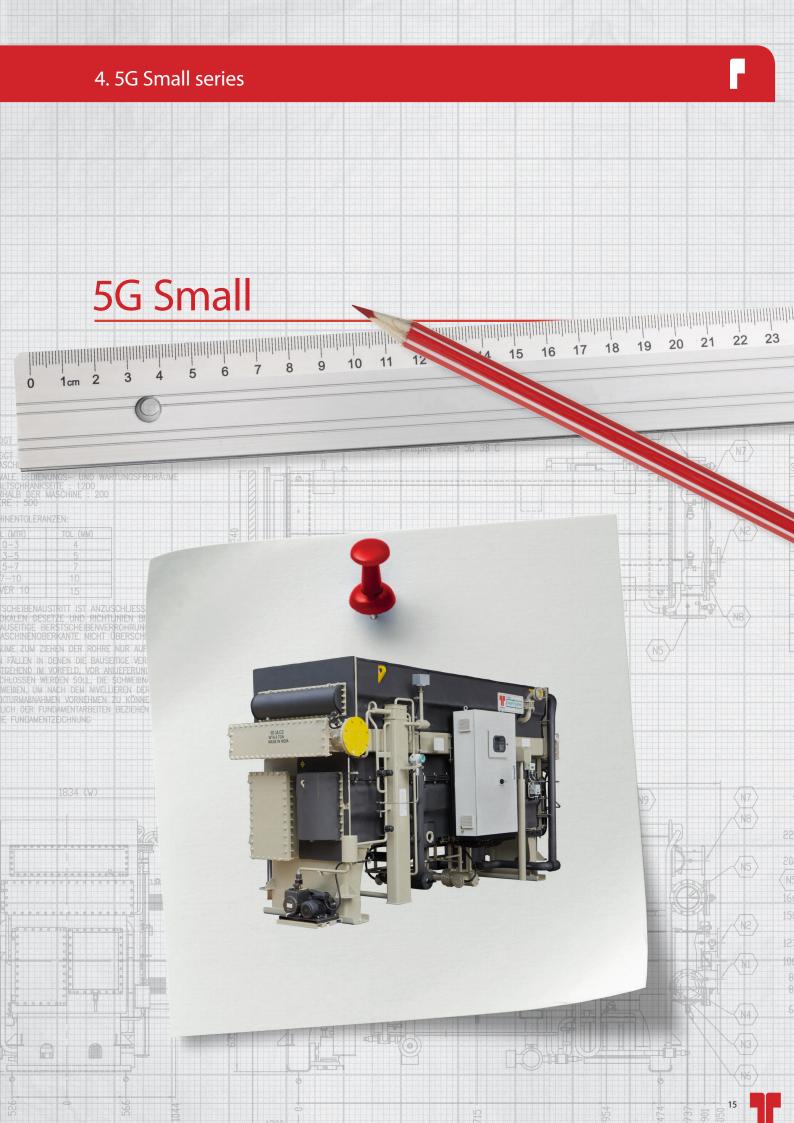


EJ Multi Energy Series Capacity: from 350 to 12.300 kW Heat source: Exhaust gases+Hot water Exhaust gases temperature: 250-600°C Hot water temperature: 80-120°C COP: 1-1,1



High Efficiency Chiller/Heater Cooling capacity: from 176 to 10.500 kW Heating capacity: from 100 to 9250 kW Heat source: Steam Steam pressure: 3-10,5 bar g





4. – 5G SMALL

Latest generation of single effect low temperature hot water fired absorption chillers.

The machines are specifically designed to be used with low temperature hot water, to maximize the efficiency and they are suitable to be used with high DT in water circuits.

This new generation of machines features compact dimensions, easy to use, easy to maintain and a high efficiency.

Cooling capacity from 45 kW to 780 kW.

Hot water inlet temperature between 75 °C and 120 °C.

COP: between 0,70 and 0,76

#### STANDARD FEATURES:

- Double shell design: the upper shell (including condenser and generator), the lower shell (including evaporator and the absorber).
- Compact design.
- Straight tubes in the generators for easy maintenance.
- Gravity feed spraying technology in evaporator and absorber. Liquids are sprayed downwards on the tubes to ensure good film thickness and better heat transfer.
- Marine type headers in absorber and condenser.
- Crystallization control and prevention based on on-line determination of actual measured concentration.
- Refrigerant autoblowdown solenoid valve controlled by solution concentration
- Level electrodes for refrigerant level monitoring in the evaporator. (excluding model 5G 1A C)
- PLC based control panel SIEMENS SIMATIC S7-1200
- Alarm state announced through an audio signal and appropriate messages display on the operator interface terminal.
- Operator panel SIEMENS TP700, 7" touchscreen.
- MODBUS RTU connectivity as a standard feature.
- Several field interlocks available for plant automation.
- Mini-finned SS 430 Ti tubes in generator
- DLP copper tubes in evaporator, absorber and condenser.
- Crystallization prevention safeties: overflow pipe for auto decrystallisation, low/high cooling water inlet temperature cut-out, high temperature control for generator, hot water control valve PLC control based on generator temperature.
- PID algorithm capable of achieving part load operation from 10 to 100% stepless, based on chilled water outlet temperature.
- Purge system, which continuously and automatically removes non condensable gases from the shell side and stores them in a tank. A purge pump is provided as standard feature.
- Regenerative heat exchanger to increase the efficiency of the cycle. The heat exchanger is plate type, with copper brazed stainless steel plates, designed for the maximum heat exchange with minimum pressure loss. The use of a plate heat exchanger ensures a compact design of the unit.
- Isolating valves for easy removal of the pumps for maintenance without breaking the vacuum inside the chiller (excluded model 5G 1A C)

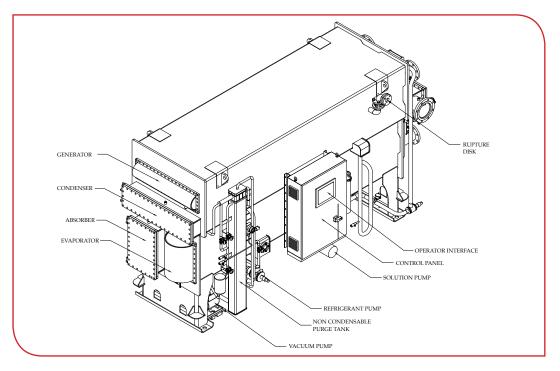
- Antifreeze protection safeties: PLC inbuilt antifreeze alarm, antifreeze thermostat, low temperature cut-out for refrigerant pump (L-cut), flow switch (starting from model 5G 2A C) and D.P. switch for chilled water.
- Completely factory assembled and wired.
- Potential free contacts for remote and automatic operation of the machine: chilled, cooling and hot water pumps start/stop, cooling tower fans start/stop, remote start/stop of the machine, remote indication of machine status (on/off) and machine trip, remote setpoint.
- Rupture disk
- Digital vacuum transmitter
- Insulation of cold surfaces.
- TRG, a patented bearing monitoring system for monitoring the wear and tear of the bearings (through contacts inside control panel, starting from model 5G 2A C)

#### OPTIONAL:

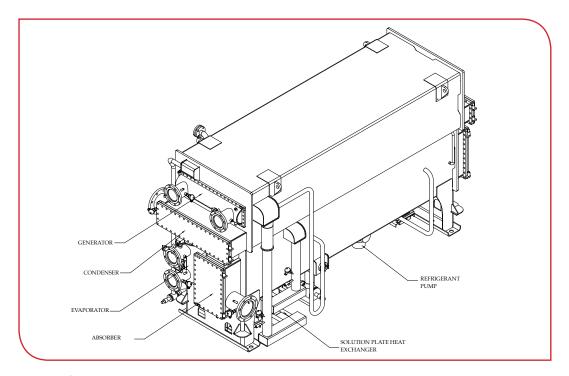
- Stand by refrigerant and solution pumps (only for models from 5G 2E C to 5G 3B C).
- Special metallurgy for tubes (CuNi 95/5, CuNi 90/10, Stainless steel, Titanium).
- Tubesheet and headers cladding in case of use of bad quality water not suitable for carbon steel
- On line indication of healthiness of bearings of refrigerant and solution pump (on line TRG, starting from model 5G 2A C).
- Insulation of hot surfaces.
- Two pieces shipment: unit can be shipped in two pieces to be reassembled on site.
- Profibus connection.
- Ethernet or Modbus TCP/IP connection.
- Palladium cell for automatic and static removal of hydrogen from purge tank.
- Autopurge system for automatic purging of purge tank (electric or pneumatic, starting from model 5G 2A C). Alternative to palladium cell.



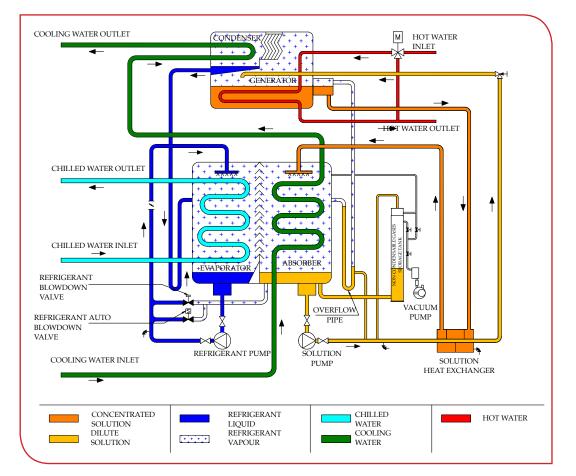
Absorption chiller of 5G Small series



3D view of a 5G Small machine with main components - Control panel side view



3D view of a 5G Small machine with main components - Rear view

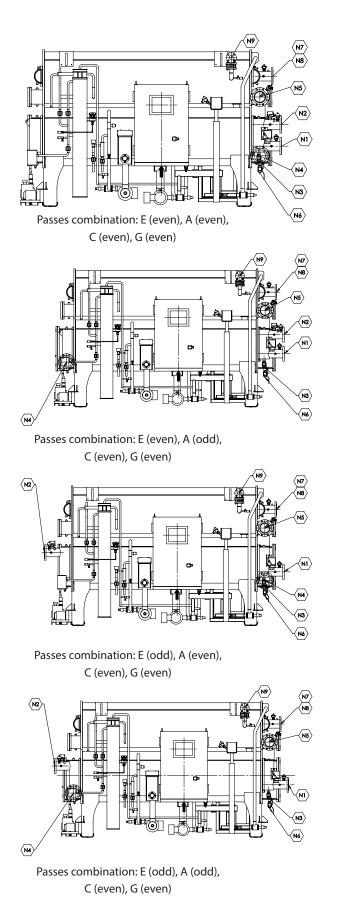


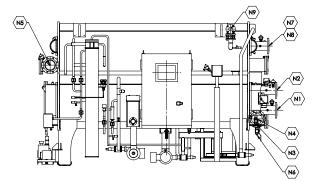
5G Small series working cycle

		UNITS	5G 1A C	5G 1B C	5G 1C C	5G2AC	5G 2B C	5G 2C C	5G 2D C	5G 2E C	5G3AC	5G3BC
Cooling												
capacity		kW	61	122	182	238	324	395	470	568	692	792
Chilled	Flow	m³/h	10,5	21	31,3	40,9	55,7	67,9	80,8	97,6	119	136,2
water	Connection diameter	DN	50	8	0	10	00		125		1	50
Cooling	Flow	m³/h	26	48,5	75,9	93,6	135	160	190	230	282	321
water	Connection diameter	DN	80	10	00	12	25		150		2	00
Hot	Flow	m³/h	7,9	15,4	22,8	29,7	40,2	47	56	67,6	82,3	94,2
water	Connection diameter	DN	50	8	0	1(	00		125		1	50
Dimensions	Length (L)	mm	1670	25	35	28	40	37	'55	4360	44	415
	Width (W)	mm	1400	16	35	15	75		1655		18	370
	Height (H)	mm	1820	22	00			2310			24	120
Weights	Shipping weight	x1000kg	2,0	3,6	3,8	4,4	4,6	5,7	5,9	6,6	7,7	8,0
	Working weight	x1000kg	2,2	3,9	4,2	5,0	5,2	6,5	6,8	7,7	9,1	9,5
Clearance	Clearance for tube removal	mm	1250	21	10	23	50	33	90	4000	40	)60
Electrical	Solution pump	kW(A)		1,1 (3,4)					1,5 (5)			
data	Refrigerant pump	kW(A)	(	),1 (0,55	)				0,3 (1,4)			
	Vacuum pump	kW(A)					0.75	(1.8)				
	Power consumption	kVA		5,1		6,9						
	Power supply				415	/ (±10 %), 50 Hz (±5 %), 3 Phase+N						

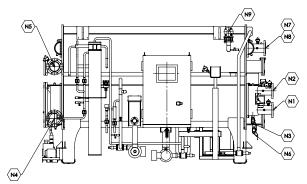
1) Model code: 5G XX - C low temperatue hot water fired absorption chiller, 2) Inlet/Outlet chilled water temperature = 12/7 °C, 3) Inlet/Outlet cooling water temperature = 29/34 °C (29/34,3°C for models 5G 1B C and 5G 2A C), 4) Inlet/Outlet hot water temperature = 90°C/80°C, 5.a) Fouling factors: chilled water and hot water - 0,018 m<sup>2</sup> K/kW, b) Fouling factor cooling water - 0,044 m<sup>2</sup> K/kW, b) Fouling factor cooling water - 0,044 m<sup>2</sup> K/kW, b) Minimum chilled water outlet temperature 3,5°C; lower temperatures upon request, 7) Minimum cooling water intel temperature 18 °C, 8) Plantoom minimum/maximum temperature 5-45 °C, 9) Maximum working pressure in water circuits = 8 bar(g); higher pressures available upon request at extra price, 10) Please contact Thermax representative/office for customised specifications.

#### NOZZLES ORIENTATION DEPENDING ON NUMBER OF PASSES:

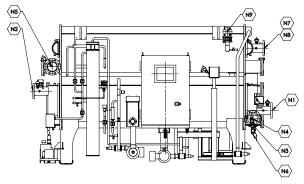




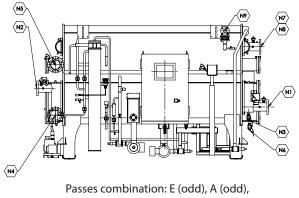
Passes combination: E (even), A (even), C (odd), G (even)



Passes combination: E (even), A (odd), C (odd), G (even)

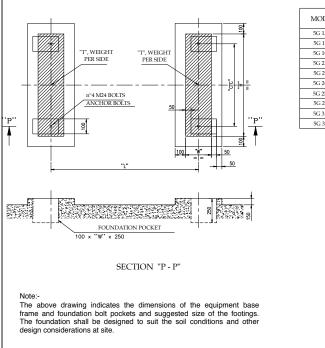


Passes combination: E (odd), A (even), C (odd), G (even)



C (odd), G (even)

- E = Evaporator, A = Absorber, C = Condenser, G = Generator
- N1 = Chilled water inlet
- N3 = Chilled water drain
- N5 = Cooling water outlet
- N7 = Hot water inlet
- N9 = Rupture disk connection
- N2 = Chilled water outlet N4 =Cooling water inlet
- N6 = Cooling water drain
- N8 = Hot water outlet



MODEL	"L"	''W''	``B''	''CTC''	``Т'
MODEL	mm	mm	mm	mm	kg
5G 1A C	852	170	792	692	1.100
5G 1B C	1.582	220	872	772	1.950
5G 1C C	1.582	220	872	772	2.100
5G 2A C	1.846	220	1.032	932	2.500
5G 2B C	1.846	220	1.032	932	2.600
5G 2C C	2.866	220	1.032	932	3.250
5G 2D C	2.866	220	1.032	932	3.400
5G 2E C	3.474	220	1.032	932	3.850
5G 3A C	3.474	324	1.192	1.092	4.550
5G 3B C	3.474	324	1.192	1.092	4.750
		IN	VDICATES TE	ZZ IE BASE	

WASHER MACHINE BASE WELD WELD S RARANGEMENT AT ANCHOR

Foundation details

#### 5G SMALL POSSIBLE APPLICATIONS:

- District heating/cooling
- Cogeneration/Trigeneration
- Food industry
- Automotive industry
- Solar cooling

#### NECESSARY DATA TO PREPARE AN OFFER

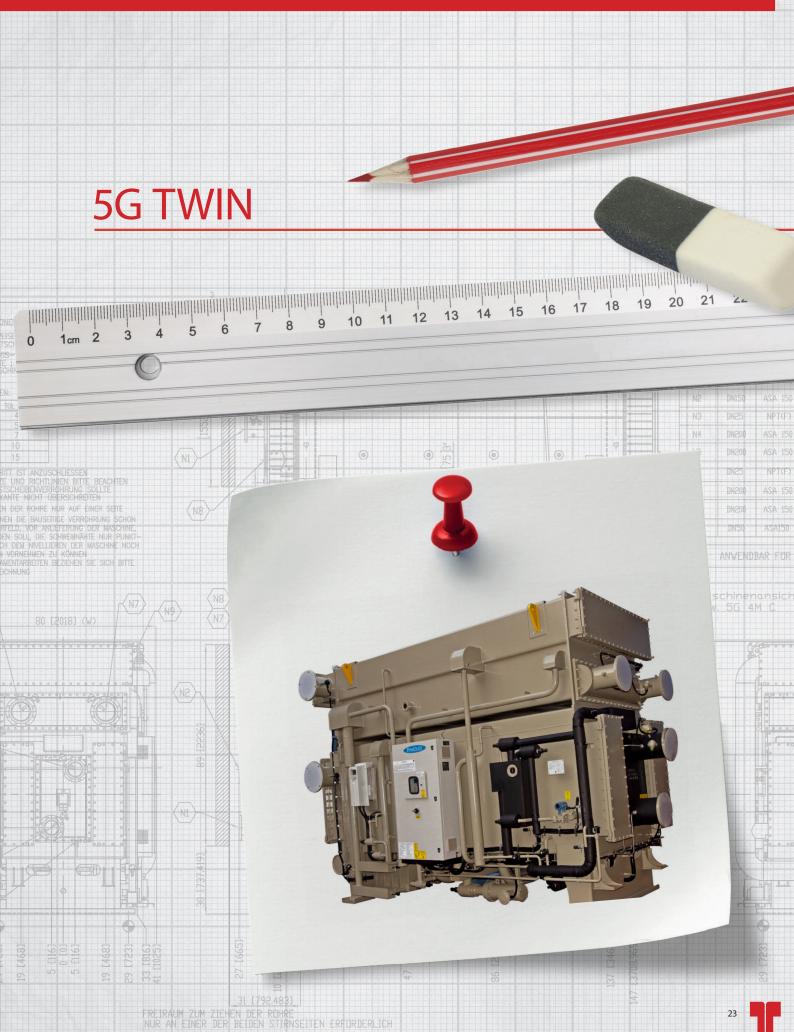
- Cooling capacity required (or alternatively the available heat capacity)
- Chilled water inlet/outlet temperatures
- · Cooling water inlet/outlet temperatures
- Hot water inlet/outlet temperatures

	Notes
-	

1 1 K - 0

22





#### 5. – 5G TWIN

Latest generation of single effect low temperature hot water fired absorption chillers. This series features a double stage evaporation/absorption technology.

The machines are specifically designed to be used with low temperature hot water, to maximize the efficiency and they are suitable to be used with high DT in water circuits.

This new generation of machines feature compact dimensions, easy to use, easy to maintain and one of the highest efficiencies in the market.

Cooling capacity from 780 kW to 5.500 kW.

Hot water inlet between 75 °C and 120 °C.

COP: between 0,75 and 0,80

In a normal absorption chiller, overall chilled water capacity is limited by the achievable capacity at a maximum concentration of Lithium Bromide. Above this concentration there is a danger of crystallisation and therefore the machine is not stable. So in this scenario the absorber is the limiting heat exchanger in the machine. For low temperature hot water, overall chilled water capacity is decided by the maximum concentration the generator can achieve. This is because with low grade heat the LiBr concentration cannot get near to crystallisation levels, so for hot water the generator is the most important section of the chiller.

As the lithium bromide concentration increases at lower pressure, it is important to keep the generator at a lower pressure which can be done either through increasing the volume of the generator or increasing cooling water flow. These are both expensive ideas so we use TWIN machines to try and find a solution.

#### WORKING CYCLE.

Twin units are created by installing vertical plates in the lower and upper shell, this allows two machines to fit in a single unit.

Lithium bromide flows in both machines in parallel and the three water circuits flow in series. Low temperature-low pressure generator (LTG) supplies Lithium Bromide to high pressure absorber and high pressurehigh temperature generator (HTG) supplies lithium bromide to the low pressure absorber. This is because the HTG can produce a higher concentration of lithium bromide which can produce a low pressure in the absorber. The lower absorber pressure allows a lower temperature chilled water production. The LTG will supply the high pressure absorber, the LTG produces a lower concentration of LiBr but this is less important as the chilled water temperatures are higher. In a twin unit the chilled water runs from high pressure evaporator to low pressure evaporator, this gives you an effective use of the concentrations and pressures so you can produce a higher capacity with the same heat transfer area.

#### STANDARD FEATURES:

- Double shell design: the upper shell (including the condensers and the generators) and the lower shell (including the evaporators and the absorbers).
- The unique TWIN design feature helps to deliver high efficiencies with low hot water temperatures and can take higher temperature differentials (DT). The TWIN design encompasses 2 separate cycles, each working at different lithium bromide concentrations and pressures, in order to optimise the heat and mass transfer and maximize the efficiency.

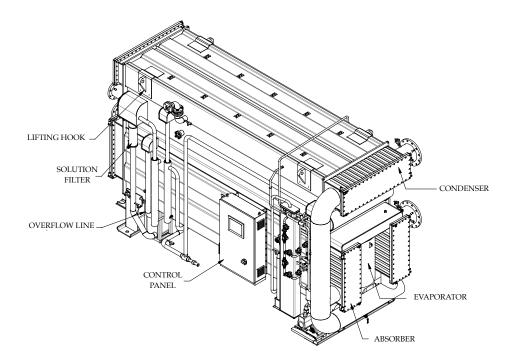
- Split absorber construction, with evaporator sandwiched between absorbers. This reduces the area to be insulated.
- Straight tubes in the generators for easy maintenance.
- Gravity feed spray technology in evaporator and absorber. Liquids are sprayed downwards on the tubes to ensure good film thickness and better heat transfer.
- Marine type headers in absorber and condenser.
- Crystallization control and prevention based on calculation of actual measured concentration.
- Refrigerant autoblowdown solenoid valve which is controlled by solution concentration
- Level electrodes for refrigerant level monitoring in the evaporator. (excluded model 5G 1A C)
- PLC based control panel SIEMENS SIMATIC S7-1200
- Alarm state annunciation through an audio signal and appropriate message display on the operator interface terminal.
- Operator panel SIEMENS TP700, 7" touchscreen.
- MODBUS RTU connectivity as a standard feature.
- Several field interlocks available for plant automation.
- Mini-finned SS 430 Ti tubes in generator
- DLP copper tubes in evaporator, absorber and condenser.
- Crystallization prevention safeties: overflow pipe for auto decrystallisation, low/high cooling water inlet temperature cut-out, high temperature control for generator, hot water control valve PLC control based on generator temperature.
- PID algorithm capable of achieving part load operation from 10 to 100% stepless, based on chilled water outlet temperature.
- Purge system, which continuously and automatically removes non condensable gases from the shell side and stores them in a tank. A purge pump is provided as standard feature.
- Two regenerative heat exchangers to increase the efficiency of the cycle. The heat exchangers are plate type, with copper brazed stainless steel plates, designed for the maximum heat exchange with minimum pressure loss. The use of a plate heat exchanger leads to a compact design of the unit.
- Isolating valves for easy removal of the pumps for maintenance without breaking the vacuum inside the chiller.
- Antifreeze protection safeties: PLC inbuilt antifreeze alarm, antifreeze thermostat, low temperature cut-out for refrigerant pump (L-cut), flow switch and D.P. switch for chilled water.
- Completely factory assembled and wired.
- Potential free contacts for remote and automatic operation of the machine: chilled, cooling and hot water pumps start/stop, cooling tower fans start/stop, remote start/stop of the machine, remote indication of machine status (on/off) and machine trip, remote setpoint.
- Rupture disk
- Digital vacuum transmitter
- Insulation of cold surfaces.
- TRG, a patented bearing monitoring system for monitoring the wear and tear of the bearings (through contacts inside control panel).
- Inverter on solution pump

#### OPTIONAL:

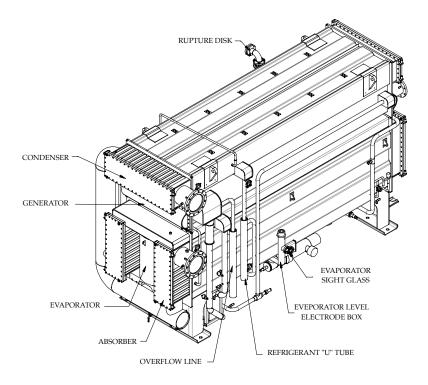
- Special metallurgy for tubes (CuNi 95/5, CuNi 90/10, Stainless steel, Titanium).
- Tubesheet and headers cladding in case of use of bad quality water not suitable for carbon steel
- On line indication of healthiness of bearings of refrigerant and solution pump (on line TRG).
- Insulation of hot surfaces.
- Two pieces shipment: unit can be shipped in two pieces to be reassembled on site.
- Profibus connection.
- Ethernet or Modbus TCP/IP connection.
- Autopurge system for automatic purging of purge tank (electric or pneumatic.



