

Single Effect Steam Driven Absorption Chiller

115 TR (404 kW) To 2100 TR (7385 kW)

COP 0.8



Absorption Cooling & Heating Solutions

Sustainable Solutions in Energy & Environment

Thermax is a USD 750 million engineering major providing sustainable solutions in the areas of energy and environment. Spanning over 90 countries, customers make use of Thermax's business-to-business solutions for heating, cooling, power and cogeneration plants; waste heat recovery units; systems for water & wastewater management and air pollution control; performance improving chemicals.

Thermax's operations are supported by ongoing Research & Development and also with tie-ups from global technology majors. With an international sales & service network spread over 27 countries, Thermax also has its state-of-the-art manufacturing facilities in 14 locations including India, Poland, Indonesia, Denmark & Germany.

Our Vision

To be a globally respected high performance organization offering sustainable solutions in energy and environment

We heat, we cool, we power and we clean

Thermax, an engineering company providing sustainable solutions in energy and environment, has the vision for the future, firmly anchored in the belief that to stay competitive, companies need to adopt sustainable development practices.

The systems, products and services developed by Thermax help industries achieve better resource productivity and improve bottom lines, while maintaining a cleaner environment. Even in the conversion of costs to profits, Thermax helps to protect the environment in its own way. A win-win for industry and the society at large.

Thermax's business portfolio includes products for heating, cooling, water and waste management, and specialty chemicals. The company also designs, builds and commissions large boilers for steam and power generation, turnkey power plants, industrial & municipal waste water treatment plants, waste heat recovery systems and air pollution control projects.



Thermax Cooling Business

With over 50 years of expertise in the field of Thermodynamics, Thermax helps extract even the last calorie available at your facility. Solutions in the form of absorption chillers, heat pump, chiller-heaters, composite chillers, ultra low pressure vapour chiller & multi energy chillers are used in more than 100 applications and over 50 industrial segments for air conditioning, industrial cooling and heating.

Thermax absorption chillers cater to industrial-cooling, commercial air-conditioning as well as industrial and space heating needs. Thermax's USP lies in identifying the unused heat available at your plant and provide recovery based or live energy based solutions to optimize energy thus reducing your operational cost.

Thermax offers solutions from -40°F to 356°F by utilizing hot water starting from 176°F vapour or steam from 0 psi(g) onwards/flue gases from engine and turbines from 518°F onwards and a variety of liquid and gaseous fuel.

Thermax has helped clients with Eco-friendly air-conditioning and process cooling to reduce their carbon

footprints. Thermax has a global foot print in 90+ countries across Asia Pacific, Africa, Middle East to CIS countries, USA and South America.

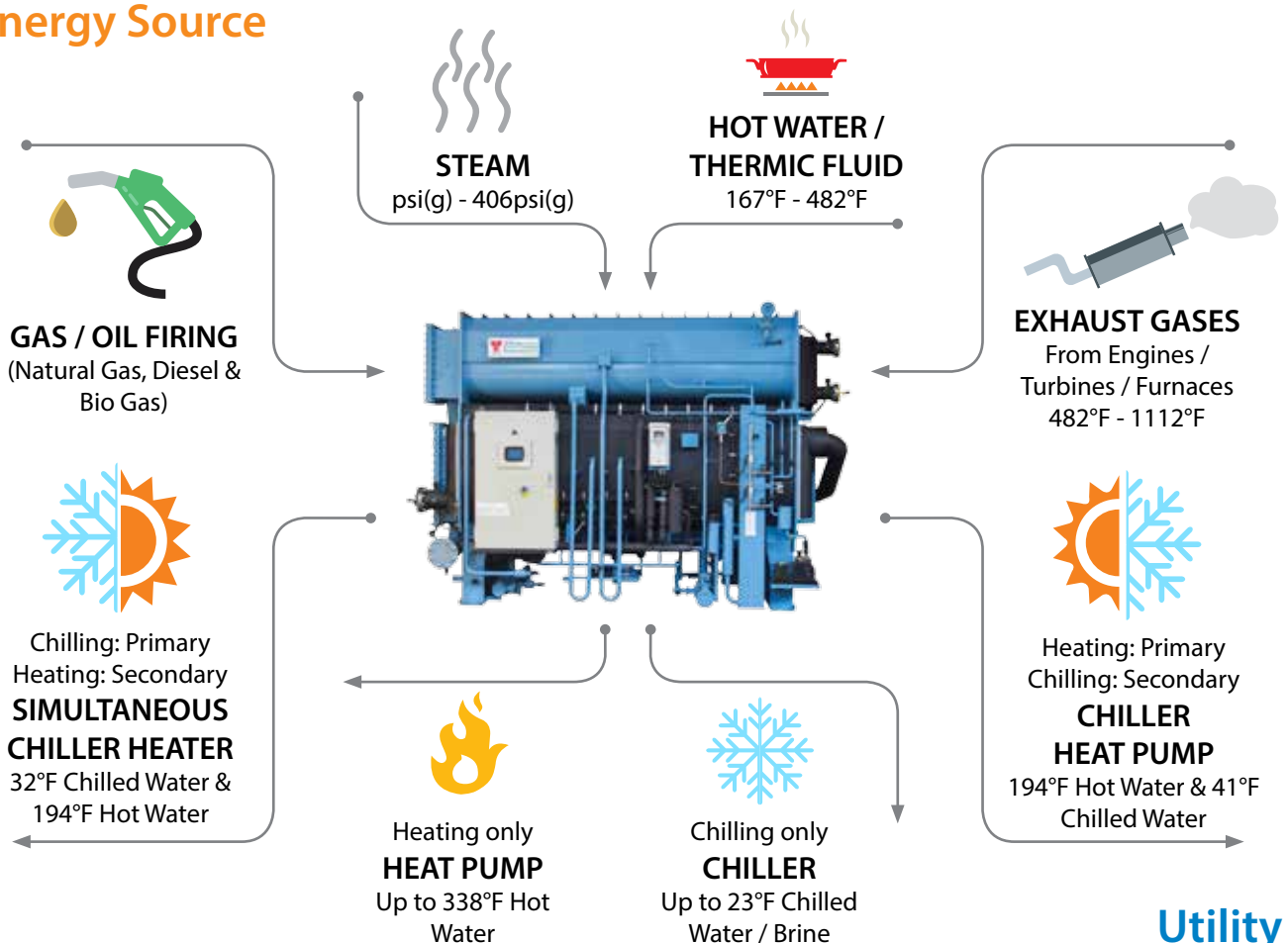
Thermax offers solutions to a wide array of industrial segments including pharmaceuticals, chemicals, fertilizers, steel, textiles, petrochemicals, food & beverages, commercial complexes, shopping complexes, office buildings, educational institutes, and airports among others.

Solutions offered by Thermax are differentiated by:

- Reduction of operational cost
- Reduction in electricity consumption
- Reduction in the GHG emissions, zero ozone depletion potential

Thermax's unique heating & cooling solutions accommodate a wide range of industrial & commercial applications across the globe. These solutions deliver high efficiency, cost effectiveness & are environment friendly.

Energy Source



Manufacturing Excellence

Inaugurated in early 2019, Thermax's manufacturing facility at Sricity, Andhra Pradesh is world-class and has been designed focusing on process automation, mechanisation and digitisation. This smart facility is equipped with best in class machinery and is a big step towards automation to facilitate zero-defect processes ensuring superior quality products. Critical processes such as welding are carried out with robots and CNC machines carry out the precision machining activities. Fabrication processes are mechanised using specially designed fixtures. Entire manufacturing records are

digitised for real time updates using MES software. Engineering design automation using 3D drawings, Cloud computing and MES have enabled this plant to employ contemporary technologies and follow the path of Industry 4.0 principles. The plant is equipped with a Welding Training Centre to hone the skills of operators. Products upto 3000 TR capacity can be tested for performance at its digitally controlled test bay facility. This infrastructure is created to deliver best in class quality output.

Certifications

Recognized by global standards





Salient Features

Best-in-class Coefficient of Performance

Thermax Chillers come with a process design that ensures maximum internal heat recovery to give the lowest specific steam consumption benefit.

Avenues for COP improvement	
Enlargement of heat transfer area	Done by all manufacturers
Two stage evaporation	Unique feature of Thermax chillers
Condensate heat recovery	Unique to Thermax chillers
Enhanced tubes in chilled water and cooling water circuit	Unique feature of Thermax chiller

Unique Two Stage Evaporation Technology

Thermax chillers are designed based on unique two stage evaporation technology. This ensures that the specific heat input is one of the lowest in the industry, resulting in higher cooling output for the same heat input. Also, larger temperature difference in chilled water to the tune of 86°F, is possible.

Gravity Feed LiBr and Refrigerant Distribution Mechanism

With a nozzle-less, non-clogging gravity feed distribution mechanism for stable and reliable operation throughout the life of the machine, Thermax chillers eliminate the drop in performance. Need for separate pump for spray eliminated, resulting in lower power consumption.

Split Evaporator Design

Split evaporator design of the chillers help to improve absorption rate of LiBr, thereby improving efficiency.

Zero Crystallization

With a unique state-of-the-art concentration monitoring & control, Thermax chillers operate even at low cooling water inlet temperature without crystallization. This unique feature virtually eliminates crystallization and is distinctly different from the conventional auto de-crystallization.

Lowest Chilled Water/ Brine Outlet Temperature

Thermax innovative absorption chillers can deliver leaving chilled water temperatures down to 33.8°F and leaving chilled brine solution up to 28.4°F, enabling absorption chillers to be used for applications involving low chilled water / brine temperature.

Highly Efficient and Reliable Solution Heat Exchangers for Maximum Internal Heat Recovery

All regenerative heat exchangers from Thermax are high efficiency plate type heat exchangers with SS316 plates, for improved reliability.

Welded Plate Heat Exchanger for Condensate Heat Recovery

Specially designed welded type plate heat exchanger from Thermax with SS316 plates are used as heat reclaimers for condensate heat recovery. These are best suited for two phase flow and are highly reliable compared to conventional brazed heat exchangers.

Isolation Valves for Canned Motor Pumps

Double seal isolation valves and bolted pumps facilitate easy maintenance of the machine mounted canned motor pumps without any loss of vacuum in the system. This significantly reduces the down time of Thermax chillers.

De-oxidised Low Phosphorus Copper Tubes

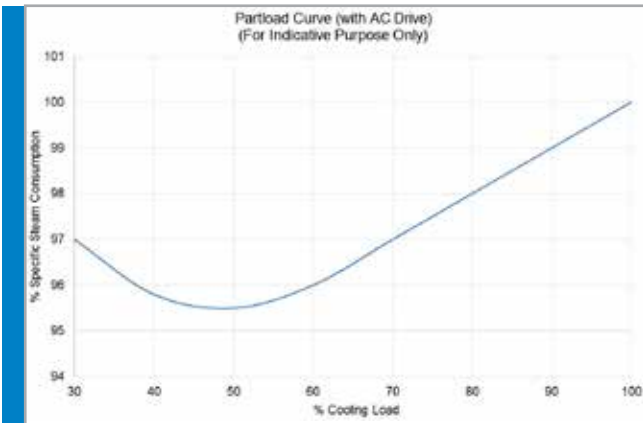
Copper tubes conforming to ASTM/JIS standards, with phosphorus content maintained below 0.005 ppm are used in chilled water and cooling water circuits. This protects the tubes from hydrogen embrittlement in LiBr environment.

Ferritic Stainless Steel Tubes in Generator

Titanium stabilized ferritic stainless steel tubes (SS430 Ti) is used in generator for lowest differential thermal expansion, thereby protecting the tubes from stress corrosion cracking. Suitable for steam with dissolved ammonia compounds, where copper alloys are not recommended.

Variable Frequency Drive on Absorbent Pump

Variable Frequency Drive on absorbent pump for higher reliability, savings in steam and savings in power, during part load operation.



10-100% Stepless Modulation

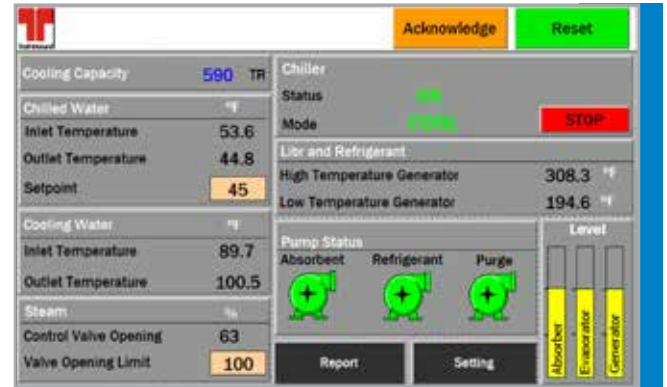
For cooling loads ranging from 10% to 100% of the designed capacity, the steam control valve automatically varies steam flow in order to maintain the temperature of chilled water leaving the chiller.