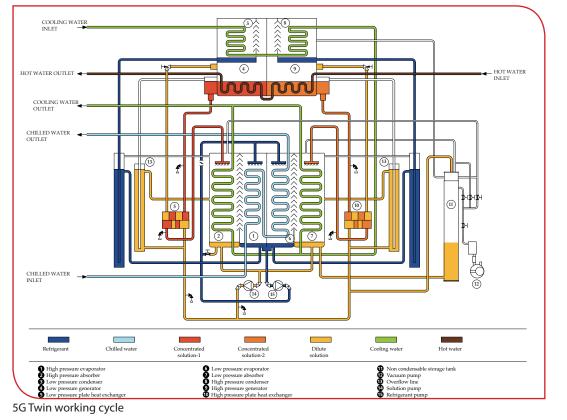
<sup>5</sup>G Twin series absorption chiller



3D view of a 5G Twin machine with main components - Control panel side view



3D view of a 5G Twin machine with main components - Rear view

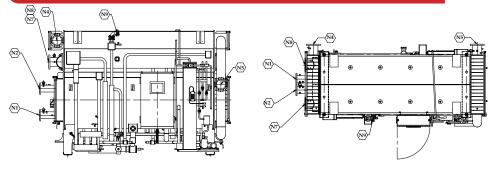


NITS	3M	4K	4L	4M	5K	5L	5M	5N	9K	9L	ЛK	72	Μ	×8	8L		8N
NN	U	U	G	5G4	2G (	5G <sup>1</sup>	565	595	G	G	U	5G.	U	5G 8	U	5G8	U

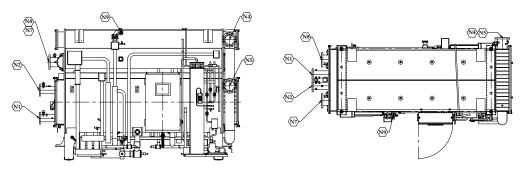
Cooling																				
capacity		kW	790	940	1059	1205	1295	1475	1625	1785	1955	2395	2625	3070	3295	3610	4120	4440	4775	5135
Chilled water	Flow	m³/h	135,5	161,2	181,6	206,7	222,1	253	278,7	306,2	335,3	410,8	450,2	526,6	565,2	619,2	706,7	761,5	819	880,7
	Connectiondiamete	erDN			150				20	00		25	50		300			35	50	
Coolingwater.	Flow	m³/h	310	358	402	463	464	556	612	556	612	940	1.038	1.040	1.117	1.232	1.516	1.603	1.516	1.603
<u>.</u>	Temperature in/out	°C	29-34	29-34,2	29-34,2	29-34,1	29-34,5	29-34,2	29-34,2	29-35,3	29-35,3	29-34	29-34	29-34,8	29-34,8	29-34,8	29-34,4	29-34,5	29-35,2	29-35,3
	Connectiondiamete	erDN			200			25	50		30	00			350			40	00	
Hot water	Flow	m³/h	89,5	107	120,8	137	147	167	184	203	223	271	299	346	372	408	465	501	540	582
	Connectiondiamete	erDN	1	50				200						250				30	00	
Dimensions	Length (L)	mm	4010	4620		4670		47	50	59	30	73	80		7390		75	20	87	70
	Width (W)	mm	1920	1920		2040		22	20	22	90	24	30		2850		31	70	31	70
	Heigth (H)	mm	2860	2860		3060		32	20	33	30	34	00		3660		39	00	39	00
Weights	Shipping weight	x1000kg	10,1	11,2	12,9	13,3	13,6	15,4	15,8	18,5	19,1	24,5	25,2	32,2	32,9	33,9	39,7	40,9	45,3	46,6
	Working weight	x1000kg	11,9	13,3	15,4	16,0	16,5	18,9	19,6	22,9	23,7	29,9	30,9	40,1	41,2	42,7	50,6	52,2	57,4	59,4
Clearance	Clearance for tube removal	mm	3700			43	00			53	40	67	00			6910			82	20
Electrical data	Solution pump	kW(A)		1,5 (5,0)	)	3,7 (	11,0)	3,7 (	11,0)	5,5 (	14,0)	6,6	(17)	4,5 (13,0)			5,5 (17)			
	Refrigerant pump kW(A) 0,3 (1,4)			)						1,5 (5,0)	)			1,5 (	5,0)					
	Vacuum pump	kW(A)								0,75	(1,8)									
	Power consumption kVA			6,9		11	,2	11	,2	13	3,4	18	3,1		15,2			18	,1	
	Power supply			415 V (±				' (±10 %), 50 Hz (±5 %), 3 Phase+N												

1) Model code: 5G XX - C low temperatue hot water fired absorption chiller, 2) Inlet/Outlet chilled water temperature = 12/7 °C, 3) Inlet/Outlet cooling water temperature = see above table, 4) Inlet/Outlet hot water temperature = 90°C/80°C, 5a) Fouling factors: chilled water and hot water - 0,018 m<sup>2</sup>K/kW, b) Fouling factor cooling water - 0,044m<sup>3</sup>K/kW, 6) Minimum chilled water outlet temperature 3,5°C; lower temperatures upon request, 7) Minimum cooling water inlet temperature 18 °C, 8) Plantroom minimum/maximum temperature 5-45 °C, 9) Maximum working pressure in water circuits = 8 bar(g); higher pressures available upon request at extra price, 10) Please contact Thermax representative/office for customised specifications.

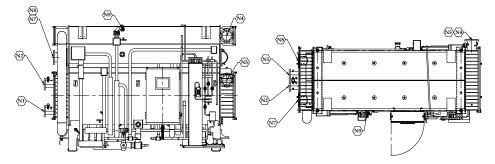




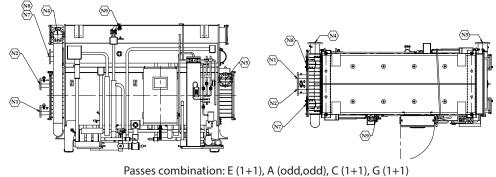
Passes combination: E (1+1), A (even, even), C (1,1), G (1+1)



Passes combination: E (1+1), A (even, even), C (1+1), G (1+1)



Passes combination: E (1+1), A (odd,odd), C (1,1), G (1+1)



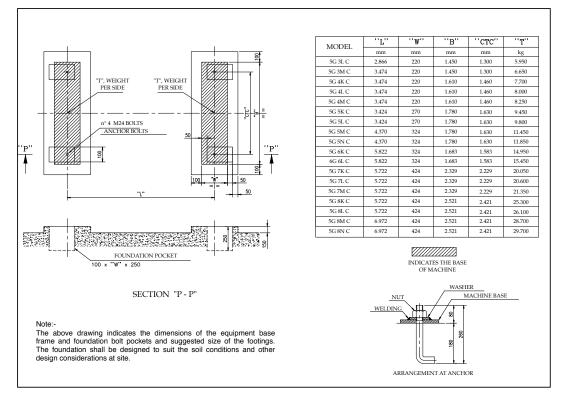
E=Evaporator, A=Absorber, C=Condenser, G=Generator

N1 = Chilled water inlet

- N3 = Chilled water drain
- N5 = Cooling water outlet
- N7 = Hot water inlet
- N9 = Rupture disk connection
- N4 =Cooling water inlet N6 = Cooling water drain

N2 = Chilled water outlet

N8 = Hot water outlet



Foundation details

#### 5G TWIN POSSIBILE APPLICATIONS:

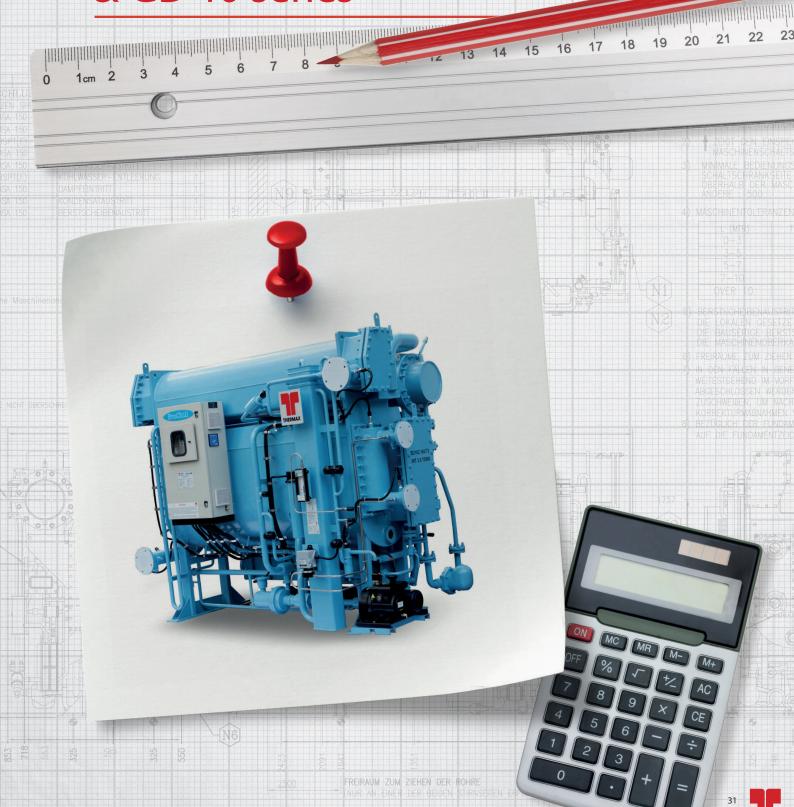
- District heating/cooling
- Cogeneration/Trigeneration
- Food industry
- Automotive industry
- Solar cooling

#### NECESSARY DATA TO PREPARE AN OFFER

- Cooling capacity required (or alternatively the available heat capacity)
- · Chilled water inlet/outlet temperatures
- Cooling water inlet/outlet temperatures
- Hot water inlet/outlet temperatures



# HD 10, SD 10, ED 10 & GD 10 series



#### 6. HD 10, SD 10, ED 10 E GD 10:

Small size double effect absorption chillers, steam fired (SD 10), superheated water fired (HD 10), exhaust gases fired (ED 10) and natural gas fired (GD 10).

The steam and superheated water fired machines are specifically designed to be used with dry saturated steam at 8 bar(g) or high temperature superheated water (180°C is the design value).

This range of machines feature compact dimensions, easy to use, easy to maintenance and one of the highest efficiency of the market.

Cooling capacity from 165 kW to 355 kW.

Superheated water inlet temperature between 155 °C and 180 °C, steam pressure between 6 bar (g) and 10 bar (g), exhaust gases inlet temperature between 350°C and 600°C.

COP: between 1,25 and 1,35

#### **STANDARD FEATURES:**

- Triple shell design: the upper shell (including condenser and low temperature generator(LTG)), the lower shell (including evaporator and the absorber) and High temperature Generator(HTG).
- Straight tubes in the HTG for easy maintenance
- Gravity feed spraying technology in evaporator and absorber. Liquids are sprayed downwards on the tubes to ensure good film thickness and better heat transfer.
- Crystallization control and prevention based on on-line determination of actual measured concentration.
- Refrigerant autoblowdown solenoid valve which controlled by solution concentration
- Level electrodes for refrigerant and solution level monitoring in the evaporator, absorber and high temperature generator.
- PLC based control panel SIEMENS SIMATIC S7-1200
- Alarm state annunciation through an audio signal and appropriate messages display on the operator interface terminal.
- Operator panel SIEMENS TP700, 7" touchscreen.
- MODBUS RTU connectivity as a standard feature.
- Several field interlocks available for plant automation.
- High temperature generator tubes in stainless steel SS430 (SD 10 and HD 10) or in boiler grade carbon steel (ED 10 and GD 10).
- DLP copper tubes in evaporator, absorber and condenser.
- All headers are Carbon steel (evaporator, absorber, condenser), fully removable from either side, for an easy access to the tube bundle. All water boxes have flanged connections.
- Hi-Low gas burner (GD 10).

• Crystallization prevention safeties: overflow pipe for auto decrystallisation, low/high cooling water inlet temperature cut-out, high temperature control for generator, steam/hot water control valve/exhaust damper PLC control based on generator temperature.

• PID algorithm capable of achieving part load operation from 10 to 100% stepless, based on chilled water outlet temperature.

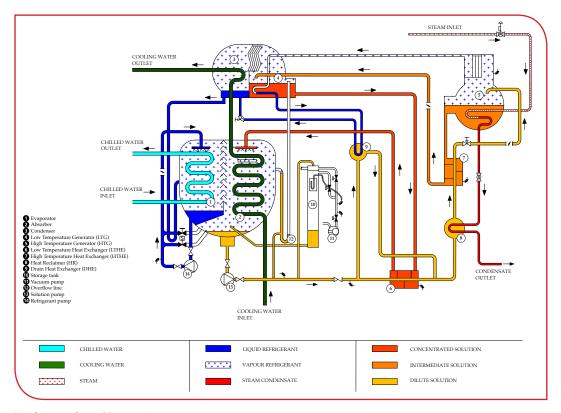
- Purge system, which continuously and automatically removes non condensable gases from the shell side and stores them in a tank. A purge pump is provided as standard feature.
- Three (HD 10, GD 10 or ED 10) or four (SD 10) regenerative heat exchanger to increase the efficiency of the cycle. The heat exchangers are plate type, with copper brazed stainless steel plates, designed for the maximum heat exchange with minimum pressure loss. The use of a plate heat exchanger ensures compact design of the unit.
- Isolating valves for easy removal of the pumps for maintenance without breaking the vacuum inside the chiller.
- Antifreeze protection safeties: PLC inbuilt antifreeze alarm, antifreeze thermostat, low temperature cut-out for refrigerant pump (L-cut), flow switch and D.P. switch for chilled water.
- Completely factory assembled and wired.
- Potential free contacts for remote and automatic operation of the machine: chilled and cooling water pumps start/stop, cooling tower fans start/stop, remote start/stop of the machine, remote indication of machine status (on/off) and machine trip, remote setpoint.
- Rupture disk
- Digital vacuum transmitter
- TRG, a patented bearing monitoring system for monitoring the wear and tear of the bearings (through contacts inside control panel)

#### OPTIONAL:

- Special metallurgy for tubes (CuNi 95/5, CuNi 90/10, Stainless steel, Titanium).
- Tubesheet and headers cladding in case of use of bad quality water not suitable for carbon steel
- On line indication of healthiness of bearings of refrigerant and solution pump (on line TRG).
- Insulation of cold and hot surfaces (excluded surfaces at T higher than 150°C).
- Three pieces shipment: unit can be shipped in three pieces to be reassembled on site: lower shell, upper shell and HTG.
- Profibus connection.
- Ethernet or Modbus TCP/IP connection.
- Autopurge system for automatic purging of purge tank (electric or pneumatic).
- Modulating burner (GD 10)



Double effect absorption chiller SD 10 series



Working cycle os SD 10 series

Working cycles of HD, ED and GD machines differ only for the HTG side, where heat source is varying. Heat reclaimer is present only in SD 10 machines.

		UNITS	SD10ACU	SD10BCU	SD10CCU
Cooling					
capacity		kW	172	267	366
Chilled water	Flow	m³/h	29,6	45,9	62,8
	Connection diameter	DN		80	
Coolingwater.	Flow	m³/h	53,5	83,0	112,4
	Connection diameter	DN		100	
Steam	Flow	kg/h	204,0	316,0	432,0
	Connection diameter (Steam)	DN		40	
	Connection diameter (Condensat	te)DN		25	
Dimensions	Length (L)	mm	2550	28	60
	Width (W)	mm	1375	15	95
	Height (H)	mm	2020	22	35
Weights	Shipping weight	x 1000 kg	3,4	3,9	4,1
	Working weight	x 1000 kg	3,7	4,4	4,6
Clearance	Clearance for tube removal	mm	2200	2500	2500
Electrical data	Solution pump	kW(A)		1,1 (3,4)	1
	Refrigerant pump	kW(A)		0,3 (1,4)	
	Vacuum pump	kW(A)	(	0,75 (1,8	)
	Power consumption	kVA		5,7	
	Power supply			(±10 %), 6), 3 Pha	

1) Model code: SD 10 X CU steam fired double effect absorption chiller, 2) Inlet/Outlet chilled water temperature = 12/7 °C, 3) Inlet/Outlet cooling water temperature = 29-34°C, 4) Steam pressure: 8 bar (g), 5,a) Fouling factors: cooling water - 0,044m<sup>2</sup> K/kW, 6) Minimum chilled water outlet temperature 3,5°C; lower temperatures upon request, 7) Minimum cooling water inlet temperature 3,0°C; and Plantroom minimum/maximum temperature 5-45 °C, 9) Maximum working pressure in water circuits = 8 bar(g); higher pressures available upon request, 10) Maximum working pressure of steam circuit 10,5 bar (g), 11) Please contact Thermax representative/office for customised specifications.

		UNITS	ED10ACU	ED10BCU	ED10CCU
Cooling					
capacity		kW	172	267	366
Chilled water	Flow	m³/h	29,6	45,9	62,8
	Connection diameter	DN		80	
Coolingwater.	Flow	m³/h	52,5	81,5	112
	Connection diameter	DN		100	
Exhaust gases	Heat input	kW	146,1	226,4	310
Dimensions	Length (L)	mm	2600	29	00
	Width (W)	mm	1850	20	25
	Height (H)	mm	2100	23	00
Weights	Shipping weight	x 1000 kg	4,1	4,5	4,7
	Working weight	x 1000 kg	4,5	5,0	5,2
Clearance	Clearance for tube removal	mm	2200	2500	2500
Electrical data	Solution pump	kW(A)		1,1 (3,4)	
	Refrigerant pump	kW(A)		0,3 (1,4)	
	Vacuum pump	kW(A)	(	),75 (1,8	)
	Power consumption	kVA		5,7	
	Power supply			(±10%), 6), 3 Pha	

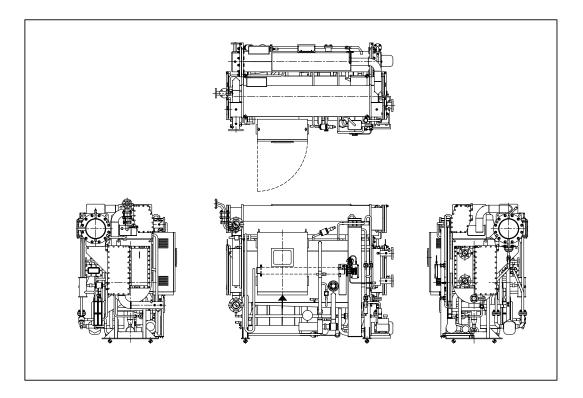
1) Model code: ED 10 X CU exhaust gases fired double effect absorption chiller, 2) Inlet/Outlet chilled water temperature = 12/7 "C, 3) Inlet/Outlet cooling water temperature = 29-34"C, 4) Exhaust gases inlet temperature between 350"C and 600"C; Minimum exhaust gases outlet temperature = 170"C, 5a) Fouling factors: chilled water - 0,018 m<sup>3</sup>K/kW, b) Fouling factors: cooling water - 0,044m<sup>3</sup>K/kW, 6) Minimum chilled water outlet temperature 3,5"C; lower temperatures upon request, 7) Minimum cooling water inlet temperature 20 "C, 8) Plantroom minimum/maximum temperature 5-45 "C, 9) Maximum working pressure in water circuits = 8 bar(g); higher pressures available upon request at extra price, 10) Please contact Thermax representative/office for customised specifications.

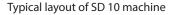
		UNITS	GDIOKON	GD10RCU	GD10CU
Cooling					
capacity		kW	172	267	366
Chilled water	Flow	m³/h	29,6	45,9	62,8
	Connection diameter	DN		80	
Coolingwater	Flow	m³/h	52,5	81,5	112
	Connection diameter	DN		100	
Gas circuit	Gas consumption	m <sub>N</sub> ³/h	14,0	21,6	29,6
	Stack connection diameter	DN	100	12	25
Dimensions	Length (L)	mm	2550	28	60
	Width (W)	mm	1800	19	85
	Height (H)	mm	2100	23	00
Weights	Shipping weight	x 1000 kg	4,0	4,4	4,6
	Working weight	x 1000 kg	4,4	4,9	5,1
Clearance	Clearance for tube removal	mm	2200	2500	2500
Electrical data	Solution pump	kW(A)		1,1 (3,4)	)
	Refrigerant pump	kW(A)		0,3 (1,4)	)
	Vacuum pump	kW(A)	(	0,75 (1,8	;)
	Burner	kW(A)		0,4 (2,6)	)
	Power consumption	kVA		7,5	
	Power supply			0%),50H Phase+	Hz(±5%), N

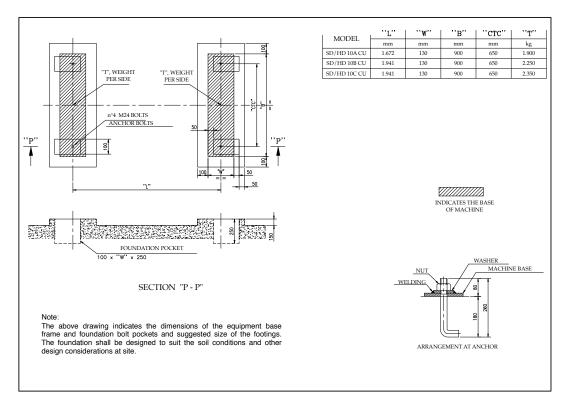
1) Model code: GD 10 X CU gas fired double effect absorption chiller, 2) Inlet/Outlet chilled water temperature = 12/37 °C, 3) Inlet/Outlet cooling water temperature = 29:34°C, 4) Gross calorific value of gas = 37.683 kJ/ Nm3, 5.a) Fouling factors: chilled water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: cooling water - 0,018 m<sup>3</sup> K/kW, b) Fouling factors: 0,018 m<sup>3</sup> K

		UNITS	HD10ACU	HD10BCU	HD100CU
Cooling					
capacity		kW	172	267	366
Chilled water	Flow	m³/h	29,6	4562	50,8
	Connection diameter	DN		80	
Coolingwater	Flow	m³/h	52,5	81,5	112
	Connection diameter	DN		100	
Superheated	Flow	m³/h	12,2	18,9	25,9
water	Connection diameter	DN		50	
Dimensions	Length (L)	mm	2550	28	60
	Width (W)	mm	1375	15	95
	Height (H)	mm	2020	22	35
Weights	Shipping weight	x 1000 kg	3,5	4,0	4,2
	Working weight	x 1000 kg	3,8	4,5	4,7
Clearance	Clearance for tube removal	mm	2200	2500	2500
Electrical data	Solution pump	kW(A)		1,1 (3,4)	)
	Refrigerant pump	kW(A)		0,3 (1,4)	)
	Vacuum pump	kW(A)	(	),75 (1,8	;)
	Power consumption	kVA		5,7	
	Power supply			0%),50H Phase+	lz(±5%), Ν

1) Model code: HD 10 X CU superheated water fired double effect absorption chiller, 2) Inlet/Outlet chilled water temperature = 1277 °C, 3) Inlet/Outlet cooling water temperature = 29-34°C, 4) Inlet/Outlet superheated water = 175/165°C, 5.a) Fouling factors: chilled water - 0.018 m<sup>3</sup> k/k/W, b) Fouling factors: cooling water - 0.044 m<sup>3</sup> k/k/W, b) Fouling factors: cooling water water outlet temperature  $3.7^{\circ}$ C, lower temperature super request, 7) Minimum cooling water inlet temperature 20 °C, 8) Plantroom minimum/maximum temperature 5-45 °C, 9) Maximum working pressure in water circuits = 8 bar(g); higher pressures available upon request at extra price, 10) Maximum working source of superheated water circuit: 10,5 bar (g), 11) Please contact Thermax representative/office for customised specifications.







Foundation details for SD10/HD 10 machines

36

#### 10 SERIES POSSIBLE APPLICATIONS:

- District heating/cooling
- Cogeneration/Trigeneration
- Food industry
- Automotive industry
- Solar cooling
- Steam from turbines discharge

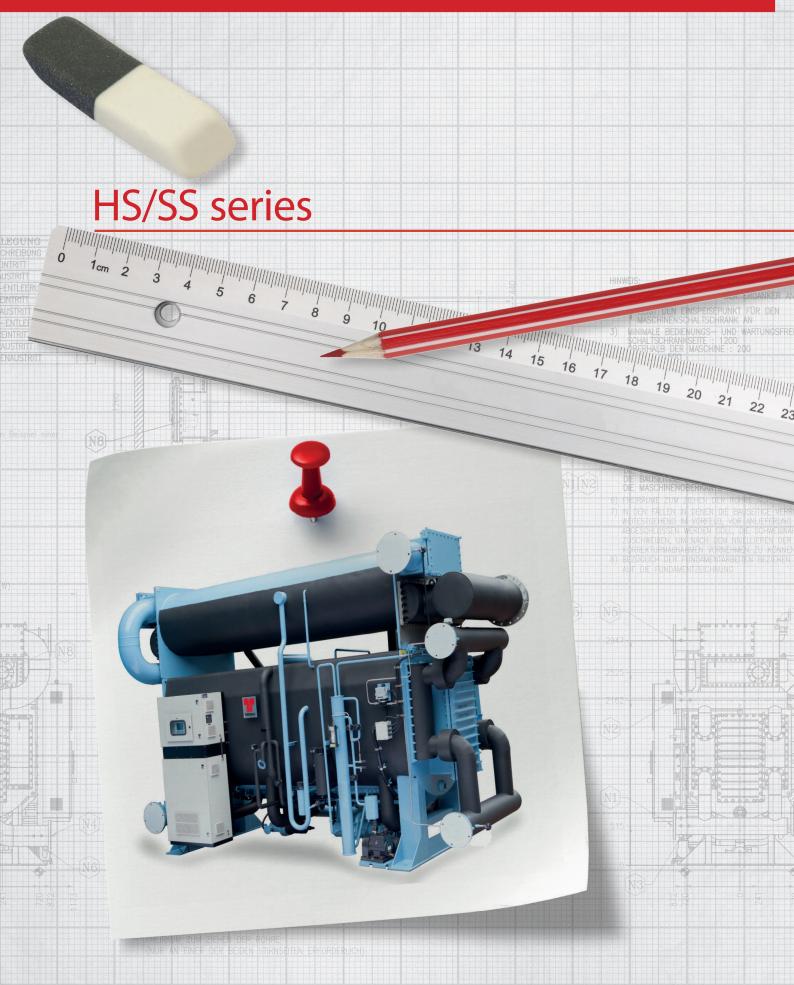
#### NECESSARY DATA TO PREPARE AN OFFER

- Cooling capacity required (or alternatively the available heat capacity)
- Chilled water inlet/outlet temperatures
- Cooling water inlet/outlet temperatures
- Superheated water inlet/outlet temperatures (HD 10)
- Available steam pressure (SD 10)
- Exhaust gases temperature and flow (ED 10)
- Allowable Pressure drop in exhaust furnace (ED 10)

	Notes
-	

11-12-2

38



7. HS/SS SERIES:

Single effect medium temperature superheated water fired (HS) or steam fired (SS) absorption chillers.

The machines are specifically designed to be used with medium temperature superheated water or with low pressure steam.

Cooling capacity from 350 kW to 7.000 kW (higher capacities available upon request).

Superheated water inlet temperature between 115 °C and 150 °C.

Steam pressure between 0,5 bar (g) and 3,5 bar (g).