Multi-stage Level Control

Multiple stage level control in three locations enable effective operation during part load and prevents cavitation of refrigerant and absorbent pumps.

PLC Based Control Panel

Thermax chillers are provided with advanced PLC based control panel, user friendly 7 inch touch screen operator interface and data logging system.



BAS/DCS Connectivity

Direct connectivity of machine PLC panel with Third party monitoring systems like BAS (Building Automation System), DCS (Distributed Control System) or PLC (Programmable Logic Controller) can be provided via Modbus RTU protocol on RS485 network.

Fully Automatic Purging

Factoryfitted high efficiency Automatic purge system with purge cooler, continuously removes noncondensable gases from the chiller into the storage tank while in operation. A high efficiency multi-location purging system helps to independently remove noncondensable gases from different pressure levels. This also eliminates the need for periodic monitoring of purge tank pressure and manual operation of purge system.

Non-toxic Corrosion Inhibitor

New generation non-precipitating, non-toxic molybdenum based corrosion inhibitor which is more effective than conventional inhibitors based on Chromate (Cancer causing, prohibited in several countries) and Nitrate.

Customised Solutions

Customized Electrical and Instrumentation

Thermax possesses rich experience supplying chillers for critical applications in refinery and petrochemical plants across the globe. Thermax has in house capability to address critical applications such as:

- Hazardous area design for gas group class 1, division 2, IIA/IIB, per IEC and NEC Standards
- Redundant PLC systems, with redundancy at all levels, of various makes for fail safe operations
- Centralized Load management systems for multiple machines operating in tandem
- SCADA connectivity for remote monitoring and control of machines.

Tailor Made, High Efficiency Solutions for Low Steam Pressure

Custom designed single effect absorption chillers can be offered to make it suitable for steam pressure as low as 0psi(g).

LiBr Absorption Chillers for Sub-Zero Cooling Applications

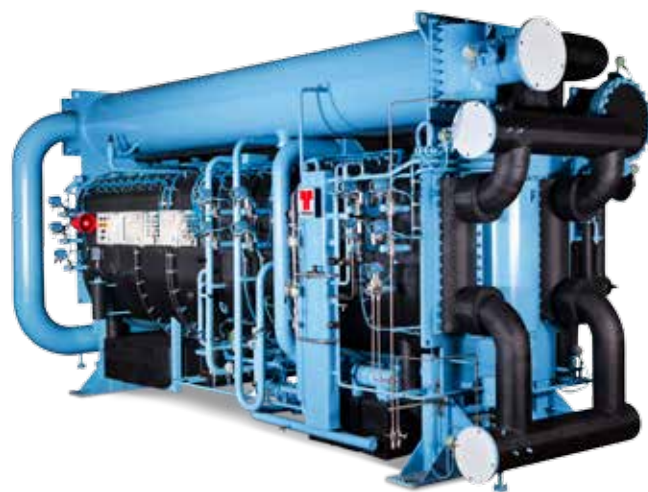
Lithium bromide absorption chillers can be offered for leaving brine temperatures as low as 14°F, offering great savings in operating costs.

Stand-by Pumps

For critical applications where scheduled maintenance of pumps cannot be carried out, stand-by absorbent, re-frigerant and/or vacuum pump can be provided.

Special Tube Metallurgy

Special tube materials like Cupro-Nickel, Stainless Steel or Titanium depending on water quality on site. This not only improves the reliability & efficiency but also makes the chiller suitable for special applications involving sea water and brackish water.

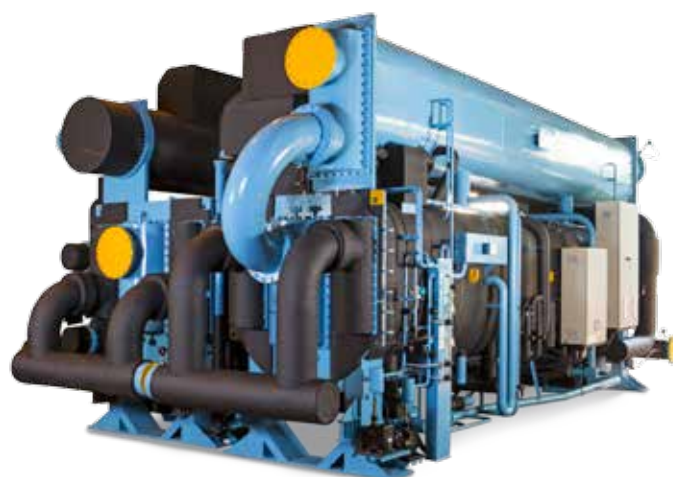


Multi Sectional Shipment Arrangement

For convenience of shipping, the absorption chillers can be shipped in two or more sections depending upon the site requirement. This is particularly convenient arrangement for retrofit / replacement jobs.

Chillers for High Capacity & High Pressure

As pioneers in Absorption technology, we offer specially designed absorption chillers for high capacity, high COP, customized solutions to cater large industrial and commercial air conditioning requirements. Chillers with steam and water circuits are designed for higher operating pressures such as 232 psi(g) and 352.5 psi(g).

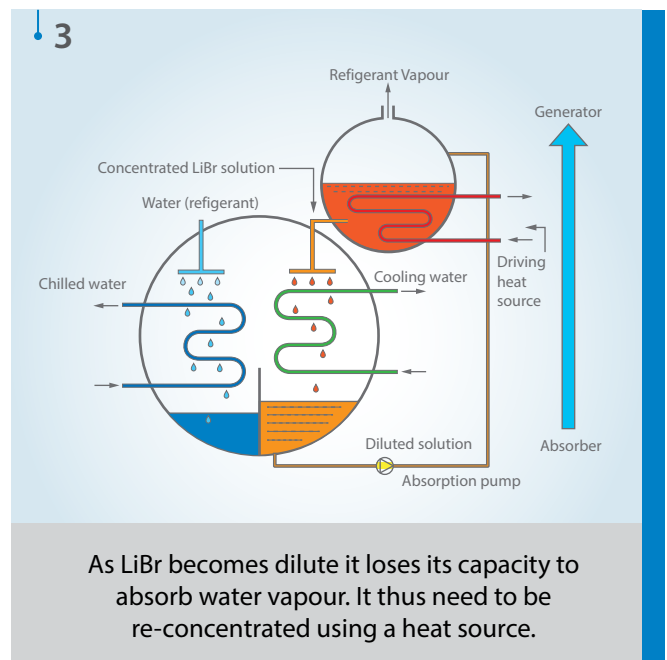
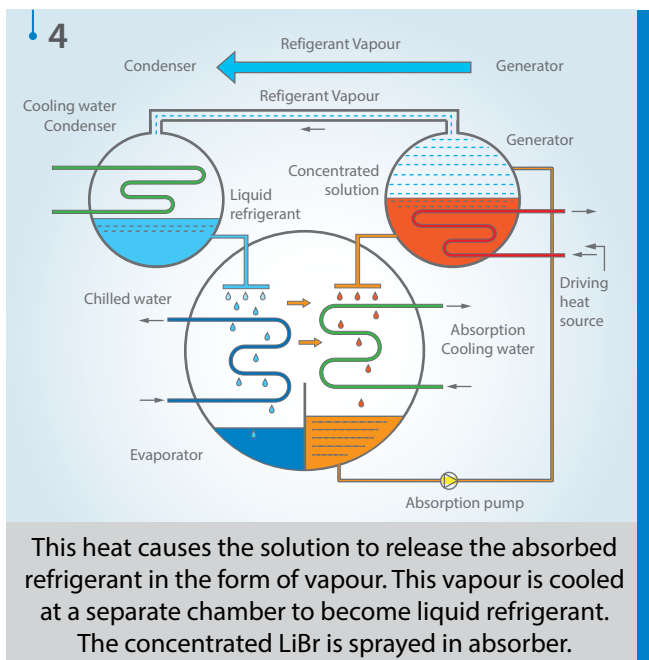
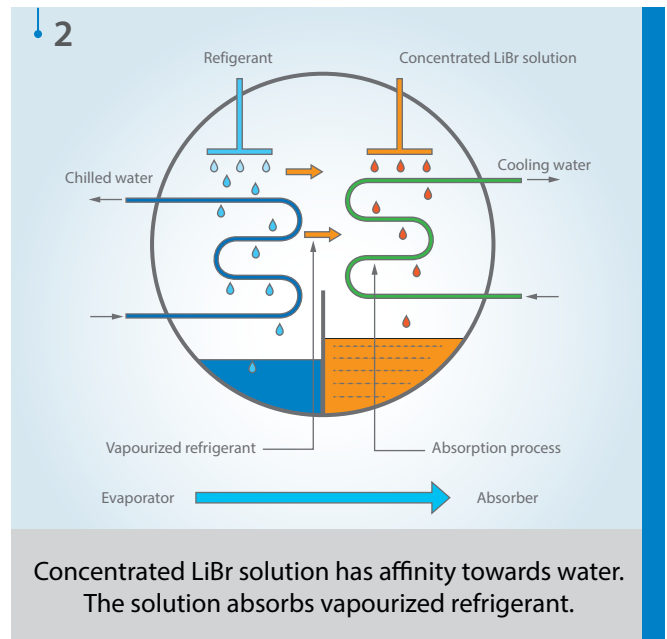
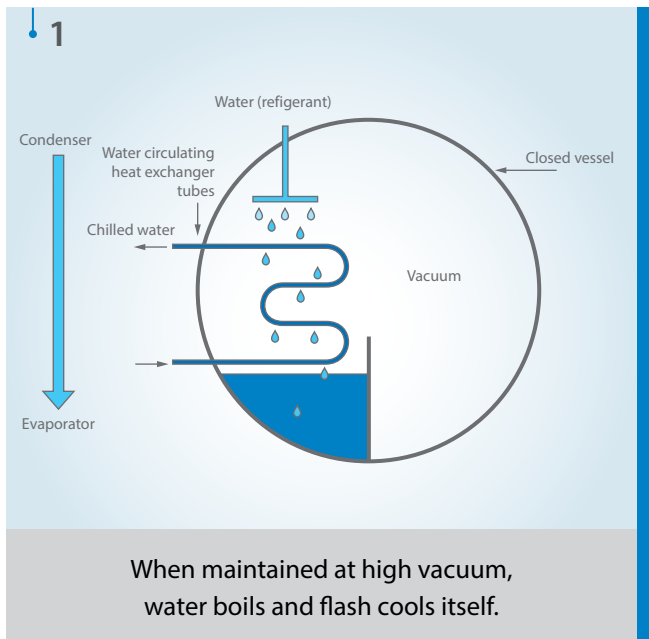


3500 TR
Absorption Chiller

Basic Principle

Vapour Absorption Machine uses water as the refrigerant and Lithium Bromide (LiBr) solution as the absorbent. The process of cooling goes through stages such as evaporation of refrigerant in evaporator, absorption of refrigerant by concentrated LiBr solution in absorber, boiling of dilute LiBr solution to generate refrigerant vapour in generator and condensation of refrigerant vapour in condenser.