Steam pressure as low as 0,2 bar (g) for special applications available upon request

COP: between 0,7 and 0,72

#### STANDARD FEATURES:

- Double shell design: the upper shell (including condenser and generator), the lower shell (including evaporator and the absorber).
- "Split" type evaporator: the evaporator is divided into two different tube bundles, placed on both sides of the absorber. This solution gives better efficiency at part load, optimizing the mass transfer inside the solution.
- Straight tubes in the generators for easy maintenance.
- Gravity feed spray technology in evaporator and absorber. Liquids are sprayed downwards on the tubes to ensure good film thickness and better heat transfer.
- Marine type headers on one side of absorber and condenser, for an easy access to the tube bundle without need of lifting systems to support the header. All water boxes have flanged connections. All water boxes are provided with drain and vent connections.
- Crystallization control and prevention based on internal calculation of actual measured concentration.
- Refrigerant autoblowdown solenoid valve controlled by solution level in absorber
- Level electrodes for refrigerant and solution level monitoring in the evaporator and absorber.
- PLC based control panel SIEMENS SIMATIC S7-1200
- Alarm state annunciation through an audio signal and appropriate messages display on the operator interface terminal.
- Operator panel SIEMENS TP700, 7" touchscreen.
- MODBUS RTU connectivity as a standard feature.
- Several field interlocks available for plant automation.
- Mini-finned SS 430 Ti tubes in generator
- DLP copper tubes in evaporator, absorber and condenser.
- Crystallization prevention safeties: overflow pipe for auto decrystallisation, low/high cooling water inlet temperature cut-out, high temperature control for generator, hot water/steam control valve PLC control based on generator temperature.

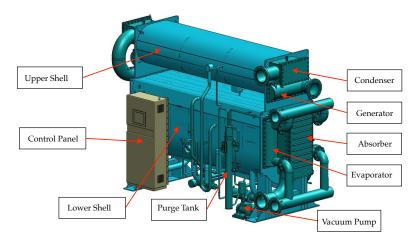
- PID algorithm capable of achieving part load operation from 10 to 100% stepless, based on chilled water outlet temperature.
- Purge system, which continuously and automatically removes non condensable gases from the shell side and stores them in a tank. A purge pump is provided as standard feature.
- Regenerative heat exchanger to increase the efficiency of the cycle. The heat exchanger is plate type, with copper brazed stainless steel plates, designed for the maximum heat exchange with minimum pressure loss. The use of a plate heat exchanger means a compact design of the unit.
- Heat reclaimer to recover heat from steam condensate (SS)
- Isolating valves for easy removal of the pumps for maintenance without breaking the vacuum inside the chiller.
- Antifreeze protection safeties: PLC inbuilt antifreeze alarm, antifreeze thermostat, low temperature cut-out for refrigerant pump (L-cut), flow switch and D.P. switch for chilled water.
- Completely factory assembled and wired.
- Potential free contacts for remote and automatic operation of the machine: chilled and cooling water pumps start/stop, cooling tower fans start/stop, remote start/stop of the machine, remote indication of machine status (on/off) and machine trip.
- Rupture disk
- Digital vacuum transmitter
- Inverter on solution pump.
- TRG, a patented bearing monitoring system for monitoring the wear and tear of the bearings (through contacts inside control panel)

#### **OPTIONAL:**

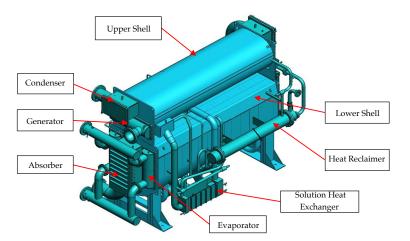
- Stand by refrigerant and solution pumps.
- Special metallurgy for tubes (CuNi 95/5, CuNi 90/10, Stainless steel, Titanium).
- Tubesheet and headers cladding in case of use of bad quality water not suitable for carbon steel
- On line indication of healthiness of bearings of refrigerant and solution pump (on line TRG).
- Insulation of cold and hot surfaces.
- Two pieces shipment: unit can be shipped in two pieces to be reassembled on site.
- Profibus connection.
- Ethernet or Modbus TCP/IP connection.
- Autopurge system for automatic purging of purge tank (electric or pneumatic).

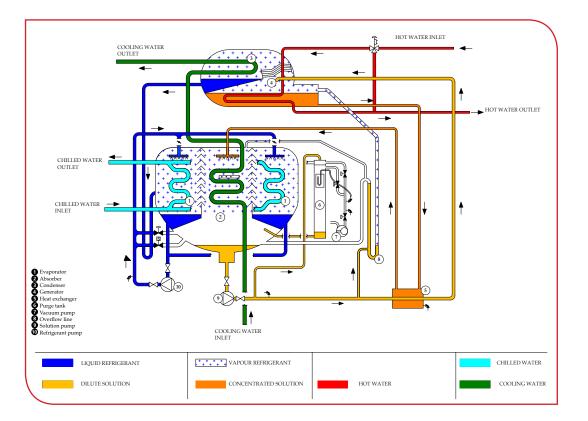


Steam fired chiller of SS series

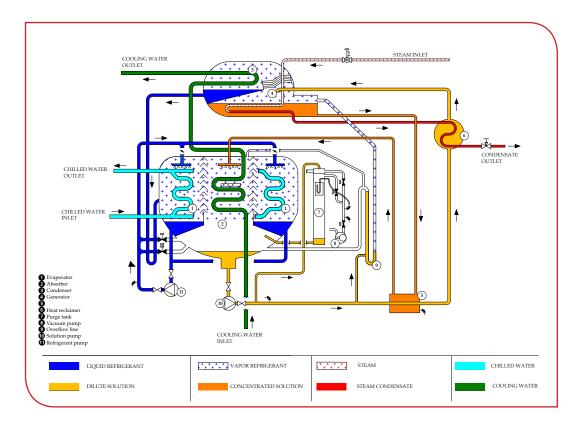


3D view of an SS machine with main components - Control panel side view





#### Working cycle of HS machine

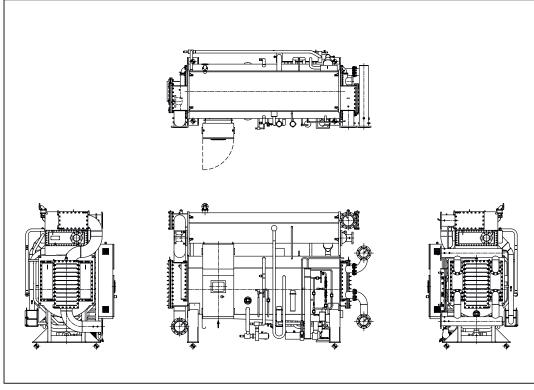


Working cycle of SS machine

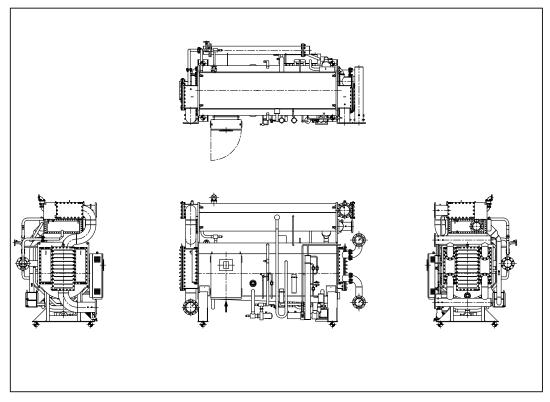
		UNITS	<b>SS20ACU</b>	SS20BCU	SS20CCU	SS20DCU	SS30ACU	SS30BCU	SS30CCU	SS40ACU	SS40BCU	SS40CCU	SS50ACU	SS50BCU	SS60ACU	SS60BCU	SS60CCU	SS60DCU	SS70ACU	SS70BCU	SS80ACU	SS80BCU	SS80CCU	SS80DCU	
Cooling																									
capacity		kW	469	563	710	850	1.025	1.150	1.370	1.550	1.755	1.920	2.180	2.280	2.705	2.995	3.305	3.660	4.192	4.670	5.195	5.690	6.680	7.200	
Chilled water	Flow	m³/h	80,4	96,6	121,8	145,8	175,8	197,2	235	265,9	301	329,3	373,9	391,1	464	513,7	566,9	627,8	719	801	891	975,9	1.146	1.235	
	Connectiondiamete	er DN		125	5			150			200		20	00		2	50		3	00		350	4	00	
Cooling	Flow	m³/h	115	139	174	210	250	281	335	377	427	469	532	555	658	729	805	894	1.030	1.140	1.260	1.390	1.645	1.762	
water.	Connectiondiamete	er DN		150				200			250			50		30				50			00		
Steam	Flow	kg/hr	1.022	1.236	1.533	1.849	2.209	2.485	2.978	3.330	3.774	4.165	4.697	4.913	5.822	6.452	7.135	7.927	9.017	10028	1112	7 12203	14436	15481	
	Connectiondiamete (Steam) Connectiondiamete		15					200			250		2	50		30	00			50		400	-	50	
	(Condensate)	DN		40	)				5	0				6	5				30			1	00		
Dimensions	Length (L)	mm	29	70	40	00	41	30	4740		4930		50	)50	65	590	78	80	79	950	8	630	98	370	
	Width (W)	mm	19	80	20	20	23	00	2325		2470		26	570	27	780	27	30	29	960		3	600		
	Height (H)	mm		283	0			2940			3325		34	100		38	25		41	90		4	690		
Weights	Shipping weight	x1000kg	4,9	5,0	5,9	6,1	7,6	7,8	8,6	10,8	11,1	11,4	13,1	13,3	19,4	19,8	22,2	22,9	29,2	29,8	38,6	39,0	43,3	43,8	
	Working weight	x1000kg	5,4	5,6	6,6	6,8	8,6	8,9	9,8	12,5	12,9	13,2	15,3	15,7	22,5	23,1	25,8	26,7	34,0	34,9	45,6	46,3	51,2	52,0	
Clearance	Clearance for tube removal	mm	26	00	36	00	37	00	4200		4250		44	100	57	700	69	00	69	900	7	000	83	800	
Electrical data	Solution pump	kW(A)	1,1 (3,4) 1,5 (			(5,0)		3,0 (8,0	)	3	,7 (11,0	))	3,7 (	11,0)	5,5 (	14,0)	6,6 (	17,0)	4,5 (	13,0)	4,5	(13,0)	5,5 (	17,0)	
dutu	Refrigerant pump	kW(A)							0,3	(1,4)										1,	,5 (5,0)	(5,0)			
	Vacuum pump	kW(A)											0,75 (1,8)												
							9,1 11,2					11	11,2 13,4 18,1					1'	5,2		15,2	18	2 1		
	Power consumptio Power supply 1) Model code: SS XXX - C - 0,018 m <sup>3</sup> K/kW, b) Foulin temperature 5-45 °C, 9) Max	U single effe	ect steam bling wat	ter - 0,044r	orption o m²·K/kW	, 6) Minii	mum chil	et chilled led water	outlet te	emperatu	415 e = 12/7 re 3,5°C;	°C, 3) Inle lower ten	%), 50 et/Outlet on perature	Hz (±5 cooling w	%) <b>, 3 P</b> vater temp equest, 7	hase+N perature = ) Minimur	29/37,5° n cooling	C 4) Stear	m pressur	re = 1,5 erature	bar (g), 5.	a) Fouling f	actors: chil	led wate	
	Power supply 1) Model code: SS XXX - C - 0,018 m <sup>2</sup> K/kW, b) Foulin	U single effe	ect steam bling wat	fired abso ter - 0,044r	orption o m²·K/kW	chiller, 2) 7, 6) Minii	mum chil	et chilled led water	outlet te	emperatu	415 e = 12/7 re 3,5°C;	°C, 3) Inle lower ten	%), 50 et/Outlet on perature	Hz (±5 cooling w	%) <b>, 3 P</b> vater temp equest, 7	hase+N perature = ) Minimur	29/37,5° n cooling	C 4) Stear	m pressur	re = 1,5 erature	bar (g), 5.	a) Fouling f	actors: chil	led wate	
	Power supply 1) Model code: SS XXX - C 0,018 m <sup>2</sup> K/kW, b) Foolin temperature 5-45 °C, 9) Max	U single effe ig factor coc imum workir	ect steam bling wat	n fired abso ter - 0,044r ire in water	orption o m <sup>2</sup> ·K/kW circuits :	chiller, 2) 7, 6) Minii = 8 bar(g)	mum chil ; higher pi	et chilled led water ressures av	outlet te vailable up	emperatui oon reque	415 e = 12/7 re 3,5°C; st at extra	°C, 3) Inle lower ten price, 10)	%), 50 et/Outlet of nperature ) Please co	Hz (±5 cooling w s upon n ontact The	%), 3 P vater temp equest, 7 ermax rep	hase+N perature = ) Minimur resentative	29/37,5° n cooling e/office fo	C 4) Stear water ir r customis	m pressur hlet temp sed specif	re = 1,5 erature ications.	bar (g), 5. 10 °C, 8)	a) Fouling f Plantroom	factors: chil minimum/i	led wate maximum	
	Power supply 1) Model code: SS XXX - C 0,018 m <sup>2</sup> K/kW, b) Foolin temperature 5-45 °C, 9) Max	U single effe ig factor coc imum workir	ect steam bling wat	n fired abso ter - 0,044r rre in water o DB CS H	orption o m <sup>2</sup> ·K/kW circuits :	chiller, 2) 7, 6) Minii = 8 bar(g)	num chil ; higher pr H	et chilled led water ressures av	HERE AND	H2404CU H2404CU	415 e = 12/7 re 3,5°C; st at extra	°C, 3) Inle lower ten a price, 10)	%), 50 et/Outlet of nperature ) Please co	Hz (±5 cooling w is upon ro ontact The DQ 05 SH	%), 3 P rater temp equest, 7 rrmax rep	hase+N perature = ) Minimur resentative	29/37,5° n cooling e/office fo	C 4) Stean water ir r customis	m pressur hlet temp sed specif	re = 1,5 erature ications.	bar (g), 5. 10 °C, 8)	a) Fouling f Plantroom	factors: chil minimum/r	led wate maximum	
Cooling	Power supply 1) Model code: SS XXX - C - 0,018 m <sup>2</sup> K/KW, b) Foulin temperature 5-45 °C, 9) Max	U single effe ig factor coc imum workin	act steam bling wat ng pressu	n fired abso ter - 0,044r re in water of DOB OCSH 563	orption of m <sup>2</sup> ·K/kW circuits = DD002SH 710	chiller, 2) ; 6) Minin = 8 bar(g) DOOCSH 850	num chil ; higher pr H	et chilled led water ressures an DBOES SH 1.150	HERE AND	H2404CU H2404CU	415 = = 12/7 re 3,5°C; st at extra D80554	°C, 3) Inle lower ten a price, 10) DOOFSH 1.920	%), 50 et/Outlet of perature Please co	Hz (±5 cooling w is upon n pontact The DB05554 2.280	%), 3 P rater temp equest, 7 rrmax rep	hase+N perature = ) Minimur resentative D2095 2.995	29/37,5° n cooling e/office fo	C 4) Stear water ir r customis DO0095H 3.660	m pressui ilet temp sed specif	re = 1,5 erature ications.	bar (g), 5. 10 °C, 8)	a) Fouling f Plantroom	factors: chil minimum/r DD SQ SQ G.6880	Ied wate maximum	
Cooling capacity	Power supply 1) Model code: SS XXX - C - 0,018 m <sup>2</sup> K/KW, b) Foulin temperature 5-45 °C, 9) Max	U single effe gg factor coc imum workir SLIN SLIN M W m <sup>3</sup> /h	Act steam oling wat ng pressu DVOZSH	n fired abso ter - 0,044r re in water of DOB OCSH 563	orption or m <sup>2</sup> -K/kW circuits = P250CCU H 710 121,8	chiller, 2) 7, 6) Minin = 8 bar(g) NDCOCSH 850 145,8	num chil ; higher pr DVOESH 1.025 175,8	et chilled led water ressures av DBOESE 1.150 197,2 150	1.370 235	nperatur pon reque nperatur nperatur nperatur nperatur n nperatur n nperatur n nperatur n nperatur n n n n n n n n n n n n n n n n n n n	415 2 = 12/7 * a = 3,5°C; st at extra OD80455 H	°C, 3) Inle lower ten price, 10) DOOFSH 1.920	%), 50 tr/Outlet on peratures Please cc DV055H 2.180 373,9 20	Hz (±5 cooling to the support of the pontact The OCCONSTINCT 2.280 391,1 00	%), 3 P rater tem; equest, 7 rrmax rep DV009SH 2.705 464	hase+N perature = ) Minimur resentative 2.995 513,7 2!	3.305 566,9	C 4) Stear water ir customis DO00951 3.660 627,8	m pressum nlet temp sed specif OUCCSH 4.192 719 31	re = 1,5 ications. DB025H 4.670 801 00	bar (g), 5. 10 °C, 8)	a) Fouling f Plantroom	iactors: chil minimum/r DD00894 6.680 1.146 4	led water maximum 7.200 1.235 00	
Cooling capacity Chilled water Cooling	Power supply 1) Model code: SS XXX - C - 0,018 m <sup>2</sup> K/KW, b) Foulin temperature 5-45 °C, 9) Max Flow Connectiondiamete Flow	LU single effe ing factor coc imum workin SLIN KW m <sup>3</sup> /h er DN m <sup>3</sup> /h	Act steam oling wat ng pressu DVOZSH	n fired abso ter - 0,044r re in water of 000 000 000 000 000 000 000 000 000 0	710 717 710 717 717 710	chiller, 2) ; 6) Minin = 8 bar(g) DOOCSH 850	num chil ; higher pr DYOESH 1.025	et chilled led water ressures at 0000 0000 0000 0000 0000 0000 0000 0	1.370	nperatur pon reque nperatur nperatur nperatur nperatur n nperatur n nperatur n nperatur n nperatur n n n n n n n n n n n n n n n n n n n	415 = 12/7 = 3,5°C; st at extra 000000000000000000000000000000000000	°C, 3) Inle lower ten price, 10) DOOFSH 1.920	%), 50 tr/Outlet of preature Please cc 2.180 373,9 20 536	Hz (±5 cooling w s upon the pontact The 2.280 391,1 00 559	%), 3 P rater temp equest, 7 ermax rep DV09SH 2.705	hase+N berature = ) Minimur resentative 2.995 513,7 22 738	3.305 566,9 815	C 4) Stear water ir r customis DO0095H 3.660	n pressui het temp sed specif 0000254 4.192 719 30 1.030	re = 1,5 ications. 00 1.148	bar (g), 5. 10 °C, 8)	a) Fouling f Plantroom 2 5 5.690 975,9 350 3 1.394	factors: chil minimum/r 6.680 1.146 44 1.645	led water maximum 7.200 1.235 00	
Cooling capacity Chilled water Cooling water.	Power supply 1) Model code: SS XXX - C - 0,018 m <sup>2</sup> K/kW, b) Foulin temperature 5-45 °C, 9) Max Flow Connectiondiamete Flow Connectiondiamete	LU single effe ing factor coor imum workin SEINO kW m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN	ACC steam oling wat og pressu ACC Steam ACC ST	n fired abso ter - 0,044r re in water DB 000 000 000 000 000 000 000 000 000	710 121,8 5 176 0	chiller, 2) , 6) Minii = 8 bar(g) 0000000 0000000 000000 000000 000000	1.025 175,8	et chilled led water ressures av 000000000000000000000000000000000000	1.370 235 342	1.550 265,9 382	415 = 12/7 = 3,5°C; st at extra 0000 432 250	<sup>c</sup> C, 3) Inle lower ten price, 10 000059 1.920 329,3 474	%), 50 tr/Outlet of preature Please co 2.180 373,9 20 536 2.1	Hz (±5 cooling w s upon m ontact The 2.280 391,1 00 559 50	%), 3 P rater tem, equest, 7 ermax rep DV09SH 2.705 464 664	hase+N perature = ) Minimur resentative 2.995 513,7 2! 738 3(	29/37,5° n cooling e/office fo 3,305 566,9 50 815	C 4) Stean water in r customis DO00951 3.660 627,8 904	n pressui hlet temp sed specif 4.192 719 30 1.030 3.	re = 1,5 rerature ications. 000 1.148 50	bar (g), 5. 10 °C, 8) DY00000 0 5.199 891 891 891	a) Fouling f Plantroom 5 5.690 975,9 350 3 1.394 4	factors: chil minimum/r 000 6.680 1.146 44 1.645	1ed wate maximum 7.200 1.235 00 1.768	
Cooling capacity Chilled water Cooling water. Superheated	Power supply 1) Model code: SS XXX - C - 0,018 m <sup>2</sup> K/kW, b) Foulin temperature 5-45 °C, 9) Max Flow Connectiondiamete Flow Connectiondiamete Flow	LU single effe ing factor coor imum workin SLIN kW m <sup>3</sup> /h er DN m <sup>3</sup> /h m <sup>3</sup> /h	Act steam bling wat ng pressu NDV07 CSH 469 80,4	n fired abso frer - 0,044r re in water of 0000000 563 96,6 125 140 150 37,2	7110 121,8 5 176 0 46,8	chiller, 2) 7, 6) Minin = 8 bar(g) NDCOCSH 850 145,8	num chil ; higher pr DVOESH 1.025 175,8	et chilled led water ressures av 000000 SH 1.150 197,2 150 284 200 75,2	1.370 235	1.550 265,9 382	415 e = 12/7 3.5°C; st at extra 1.755 301 200 432 250 1114,4	<sup>c</sup> C, 3) Inle lower ten price, 10 000059 1.920 329,3 474	%), 50 et/Outlet of perature Please cc 2.180 373,9 20 536 2! 142,4	Hz (±5 cooling w is upon n ontact The 2,280 391,1 00 559 50 149,3	%), 3 P rater tem, equest, 7 ermax rep DV09SH 2.705 464 664	hase+h ) Minimur resentative 2.995 513,7 22 738 30 196,1	29/37,5° n cooling no cooling //office fo 3,305 566,9 815 500 217,4	C 4) Stean water in r customis DO00951 3.660 627,8 904	m pressui let temp eed specif 4.192 719 3.0 1.030 3. 273,3	re = 1,5 rererature ications. 4.670 801 00 1.148 50 304,4	bar (g), 5. 10 °C, 8)	a) Fouling f Plantroom f 2000 2000 2000 2000 2000 2000 2000 20	factors: chill minimum/r 000 1.146 44 1.645 400 436,4	led water maximum 900 99 7.200 1.235 00 1.768 469,5	
Cooling capacity Chilled water Cooling water. Superheated water	Power supply I) Model code: S5 XXX - C O,018 m <sup>2</sup> K/KW, b) Foulin temperature 5-45 °C, 9) Max Flow Connectiondiametee Flow Connectiondiametee Flow Connectiondiametee	U single effect ig factor coc imum workin SLIN kW m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h	DV025H	n fired abso fer - 0,044r re in water of 000000000000000000000000000000000000	710 121,8 5 176 0 46,8 0	chiller, 2) 6 () Minini 8 bar(g) 8 500 145,8 210 56	1.025 175,8 252 67,1	et chilled led water essures av 000000000000000000000000000000000000	outlet te vailable up 1.370 235 342 90,4	1.550 265,9 382	415 = 12/7 = 3,5°C; st at extra 000 1.755 301 200 432 250 114,4 250	<sup>c</sup> C, 3) Inle lower ten price, 10 000059 1.920 329,3 474	9(6), 500 et/Outlet of PPlease cc 2.1800 373,9 201 536 2.11 142,4 2.12 142,4	Hz (±5 cooling w s upon n nntact The 2.280 391,1 00 559 50 149,3 50	%), 3 P ( ater tem; equest, 7 mmax rep 2.705 464 664 176,4	hase+h beerature = Minimum 2.995 513,7 22 738 30 196,1 31	229/37,5° n cooling /office fo 3.305 566,9 815 500 217,4 20	C 4) Steaa water ir customit 3.660 627,8 904 240,8	m pressui let temp ed specif 4.192 719 30 1.030 3 2773,3 3	Part of the second seco	bar (g), 5. 7 (g), 5. 10 °C, 8) (g) 5. 19! (g) 5. 19! (g) 5. 19! (g) 6 (g) 7 (g) 7 (	a) Fouling f Plantroom 5 5.690 975,9 350 3 1.394 43 370,1 400	actors: chil minimum/r 6.680 1.146 44 1.645 400 436,4 4.	led water maximum 7.2000 1.235 000 1.768 469,5 50	
Cooling capacity Chilled water Cooling water. Superheated	Power supply I) Model code: SS XXX - C O(D18 m <sup>2</sup> K/KW, b) Foulin temperature 5-45 °C, 9) Max Flow Connectiondiametee Flow Connectiondiametee Flow Connectiondiametee Length (L)	U single effe ing factor coc imum workin SLIN kW m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h	CDV0025H 469 80,4 1116 31	n fired abso frer - 0,044r re in water of 000000000000000000000000000000000000	710 121,8 5 46,8 0 40	chiller, 2) , 6) Minii = 8 bar(g) DOQCSH 8500 145,8 2100 566 000	DV000000000000000000000000000000000000	et chilled led water essures av 1.150 197,2 150 284 200 75,2 200 30	outlet to the value of the valu	1.550 265,9 382	415 = 12/7 = 3,5°C; st at extra DB0P54 1.755 301 200 432 250 114,4 250 4930	<sup>c</sup> C, 3) Inle lower ten price, 10 000059 1.920 329,3 474	9(6), 500 tt/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet 2.1802.180373,92.180373,92.180142,42.12,50	Hz (±5 cooling w work of the second s	%), 3 P (%),	Aase+N aserature = Minimum Seesentative 2.995 513,7 2.9 738 3( 196,1 3( 3)90	29/37,5° n cooling /office fo 3.305 566,9 815 00 217,4 00 78	C 4) Steaa water ir customic customic 3.660 627,8 904 240,8 80	m pressul m pressul ed specific 4.192 719 3.1 1.030 3.3 273,3 3.3 75	re = 1,5 erature ications. 4.670 801 00 1.148 50 304,4 50 550	bar (g), 5. 7 (g), 5. 10 °C, 8) (g) 5. 19! (g) 5. 19! (g) 5. 19! (g) 6 (g) 7 (g) 7 (	a) Fouling f Plantroom 5 5.690 975,9 350 3 1.394 400 4630	actors: chill minimum/r 6.680 1.146 4. 1.645 400 436,4 4. 98	led water maximum 900 99 7.200 1.235 00 1.768 469,5	
Cooling capacity Chilled water Cooling water. Superheated water	Power supply 1) Model code: SS XXX - C - 0,018 m <sup>2</sup> K/KW, b) Foulin temperature 5-45 °C, 9) Max Flow Connectiondiametee Flow Connectiondiametee Flow Connectiondiametee Flow Connectiondiametee Flow Connectiondiametee Flow Connectiondiametee Flow Connectiondiametee Flow Connectiondiametee Flow Connectiondiametee Flow Connectiondiametee Flow	LU single effe ing factor coc imum workin LU single effect imum workin LU single effect imum workin kW m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h	CDV0025H 469 80,4 1116 31	n fired abso her - 0,044r re in water of 000000000000000000000000000000000000	7110 121,8 5 176 0 46,8 0 40 20	chiller, 2) 6) Minini 8 bar(g) 000254 8550 145,8 210 56	DV000000000000000000000000000000000000	et chilled led water essures av 1.150 197,2 150 284 200 75,2 200 30 00	outlet te vailable up 1.370 235 342 90,4	1.550 265,9 382	415 = 12/7 e 3,5°C; st at extra 1.755 301 200 432 250 114,4 250 4930 2470	<sup>c</sup> C, 3) Inle lower ten price, 10 000059 1.920 329,3 474	9(6), 500 tr/Outlet ct/Pietater Prease cc 2.180 3773,9 2.12 536 2.21 142,4 2.22 500 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 2.61 	Hz (±5 cooling w work of the second s	%), 3 P (%),	hase+hN serature = ) Minimum essentative 2.995 513,7 2.9 738 30 196,1 30 590 *80	29/37,5° m cooling /office fo 33.305 566,9 815 20 217,4 20 78 27	C 4) Steaa water ir customic customic 3.660 627,8 904 240,8 80	m pressus more specific more s	re = 1,5 erature lcations. 4.6700 801 00 1.1148 50 304,4 50 550 960	bar (g), 5. 7 (g), 5. 10 °C, 8) (g) 5. 19! (g) 5. 19! (g) 5. 19! (g) 6 (g) 7 (g) 7 (	a) Fouling f Plantroom 5 5.690 975,9 3 1.394 4 3 370,1 400 633	actors: chill minimum/ 6.680 1.146 44 1.645 400 436,4 436,4 436,4 436,4 436,4	led water maximum 7.2000 1.235 000 1.768 469,5 50	
Cooling capacity Chilled water Cooling water. Superheated water Dimensions	Power supply 1) Model code: SS XXX - C - 0,018 m <sup>2</sup> K/kW, b) Foulin temperature 5-45 °C, 9) Max Flow Connectiondiametee Flow Connectiondiametee Flow Connectiondiametee Length (L) Width (W) Height (H)	kW m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h mm mm	CDF002SH 469 80,4 1116 31 29 19	n fired abso ter - 0,044r re in water DB 000 000 000 000 000 000 000 000 000	710 710 121,8 5 176 0 46,8 0 40 20 60	chiller, 2) , 6) Miniti 8 bar(g) 000 210 20 20	Devo Est 1.025 252 67,1 41	et chilled led water essures av 1.150 197,2 150 284 200 75,2 200 30 00 2940	outlet te transmission outlet te transmissio	DP0059	415 = 127 re 3,5°C; st at extra 1.755 301 1.755 301 200 432 250 114,4 250 4930 2470 3325	C, 3) Inleidoure tenero (1000) DO00994 1.9200 329,3 474 126,2	96), 50 tr(Outlet et pperature Prease cc 2.180 373,9 24 536 2: 142,4 2: 500 26 34	Hz (±5 cooling w signed for the signal sector of th	%), 3 P ater temperature temp	hase+hN perature = ) Minimum essentative 2.995 513,7 2.9 738 3( 196,1 3( 390 *80 38	22/37,5° m cooling /office for 3.305 566,9 3 3 3 5 5 6 0 217,4 00 7 8 27 25	C 4) Steam water in customic customic 3.660 627,8 904 240,8 80 30	m pressure het temp ed specif 4.192 719 3/ 1.030 3. 273,3 3. 79 229 4.1	re = 1.5 ererature lications. 4.670 801 00 1.148 50 304,4 50 50 90	bar (g), 5, 19 0 (c, 8) 0 5, 19 891 3 1,264 4 337, 7 8 2 2 2 2 2 3 3 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3	a) Fouling f Plantroom 5 5.690 975,9 3 1.394 400 40 3 370,1 400 3 370,1 400 3 370,1 400 3 4	actors: chil minimum/i 6.680 1.146 44 1.645 100 436,4 436,4 436,4 436,4 436,4 436,4	led water maximum 7.2000 1.2355 000 1.768 469,5 50 370	
Cooling capacity Chilled water Cooling water. Superheated water Dimensions	Power supply 1) Model code: SS XXX - C - 0,018 m <sup>2</sup> K/KW, b) Foulin temperature 5-45 °C, 9) Max Flow Connectiondiameter Flow Connectiondiameter Flow Connectiondiameter Length (L) Width (W) Height (H) Shipping weight	U single effect ig factor coc imum workir SLIN kW m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN mm mm mm x1000kg	Act steam ping pressu POV075H 469 80,4 1116 31 29 19 4,9	n fired abso fer - 0,044r re in water of 000000000000000000000000000000000000	710 710 121,8 5 176 0 46,8 0 40 20 5,9	chiller, 2) 6) Minini 8 bar(g) 000 145,8 210 56 000 120 6,1	Devoces 1.025 175,8 252 67,1 411 23 7,6	et chilled led water essures av 1.150 197,2 150 284 200 75,2 200 30 00 2940 7,8	outlet te transmission DOCESS 1.370 2355 3422 90,4 4740 2325 8,6	mperature 2007 reque 1.550 265,9 382 101,3 101,3 10,8	415 = 127 = 3,5°C; st at extra 200 432 250 114,4 250 4930 2470 3325 11,1	C, 3) Inle lower ten price, 10 1.920 329,3 474 126,2 11,4	9(6), 500 tt/Outlet <0 PPlease cc 2.180 373,9 2.0 536 2.2 142,4 2.2 500 2.6 3.4 13,1	Hz (±5 cooling w s upon n nntact The 2.280 391,1 00 559 50 149,3 50 50 50 50 50 149,3 70 100 13,3	%), 3 P (%),	hase+h Minimum Minimum 2.995 513,7 22 738 33 196,1 33 390 780 388 19,8	22)73,5° m cooling office for 3.305 566,9 815 500 217,4 00 78 27 25 22,2	C 4) Stead water in customic customic 3.660 627,8 904 240,8 80 30 222,9	m pressui pressui ed specif 4.192 719 30 1.030 3. 273,3 3. 75 259 41 29,2	re = 1,5 erature ications. 4.6700 8011 00 1.1482 50 304,4 50 50 90 90 29,8	bar (g), 5, 7 VOSS VOSS 891 3 1,268 4 337,8 6 6 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268 1,268	a) Fouling f Plantroom 5 5.690 975,9 350 3 1.394 400 403 370,1 40 3 370,1 40 3 370,1 40 3 370,1	actors: chill minimum/r 6.680 1.146 4. 1.645 000 436,4 4. 98 600 690 43,3	led wate maximum 7.2000 1.235 00 1.768 469,5 50 370	
Cooling capacity Chilled water Cooling water. Superheated water Dimensions	Power supply 1) Model code: SS XXX - C - 0,018 m <sup>2</sup> K/kW, b) Foulin temperature 5-45 °C, 9) Max Flow Connectiondiametee Flow Connectiondiametee Flow Connectiondiametee Length (L) Width (W) Height (H) Shipping weight Clearance for tube	LU single effer ing factor coor imum workin SEL KW m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h xlouokg xlouokg	Act steam ping pressu POV075H 469 80,4 1116 31 29 19 4,9	n fired abso her - 0,044r re in water 00000 563 96,6 125 140 150 37,2 150 37,2 150 37,2 150 37,2 150 37,2 150 37,2 5,0	710 121,8 5 176 0 46,8 0 40 20 6,6	chiller, 2) , 6) Miniti 8 bar(g) 000 210 20 20	Devocsed 1.025 175,8 252 67,1 411 23 7,6 8,6	et chilled led water essures av 1.150 197,2 150 284 200 75,2 200 30 00 2940	outlet te transmission outlet te transmissio	DP0059	415 = 127 re 3,5°C; st at extra 1.755 301 1.755 301 200 432 250 114,4 250 4930 2470 3325	C, 3) Inle lower ten price, 10 1.920 329,3 474 126,2 11,4	96), 500 tr/Outlet ac PPease cc 2.180 373,9 2.180 373,9 2.12 536 2.21 142,4 2.22 500 2.66 3.44 13,1 15,3	Hz (±5 cooling w signed for the signal sector of th	%), 3 P P atter tem, 1, 2, 2, 5 P atter tem, 1, 2, 2,	hase+hN perature = ) Minimum essentative 2.995 513,7 2.9 738 3( 196,1 3( 390 *80 38	29/37,5° m cooling /office for 3,305 566,9 30 815 20 217,4 20 78 27 25 22,2 25,8	C 4) Stead water in customic customic 3.660 627,8 904 240,8 80 30 222,9	m pressus het temp ed specif 4.192 719 3.0 1.030 3. 273,3 3. 79 225 4.11 29,2 34,0	re = 1,5 erature ications. 4.6700 8011 00 1.1482 50 304,4 50 50 90 90 29,8	bar (g), 5, 7	a) Fouling f Plantroom 5 5.690 975,9 350 3 1.394 400 403 370,1 40 3 370,1 40 3 370,1 40 3 370,1	actors: chil minimum/ 6.6800 1.146 44 1.645 400 436,4 4.98 600 690 43,3 51,2	led wate maximun 7.200 1.235 000 1.768 469,5 50 370	
Cooling capacity Chilled water Cooling water. Superheated water Dimensions Weights Clearance	Power supply 1) Model code: SS XXX - C - 0,018 m <sup>2</sup> K/kW, b) Foulin temperature 5-45 °C, 9) Max Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Length (L) Width (W) Height (H) Shipping weight Clearance for tube removal	LU single effector coci imum workin LU single factor coci imum workin kW m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN mm mm mm x1000kg x1000kg	CDV0025H 469 80,4 1116 31 29 19 4,9 5,4	n fired abso ter - 0,044r re in water of 000 000 004 000 004 000 000 000 000 100 000 0	Protion of 0000000000000000000000000000000000	chiller, 2) ( 6) Minii 8 8 bar(g) 8 850 145,8 210 566 200 20 6,1 6,8	Devery and the second s	et chilled led water essures av 1.150 197,2 150 284 200 75,2 200 30 00 2940 7,8 8,9	outlet te transmission Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Construction Constr	mperature D00059 1.550 265,9 101,3 101,3 101,3 10,8 12,5 10,8 12,5	415 = 12/7 = 3,5°C; st at extra 1.755 301 200 432 250 114,4 250 4930 2470 3325 11,1 12,9	C, 3) Inle lower ten price, 10 1.920 329,3 474 126,2 111,4 13,2	96), 50 PPease cc PPease cc 2.180 373,9 2.18 142,4 2.18 142,4 2.18 142,4 13,1 15,3 44	Hz (±5 cooling w work of the second s	%), 3 P ater temperature equest, 7 7 2.705 464 664 176,4 655 277 19,4 22,5 57	hase+hN perature = ) Minimum essentative 2.9955 513,7 2.9 738 30 196,1 30 590 80 38 19,8 19,8 23,1	29/37,5° m cooling /office for 3,305 566,9 30 815 20 217,4 20 78 27 25 22,2 25,8	C 4) Stease water in customiz customiz customiz 3.660 627,8 904 240,8 80 30 22,9 26,7 00	m pressure het temp edspecif 4.192 719 3.0 273,3 3.3 273,3 3.3 273,3 3.3 279,2 29,2 34,0 65	re = 1,5 erature lcations. 4.670 801 4.670 801 1.148 50 50 90 90 29,8 34,9	Der (g), 5, 7 10 °C, 8) 20 5, 19 °C, 8 20 5, 19 °C 891 3891 4 337, 8 4 337, 8 5 7 38, 6 4 5, 6 7	a) Fouling f Plantroom 5 5.690 975,9 3 1.394 43 370,1 400 4630 34 39,0 46,3	actors: chil minimum/i 6.680 1.146 4.4 1.645 600 436,4 436,4 43,3 51,2 83	led wateu maximum 7.2000 1.2355 00 1.768 469,55 50 443,8 52,0	
Cooling capacity Chilled water Cooling water. Superheated water Dimensions Weights Clearance	Power supply 1) Model code: SS XXX - C - 0,018 m <sup>2</sup> K/kW, b) Foulin temperature 5-45 °C, 9) Max Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Length (L) Width (W) Height (H) Shipping weight Clearance for tube removal Solution pump	LU single effer ing factor coor imum workin LU single effer ing factor coor imum workin kW m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN mm mm x1000kg mm	CDV02SH 469 80,4 1116 31 4,9 5,4 26	n fired abso ter - 0,044r re in water of 000 000 004 000 004 000 000 000 000 100 000 0	Protion of 0000000000000000000000000000000000	chiller, 2) , 6) Miniti 8 bar(g) 850 145,8 210 56 00 20 6,1 6,8 00	Devery and the second s	et chilled led water essures at 1.150 197,2 150 284 200 75,2 200 30 00 2940 7,8 8,9 00	outlet te transmission of the second	mperature D00059 1.550 265,9 101,3 101,3 101,3 10,8 12,5 10,8 12,5	415 = 127 35°C, 300 1.755 301 200 4322 250 1114,4 250 4930 2470 33255 11,1 12,9 4250	C, 3) Inle lower ten price, 10 1,920 329,3 474 126,2 111,4 13,2	96), 50 PPease cc PPease cc 2.180 373,9 2.18 142,4 2.18 142,4 2.18 142,4 13,1 15,3 44	Hz (±5 cooling w work of the second s	%), 3 P ater temperature equest, 7 7 2.705 464 664 176,4 655 277 19,4 22,5 57	hase+h perature = ) Minimum essentative 2.995 513,7 22 738 3( 196,1 30 90 880 388 19,8 23,1 10,8 23,1	29/37,5° m cooling /office for 3.305 566,9 3.305 200 217,4 00 78 227 22,2 22,8 69	C 4) Stease water in customiz customiz customiz 3.660 627,8 904 240,8 80 30 22,9 26,7 00	m pressure het temp edspecif 4.192 719 3.0 273,3 3.3 273,3 3.3 273,3 3.3 279,2 29,2 34,0 65	re = 1.5 erature lcations. 4.670 801 00 1.148 50 304,4 50 50 90 29,8 34,9 90 200 113,0)	Der (g), 5, 7 10 °C, 8) 20 5, 19 °C, 8 20 5, 19 °C 891 3891 4 337, 8 4 337, 8 5 7 38, 6 4 5, 6 7	a) Fouling f Plantroom 5 5.690 975,9 350 3 1.394 400 3370,1 400 339,0 46,3 39,0 46,3	actors: chil minimum/i 6.680 1.146 4.4 1.645 600 436,4 436,4 43,3 51,2 83	led water maximum 7.2000 1.235 00 1.768 469,5 50 370 43,8 52,0 00	
Cooling capacity Chilled water Cooling water. Superheated water Dimensions Weights Clearance Electrical	Power supply 1) Model code: SS XXX - C - 0,018 m <sup>2</sup> K/kW, b) Foulin temperature 5-45 °C, 9) Max Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Length (L) Width (W) Height (H) Shipping weight Clearance for tube removal Solution pump	LU single effor ing factor cool imum workin ELUIN kW m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN mm mm mm x1000kg x1000kg mm kW(A)	CDV02SH 469 80,4 1116 31 4,9 5,4 26	n fired abso ter - 0,044r re in water of 000 000 004 000 004 000 000 000 000 100 000 0	Protion of 0000000000000000000000000000000000	chiller, 2) , 6) Miniti 8 bar(g) 850 145,8 210 56 00 20 6,1 6,8 00	Devery and the second s	et chilled led water essures at 1.150 197,2 150 284 200 75,2 200 30 00 2940 7,8 8,9 00	outlet te transmission of the second	Deperturn of the second	415 = 127 35°C, 300 1.755 301 200 4322 250 1114,4 250 4930 2470 33255 11,1 12,9 4250	C, 3) Inle lower ten price, 10 1,920 329,3 474 126,2 111,4 13,2	96), 500 tr/Outlet  tr/Outlet ct/Outlet  tr/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct/Outlet ct	Hz (±5 cooling w work of the second s	%), 3 P ater temperature equest, 7 7 2.705 464 664 176,4 655 277 19,4 22,5 57	hase+h perature = ) Minimum essentative 2.995 513,7 22 738 3( 196,1 30 90 880 388 19,8 23,1 10,8 23,1	29/37,5° m cooling /office for 3.305 566,9 3.305 200 217,4 00 78 227 22,2 22,8 69	C 4) Stease water in customiz customiz customiz 3.660 627,8 904 240,8 80 30 22,9 26,7 00	m pressure het temp edspecif 4.192 719 3.0 273,3 3.3 273,3 3.3 273,3 3.3 279,2 29,2 34,0 65	re = 1.5 erature lcations. 4.670 801 00 1.148 50 304,4 50 50 90 29,8 34,9 90 200 113,0)	bar (g), 5, 7 10 °C, 8) 20 5, 199 891 3 1, 264 3 337, 4 3 337, 4 4 337, 4 5 7 4 45,6 7 7	a) Fouling f Plantroom 5 5.690 975,9 350 3 1.394 400 3370,1 400 339,0 46,3 39,0 46,3	actors: chil minimum/i 6.680 1.146 4.4 1.645 600 436,4 436,4 43,3 51,2 83	led water maximum 7.2000 1.235 00 1.768 469,5 50 370 43,8 52,0 00	
Cooling capacity Chilled water Cooling water. Superheated water Dimensions Weights Clearance Electrical	Power supply 1) Model code: SS XXX - C 0,018 m <sup>2</sup> K/KW, b) Foulin temperature 5-45 °C, 9) Max Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete Flow Connectiondiamete	LU single effor ing factor coor imum workin KW m <sup>3</sup> /h er DN m <sup>3</sup> /h er DN kW(A) kW(A) kW(A)	CDV07CSH 469 80,4 1116 31 29 19 5,4 26 1,111	n fired abso ter - 0,044r re in water of 000 000 004 000 004 000 000 000 000 100 000 0	Protion of m <sup>2</sup> K/kW (circuits - 710 121,8 5 176 0 46,8 0 46,8 0 40 200 5,9 6,6 366 1,5	chiller, 2) , 6) Miniti 8 bar(g) 850 145,8 210 56 00 20 6,1 6,8 00	Devery and the second s	et chilled led water essures at 1.150 197,2 150 284 200 75,2 200 30 00 2940 7,8 8,9 00	outlet te transmission of the second	Deperturn of the second	415 = 12/7 = 3,5°C; st at extra 200 432 250 114,4 250 4930 22470 3325 11,1 12,9 4250 ,7 (11,0 11,2	C, 3) Inle lower ten price, 10 1.920 329,3 474 126,2 111,4 13,2	96), 50 tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Outlet tr/Ou	Hz (±5 cooling w with a second	%), 3 P %), 3 P %), 3 P %), 3 P %), 4 %), 3 P %), 4 %),	hase+h perature = ) Minimum essentative 2.995 513,7 22 738 3( 196,1 30 90 880 388 19,8 23,1 10,8 23,1	29/37,5° m cooling /office for 3.305 566,9 815 300 217,4 300 78 27 25 22,2 25,8 69 6,6 ( 9 6,6 (	C 4) Stease water in customic customic customic 3.660 627,8 904 240,8 80 30 22,9 26,7 00 17,0)	m pressure het temp edespecif 4.192 719 30 1.030 3. 273,3 3. 3. 799 225 411 29,2 34,0 65 4,5 (	re = 1.5 erature lcations. 4.670 801 00 1.148 50 304,4 50 50 90 29,8 34,9 90 200 113,0)	Der (g), 5, 191 0 °C, 8) 0 5, 191 891 1 0 °C, 8) 891 1 0 °C, 8) 1 0 °C, 8) 891 1 0 °C, 8) 1 0 °C, 8)	a) Fouling f Plantroom 5 5.690 975,9 350 3 1.394 400 3370,1 400 339,0 46,3 39,0 46,3	actors: chil minimum/i 6.680 1.146 4.4 1.645 100 436,4 436,4 436,4 436,4 43,3 51,2 83 51,2 83 5,5 (	led water maximum 7.200 1.235 00 1.768 469,5 50 370 43,8 52,0 00	