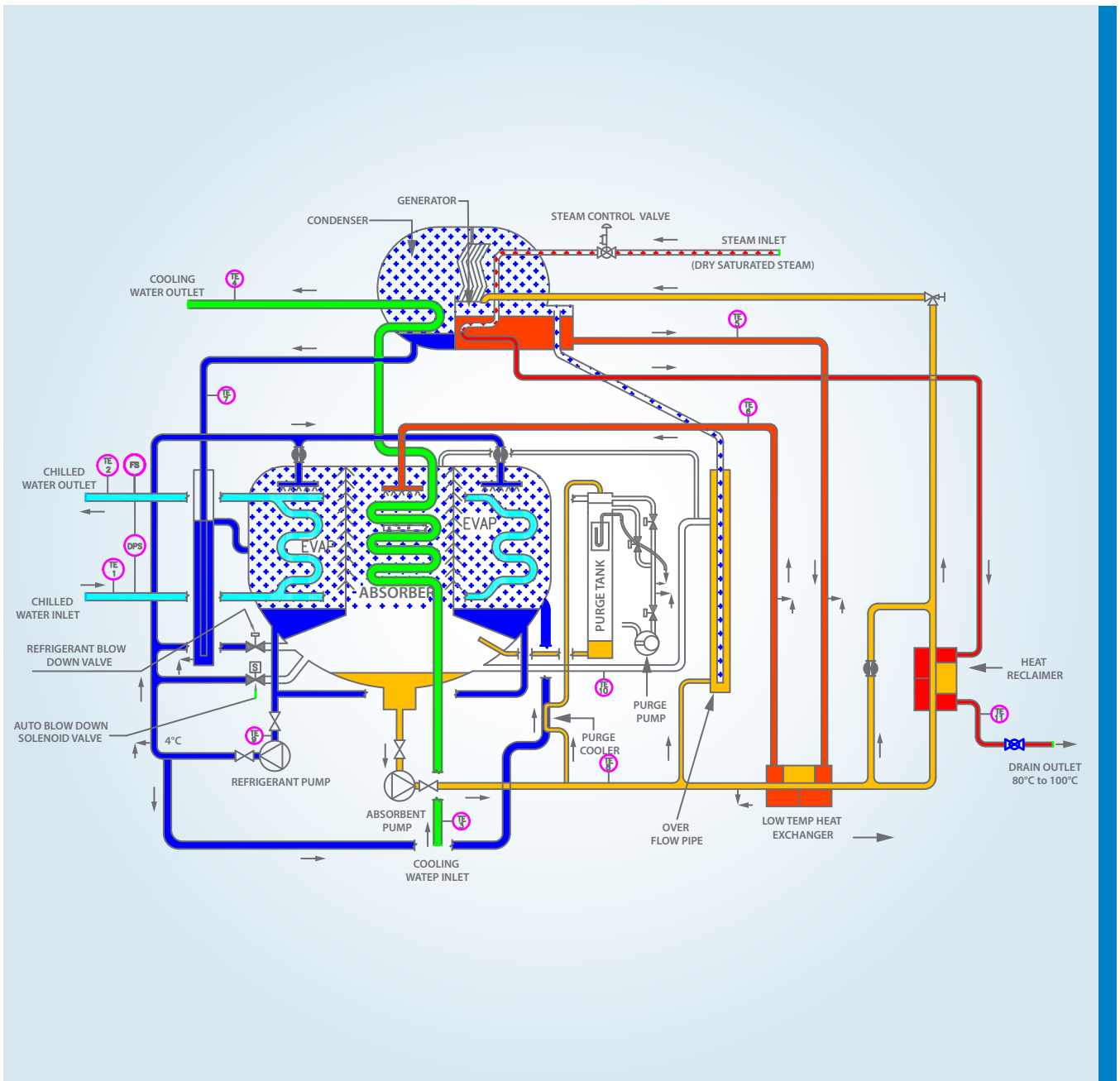
The boiling point of water is directly proportional to pressure. At 6mmHg absolute pressure the boiling point of water is 38.66°F. To change water from liquid to vapour it has to be heated. The heat, required to change the phase of a liquid to vapour, is called the Latent heat of evaporation.



LiBr is a chemical similar to common salt (NaCl). LiBr is soluble in water. The LiBr water solution has a property to absorb water due to its chemical affinity. As the concentration of LiBr solution increases, its affinity towards water vapour increases. Also as the temperature of LiBr solution decreases, its affinity to water vapour

increases. Further, there is a large difference between vapour pressure of LiBr and water. This means that if we heat the LiBr water solution, the water will vapourise but the LiBr will stay in the solution and become concentrated.

Cycle of Operation



Chilled Water
 Cooling Water
 Steam

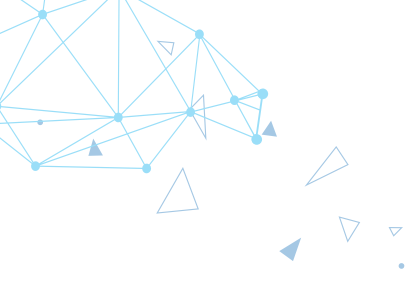
Refrigerant Liquid
 Refrigerant Vapour
 Steam Condensate

Strong Solution
 Intermediate Solution
 Dilute Solution

Evaporator

The evaporator consists of a tube bundle, an outer shell, distribution trays and a refrigerant pan. The process water to be cooled flows inside the evaporator tubes. A refrigerant pump circulates the liquid refrigerant from the refrigerant pan into the distribution trays. From the trays, the refrigerant falls on the evaporator tubes.

The shell pressure is very low ($\approx 6\text{mmHg}$). At this pressure the refrigerant evaporates at a low temperature and extracts latent heat of evaporation from the water being circulated through the evaporator tubes. Thus the heat is extracted from the process water which is being circulated through the tubes and it gets cooled.



Absorber

The absorber consists of a tube bundle, an outer shell (common with the evaporator), distribution trays, and an absorbent collection sump. Concentrated absorbent solution ($\approx 63.4\%$) from the generator is fed into the distribution trays. This solution falls on the absorber tubes.

Concentrated absorbent has an affinity to water vapour. Hence the vaporized refrigerant from the evaporator section is absorbed by the concentrated absorbent. Due to this absorption the vacuum in the shell is maintained and ensures the heat extraction from the chilled water.

The concentrated absorbent becomes diluted. During this dilution the 'Heat of Dilution' is generated. This increases the temperature of the absorbent solution. The cooling water being circulated in the absorber tubes remove the heat of dilution.

As it loses its heat to the cooling water, the absorbent is able to absorb more refrigerant vapour and gets further diluted. The diluted absorbent ($\approx 57.0\%$) collects in the bottom of the shell.

Solution Heat exchangers

The absorbent pump pumps the diluted absorbent to the generator. It first passes through the solution heat exchanger where it absorbs heat from the concentrated absorbent coming from generator. It next flows through heat reclaimer where it absorbs heat from steam condensate.

This solution then enters the generator. The heat exchangers serve to heat up the absorbent solution before it enters the generator for regeneration. This reduces the heat input required in the generator. This increases the efficiency of the cycle.

Generator

The steam flowing in the generator tubes heat the dilute absorbent flowing outside the tubes and condenses. The steam condensate flows into the heat reclaimer. The absorbent, which has become concentrated in the generator (63.4%) drains to the absorber to begin a new absorbent cycle. Refrigerant vaporised from the dilute absorbent passes through the eliminators to the condenser.

Condenser

The cooling water circulated inside the condenser tubes cool these vapours. The refrigerant vapour condenses on the outside of the condenser tubes and collects in the bottom of the condenser. The condensed refrigerant then flows to the evaporator.



Technical Specifications

Parameters	Model Number - TAC	Units	S1 C3	S1 C4	S1 D1	S1 D2	S1 D3	S1 D4	S1 E1	S1 E2	S1 E3		
Cooling Capacity		TR	114	142	179	213	267	301	357	403	460		
Chilled Water Circuit	Flow rate	gpm	272.6	339.4	427.8	509	638.1	719.4	853.2	963.1	1099		
	Connection diameter	NPS	5"				6"						
Cooling water Circuit	Flow rate	gpm	456	568	716	852	1068	1204	1428	1612	1844		
Cooling water connection diameter	Connection diameter	NPS	6"				8"				10"		
Steam Circuit	Steam consumption	lb/hr	1690.2	2105.7	2644.2	3150.9	3943.4	4442	5265.3	5935.5	6780		
	Connection diameter (Steam)	NPS	5		6				8				
	Drain connection diameter (Condensate)	NPS	1-½"										
Electric Supply	Power supply												
	Power consumption	kVA	8.3				10.7			13.1			
	Absorbent pump rating	kW (A)	2.2 (6.0)				3.0 (9.0)			3.7 (12.0)			
	Refrigerant pump rating	kW (A)	0.3 (1.4)				0.3 (1.4)			0.3 (1.4)			
	Vacuum pump rating	kW (A)	0.75 (1.8)				0.75 (1.8)			0.75 (1.8)			
	MOP		18				25			32			
	MCA		14				17			21			
Overall Dimensions	Length	in.	118		158		163		187		194		
	Width	in.	76		76		84		87		91		
	Height	in.	114		112		121				134		
Weights	Operating weight	x 1000 lbs	13.9	14.1	17.0	17.6	21.4	22.0	24.7	29.1	30.0		
	Maximum Shipping Weight	x 1000 lbs	12.6	13.0	15.9	16.3	20.1	21.2	23.6	27.3	28.0		
Clearance	Tube cleaning space	in.	105		141		144		171		184		

Notes:

- Model Number: TAC S1 XX - Steam Fired Single Effect Absorption Chiller
- Chilled water inlet / outlet temperature = 54 / 44 °F
- Cooling water inlet / outlet temperature = 85 / 98.5 °F
- Steam at Control Valve Inlet is at 21 PSI(g) pressure in dry saturated condition
- Minimum Cooling water inlet temperature is 50 °F
- Ambient condition shall be between 41 to 113 °F
- Maximum Allowable pressure in chilled / cooling water system = 150 PSI(g)
- Maximum Allowable pressure in steam system = 71.1 PSI(g)
- Control panel Electric Input = 1kVA
- All Water Nozzle connections to suit ASME B16.5 Class 150



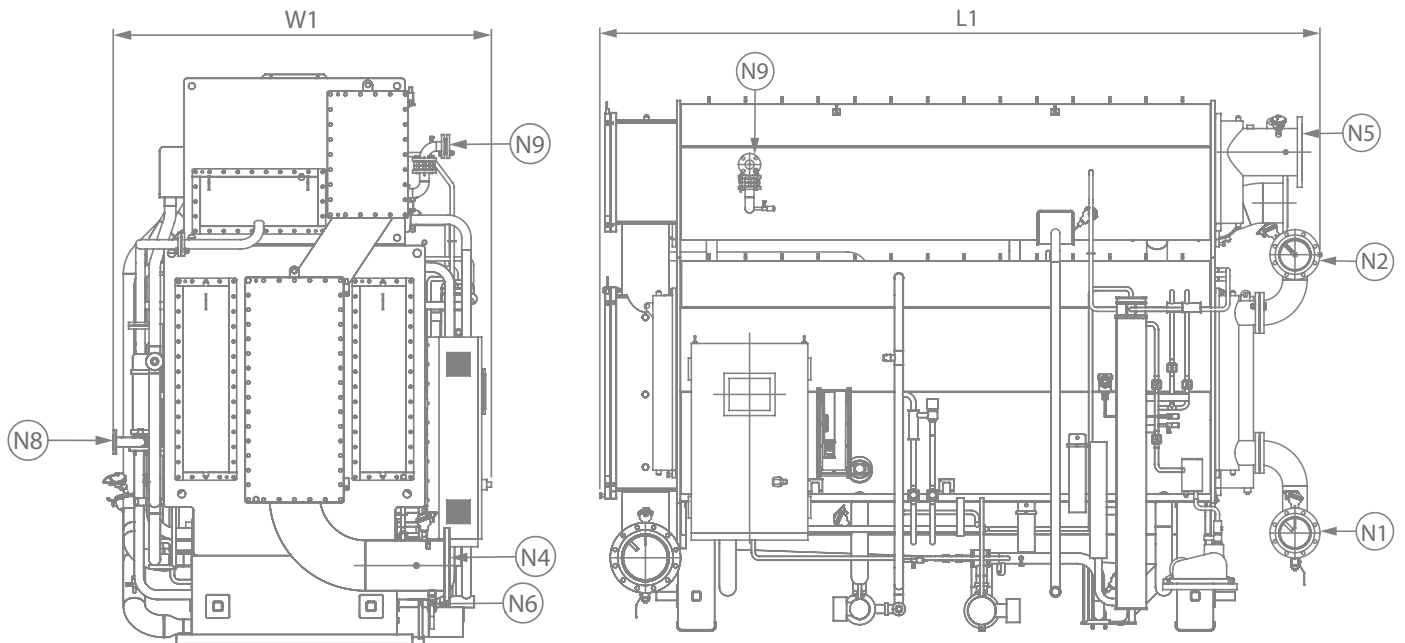
	S1 E4	S1 E5	S1 E6	S1 F1	S1 F2	S1 F3	S1 G1	S1 G2	S1 G3	S1 G4	S1 G5	S1 G6	S1 H1	S1 H2	S1 J1	S1 J2
0	498	549	611	640	669	746	846	948	1041	1132	1363	1475	1576	1779	1912	2153
4	1190.2	1312.1	1460.2	1529.5	1598.8	1782.9	2021.8	2265.6	2487.9	2705.4	3257.4	3525.1	3766.5	4251.6	4569.5	5145.4
	8"			10"				12"		14"				16"		
0	1992	2196	2444	2560	2676	2984	3384	3792	4164	4528	5452	5900	6304	7116	7648	8612
	12"			14"				16"		18"				20"		
3	7336	8135.5	9035.2	9377.4	9911.6	11043.1	12556	14046.9	15482.4	16839.3	20148.2	21846.1	23395.8	26394.3	28410.8	32044.6
	10					12				14		16		18		
	2							2-½"								
460 V(±10%), 60 Hz(±5%), 3 Phase+N																
	14.7			20			22.4			27.9			31.5			
	5.5 (14.0)			6.6 (17.0)			7.5 (18.0)			9.0 (27.0)			11.0 (28.0)			
	0.3 (1.4)			1.5 (5.0)			1.5 (5.0)			1.5 (5.0)			2.2 (8.5)			
	0.75 (1.8)			0.75 (1.8)			0.75 (1.8)			0.75 (1.8)			0.75 (1.8)			
	36			47			49			69			75			
	24			32			33			44			50			
4	195			241			298		308		321		370		436	
	97			102			98		111		133					
4	144			149			149		165		177			180		
0	30.9	35.3	36.2	45.6	46.5	47.6	55.6	57.1	76.5	77.8	96.6	98.1	109.8	111.8	124.6	126.5
0	28.7	32.4	33.1	41.7	42.5	43.4	50.9	52.3	68.3	69.4	84.4	85.3	96.6	97.7	108.7	110.0
5	186			218			276		276		285		334		394	