1) Model code: HS XXX - CU single effect superheated water fired absorption chiller, 2) Inlet/Outlet chilled water temperature = 12/7 °C, 3) Inlet/Outlet cooling water temperature = 29/37,5°C 4) Inlet/Outlet superheated water = 150/130°C, 5a) Fouling factors: chilled water - 0,018 m<sup>2</sup>-K/kW, b) Fouling factor cooling water - 0,044m<sup>2</sup>-K/kW, 6) Minimum chilled water outlet temperature 3,5°C; lower temperatures upon request, 7) Minimum cooling water inlet temperature 10°C, 8) Plantcoom minimum/maximum temperature 5-45 °C, 9) Maximum working pressure in water circuits = 8 bar(g); higher pressures available upon request at extra price, 10) Please contact Thermax representative/office for customised specifications.

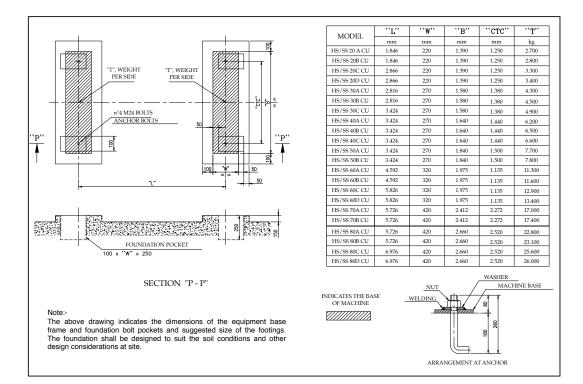
44



Typical layout of HS machine



Typical layout of SS machine



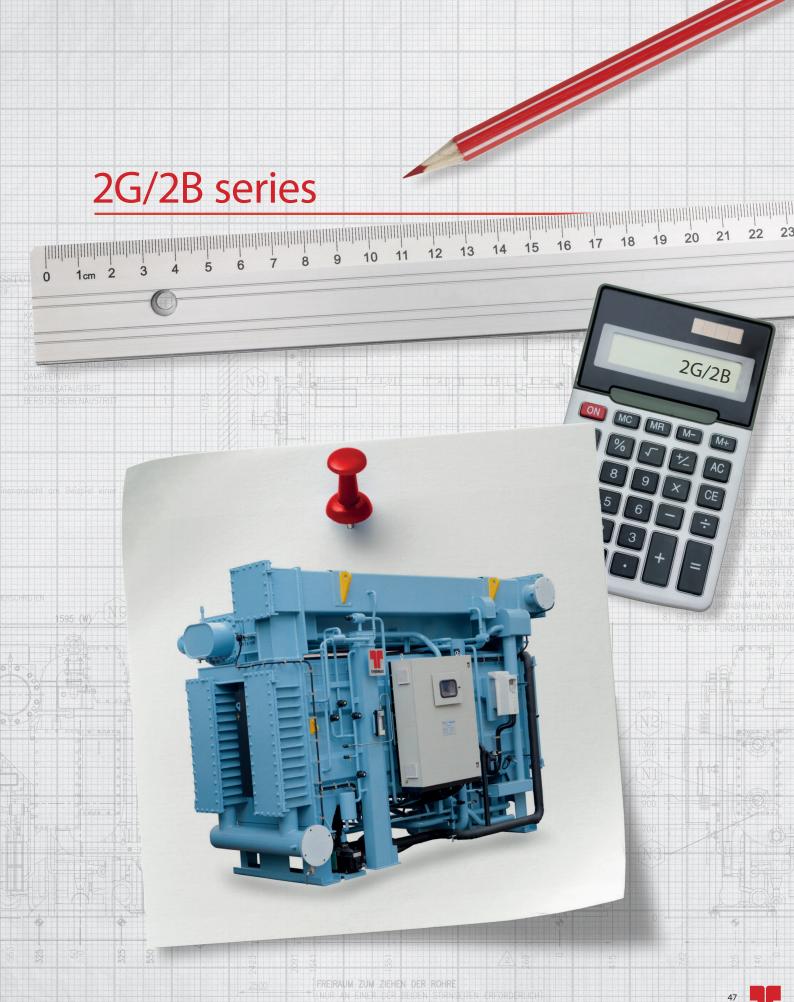
Foundation details for SS/HS series

#### SS/HS SERIES POSSIBLE APPLICATIONS:

- District heating/cooling
- Cogeneration/Trigeneration
- Food industry
- Automotive industry
- Solar cooling
- Steam from turbines discharge

#### NECESSARY DATA TO PREPARE AN OFFER

- Cooling capacity required (or alternatively the available heat capacity)
- Chilled water inlet/outlet temperatures
- Cooling water inlet/outlet temperatures
- Superheated water inlet/outlet temperatures (HS)
- Steam pressure (SS)



8. 2G/2B SERIES:

Latest generation of double effect high temperature superheated water fired (2G) or steam fired (2B) absorption chillers. This series features a double stage evaporation/absorption technology.

The machines are specifically designed to be used with high temperature superheated water or with steam.

This new generation of machines feature compact dimensions, easy to use, easy to maintenance and one of the highest efficiency of the market.

Cooling capacity from 350 kW to 8.500 kW (higher capacities available upon request).

Superheated water inlet temperature between 155 °C and 180 °C.

Steam pressure between 4 bar (g) and 10 bar (g)

COP: between 1,38 and 1,43

#### **STANDARD FEATURES:**

- Triple shell design: the upper shell (including condenser and generator (LTG), the lower shell (including evaporators and the absorbers) and High temperature Generator (HTG)
- The lower shell has a 2 Pressure level design, with 'split' type evaporator and 2 absorbers. This gives the advantage of higher efficiency of absorption (water vapour into sprayed LiBr solution).
- Straight tubes in the generators for easy maintenance.
- Gravity feed spray technology in evaporator and absorber. Liquids are sprayed downwards on the tubes to ensure good film thickness and better heat transfer.
- Marine type headers in absorber and condenser, for an easy access to the tube bundle without use of lifting systems to support the header. All water boxes have flanged connections. All water boxes are provided with drain and vent connections.
- Crystallization control and prevention based on on-line determination of actual measured concentration.
- Refrigerant autoblowdown solenoid valve controlled by solution concentration
- Level electrodes for refrigerant and solution level monitoring in the evaporator, absorber and HTG.
- PLC based control panel SIEMENS SIMATIC S7-1200
- Alarm state annunciation through an audio signal and appropriate messages display on the operator interface terminal.
- Operator panel SIEMENS TP700, 7" touchscreen.
- MODBUS RTU connectivity as a standard feature.
- Several field interlocks available for plant automation.
- SS 430 Ti tubes in generator.
- DLP copper tubes in evaporator, absorber and condenser.
- Crystallization prevention safeties: overflow pipe for auto decrystallisation, low/high cooling water inlet temperature cut-out, high temperature control for generator, hot water/steam control valve PLC control based on generator temperature.
- PID algorithm capable of achieving part load operation from 10 to 100% stepless, based on chilled water outlet temperature.

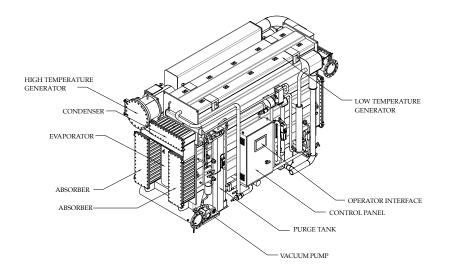
- Purge system, which continuously and automatically removes non condensable gases from the shell side and stores them in a tank. A purge pump is provided as standard feature.
- Three (2G) or four (2B) regenerative heat exchangers to increase the efficiency of the cycle. The heat exchangers are plate type, with copper brazed stainless steel plates, designed for the maximum heat exchange with minimum pressure loss. The use of a plate heat exchanger ensures a compact design of the unit.
- Isolating valves for easy removal of the pumps for maintenance without breaking the vacuum inside the chiller.
- Antifreeze protection safeties: PLC inbuilt antifreeze alarm, antifreeze thermostat, low temperature cut-out for refrigerant pump (L-cut), flow switch and D.P. switch for chilled water.
- Completely factory assembled and wired.
- Potential free contacts for remote and automatic operation of the machine: chilled and cooling water pumps start/stop, cooling tower fans start/stop, remote start/stop of the machine, remote indication of machine status (on/off) and machine trip, remote setpoint.
- Rupture disk
- Digital vacuum transmitter
- Inverter on solution pump.
- TRG, a patented bearing monitoring system for monitoring the wear and tear of the bearings (through contacts inside control panel)
- Generator pressure switch

#### OPTIONAL:

- Stand by refrigerant and solution pumps.
- Special metallurgy for tubes (CuNi 95/5, CuNi 90/10, Stainless steel, Titanium).
- Tubesheet and headers cladding in case of use of bad quality water not suitable for carbon steel
- On line indication of healthiness of bearings of refrigerant and solution pump (on line TRG).
- Insulation of cold and hot surfaces (excluded surfaces at T higher than 150°C).
- Three pieces shipment: unit can be shipped in three pieces to be reassembled on site (lower shell, upper shell and HTG).
- Profibus connection.
- Ethernet or Modbus TCP/IP connection.
- Autopurge system for automatic purging of purge tank (electric or pneumatic).



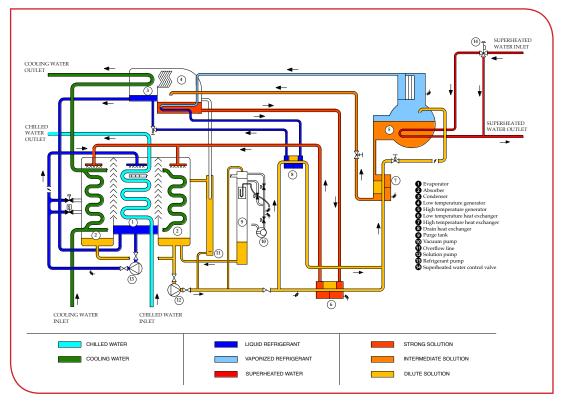
Double effect steam fired absorption chiller of 2B series



HIGH TEMPERATURE ENERATOR ONDENSER ABSORBER ABSO

3D view of a 2B machine with main components - Control panel side view

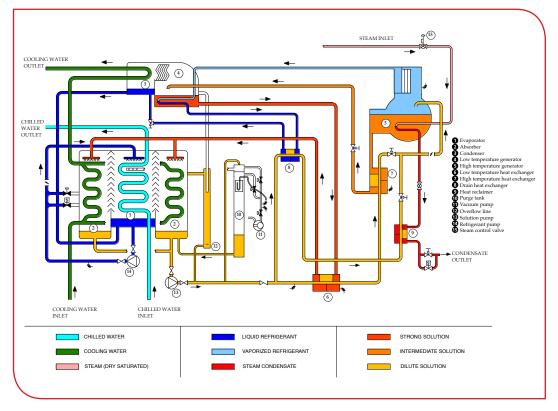
<sup>3</sup>D view of a 2B machine with main components - Rear view



0

F

Working cycle of a 2G machine

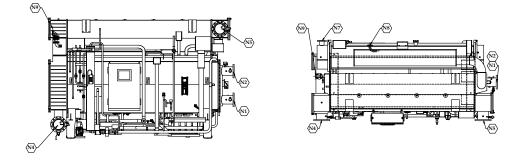


Working cycle of a 2B machine

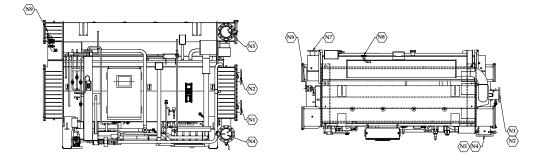
	UNITS	2B2KC	2B2LC	2B2MC	2B2NC	2B3KC	2B3LC	2B3MC	2B4KC	2B4LC	2B4MC	2B5KC	2B5LC	2B5MC	2B5NC	2B6KC	2B6LC	2B7KC	2B7LC	2B7MC	2B8KC	2B8LC	2B8MC	2B8NC
Cooling																								
capacity	kW	476	568	704	840	1.005	1.130	1.354	1.515	1.705	1.885	2.086	2.302	2.654	2.965	3.280	3.655	4.665	5.160	5.680	6.580	7.110	7.940	8.490
Chilled	Flow m³/h	81,6	97,4	120,7	144,1	172,4	193,8	232,2	259,9	292,4	323,2	357,8	394,8	455,2	508,6	562,6	626,9	800,1	885	974,2	1.129	1.220	1.362	1.456
water	Connectiondiameter DN		1	25			150			200		20	00		2	50			350			4	00	
Cooling	Flow m <sup>3</sup> /h	142	170	210	252	300	335	404	450	500	562	622	688	792	882	970	1.094	1.380	1.530	1.641	1.960	2.100	2.337	2.337
water	Connectiondiameter DN		1.	50			200			250		30	00		3!	50			400			4	50	
Steam	Flow kg/hr	511,6	610,5	757,7	903,2	1.072	1.205	1.449	1.616	1.819	2.013	2.225	2.455	2.829	3.161	3.535	3.938	5.015	5.545	6.109	7.071	7.641	8.534	9.129
	Connectiondiameter DN (Steam)		6	55		80				100		1(	00		12	25			150			2	:00	
	Connectiondiameter DN (Condensate)			10			40			40			0			0			65				65	
Dimensions	Length (L) mm		350		370	39		4590		4720			10	58		73			7480			580		30
	Width (W) mm		)50		390	19		2010		2150		24		24		24			2940			80		810
	Height (H) mm	26	580	26	580	27	90	2790		3060		32	50	33	50	34	30		3800		4	200	42	230
Weights	Working weight x1000kg	6,8	7,0	8,3	8,6	10,0	10,3	11,5	14,0	14,5	14,9	17,5	18,0	21,7	22,4	27,8	28,7	40,6	41,7	43,1	50,3	51,6	58,5	60,0
	Shipping weight x1000kg	6,2	6,3	7,6	7,8	8,9	9,1	10,2	12,2	12,7	12,9	15,1	15,4	18,8	19,3	24,1	24,8	34,6	35,4	36,4	42,3	43,2	49,5	50,7
Clearance	Clearance for tube removal mm	25	500	35	500	36	00	4200		4250		43	50	54	00	68	60		6910		6	910	82	220
	Solution pump kW(A)		2,2	(6,0)		:	3,0 (8,0	)	3	8,7 (11,0	D)	5,5 (	14,0)	6,6 (	17,0)		7,5 (	20,0)			9,0 (27,	0)	11,0	(28,0)
data	Refrigerant pump kW(A)							0,3 (	(1,4)										1,5 (5	,0)				
	Vacuum pump kW(A)											0,75 (1,8)												
	Power consumptionkVA		7	,6		9,1			11,2			13,4 15,5 %), 50 Hz (±5 %), 3 Pha		i,5			20,3			25,3			5,0	
	Power supply 1) Model code: 28 XX - C double ef Steam pressure = 8 bar (g), 5.a) For inlet temperature 10 °C, 8) Plantroor for customised specifications.	ling fact	ors: chille	ed water	- 0,018	m²·K/kW,	b) Fouli	ng factor	cooling	ature = 1 water - 0	2/7 °C, 3 ),044m²·K	) Inlet/Ou /kW, 6) N	utlet cool Ainimum	ing wate chilled w	r temper ater out	ature = 2 let tempe	rature 3,	5°C; lowe	er tempe	ratures u	pon requ	est, 7) Mir	nimum coo	oling wa
	1) Model code: 2B XX - C double ef Steam pressure = 8 bar (g), 5.a) Fou inlet temperature 10 °C, 8) Plantroor	ling fact	ors: chille	ed water	- 0,018	m²·K/kW,	b) Fouli	ng factor	cooling	ature = 1 water - 0	2/7 °C, 3 ),044m²·K	) Inlet/Ou /kW, 6) N	utlet cool Ainimum	ing wate chilled w	r temper ater out	ature = 2 let tempe	rature 3,	5°C; lowe	er tempe	ratures u	pon requ	est, 7) Mir	nimum coo	oling wa
	1) Model code: 2B XX - C double ef Steam pressure = 8 bar (g), 5.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications.	iling fact n minim	ors: chille um/maxir	ed water num tem	- 0,018 iperature	m <sup>2</sup> ·K/kW, 5-45 °C,	b) Foulii 9) Maxin	ng factor num work	cooling king pres	ature = 1 water - C sure in w	12/7 °C, 3 0,044m <sup>2.</sup> K vater circi	i) Inlet/Ou /kW, 6) M uits = 8 I	utlet cool Ainimum bar(g); hi	ing wate chilled w gher pres	r temper vater out isures av	ature = 2 let tempe ailable up	rature 3, oon requ	.5°C; lowe	er tempe tra price,	ratures u 10) Plea	pon requ se contac	est, 7) Mir t Thermax	nimum coo represent	oling wat ative/offi
	1) Model code: 2B XX - C double ef Steam pressure = 8 bar (g), S.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications.	iling fact n minim	ors: chille um/maxir	ed water num tem	- 0,018 iperature	m²-К/kW, 5-45 °С, О Ж е б С	b) Foulii 9) Maxin 0 T E D 7 C	U W M M M M M M M M M M M M M M M M	cooling king pres 74KC 75 75 7	ature = 1 water - 0 sure in w 50 7 7 7 7 7 7 7 7	12/7 °C, 3 0,044m <sup>2.</sup> K vater circ	) inlet/Ou /kW, 6) M uuits = 8 I S S S C	utlet cool Ainimum bar(g); hi	ing wate chilled w gher pres	UNC	ature = 2 let tempe ailable up	rature 3, oon requ	5°C; lowe est at ext し ソトレ で	er tempe tra price,	UNC	pon requ se contac Se CONTAC	est, 7) Mir t Thermax	nimum coo represent	ative/offi
Cooling capacity	1) Model code: 2B XX - C double ef Steam pressure = 8 bar (g), 5.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications.	Uning factor m minimu V V V V V V V V V V V V V V V V V V V	ors: chille um/maxir 0 7 0 7 0 7	U W C C C C C C C C C C C C C C C C C C	- 0,018 aperature	m²-K/kW, 5-45 °C, U XE 5 7 7 1.005	b) Foulii 9) Maxin 0) TC 0 7 0 7 0 7 0 7 1.130	U S S S S S S S S S S S S S S S S S S S	cooling cing pres U 4 K D Z Z 1.515	ature = 1 water - 0 sure in w U H U V V V U V U V U V V V V V V V V V	2/7 °C, 3 0,044m <sup>2</sup> ·K vater circl	) inlet/Ou /kW, 6) M uuits = 8 I S S S C	Utlet cool Ainimum bar(g); hi U U S C 2.302	UNCONTRACTOR	UNCONCEPTION	ature = 2 let tempe ailable up U Y 9 0 7	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5°C; lowe est at ext し ソトレ で	UTL 57	UNCONTRACTOR	pon requ se contac Se CONTAC	est, 7) Mir t Thermax U U U U U U U U U U U U U U U U U U U	U W W W W W W W W W W W W W W W W W W W	UNC 200 200 200 200 200 200 200 200 200 20
Cooling capacity Chilled	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), 5.a) Fot inlet temperature 10 °C, 8) Plantroor for customised specifications.	Uling fact m minim U V V V V V V V V V V V V V V V V V V	ors: chille um/maxir 270 2568 97,4	U W C B C C C C C C C C C C C C C C C C C	- 0,018 aperature UNC 55 7 840	m²-K/kW, 5-45 °C, U XE 5 7 7 1.005	b) Foulii 9) Maxin 0) TC 0 7 0 7 0 7 0 7 1.130	U Service States	cooling cing pres U 4 K D Z Z 1.515	ature = 1 water - 0 sure in w U H U V V V U V U V U V V V V V V V V V	2/7 °C, 3 0,044m <sup>2</sup> ·K vater circl	) Inlet/Ou /kW, 6) N uits = 8 I 2,086	Utlet cool Ainimum bar(g); hi UTSU UTSU UTSU UTSU UTSU UTSU UTSU UTS	UNCONTRACTOR	U 2.965 508,6	ature = 2 let tempe ailable up 95 7 3.280	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5°C; lowe est at ext UX 20 4.665 800,1	UTL 57	OWL557	Don requese contact se contact Mo U Mo U Mo C C 6.580	est, 7) Mir t Thermax	V Represent	U Notes and the second
Cooling capacity Chilled water	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), S.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications.	Uling fact m minim U V V V V V V V V V V V V V V V V V V	ors: chille um/maxir 270 2568 97,4	20 water num tem 20 20 20 20 20 20 20 20 20 20 20 20 20	- 0,018 aperature UNC 55 7 840	m²-K/kW, 5-45 °C, U XE 5 7 7 1.005	b) Foulii 9) Maxin 9) Maxin 72 72 73 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	U Service States	cooling cing pres U 4 K D Z Z 1.515	ature = 1 water - 0 sure in w UT+0 5 7 1.705 292,4	2/7 °C, 3 0,044m <sup>2</sup> ·K vater circl	) Inlet/Ou /kW, 6) N uits = 8 I 95 7 2.086 357,8	Utlet cool Ainimum bar(g); hi U 15 57 2.302 394,8 00	UNCONTRACTOR	U 2.965 508,6	ature = 2 let tempe ailable up 95 7 3.280 562,6	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5°C; lowe est at ext UXL 5°C 4.665 800,1 31	UTL97 5.160 885	DWL97 5.680 974,2 3	000 requese contact 000 200 000 200 000 0	est, 7) Mir t Thermax U 0 0 7.110 1.220	U 2007 7.940	2000 2000 2000 2000 2000 2000 2000 200
Cooling capacity Chilled	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), 5.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications. SLUC KW Flow m <sup>3</sup> /h Connectiondiameter DN Flow m <sup>3</sup> /h	Unit of the second seco	075: chille um/maxir 775 97,4 12 170	20 water num tem 20 20 20 704 120,7 25	- 0,018 pperature UN2552 840 144,1	m²-K/kW, 5-45 °C, U XE 9 7 1.005 172,4	b) Foulii 9) Maxin 9) Maxin 10 193,8 150	U K K K K K K K K K K K K K K K K K K K	cooling king pres 79480 7078 7078 7078 7078 7078 7078 7078 7	ature = 1 water - 0 sure in w 0 7 8 5 7 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8	2/7 °C, 3 0,044m <sup>2</sup> K vater circl	) Inlet/OL /kW, 6) N uits = 8 I 2.086 357,8 20	Utlet cool Ainimum bar(g); hi UTS US 2.302 394,8 00 688	Upper preserved and the second	2.965 508,6 21 882	ature = 2 let tempe ailable up 95 7 3.280 562,6	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5°C; lowe est at ext UXL 5°C 4.665 800,1 31	UTL97 5.160 885	DWL97 5.680 974,2 3	000 requese contact 000 200 000 200 000 0	est, 7) Mir t Thermax 9 7.110 1.220 2.100	U 2000 7.940 1.362 400	2000 2000 2000 2000 2000 2000 2000 200
Cooling capacity Chilled water Cooling water	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), 5.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications. KW Flow m <sup>3</sup> /h Connectiondiameter DN Flow m <sup>3</sup> /h Connectiondiameter DN	UX76 81,6	075: chille um/maxir 775 97,4 12 170	20 water mum term 20 25 210 50	- 0,018 pperature 200 200 200 200 200 200 200 200 200 20	m²-K/kW, 5-45 °C, U XE 9 7 1.005 172,4	b) Foulin 9) Maxim 9) Maxim 100 193,8 150 335 200	U K K K K K K K K K K K K K K K K K K K	Cooling (ing press 0) 1515 259,9 450	ature = 1 water - 0 sure in w 0745 200 500	0044m <sup>2</sup> K vater circo 1.885 323,2 562	U) Inlet/OC /kW, 6) M uits = 8 I 2.086 357,8 20 622 30	Utlet cool dinimum bar(g); hi 2,302 394,8 00 688 00	2.654 455,2 792	2.965 508,6 2.9 882	ature = 2 let tempe ailable up 3.280 562,6 50 970 50	-rature 3, son requi	5°C; lowe est at ext 29 4.665 800,1 30 1.380	27 5.160 885 00 1.530 400	DWL507 5.680 974,2 3 1.641	000 requise contact 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 0000 000 000 000	2.100	U 2.337	2.37
Cooling capacity Chilled water Cooling water	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), 5.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications. KW Flow m <sup>3</sup> /h Connectiondiameter DN Flow m <sup>3</sup> /h Connectiondiameter DN	Units of the second sec	073 568 97,4 170 15	20 water mum term 20 25 210 50	- 0,018 pperature 200 840 144,1 252 36,5	m²-K/kW, 5-45 °C, 9 1.005 172,4 300	b) Foulin 9) Maxim 9) Maxim 100 193,8 150 335 200	232,2 404	cooling ding press 259,9 450 666,0	ature = 1 water - 0 sure in w 7495 1.705 292,4 200 500 250	0044m <sup>2</sup> K vater circo 1.885 323,2 562	U) Inlet/OC /kW, 6) M uits = 8 I 2.086 357,8 20 622 30	Utlet cool dinimum bar(g); hi 2,302 394,8 00 688 00	2.654 455,2 792	2.965 508,6 2.9 882	ature = 2 let tempe ailable up 3.280 562,6 50 970 50	CT 100 CT	5°C; lowe est at ext 29 4.665 800,1 30 1.380	27 5.160 885 00 1.530 400	DWL507 5.680 974,2 3 1.641	000 requise contact 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 0000 000 000 000	2.100	7.940 1.362 400 2.337 50 345,6	2.37
Cooling capacity Chilled water Cooling water Hot water	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), S.a) Fot inlet temperature 10 °C, 8) Plantroor for customised specifications.	Ump fact m minim 20 476 81,6 142 20,8 6	075: chille um/maxir 568 97,4 12 170 15 24,7	20 water num tem 704 120,7 25 210 50 30,8 8	- 0,018 pperature 200 840 144,1 252 36,5	m²-K/kW, 5-45 °C, 9 1.005 172,4 300	b) Foulini 9) Maxin 1938 150 3335 200 48,9	UNE 59,0	cooling ding press 259,9 450 666,0	ature = 1 water - 0 sure in w 7495 1.705 292,4 200 500 250	0044m <sup>2</sup> K vater circo 1.885 323,2 562	U) Inlet/OC /kW, 6) M uits = 8 I 2.086 357,8 20 622 30	utlet cool ilinimum bar(g); hi 2.302 394,8 00 688 00 100,0 12	2.654 455,2 792	t temperater out sures aver 508,6 22,965 508,6 22: 882 33: 128,6	ature = 2 let tempe ailable up 3.280 562,6 50 970 50 144,2	U 99 3.655 626,9 1.094 160,6 50	5°C; lowe est at ext 20 20 4.665 800,1 30 1.380	27 5.160 885 00 1.530 400	2447,6 200	00000000000000000000000000000000000000	2.100	7.940 1.362 400 2.337 50 345,6 2	2.37 369,0
Cooling capacity Chilled water Cooling water Hot water	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), S.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications.	U H C C C C C C C C C C C C C C C C C C	075: chille um/maxir 568 97,4 12 170 15 24,7 5	d water num tem 704 120,7 25 210 30,8 8 8 38	- 0,018 sperature 2002 2002 2002 2002 2002 2002 2002 20	m²-K/kW, 5-45 °C, 97 1.005 172,4 300 43,7	b) Fouliui 9) Maxin 11.130 193,8 150 3335 200 48,9 90	232,2 404 59,0	cooling ding press 259,9 450 666,0	ature = 1 1 water - C 2 sure in w 1.705 292,4 200 500 2500 74,0	0044m <sup>2</sup> K vater circo 1.885 323,2 562	i) Inlet/OU /kW, 6) M uits = 8 I 2.086 357,8 200 622 300 90,6	utlet cool Alinimum bar(g); hi 5 7 2.302 394,8 20 688 20 100,0 12 10	ing wate chilled w gher pres 2.654 455,2 792 115,2 25	t temperater out sures aver 2.965 508,6 22 882 31 128,6 70	ature = 2 let temper go 2 3.280 562,6 50 970 144,2 1! 73	U 99 3.655 626,9 1.094 160,6 50	5°C; lowe est at ext 29 4.665 800,1 30 1.380	071297 5.160 885 00 1.530 400 225,1	2447,6 2000	Den requests contact D W B C 6.580 1.129 50 1.960 286,6 7.	2.100 4 309,6	7.940 1.362 400 2.337 50 345,6 2 88	2.377 369,60
Cooling capacity Chilled water Cooling water Hot water	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), 5.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications.	U X 20 X 20	01257 568 97,4 12 170 15 50	2007 2017 2017 2017 2017 2017 2017 2017	- 0,018 pperature 252 36,5 0 70	m²-K/kW, 5-45 °C, 9 1.005 172,4 300 43,7 39	b) Foulium )) Roulium )) Maxim )) Maxim )) Foulium )) Foulium )) Foulium )) Foulium )) Roulium )) Roulium	232,2 404 59,0 10 10 4590	cooling ding press 259,9 450 666,0	ature = 1 water - C sure in w 292,4 200 500 250 74,0 4720	0044m <sup>2</sup> K vater circo 1.885 323,2 562	i) Inlet/OL /kW, 6) N M 5 2.086 357,8 20 622 30,6 48	utlet coold dinimum dinimum bar(g); hi 5 7 2.302 394,8 20 688 20 100,0 12 10 75	ing wate chilled w spher press 2.654 455,2 792 1115,2 25 58	r temper rater out sures aver 50 508,6 2: 508,6 2: 882 3: 128,6 70 70 70	ature = 2 let temper go 2 3.280 562,6 50 970 144,2 1! 73	2 1995 3.655 626,9 1.094 160,6 50	5°C; lowe est at ext 29 4.665 800,1 30 1.380	27257 5.160 885 00 1.530 400 225,1 7480	UNL55 5.680 974,2 3 1.641 247,6 200	286,66 7. 3	2.100 4 309,6	7.940 1.362 400 2.337 50 345,6 2 88 33	2.37 369,0 330
Cooling capacity Chilled water Cooling water Hot water Dimensions	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), 5.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications.	U N N N N N N N N N N N N N N N N N N N	075: chilleum/maxir 568 97,4 12 170 15 50 50 50	2007 2017 2017 2017 2017 2017 2017 2017	- 0,018 pperature 200 200 200 200 200 200 200 200 200 20	0 m <sup>2+</sup> K/kW, 5-45 °C, 1005 172,4 300 43,7 39	b) Foulilui )) Roulilui )) Maxin )) Rouli )) Rouli	232,2 404 59,0 2010 2010	cooling ding press 259,9 450 666,0	ature = 1 water - C sure in w 292,4 2000 2500 74,0 2150 3060	0044m <sup>2</sup> K vater circo 1.885 323,2 562	i) Inlet/OL /kW, 6) N M 2086 357,8 2086 622 30,6 90,6 488 23 32	utlet coold dinimum dinimum bar(g); hi 5 7 2.302 394,8 20 688 20 100,0 12 10 75	ing wate chilled w gsp 2.654 455,2 792 115,2 25 58 24	r temper rater out sures av 2.965 508,6 22 882 31 128,6 70 70 50	ature = 2 elet temper go 2 3.280 562,6 50 970 144,2 1,1 73 2,4	U 900 1000 1000 1000 1000 1000 1000 1000	5°C; lowe est at ext 29 4.665 800,1 30 1.380	27257 5.160 885 00 1.530 400 225,1 7480 2940	UNL55 5.680 974,2 3 1.641 247,6 200	286,66 7. 3	est, 7) Mir t Thermax 7.110 1.220 2.100 4 309,6 580 180	7.940 1.362 400 2.337 50 345,6 2 88 33	8,490 1,450 369,0 330 310
Cooling capacity Chilled water Cooling water Hot water Dimensions	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), 5.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications.	UN 000000000000000000000000000000000000	075: chilleum/maxir 568 97,4 12 170 15 50 50 80	2007 2007 2007 2007 2007 2007 2007 2007	- 0,018 pperature 252 36,5 0 70 90 80	m <sup>2+</sup> K/kW, 5-45 °C, 1,005 172,4 300 43,7 39 19 19	b) Foulilui )) Roulilui )) Maxin )) Rouli )) Rouli	232,2 404 59,0 2010 2010	Cooling ding pres 1515 259,9 450 66,0 00	ature = 1 (1) water - C sure in w 292,4 200 2500 2500 2500 24720 2150 30600 14,5	2/7 °C, 3 0,044m <sup>3</sup> K vater circl 1,885 3223,2 562 81,9	1) Inlet/OL /kW, 6) N 19 2086 357,8 2086 357,8 20 622 30 90,6 48 23 32 17,5	utlet coold dinimum dinimum bar(g); hi 2.302 394,8 00 688 00 100,0 112 10 75 50	ing wate chilled w 55 2.654 455,2 792 115,2 25 58 24 33	r tempere rater out sures aver 2.965 508,6 22 882 33 128,6 70 70 50 222,4	ature = 2 let temper lalable ur 562,6 50 970 50 144,2 1! 733 24 3.4	21995 3.6555 626,9 1.094 160,6 50 30 28,7	U X 25°C; loweest at ext 2 X 25°C; loweest at	01252 5.160 885 00 1.530 400 225,1 7480 2940 3800 41,7	247,6 243,1	000 requests contact 000 mega 000	2.100 2.100 4 309,6 80 200	2.337 7.940 1.362 400 2.337 50 345,6 2 888 333 42	2.37 369,0 310 230 60,0
Cooling capacity Chilled water Cooling water Hot water Dimensions	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), 5.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications.	U X V X V X V X V X V X V X V X V X V X	07:: chilleum/maxir 568 97,4 120 170 15 50 50 80 7,0	2007 2017 2017 2017 2017 2017 2017 2017	- 0,018 pperature 200 252 36,5 0 70 90 80 8,6	m <sup>2</sup> K/kW, 5-45 °C, 1.005 172,4 300 43,7 39 19, 27 10,0	b) Foulium p) Maxim p) M	2000 1.354 232,2 404 59,0 10 2010 2790 11,5	cooling ding pres 450 666,0 00 14,0	ature = 1 (1) water - C sure in w 292,4 200 2500 2500 2500 24720 2150 30600 14,5	2/7 °C 3 3 0,044m <sup>2</sup> K vater direct 1.8855 323,2 562 81,9 14,9	1) Inlet/OL /kW, 6) N 19 2086 357,8 2086 357,8 20 622 30 90,6 48 23 32 17,5	utlet coold dinimum dinimum bar(g); hi 50 2.302 394,8 00 688 00 100,0 12 10,0 75 50 18,0 15,4	ing wate chilled w yher prese 2.654 455,2 792 115,2 25 58 24 33 21,7	r temper rater out sures aver 508,6 2:965 508,6 2: 882 3: 128,6 70 70 70 70 70 22,4 19,3	ature = 2 elet temper go 2 3.280 562,6 50 970 144,2 19 73 24 34 27,8 24,1	21995 3.6555 626,9 1.094 160,6 50 30 28,7	203,1 40,6	01252 5.160 885 00 1.530 400 225,1 7480 2940 3800 41,7	UNL55 5.680 974,2 3 1.641 247,6 200	286,66 7. 3 4,23	2.100 4 309,6 51,6	7.940 1.362 400 2.337 50 345,6 2 88 33 42 58,5 49,5	2.37 369,0 310 230 60,0
Cooling capacity Chilled water Cooling water Hot water Dimensions Dimensions Clearance Electrical	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), 5.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications.	U X V X V X V X V X V X V X V X V X V X	07: chilleum/maxir 568 97,4 12 170 15 50 50 80 7,0 6,3	2000 2000 2000 2000 2000 2000 2000 200	- 0,018 pperature 252 36,5 0 70 90 80 8,6 7,8	m <sup>2+</sup> K/kW, 5-45 °C, 1005 172,4 300 43,7 10,0 8,9 36	b) Foulium p) Maxim p) M	2000 2010 2010 2010 2010 2010 2010 2010	cooling ding pres 1515 259,9 450 66,0 00 14,0 12,2	ature = 1 water - C sure in w 292,4 200 2500 74,0 47200 21500 30600 14,5 12,7	2/7 °C 3 3 0,044m <sup>2</sup> K vater direction 1.8885 323,2 562 81,9 14,9 14,9 12,9	1) Inlet/OL /kW, 6) N 10 2086 357,8 20 622 30 90,6 48 23 22 17,5 15,1	Iller cool Alinimum bar(g); hi 2,302 394,8 00 688 00 100,0 12 100,0 12 50 118,0 15,4 50	ing wate chilled w geo 2654 455,2 792 115,2 25 58 24 33 21,7 18,8	r tempere rater out sures aver 2.965 508,6 22 882 33 128,6 70 70 70 50 22,4 19,3 00	ature = 2 elet temper go 2 3.280 562,6 50 970 144,2 19 73 24 34 27,8 24,1	2990 3.655 626,9 1.094 160,6 50 28,7 24,8 60	203,1 40,6	CTL 5.160 885 00 1.530 400 225,1 7480 22940 3800 41,7 35,4	UML92 5.6680 974,2 3 1.641 247,6 200 43,1 36,4	286,66 7. 3 4,23	2.100 2.100 4 309,6 580 180 200 51,6 43,2 210	2.337 7.940 1.362 400 2.337 50 345,6 2 88 33 42 58,5 49,5 82	2.377 369,0 310 230 60,0 50,7
Cooling capacity Chilled water Cooling water Hot water Dimensions Weights Clearance	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), 5.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications.	U X V X V X V X V X V X V X V X V X V X	012 012 012 012 012 012 012 012 012 012	2000 2000 2000 2000 2000 2000 2000 200	- 0,018 pperature 252 36,5 0 70 90 80 8,6 7,8	m <sup>2+</sup> K/kW, 5-45 °C, 1005 172,4 300 43,7 10,0 8,9 36	b) Foulium )) Roulium 1.130 193,8 150 3335 2000 48,9 90 60 90 10,3 9,1 00	2000 2010 2010 2010 2010 2010 2010 2010	cooling ding pres 1515 259,9 450 66,0 00 12,2 3	ature = 1 (1) water - C sure in w 292,4 200 2500 2500 2500 2500 24720 2150 30600 14,5 12,7 4250	2/7 °C 3 3 0,044m <sup>2</sup> K vater direction 1.8885 323,2 562 81,9 14,9 14,9 12,9	1) Inlet/OL 7kW, 6) N M 10 10 10 10 10 10 10 10 10 10	Iller cool Alinimum Alinimum bar(g); hi bar 2,302 394,8 00 688 00 100,0 12 100,0 12 50 118,0 15,4 50	ing wate chilled w gher press 2.654 455,2 792 1115,2 25 58 24 33 21,7 18,8 54	r tempere rater out sures aver 2.965 508,6 22 882 33 128,6 70 70 70 50 22,4 19,3 00	ature = 2 elet temper go 2 3.280 562,6 50 970 144,2 19 73 24 34 27,8 24,1	2990 3.655 626,9 1.094 160,6 50 28,7 24,8 60	203,1 4.066 800,1 1.380 203,1 40,6 34,6	CTL 5.160 885 00 1.530 400 225,1 7480 22940 3800 41,7 35,4	UML92 5.6680 974,2 3 1.641 247,6 200 43,1 36,4	Den requests contact second and s	2.100 2.100 4 309,6 580 180 200 51,6 43,2 210	2.337 7.940 1.362 400 2.337 50 345,6 2 88 33 42 58,5 49,5 82	2,377 369,60 310 320 60,00 50,7
Cooling capacity Chilled water Cooling water Hot water Dimensions Dimensions Clearance Electrical	1) Model code: 2B XX - C double et Steam pressure = 8 bar (g), 5.a) Fou inlet temperature 10 °C, 8) Plantroor for customised specifications.	U X V X V X V X V X V X V X V X V X V X	012 012 012 012 012 012 012 012 012 012	2000 2000 2000 2000 2000 2000 2000 200	- 0,018 pperature 252 36,5 0 70 90 80 8,6 7,8	m <sup>2+</sup> K/kW, 5-45 °C, 1005 172,4 300 43,7 10,0 8,9 36	b) Foulium )) Roulium 1.130 193,8 150 3335 2000 48,9 90 60 90 10,3 9,1 00	232,2 404 59,0 11,5 404 404 232,2 232,2 404 404 232,2 2010 2010 2010 2010 2010 2010 2010 2	cooling ding pres 1515 259,9 450 66,0 00 12,2 3	ature = 1 (1) water - C sure in w 292,4 200 2500 2500 2500 24720 2150 30600 14,5 12,7 4250	2/7 °C 3 3 0,044m <sup>2</sup> K vater direction 1.8885 323,2 562 81,9 14,9 14,9 12,9	1) Inlet/OL 7/kW, 6) N 10 2086 357,8 2086 357,8 20 622 30 90,6 48 23 32 17,5 15,1 43 5,5 (1)	Iller cool Alinimum bar(g); hi 2,302 394,8 00 688 00 100,0 12 100,0 12 50 118,0 15,4 50	ing wate chilled w gher press 2.654 455,2 792 1115,2 25 58 24 33 21,7 18,8 54	r tempere rater out sures aver 2.965 508,6 22 882 33 128,6 70 70 70 50 22,4 19,3 00	ature = 2 elet temper go 2 3.280 562,6 50 970 144,2 19 73 24 34 27,8 24,1	2990 3.655 626,9 1.094 160,6 50 28,7 24,8 60	203,1 4.066 800,1 1.380 203,1 40,6 34,6	CTL 5.160 885 00 1.530 400 225,1 7480 22940 3800 41,7 35,4	UVL57 5.680 974,2 3 1.641 247,6 200 43,1 36,4	Den requests contact second se	2.100 2.100 4 309,6 580 180 200 51,6 43,2 210	2.337 7.940 1.362 400 2.337 50 345,6 2 88 33 42 58,5 49,5 82	2,377 369,0 310 2,377 369,0 310 320 60,0 50,7