- Technical specification is based on AHRI 560-2000
- Please contact Thermax representative / office for customized specifications

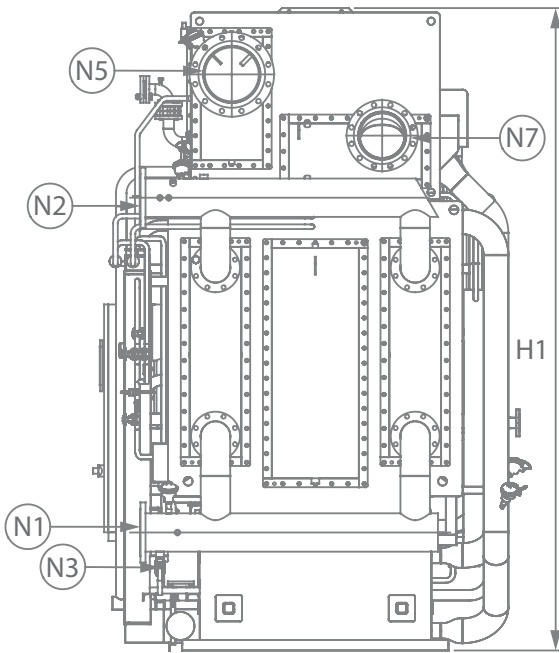
Utilizes vapour at 0~50.76 psi(g) Heat energy available in the form of:

- Condensate flash
- Potato fryer vapour
- Vapour from continuous polymerization
- Distillation column
- De-aerator flash
- Process vapour
- Turbine extraction

Physical Dimensions



Model	Machine Dimensions												
	L1 Inch	W1 Inch	H Inch	N1 Inch	N2 Inch	N3 Inch	N4 Inch	N5 Inch	N6 Inch	N7 Inch	N8 mm	N8 Inch	N9 Inch
TAC S1 C3	118	76	114	5	5	1	6	6	1	5		1 1/2	2
TAC S1 C4	118	76	114	5	5	1	6	6	1	5		1 1/2	2
TAC S1 D1	158	76	112	5	5	1	6	6	1	6		1 1/2	2
TAC S1 D2	158	76	112	5	5	1	6	6	1	6		1 1/2	2
TAC S1 D3	163	84	121	6	6	1	8	8	1	6		1 1/2	2
TAC S1 D4	163	84	121	6	6	1	8	8	1	6		1 1/2	2
TAC S1 E1	187	87	121	6	6	1	8	8	1	8		1 1/2	2
TAC S1 E2	194	91	134	8	8	1	10	10	1	8		1 1/2	2
TAC S1 E3	194	91	134	8	8	1	10	10	1	8		1 1/2	2
TAC S1 E4	194	91	134	8	8	1	10	10	1	8		1 1/2	2
TAC S1 E5	195	97	144	8	8	1	12	12	1	10		2	2
TAC S1 E6	195	97	144	8	8	1	12	12	1	10		2	2
TAC S1 F1	241	102	149	10	10	1	14	14	1	10		2	3
TAC S1 F2	241	102	149	10	10	1	14	14	1	10		2	3
TAC S1 F3	241	102	149	10	10	1	14	14	1	10		2	3
TAC S1 G1	298	98	149	10	10	1	14	14	1	12		2	3
TAC S1 G2	298	98	149	10	10	1	14	14	1	12		2	3
TAC S1 G3	308	111	165	12	12	1	16	16	1	12		2 1/2	3
TAC S1 G4	308	111	165	12	12	1	16	16	1	12		2 1/2	3
TAC S1 G5	321	133	177	14	14	1	18	18	1	14		2 1/2	3
TAC S1 G6	321	133	177	14	14	1	18	18	1	14		2 1/2	3
TAC S1 H1	370	133	177	14	14	1	18	18	1	16		2 1/2	3
TAC S1 H2	370	133	177	14	14	1	18	18	1	16		2 1/2	3
TAC S1 J1	436	133	180	16	16	1	20	20	1	18		2 1/2	3
TAC S1 J2	436	133	180	16	16	1	20	20	1	18		2 1/2	3



Nozzle Schedule		
Nozzle	Nozzle FL. Rating	Description
N1	ASA 150	Chilled Water Inlet
N2	ASA 150	Chilled Water Outlet
N3	-	Chilled Water Drain Valve
N4	ASA 150	Cooling Water Inlet
N5	ASA 150	Cooling Water Outlet
N6	-	Cooling Water Drain Valve
N7	ASA 150	Steam Inlet
N8	ASA 150	Condensate Outlet
N9	ASA 150	Rupture Disc Outlet