1) Model code: 2G XX - C double effect superheated water fired absorption chiller, 2) Inlet/Outlet chilled water temperature = 12/7 °C, 3) Inlet/Outlet cooling water temperature = 29/34°C except for models 2G 7M C (29/34,1°C) and 2G 8N C (29/34,4°C) 4) Inlet/Outlet superheated water = 180/165°C, 5a) Fouling factors: chilled water - 0,018 m<sup>3</sup>K/kW, b) Fouling factor cooling water - 0,044m<sup>3</sup>K/kW, 6) Minimum chilled water outlet temperature 3,5°C; lower temperatures upon request, 7) Minimum cooling water inlet temperature 107, 7(5, 8) Plantroom minimum/maximum temperature 5-45 °C, 9) Maximum working pressure in water circuits = 8 bar(g); higher pressures available upon request at extra price, 10) Please contact Thermax representative/office for customised specifications.

#### NOZZLES ORIENTATION DEPENDING ON NUMBER OF PASSES:



Passes combination: Evaporator (even), Absorber (even), Condenser (1)

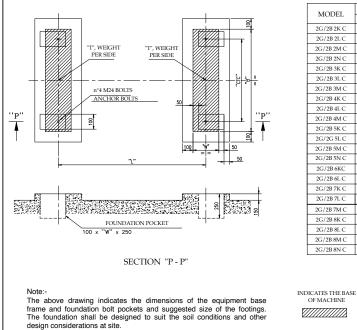


Passes combination: Evaporator (even), Absorber (odd), Condenser (1)

- N1 = Chilled water inlet
- N4 = Cooling water inlet
- N7 = Steam inlet
- N9 = Rupture disk connection
- N2 = Chilled water outlet
- N5 = Cooling water outlet
- N8 = Condensate outlet

WASHER MA

ACHINE BASE



MODEL	``L''	``W''	``B''	''CTC''	``T`'
MODEL	mm	mm	mm	mm	kg
2G/2B2KC	1.846	220	1.150	1.054	3.400
2G/2B 2L C	1.846	220	1.150	1.054	3.500
2G/2B 2M C	2.866	220	1.150	1.054	4.200
2G/2B 2N C	2.866	220	1.150	1.054	4.300
2G/2B 3K C	2.866	220	1.315	1.214	5.000
2G/2B 3L C	2.866	220	1.315	1.214	5.200
2G/2B 3M C	3.474	220	1.315	1.214	5.800
2G/2B 4K C	3.474	220	1.475	1.374	7.000
2G/2B 4L C	3.474	220	1.475	1.374	7.200
2G/2B 4M C	3.474	220	1.475	1.374	7.400
2G/2B 5K C	3.424	270	1.635	1.534	8.700
2G/2G 5L C	3.424	270	1.635	1.534	9.000
2G/2B 5M C	4.374	320	1.635	1.534	10.900
2G/2B 5N C	4.374	320	1.635	1.534	11.200
2G/2B 6KC	5.826	320	1.780	1.610	13.900
2G/2B 6L C	5.826	320	1.780	1.610	14.400
2G/2B7KC	5.724	425	2.355	2.184	20.300
2G/2B 7L C	5.724	425	2.355	2.184	20.900
2G/2B 7M C	5.724	425	2.355	2.184	21.500
2G/2B 8K C	5.724	425	2.545	2.374	25.200
2G/2B 8L C	5.724	425	2.545	2.374	25.800
2G/2B 8M C	6.974	425	2.545	2.374	29.300
2G/2B 8N C	6.974	425	2.545	2.374	30.000

NUT

WELDING

rħ

Foundation details for 2G/2B series

#### SS/HS SERIES POSSIBLE APPLICATIONS:

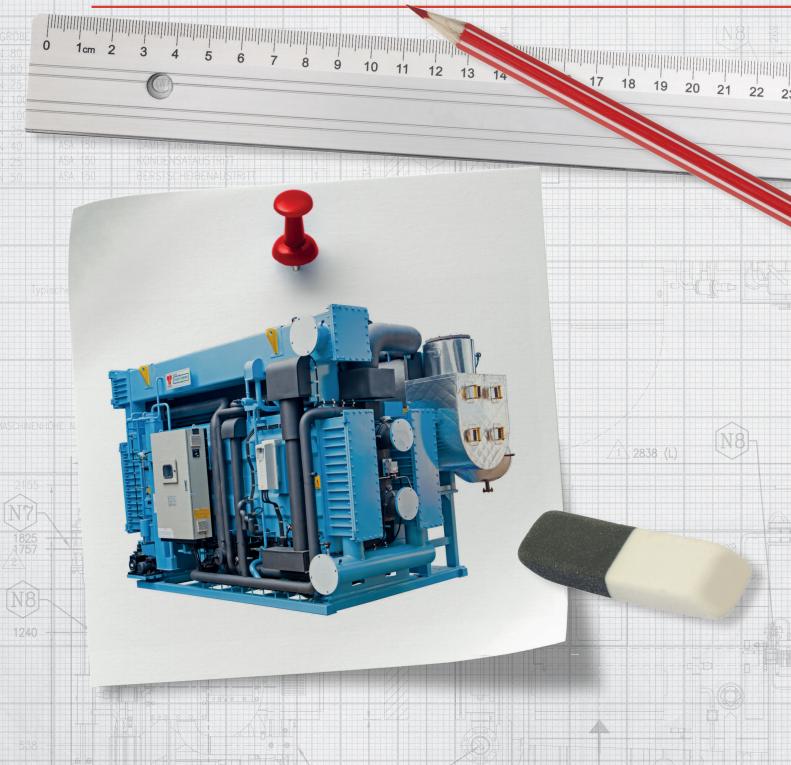
• District heating/cooling

- Cogeneration/Trigeneration
- Food industry
- Automotive industry
- Solar cooling

#### NECESSARY DATA TO PREPARE AN OFFER

- Cooling capacity required (or alternatively the available heat capacity)
- Chilled water inlet/outlet temperatures
- Cooling water inlet/outlet temperatures
- Superheated water inlet/outlet temperatures (2G)
- Steam pressure (2B)

# 9. 2D series



Latest generation of double effect exhaust gases fired absorption chillers. This series features a double stage evaporation/absorption technology.

The machines are specifically designed to be used with exhaust gases coming from a gas engine or a gas turbine.

This new generation of machines feature compact dimensions, easy to use, easy to maintenance and one of the highest efficiency of the market.

Cooling capacity from 350 kW to 8.500 kW (higher capacities available upon request).

Exhaust gases temperature between 350 °C and 600 °C (lower temperatures upon request).

COP: between 1,38 and 1,43

#### STANDARD FEATURES:

- Triple shell design: the upper shell (including condenser and generator (LTG), the lower shell (including evaporators and the absorbers) and High temperature Generator (HTG)
- The lower shell has a 2 Pressure level design, with 'split' type evaporator and 2 absorbers. This gives the advantage of higher efficiency of absorption (water vapour into sprayed LiBr solution).
- Straight tubes in the generators for easy maintenance.
- Gravity feed spraying technology in evaporator and absorber. Liquids are sprayed downwards on the tubes to ensure good film thickness and better heat transfer.
- Marine type headers in absorber and condenser, for an easy access to the tube bundle without need
  of lifting systems to support the header. All water boxes have flanged connections. All water boxes
  are provided with drain and vent connections.
- Crystallization control and prevention based on on-line determination of actual measured concentration.
- Refrigerant autoblowdown solenoid valve controlled by solution concentration
- Level electrodes for refrigerant and solution level monitoring in the evaporator, absorber and HTG.
- PLC based control panel SIEMENS SIMATIC S7-1200
- Alarm state annunciation through an audio signal and appropriate messages display on the operator interface terminal.
- Operator panel SIEMENS TP700, 7" touchscreen.
- MODBUS RTU connectivity as a standard feature.
- Several field interlocks available for plant automation.
- Boiler grade carbon steel tubes in high temperature generator.
- DLP copper tubes in evaporator, absorber and condenser.
- Crystallization prevention safeties: overflow pipe for auto decrystallisation, low/high cooling water inlet temperature cut-out, high temperature control for generator, exhaust damper PLC control based on generator temperature.
- PID algorithm capable of achieving part load operation from 10 to 100% stepless, based on chilled water outlet temperature.
- Purge system, which continuously and automatically removes non condensable gases from the shell side and stores them in a tank. A purge pump is provided as standard feature.
- Three regenerative heat exchangers to increase the efficiency of the cycle. The heat exchangers are

## 9. 2D series

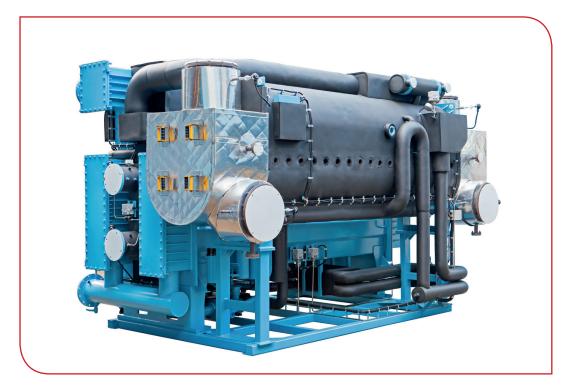
plate type, with copper brazed stainless steel plates, designed for the maximum heat exchange with minimum pressure loss. The use of a plate heat exchanger ensures a compact design of the unit.

- Isolating valves for easy removal of the pumps for maintenance without breaking the vacuum inside the chiller.
- Antifreeze protection safeties: PLC inbuilt antifreeze alarm, antifreeze thermostat, low temperature cut-out for refrigerant pump (L-cut), flow switch and D.P. switch for chilled water.
- Completely factory assembled and wired.
- Potential free contacts for remote and automatic operation of the machine: chilled and cooling water pumps start/stop, cooling tower fans start/stop, remote start/stop of the machine, remote indication of machine status (on/off) and machine trip, remote setpoint.
- Rupture disk
- Digital vacuum transmitter
- Inverter on solution pump.
- TRG, a patented bearing monitoring system for monitoring the wear and tear of the bearings (through contacts inside control panel)
- Generator pressure switch.

#### **OPTIONAL:**

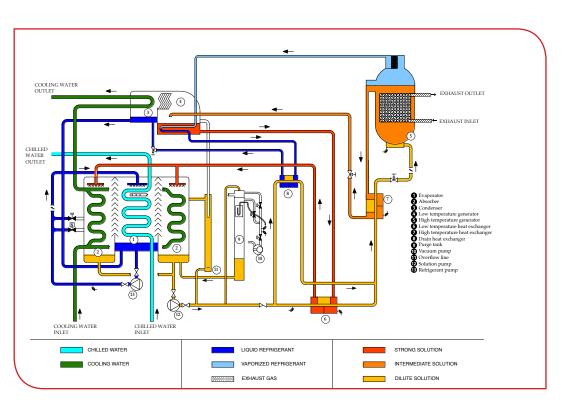
- Stand by refrigerant and solution pumps.
- Special metallurgy for tubes (CuNi 95/5, CuNi 90/10, Stainless steel, Titanium).
- Tubesheet and headers cladding in case of use of bad quality water not suitable for carbon steel
- On line indication of healthiness of bearings of refrigerant and solution pump (on line TRG).
- Insulation of cold and hot surfaces (excluded surfaces at T higher than 150°C).
- Three pieces shipment: unit can be shipped in three pieces to be reassembled on site (lower shell, upper shell and HTG).
- Profibus connection.
- Ethernet or Modbus TCP/IP connection.
- Autopurge system for automatic purging of purge tank (electric or pneumatic).





Double effect exhaust fired absorption chiller of 2D series

# 9. 2D series



Working cycle of 2D series

		UNITS	2D2KC	2D2LC	2D2MC	2D2NC	2D3KC	2D3LC	2D3MC	2D4KC	2D4LC	2D4MC	2D5KC	2D5LC	2D5MC	2D5NC	2D6KC	2D6LC	2D7KC	2D7LC	2D7MC	2D8KC	2D8LC	2D8MC	2D8NC	
Cooling																										
capacity		kW	476	568	704	840	1.005	1.130	1.354	1.515	1.705	1.885	2.086	2.302	2.654	2.965	3.280	3.655	4.665	5.160	5.680	6.580	7.110	7.940	8.490	
Chilled	Flow	m³/h	81,6	97,4	120,7	144,1	172,4	193,8	232,2	259,9	292,4	323,2	357,8	394,8	455,2	508,6	562,6	626,9	800,1	885	974,2	1.129	1.220	1.362	1.456	
water	Connection diameter	DN		1	25			150			200		20	00		25	50			350			4	00		
Cooling	Flow	m³/h	142	170	210	252	300	335	404	450	500	562	622	688	792	882	970	1.094	1.380	1.530	1.641	1.960	2.100	2.337	2.337	
water	Connection diameter	DN		1	50			200			250		30	00		35	50			400			4	50		
Exhaust	Heat input	kW	338	401	500	592	707	792	955	1.069	1.200	1.327	1.468	1.620	1.865	2.083	2.336	2.602	3.291	3.647	4.012	4.643	5.016	5.598	5.988	
Dimensions	Length (L)	mm	33	50	44	00	44	50	5075		5150		52	00	62	00	76	75		7825		78	350	91	50	
	Width (W)	mm	26	75	26	00	28	25	2875		3150		34	00	35	50	37	50		4450		48	300	50	00	
	Height (H)	mm	27	'90	27	90	28	90	2890		3160		33	50	34	50	35	30		3900		43	350	43	80	
Weights	Working weight	x1000kg	9,2	9,2	10,9	11,5	13,1	13,5	15,2	18,3	19,0	19,4	22,0	22,7	28,0	28,9	34,6	35,8	48,7	50,1	52,4	59,8	61,6	69,3	71,5	
	Shipping weigh	t x1000kg	8,6	8,8	10,4	10,9	12,3	12,7	14,3	17,3	17,9	18,3	20,6	21,1	26,4	27,1	32,4	33,5	44,8	46,0	48,0	54,4	55,9	63,3	65,3	
Clearance	Clearancefortub removal	<sup>e</sup> mm	25	00	35	00	36	00	4200		4250		43	50	54	00	68	60		6910		69	910	82	20	
Electrical data	Solution pump	kW(A)		2,2	(6,0)		1	3,0 (8,0)	)	3,7 (11,0)			5,5 (14,0)		6,6 (17,0)		7,5 (2		20,0)			9,0 (27,0	0)	11,0 (28,0)		
	Refrigerantpum	pkW(A)							0,3	8 (1,4)											1,5 (5	,0)				
	Vacuum pump	kW(A)												0,75	(1,8)											
	Power consumption	kVA		7	7,6			9,1			11,2		13	i,4	15	5,5		20	,3			25,3		26	,0	
	Power supply											415 V	′ (±10 %	), 50 Hz	z (±5 %)	), 3 Pha	se+N									

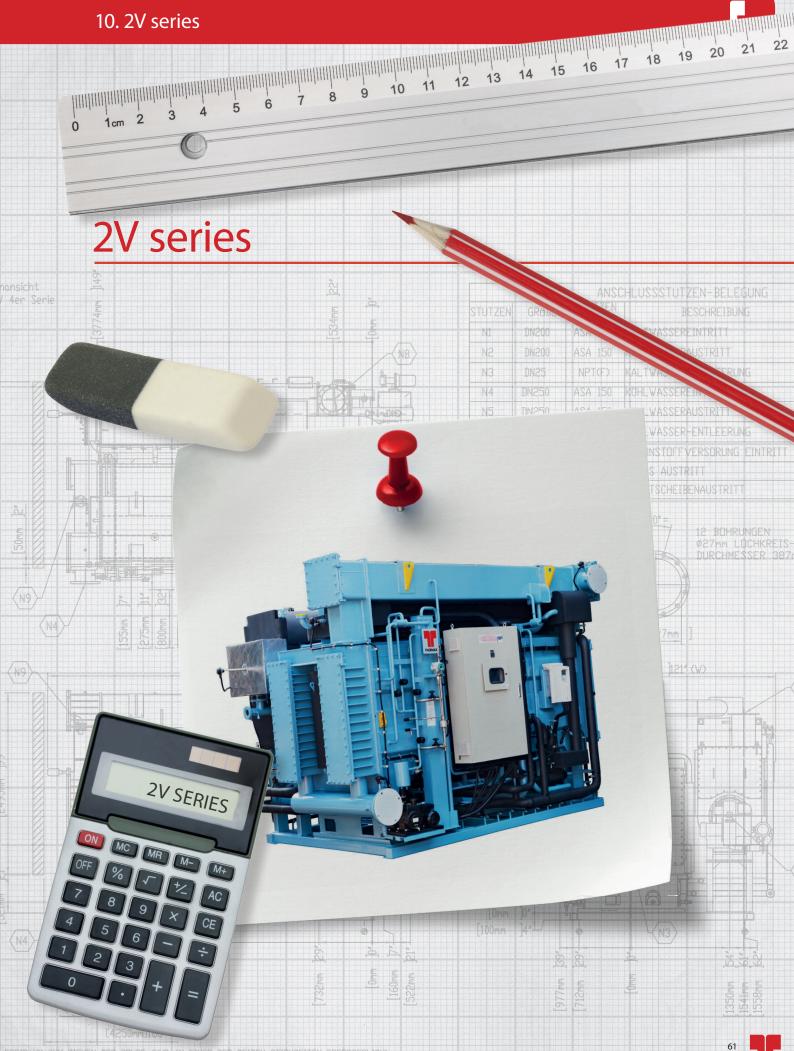
1) Model code: 2D XX - C double effect exhaust fired absorption chiller, 2) Inlet/Outlet chilled water temperature = 12/7 °C, 3) Inlet/Outlet cooling water temperature = 29/34°C except for models 2D 7M C (29/34,1°C) and 2D 8N C (29/34,4°C) 4) Inlet/ Outlet exhaust gases temperature = 450/170°C with specific heat of exaust of 1,128 IJ/Kg °C, 5a) Fouling factors: chilled water - 0,018 m<sup>3</sup>K/kW, b) Fouling factor cooling water - 0,044m<sup>2</sup>K/kW, 6) Minimum chilled water outlet temperature 3,5°C; lower temperatures upon request, 7) Minimum cooling water inlet temperature 10 °C, 8) Plantroom minimum/maximum temperature 5-45 °C, 9) Maximum working pressure in water circuits = 8 bar(g); higher pressures available upon request at extra price, 10) Please contact Thermax representative/office for customised specifications.

#### 2D SERIES POSSIBLE APPLICATIONS:

- Cogeneration/Trigeneration
- Paper industry
- Automotive industry

#### NECESSARY DATA TO PREPARE AN OFFER:

- Cooling capacity required (or alternatively the available heat capacity)
- Chilled water inlet/outlet temperatures
- Cooling water inlet/outlet temperatures
- Exhaust flow (in kg/h)
- Exhaust temperature
- Allowable Pressure drop in exhaust furnace



FREIRAUM ZUM ZIEHEN DER ROHRE (NUR AN EINER DER BEIDEN STIRNSEITEN ERFORDERLICH)

Latest generation of double effect direct fired absorption chillers. This series features a double stage evaporation/absorption technology.

The machines are specifically designed to be used with natural gas.

This new generation of machines feature compact dimensions, easy to use, easy to maintenance and one of the highest efficiency of the market.

Cooling capacity from 350 kW to 5.700 kW (higher capacities available upon request).

COP: between 1,38 and 1,43

#### STANDARD FEATURES:

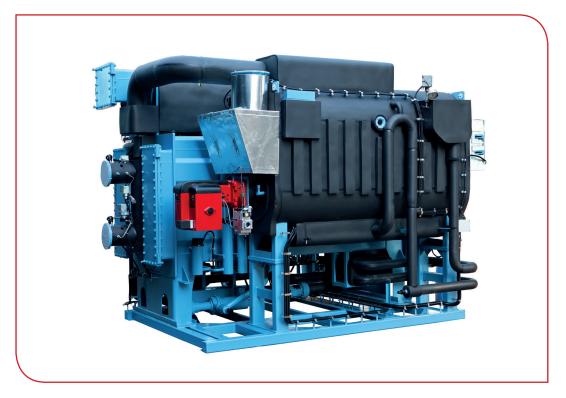
- Triple shell design: the upper shell (including condenser and generator (LTG), the lower shell (including evaporators and the absorbers) and High temperature Generator (HTG)
- The lower shell has a 2 Pressure level design, with 'split' type evaporator and 2 absorbers. This gives the advantage of higher efficiency of absorption (water vapour into sprayed LiBr solution).
- Straight tubes in the generators for easy maintenance.
- Gravity feed spraying technology in evaporator and absorber. Liquids are sprayed downwards on the tubes to ensure good film thickness and better heat transfer.
- Marine type headers in absorber and condenser, for an easy access to the tube bundle without need of lifting systems to support the header. All water boxes have flanged connections. All water boxes are provided with drain and vent connections.
- Crystallization control and prevention based on on-line determination of actual measured concentration.
- Refrigerant autoblowdown solenoid valve controlled by solution concentration
- Level electrodes for refrigerant and solution level monitoring in the evaporator, absorber and HTG.
- PLC based control panel SIEMENS SIMATIC S7-1200
- Alarm state annunciation through an audio signal and appropriate messages display on the operator interface terminal.
- Operator panel SIEMENS TP700, 7" touchscreen.
- MODBUS RTU connectivity as a standard feature.
- Several field interlocks available for plant automation.
- Boiler grade carbon steel tubes in high temperature generator.
- DLP copper tubes in evaporator, absorber and condenser.
- Crystallization prevention safeties: overflow pipe for auto decrystallisation, low/high cooling water inlet temperature cut-out, high temperature control for generator, gas burner PLC control based on generator temperature.
- PID algorithm capable of achieving part load operation from 10 to 100% stepless, based on chilled water outlet temperature.
- Purge system, which continuously and automatically removes non condensable gases from the shell side and stores them in a tank. A purge pump is provided as standard feature.

## 10. 2V series

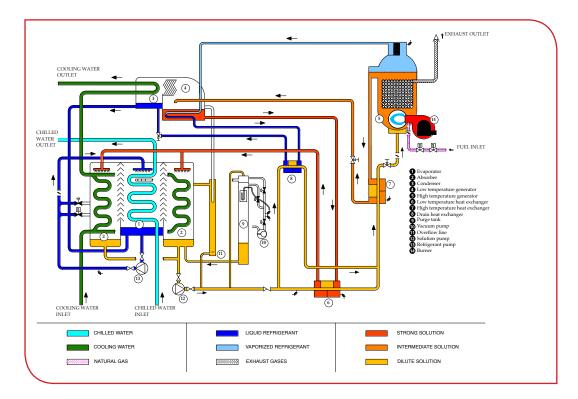
- Three regenerative heat exchangers to increase the efficiency of the cycle. The heat exchangers are plate type, with copper brazed stainless steel plates, designed for the maximum heat exchange with minimum pressure loss. The use of a plate heat exchanger ensures a compact design of the unit.
- Isolating valves for easy removal of the pumps for maintenance without breaking the vacuum inside the chiller.
- Antifreeze protection safeties: PLC inbuilt antifreeze alarm, antifreeze thermostat, low temperature cut-out for refrigerant pump (L-cut), flow switch and D.P. switch for chilled water.
- Completely factory assembled and wired.
- Potential free contacts for remote and automatic operation of the machine: chilled and cooling water pumps start/stop, cooling tower fans start/stop, remote start/stop of the machine, remote indication of machine status (on/off) and machine trip, remote setpoint.
- Rupture disk
- Digital vacuum transmitter
- Inverter on solution pump.
- TRG, a patented bearing monitoring system for monitoring the wear and tear of the bearings (through contacts inside control panel)
- Generator pressure switch.
- Hi-low or modulating burner, depending on models.

#### **OPTIONAL:**

- Stand by refrigerant and solution pumps.
- Special metallurgy for tubes (CuNi 95/5, CuNi 90/10, Stainless steel, Titanium).
- Tubesheet and headers cladding in case of use of bad quality water not suitable for carbon steel
- On line indication of healthiness of bearings of refrigerant and solution pump (on line TRG).
- Insulation of cold and hot surfaces (excluded surfaces at T higher than 150°C).
- Three pieces shipment: unit can be shipped in three pieces to be reassembled on site (lower shell, upper shell and HTG).
- Profibus connection.
- Ethernet or Modbus TCP/IP connection.
- Autopurge system for automatic purging of purge tank (electric or pneumatic).
- Special version with reverse cycle valve to generate hot water up to 60°C
- Special version with additional heat exchanger to generate hot water up to 90°C
- Special version with additional heat exchanger to generate simultaneously chilled water and hot water.



Double effect direct fired absorption chiller of 2V series



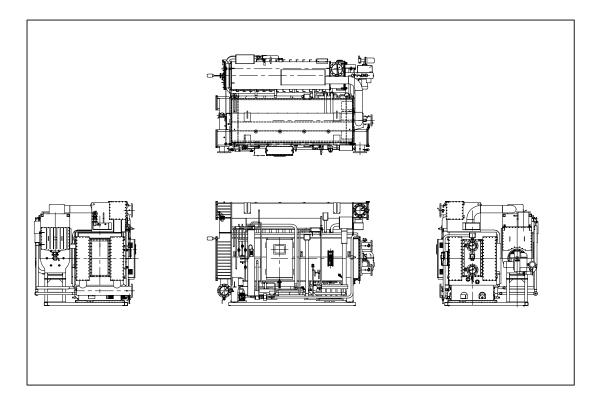
Working cycle of 2V series

-

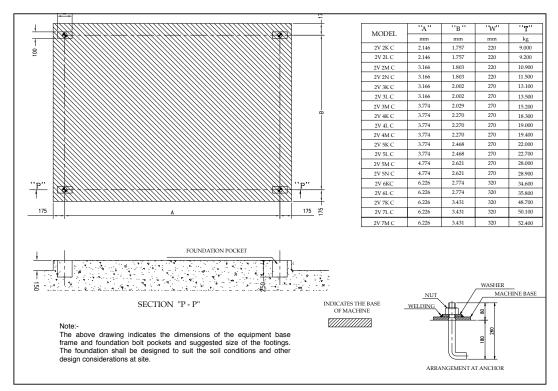
# 10. 2V series

		UNITS	2V2KC	2V2LC	2V2MC	2V2NC	2V3KC	2V3LC	<b>ZV3MC</b>	2V4KC	2V4LC	2V4MC	2V5KC	2V5LC	<b>2V5MC</b>	2V5NC	2V6KC	2V6LC	2V7KC	2V7LC	2V7MC
Cooling																					
capacity		kW	476	568	704	840	1.005	1.130	1.354	1.515	1.705	1.885	2.086	2.302	2.654	2.965	3.280	3.655	4.665	5.160	5.452
Chilled	Flow	m³/h	81,6	97,4	120,7	144,1	172,4	193,8	232,2	259,9	292,4	323,2	357,8	394,8	455,2	508,6	562,6	626,9	800,1	885	935,1
water	Connection diameter	DN		12	25			150			200		20	00		2	50			350	
Cooling	Flow	m³/h	142	170	210	252	300	335	404	450	500	562	622	688	792	882	970	1.094	1.380	1.530	1.620
water	Connection diameter	DN		15	50			200			250		30	00		3	50			400	
Gas																					
	Gas consumption	m <sub>№</sub> ³/h	34,8	41,3	51,5	61	72,9	81,7	98,5	110,2	123,7	136,9	151,4	167	192,4	214,7	240,8	268,3	339,3	376	396,7
	Stack connection diameter	DN	15	50	20	00	250				300		35	50	150		500			550	
Dimensions	Length (L)	mm	3270		4285		43	25	4930		4975		50	10	60	10	74	65		7595	
	Width (W)	mm	2640		2550		25	50	2800		3070		33	00	34	50	36	40		4310	
	Height (H)	mm	27	90	27	90	28	90	2890		3160		33	50	34	50	35	30		3900	
Weights	Working weight	x1000kg	9,0	9,2	10,9	11,5	13,1	13,5	15,2	18,3	19,0	19,4	22,0	22,7	28,0	28,9	34,6	35,8	48,7	50,1	52,4
	Shipping weight	x1000kg	8,4	8,5	10,1	10,6	11,9	12,3	13,9	16,5	17,1	17,4	19,6	20,1	25,1	25,8	30,9	31,9	42,7	43,8	45,7
Clearance	Clearance for tube removal	mm	25	00	35	00	36	00	4200		4250		43	50	54	00	68	60		6910	
Electrical	Solution pump	kW(A)		2,2	(6,0)		3	3,0 (8,0	)	3,7 (11,0)			5,5 (14,0)		6,6 (	17,0)			,5 (20,0		
	Refrigerant pump	kW(A)							0,3	(1,4)			- /- X /- /- /						1,5 (5,0	)	
	Vacuum pump	kW(A)									0	,75 (1,8	3)								
	Power consumption	kVA		11	,2		13,4	14,8	15,3		17,5		23	,9	26,1	26,4		36,7		41	1,6
												) Hz (±									

1) Model code: 2V XX - C double effect direct fired absorption chiller, 2) Inlet/Outlet chilled water temperature = 12/7 °C, 3) Inlet/Outlet cooling water temperature = 29/34°C 4) Net calorific value of gas = 37.681 kJ/Nm3, 5.a) Fouling factors: chilled water - 0,018 m<sup>2</sup>K/kW, b) Fouling factors: chilled water outlet temperature 3,5°C; lower temperatures upon request, 7) Minimum cooling water inlet temperature 0°C, 8) Plantroom minimum/maximum temperature 5-45 °C, 9) Maximum working pressure in water circuits = 8 bar(g); higher pressures available upon request at extra price, 10) Please contact Thermax representative/office for customised specifications.



Typical layout of 2V series



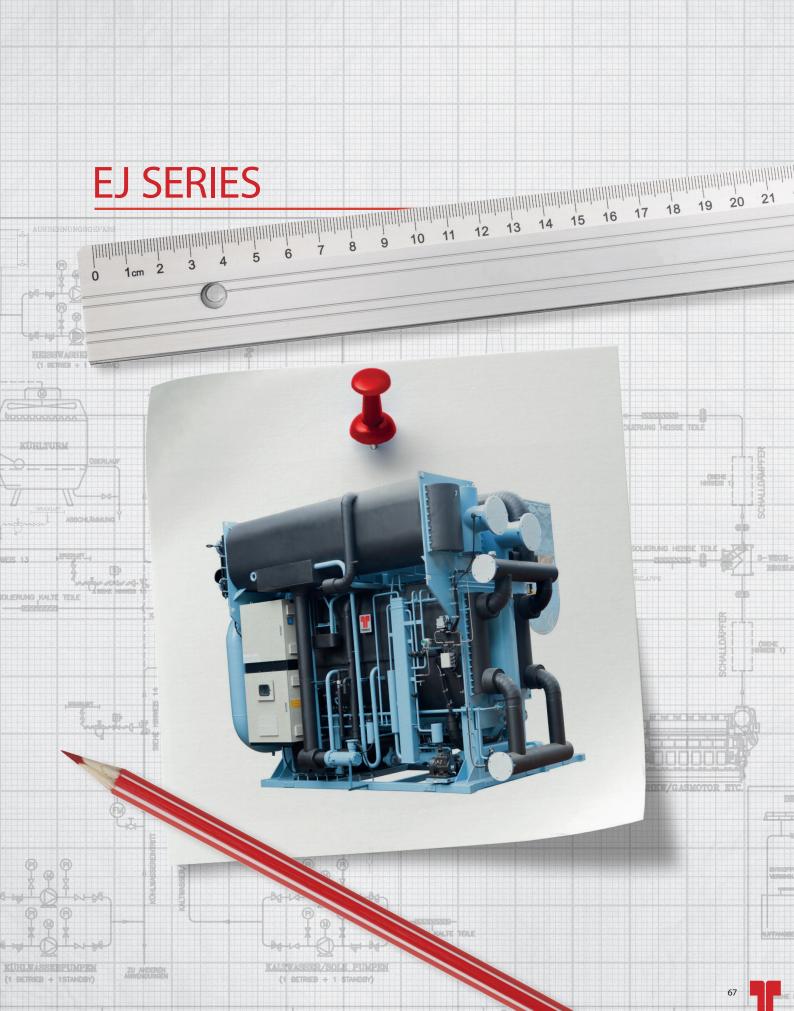
Foundation details of 2V series

#### 2V SERIES POSSIBLE APPLICATIONS:

- · Installations with fiscal facilities on gas price
- · Installations with low electrical power available
- · Installations requiring cooling and heating generation

#### NECESSARY DATA TO PREPARE AN OFFER:

- Cooling capacity required (or alternatively the available heat capacity)
- Chilled water inlet/outlet temperatures
- Cooling water inlet/outlet temperatures
- Calorific value of gas



F

#### 11. EJ SERIES:

"J" series machines can be fired with multiple heat sources simultaneously. The most common model of the series is the "EJ" series, that can be fired with hot water and exhaust gases at the same time. Other options are anyway available, like the steam + hot water (SJ) or the superheated water + hot water (HJ).

All machines in this series feature three different generators: one fired by the low temperature heat source (hot water) and two fired with the high temperature heat source. Basically it is as if the machine is running a single effect cycle and a double effect cycle at the same time.

With the "J" series it is possible to maximize the cooling output of the machine at same heat input, with much more compact dimensions respect to the use of two separate machines.

Cooling capacity 455 kW-7 MW.

HIGH TEMPERATURE HEAT SOURCE Exhaust gases: 350 °C-600 °C Steam: 4 bar(g)-10 bar(g) Superheated water: 155 °C-180 °C

LOW TEMPERATURE HEAT SOURCE Hot water: 85 °C-120 °C

BACK UP BURNER AVAILABLE IN OPTION

COP: between 0,95 and 1,1

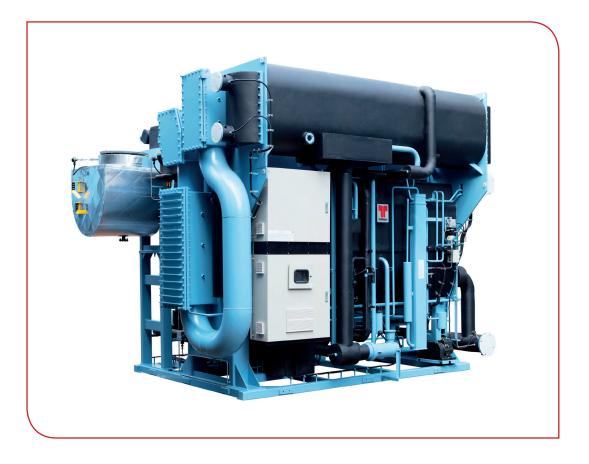
#### **STANDARD FEATURES:**

- Triple shell design: the upper shell (including the two condensers, the low temperature generator (LTG) and the hot water fired generator, the lower shell (including evaporators and the absorbers) and High temperature Generator (HTG).
- "Split" type evaporator: the evaporator is divided into two different tube bundles, placed on both sides of the absorber, that remains in the middle of the two evaporators. This solution grants a better efficiency at part load, optimizing the mass transfer inside the solution.
- Straight tubes in the generators for easy maintenance.
- Gravity feed spray technology in evaporator and absorber. Liquids are sprayed downwards on the tubes to ensure good film thickness and better heat transfer.
- Marine type headers in absorber and condenser, for an easy access to the tube bundle without need of lifting systems to support the header. All water boxes have flanged connections. All water boxes are provided with drain and vent connections.
- Crystallization control and prevention based on on-line determination of actual measured concentration.
- Refrigerant autoblowdown solenoid valve controlled by solution concentration
- Level electrodes for refrigerant and solution level monitoring in the evaporator, absorber and HTG.
- PLC based control panel SIEMENS SIMATIC S7-1200
- Alarm state annunciation through an audio signal and appropriate messages display on the operator interface terminal.

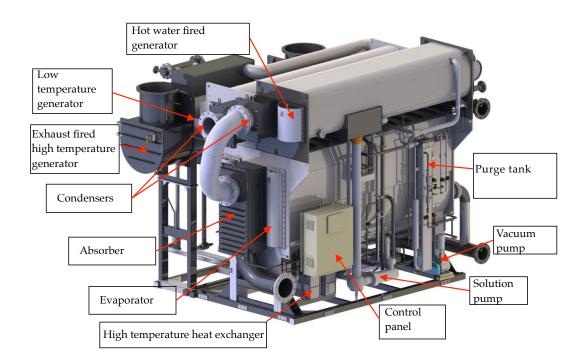
- Operator panel SIEMENS TP700, 7" touchscreen.
- MODBUS RTU connectivity as a standard feature.
- Several field interlocks available for plant automation.
- Boiler grade carbon steel tubes in high temperature generator (in case of exhasut fired firing). SS 430 Ti tubes in case of steam firing.
- DLP copper tubes in evaporator, absorber and condenser.
- Crystallization prevention safeties: overflow pipe for auto decrystallisation, low/high cooling water inlet temperature cut-out, high temperature control for generator, heat input PLC control based on generator temperature.
- PID algorithm capable of achieving part load operation from 10 to 100% stepless, based on chilled water outlet temperature.
- Purge system, which continuously and automatically removes non condensable gases from the shell side and stores them in a tank. A purge pump is provided as standard feature.
- Three regenerative heat exchangers to increase the efficiency of the cycle. The heat exchangers are plate type, with copper brazed stainless steel plates, designed for the maximum heat exchange with minimum pressure loss. The use of a plate heat exchanger ensures a compact design of the unit.
- Isolating valves for easy removal of the pumps for maintenance without breaking the vacuum inside the chiller.
- Antifreeze protection safeties: PLC inbuilt antifreeze alarm, antifreeze thermostat, low temperature cut-out for refrigerant pump (L-cut), flow switch and D.P. switch for chilled water.
- Completely factory assembled and wired.
- Potential free contacts for remote and automatic operation of the machine: chilled and cooling water pumps start/stop, cooling tower fans start/stop, remote start/stop of the machine, remote indication of machine status (on/off) and machine trip, remote setpoint.
- Rupture disk
- Digital vacuum transmitter
- Inverter on solution pumps.
- TRG, a patented bearing monitoring system for monitoring the wear and tear of the bearings (through contacts inside control panel)
- Generator pressure switch.

#### **OPTIONAL:**

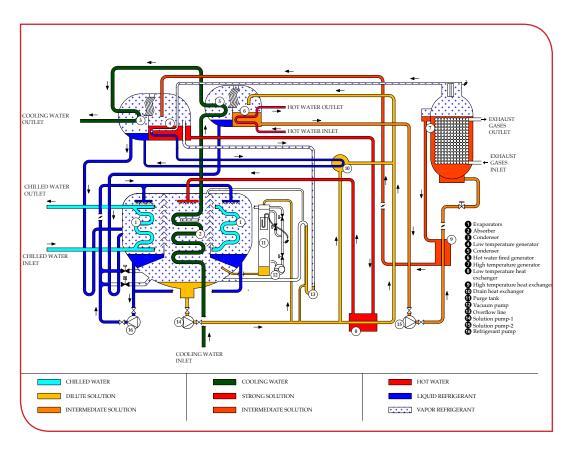
- Stand by refrigerant and solution pumps.
- Special metallurgy for tubes (CuNi 95/5, CuNi 90/10, Stainless steel, Titanium).
- Tubesheet and headers cladding in case of use of bad quality water not suitable for carbon steel
- On line indication of healthiness of bearings of refrigerant and solution pump (on line TRG).
- Insulation of cold and hot surfaces (excluded surfaces at T higher than 150°C).
- Multiple pieces shipment: unit can be shipped in multiple pieces to be reassembled on site.
- Profibus connection.
- Ethernet or Modbus TCP/IP connection.
- Autopurge system for automatic purging of purge tank (electric or pneumatic).
- Back up burner



EJ series absorption chiller fired with exhaust gases + hot water



#### 3D view of an EJ machine



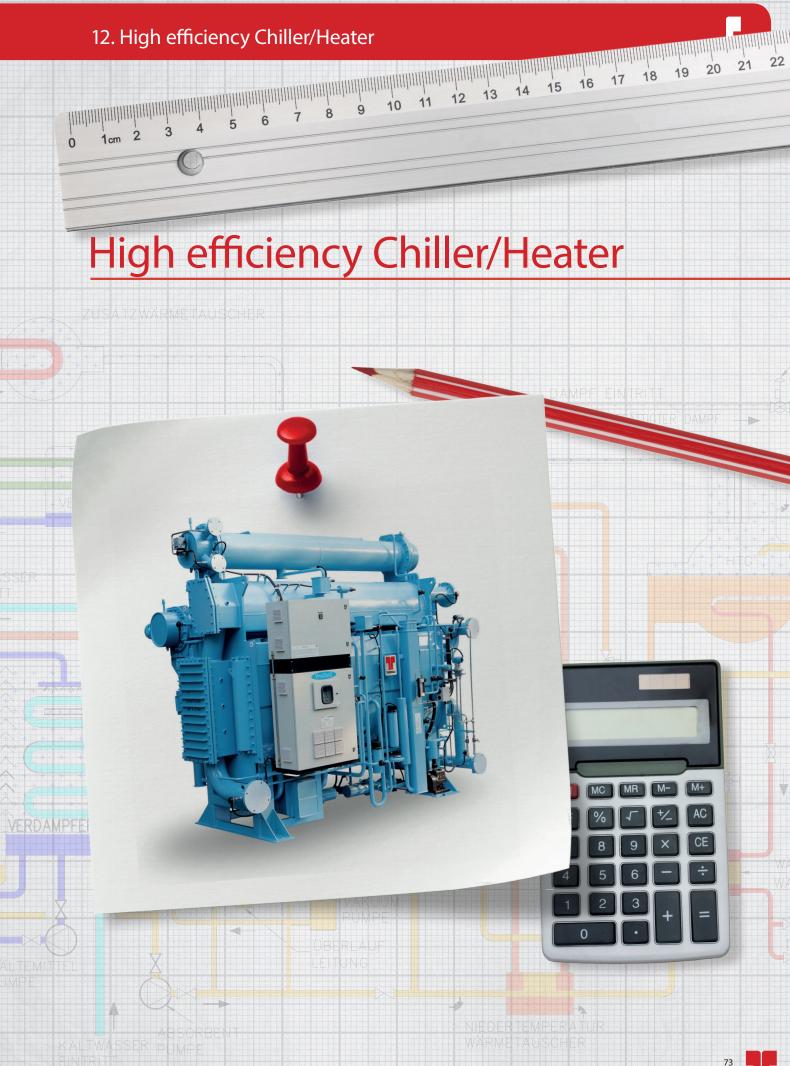
Working cycle of EJ series

#### EJ SERIES POSSIBLE APPLICATIONS:

• Cogeneration/Trigeneration when it is important to maximize the cooling capacity with the smallest footprint: industries, hospitals, airports, etc

#### NECESSARY DATA TO PREPARE AN OFFER:

- Cooling capacity required (or alternatively the available heat capacity)
- Chilled water inlet/outlet temperatures
- Cooling water inlet/outlet temperatures
- Hot water inlet/outlet temperatures
- Exhaust gases temperature
- Exhaust gases flow (in kg/h)
- Allowable Pressure drop in exhaust furnace



#### 12. HIGH EFFICIENCY CHILLER/HEATER (HEATING AND COOLING SIMULTANEOUSLY)

High efficiency Chiller/Heater is an absorption chiller capable to provide cooling and heating simultaneously in a very efficient way.

Traditionally boilers have been used to generate hot water, which are either gas or oil fired or steam fired, with the team being generated using fossil fuel fired boiler. So to produce ~90°C hot water, flue gases at 1000°C produced by combustion of fuels are used, i.e. high grade heat is used to produce low temperature hot water. These systems require around 115kW of fuel energy input to produce 100kW of hot water. 15kW loss is through energy loss in combustion.

There could also be applications in industry where both chilled water and hot water are required simultaneously. The chiller heater offers a single point solution for this dual purpose application. There are conventional chiller heaters available using absorption technology but these chiller heaters are consuming energy such as hot water plus absorption chillers. There is no energy saved. The only advantage of this is that it is a single piece of equipment.

Thermax have developed a product that can provide simultaneous chilling and heating using its vapour absorption technology with 40% saving in heating energy.

In this chiller heater product, 40% of heat required for generating hot water is recovered from low temperature chilled water. Remaining 60% is recovered from the external heat source. This means you save 40% of the energy coming from the direct heat source to heat the water, and chilled water is produced simultaneously.

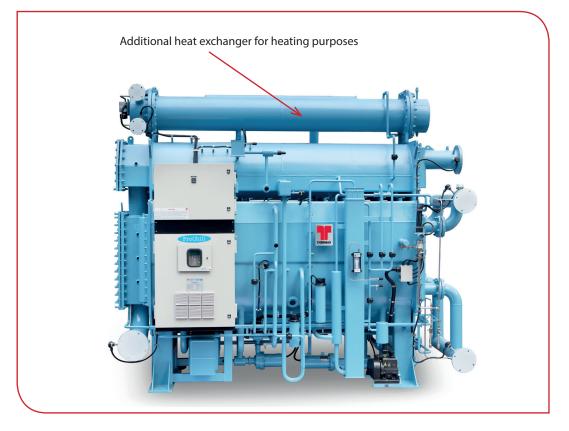
Thermax Vapour absorption chiller heater generates chilling and heating simultaneously in a single unit using Steam / Fuel firing / Exhaust gases / Hot water as heat source.

Product patent application has been filed for this product in India as well as major export markets.

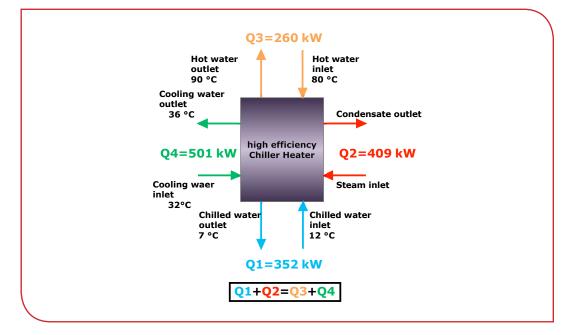
27/02/2018-----

## 12. High efficiency Chiller/Heater

High efficiency Chiller/Heater.



Below scheme shows a typical example of the energy balance of the Chiller/Heater:



The scheme of operation of chiller heater as compared to conventional hot water generator has been explained using schematic diagrams as given above.

40% of fuel consumption required for hot water generation (Q3) is recovered from the refrigeration cycle. Hence not only does the fuel consumption for heating is reduced, the heat rejection in Cooling tower (Q4) also reduces.

### 12. High efficiency Chiller/Heater

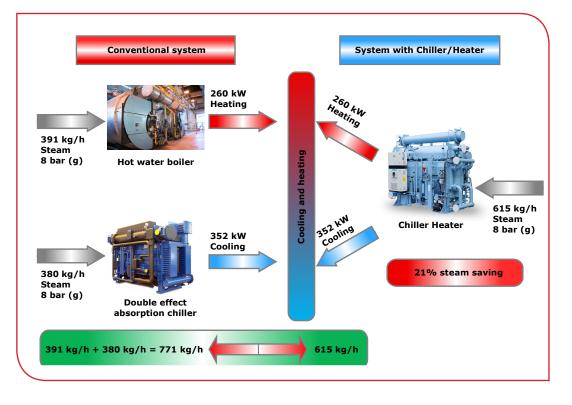
High efficiency Chiller/Heater is flexible enough to be used for production of chilled water only, hot water only or chilled water and hot water simultaneously.

In the absence of heating load the chiller-heater can run with a turndown of 20-100 % cooling capacity. This doesn't require change over of mode of operation.

When the cooling load goes down, the heating capacity delivered will also reduce. The maximum heating capacity in simultaneous mode is 75-80% of the prevailing cooling load.

When the cooling load is in the range of 90-100% of rated, the chiller heater can deliver heating with a turn down of 20-100% of rated.

In the absence of cooling load (0%), chiller-heater can produce 100% heating capacity only after change over to heating mode.

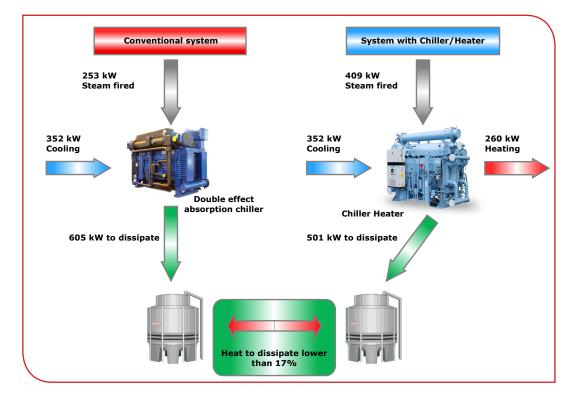


Picture below shows schematically the advantages of the high efficiency Chiller/Heater

In the above example the solution utilizing a high efficiency Chiller/heater is achieving a steam saving of 21% respect to a conventional solution utilizing a boiler and a separate absorption chiller.

Other advantages of this type of machine are the small footprint, the simple hydraulic connection required and the extremely simplified regulation.

# 12. High efficiency Chiller/Heater



Also, as already mentioned, there is another important advantage on the cooling system of the machine, as illustrated in below scheme:

At same cooling capacity and same heating capacity, the high efficiency Chiller/heater dissipate a quantity of heat which is about 17% lower than the one dissipated by a conventional system. Hence this is reducing substantially the size of the cooling tower and of the entire cooling system.

### POSSIBLE HEAT SOURCES:

Steam 3,0 bar(g)-10 bar(g) Superheated water 145 °C-180 °C Direct fired with gas burner Exhaust gases 350 °C-600 °C

### CAPACITY RANGE:

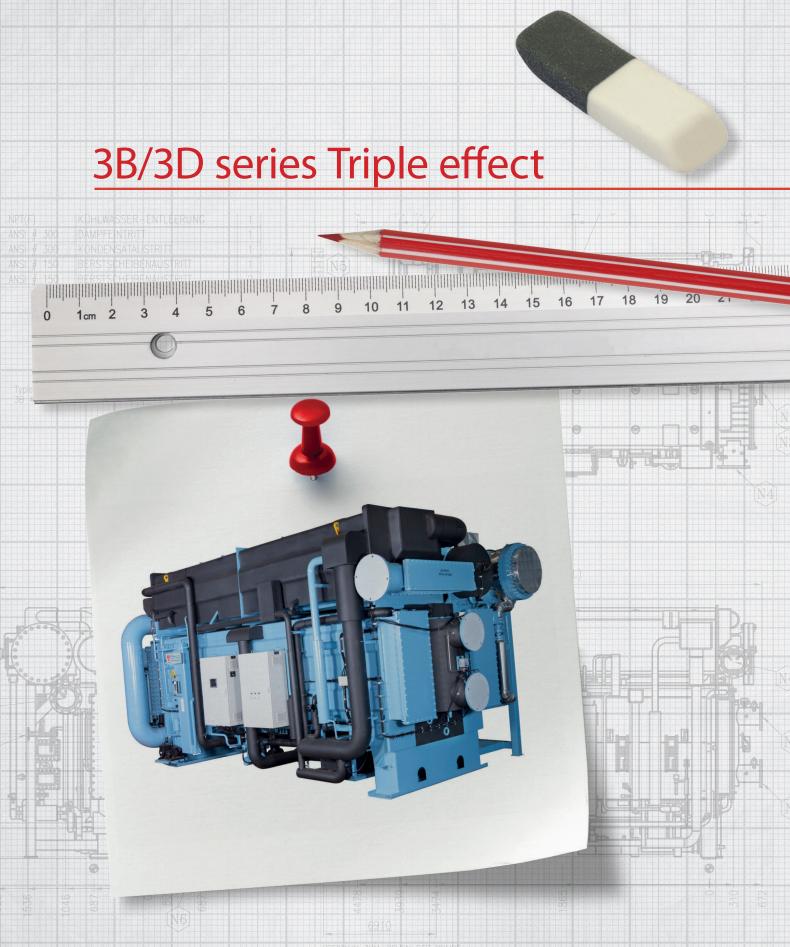
Cooling capacity between 350 kW and 12,3 MW Heating capacity between 100 kW and 9 MW

### **TEMPERATURE RANGE:**

Cooling 0-30 °C, ΔT=30 °C max. Heating 30 °C-90 °C, ΔT=5-50 °C max.

		Notes

11 16-10



- (NUR AN EINER DER BEIDEN STIRNSEITEN ERFORDERLIG



#### 13. 3B/3D SERIES:

Brand new series featuring a triple effect cycle, with three generators and low, medium and high temperature, fired with high grade heat sources like steam (3B) of exhaust gases (3D).

This series represents the highest development reached by an absorption chiller and it shows the highest values of efficiency in the market. Thermax has become the first manufacturer to have developed a triple effect machine and to have launched it in the market.

Triple effect machines have an average COP between 1,75 and 1,85. This means cooling capacities between 23 and 28% higher with same heat input respect to double effect machines.

Triple effect machines operate with high temperature generator temperatures between 180°C and 210°C. This make them the first LiBr absorption chillers running with a positive pressure, in a range between 2,5 and 4,5 bar (g).

As the number of effects increase, not only internal temperatures are raising, but at same concentration level also corrosion rate is increasing.

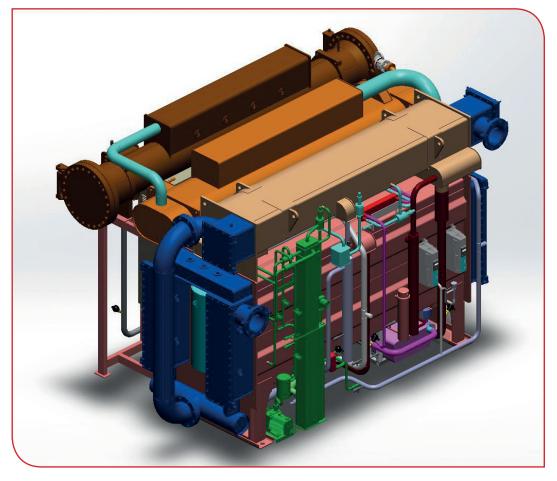
For such reasons the technical challenges given by a triple effect machine are extremely complex: the complexity of the working cycle (considering the presence of three generators and many other heat exchangers), the higher working pressures (more rugged construction required) and the higher corrosion potential of LiBr solution.

In order to give answer to all above challenges Thermax has further developed and refined the modified series cycle already used in its double effect machines. With this new cycle the couple temperature/ concentration of the solution never shows both maximum values at the same time. In high temperature generator where the temperature is the highest, the concentration will be the lowest. At same time where concentration is higher in low temperature generator, temperature is lowest.

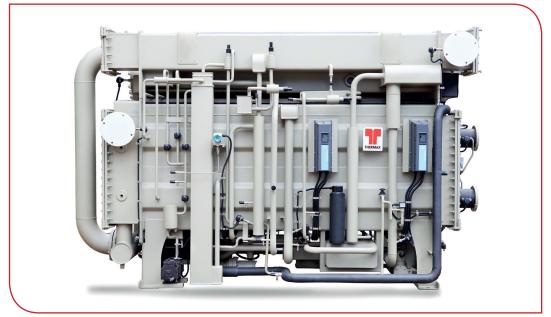
In a Thermax triple effect machine developed with this concept, solution concentration in high temperature generator is usually lower than the same one in a double effect machine.

Capacity range of steam fired machines: 175 kW-3,5 MW Capacity range of exhaust gases fired machines: 175 kW-1,8 MW

Nominal steam pressure between 15 bar(g) and 25 bar(g) Exhaust gases temperatures between 400 °C and 600 °C COP: ca. 1,75-1,85



3D view of a triple effect machine of 3B series



Picture of a triple effect machine of the 3B series

Ì



Below pictures show two real triple effect machines of 3B series installed in a plant room.





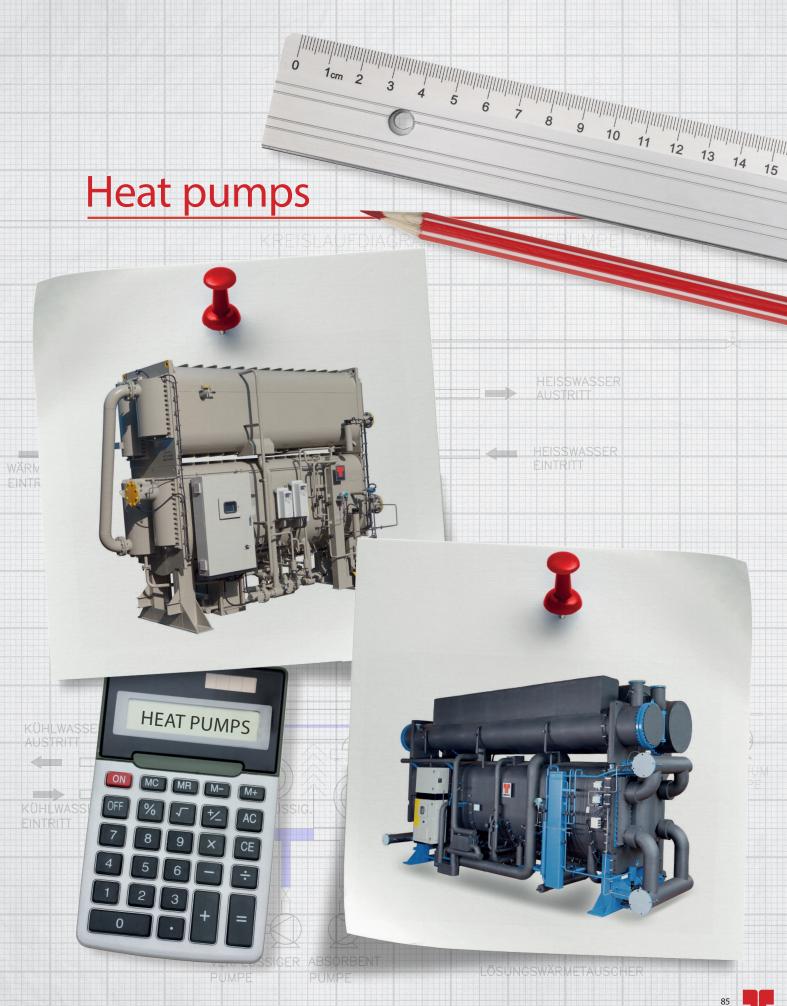
### 3B/3D POSSIBLE APPLICATIONS:

- Chemical industry
- Food industry
- Automotive industry
- Processes using steam discharge from turbine in cogeneration plants or in power plants
- Exhaust gases from gas engines in large cogeneration plants
- Industrial steam or waste heat available at the required temperature level

### NECESSARY DATA TO PREPARE AN OFFER:

- Cooling capacity required (or alternatively the available heat capacity)
- Chilled water inlet/outlet temperatures
- Cooling water inlet/outlet temperatures
- Steam pressure (3B)
- Exhaust gases temperature (3D)
- Exhaust gases flow (in kg/h) (3D)
- Allowable Pressure drop in exhaust furnace (3D)

-		Notes

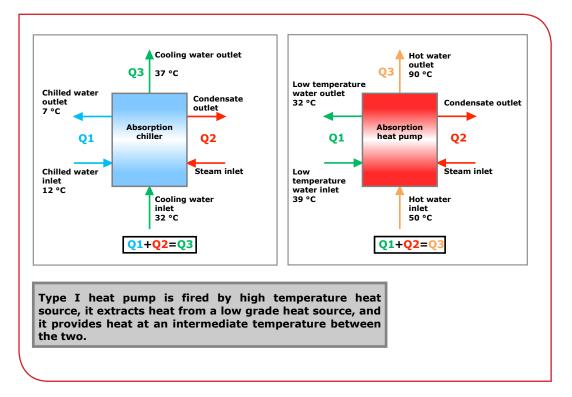


#### 14. HEAT PUMPS

Further to absorption chillers for cooling and chilled water production, the absorption technology can be applied also on heat pumps, in order to achieve production of hot water.

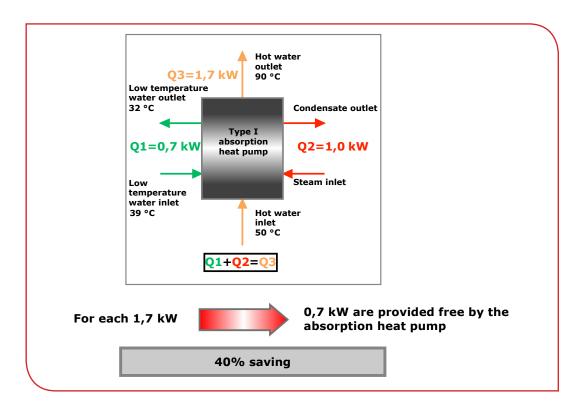
#### **TYPE I HEAT PUMPS**

Below picture shows the different temperature levels at which typically an absorption chiller and an absorption heat pump work:



The schematic diagram shown in following picture illustrates a typical energy balance of a Type I absorption heat pump.

As you can see, for each 1,7 kW of hot water given to the final user, 0,7 kW are generated for free. This means a saving of 40% respect to the use of conventional hot water boilers.



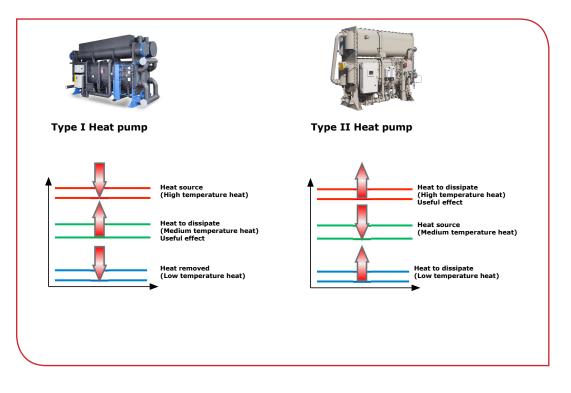
The higher is the temperature of the low temperature heat sink where the heat is extracted from, the higher is the hot water temperature that is possible to achieve.

Absorption heat pumps are designed on a case to case basis depending upon the specific request of the customers.



### **TYPE II HEAT PUMPS**

Below scheme illustrates the major differences between a Type I heat pump and a Type II heat pump:

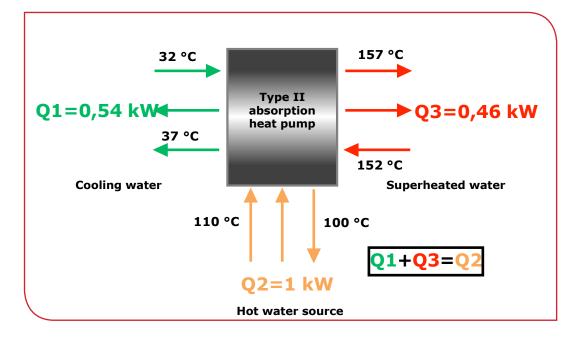


As it is shown, the position of the rejected heat (which represents the useful effect) is substantially different in the two cases. While in Type I heat pump the heat to be dissipated (hot water going to user) is at a medium temperature level, in Type II heat pump it is a the highest temperature level.

Similarly, heat source in Type I heat pump is at the highest level, while in Type II heat pump is at he medium level. Also Type II requires some heat to be dissipated at low temperature. It means Type II heat pump requires a cooling tower just like an absorption chiller.

Differences between the two heat pumps are summarized in below table:

Type I heat pump Vs Type II heat pump		
Type I heat pump	Type II heat pump	
Machine is fired by an heat source at high tem- perature. Heat is extracted by a low temperature heat sink and heat at an intermediate temperature between the two is released to final users.	Machine is fired by an heat source at a medium temperature. Part of this heat is dissipated at low temperatures (cooling towers) while part of it is released to final users at higher temperatures.	
Efficiency approx. 1,7	Efficiency approx. 0,48	
Typical temperature profile: Low temperature heat sink: 40 °C-35 °C High temperature heat source: superheated water at 180 °C-160 °C or steam at 6-8 bar (g) Hot water available to users: 60 °C-90 °C	Typical temperature profile: Medium temperature heat source: hot water at 110 °C-100 °C Cooling water: 30 °C-36 °C Hot water available to users:150 °C-160 °C	



In below scheme it is shown the typical energy balance of a Type II heat pump:

Picture below shows a Type II heat pump:



### TYPE I HEAT PUMP

Low temperature heat sink (30 °C-60 °C)

- Water from cooling towers
- Condensate from industrial processes
- Geothermal water

Capacity range between 250 kW and 40 MW

COP 1,65-1,75

Hot water released to users:

- Hot water 35 °C-90 °C
- ΔT 55 °C max.

### **TYPE II HEAT PUMP**

Medium temperature heat source (80 °C-120 °C)

- Hot water from process
- Geothermal water
- Condensate from steam turbines

High temperature heat released to users:

- Dry saturated steam (1,0 bar(a)-4,0 bar(g))
- Superheated water (110 °C-155 °C)

Capacity range between 500 kW and 10 MW

COP 0,45-0,5

Type I heat pump installed in Copenhagen (Denmark)



High temperature heat source

- Dry saturated steam (1-10 bar(g))
- Superheated water (130 °C-180 °C)
- Exhaust gases (275 °C-600 °C)



#### **15. LOW TEMPERATURE MACHINES**

All absorption chillers shown in the catalogue can be equipped with a special kit (called "Low Temperature kit") in order to achieve chilled water outlet temperatures between  $3,5^{\circ}$ C and  $-5^{\circ}$ C.

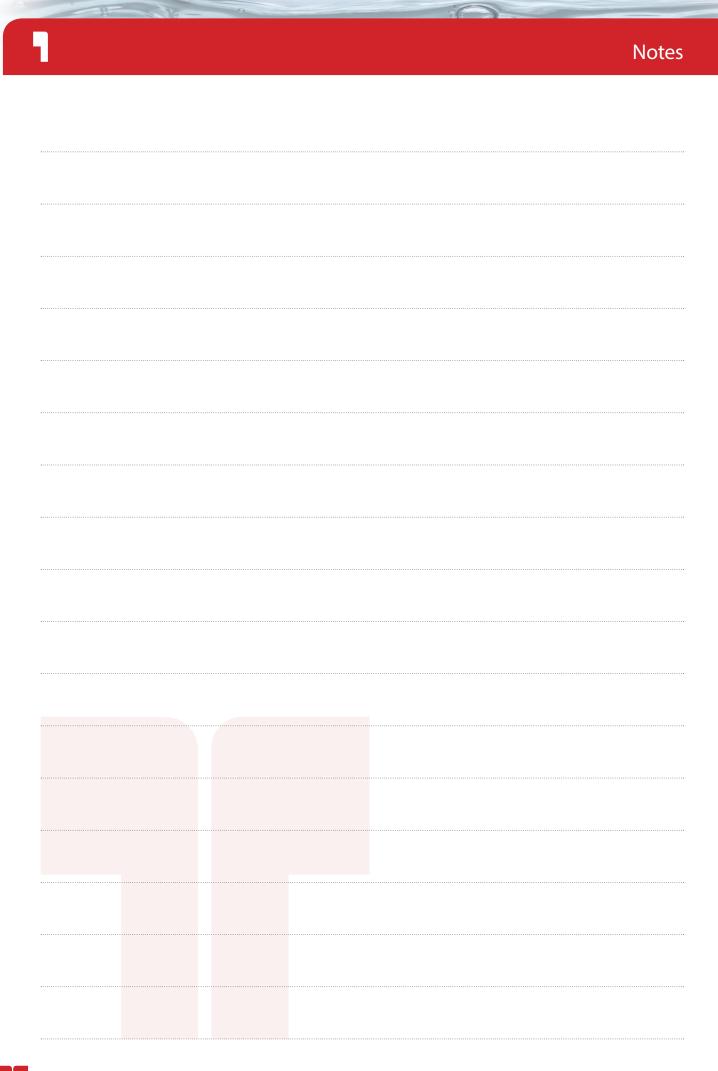
In a traditional absorption chiller the minimum chilled water outlet temperature achievable is limited by the fact that the refrigerant used by machines is water. In order to avoid the freezing of refrigerant the minimum chilled water outlet temperature achievable by a traditional machine is  $3,5^{\circ}$ C.

Thanks by the technology developed by Thermax it is possible now to achieve lower temperatures of chilled water outlet: as of now the limit is set at -5°C.

A precise and sophisticated control system injects a small quantity of LiBr solution into refrigerant: in such a way the contaminated refrigerant doesn't freeze at 0°C anymore and it is possible to achieve lower chilled water temperatures. The system is capable to determine the concentration of LiBr solution in the refrigerant and it maintain this concentration between a narrow range: enough to avoid refrigerant freezing but also to avoid excessive heat transfer loss due to too much LiBr solution in refrigerant.

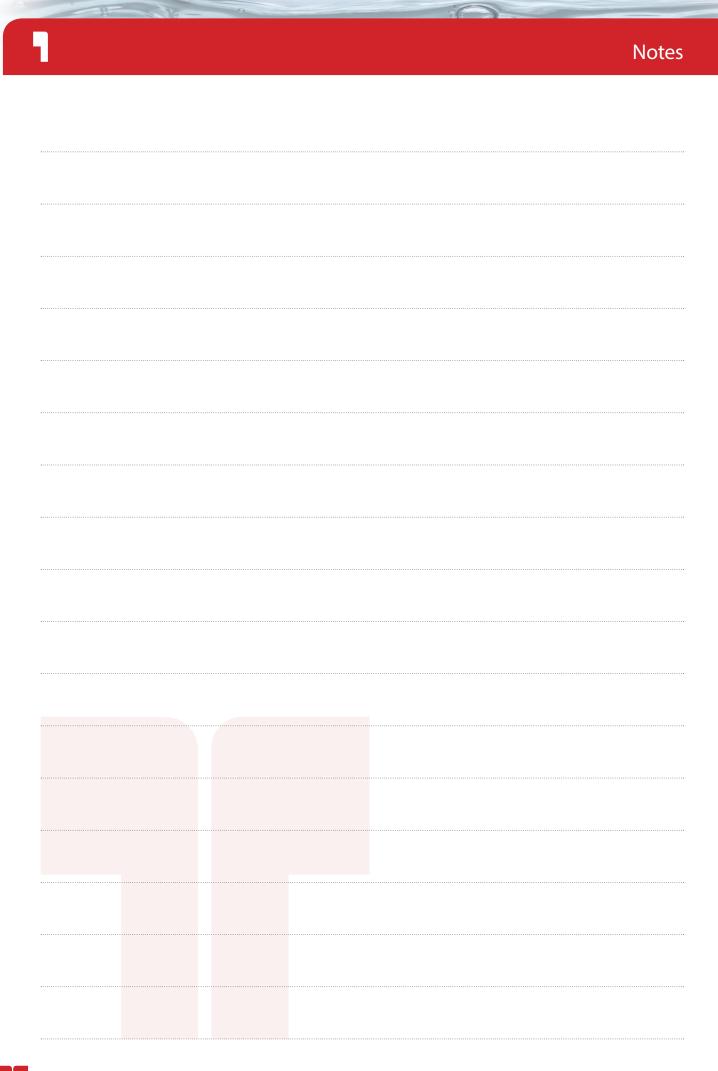
#### **POSSIBLE APPLICATIONS:**

- Food industry
- Cheese industry
- Milk industry
- Beer industry
- · Refrigeration plants in order to reduce the consumption of ammonia chillers



Notes
-------


G



Notes
-------


G

Riportiamo di seguito un estratto di alcune installazioni in Italia eseguite in collaborazione con TRANE ITALIA srl. THERMAX può vantare circa duecento unità installate in Italia e quasi 500 in tutta Europa. Per l'elenco completo rivolgersi agli uffici di Thermax o Trane Italia.

- Ergom Melfi
- Fiat Sevel

Ç,

- Università di Fisciano
- Università di Potenza
- Ferrero (stabilimenti di Alba, Balvano e S.Angelo Lodigiano)
- Ospedale di Merano
- Ospedale di Cittadella
- Ospedale di Camposanpiero
- Ospedale Este
- Humanitas Rozzano
- Policlinico di Milano
- AGAP Maserati
- Sanofi (stabilimenti di Brindisi e Scoppitto)
- Pasta Baronia
- Ospedale di Merate
- Ospedale di Feltre
- Ospedale Fatebenefratelli
- Ospedale S.Carlo Borromeo
- Ospedale Cardarelli
- Aeroporto Marco Polo Venezia
- Aeroporto G.Marconi Bologna
- Patheon
- Sigma Tau
- Eskigel
- Luxottica
- Albea Cosmetics
- Ospedale di Tricase
- Hexion
- Siemens
- Alpla
- Veritas
- Peroni