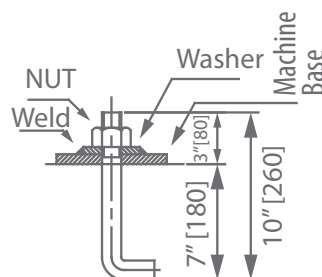
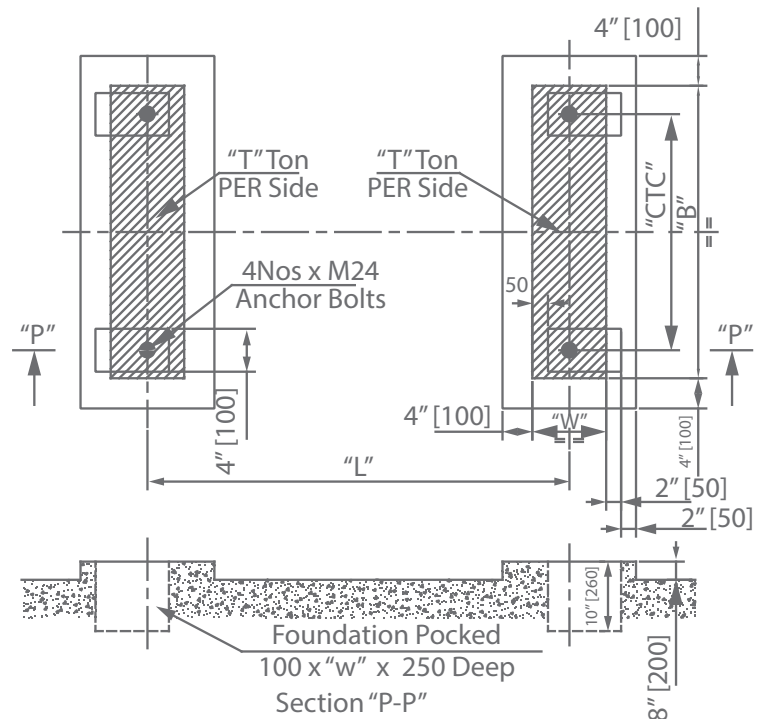
Minimum installation clearance

- Control Panel Side: 50 inch
- Top: 8 inch | Others: 20 inch

Notes

- Indicates the position of anchor bolts
- Indicates the position of power supply to the control panel

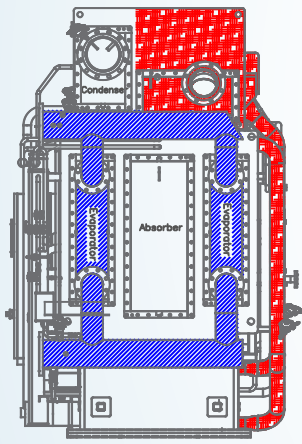
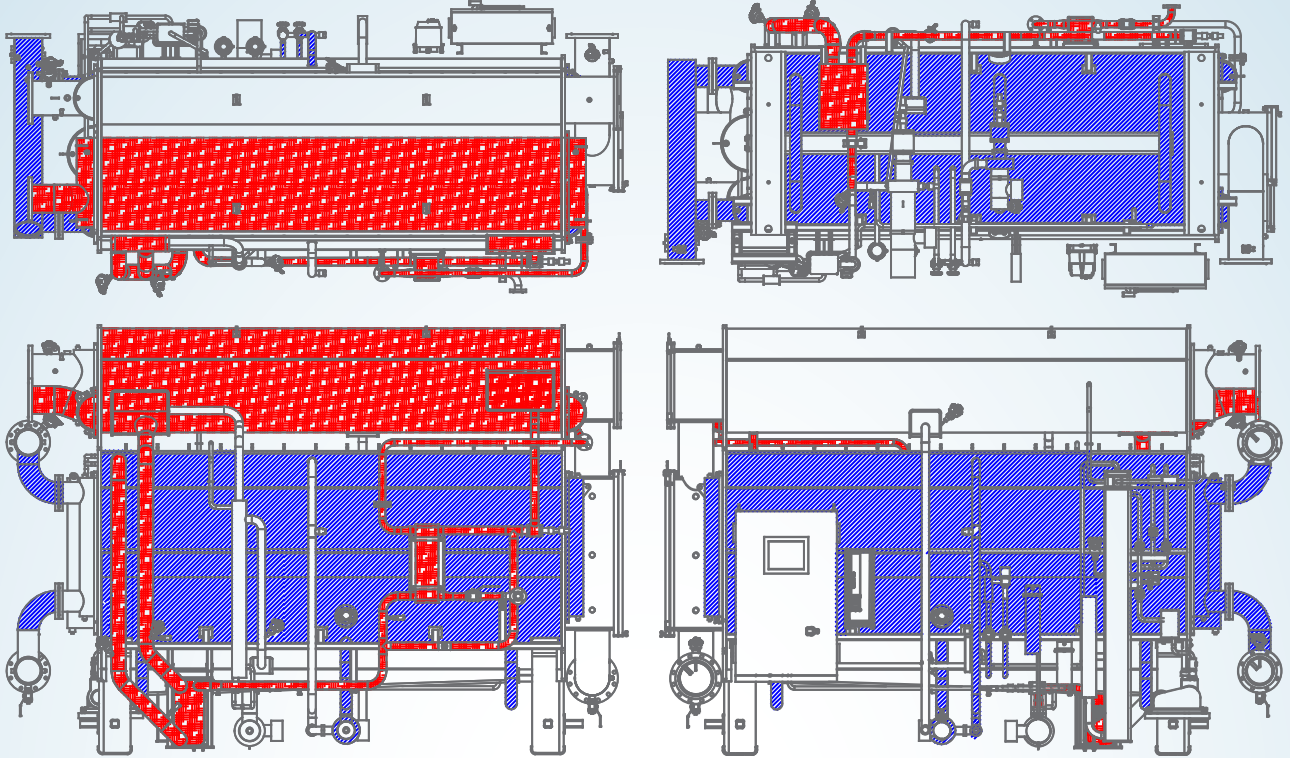
L	W	B	CTC	Weight
Inch	Inch	Inch	Inch	Pound
1816	250	1220	1120	6775
1816	250	1220	1120	6870
2836	250	1220	1120	8335
2836	250	1220	1120	8605
2836	250	1370	1270	10520
2836	250	1370	1270	10825
3444	250	1370	1270	12120
3424	270	1450	1350	14270
3424	270	1450	1350	14780
3424	270	1450	1350	15130
3424	270	1520	1420	17300
3424	270	1520	1420	17800
4384	310	1520	1420	22800
4384	310	1520	1420	22800
4384	310	1520	1420	23380
5836	310	1520	1420	27375
5836	310	1520	1420	28110
5722	424	1764	1594	37495
5722	424	1764	1594	38210
5722	424	2114	1944	47460
5722	424	2114	1944	48200
6972	424	2114	1944	54470
6972	424	2114	1944	55410
8458	424	2114	1944	61355
8458	424	2114	1944	62400



Indicates the Base of Machine

Arrangement at Anchor



Insulation Guidelines



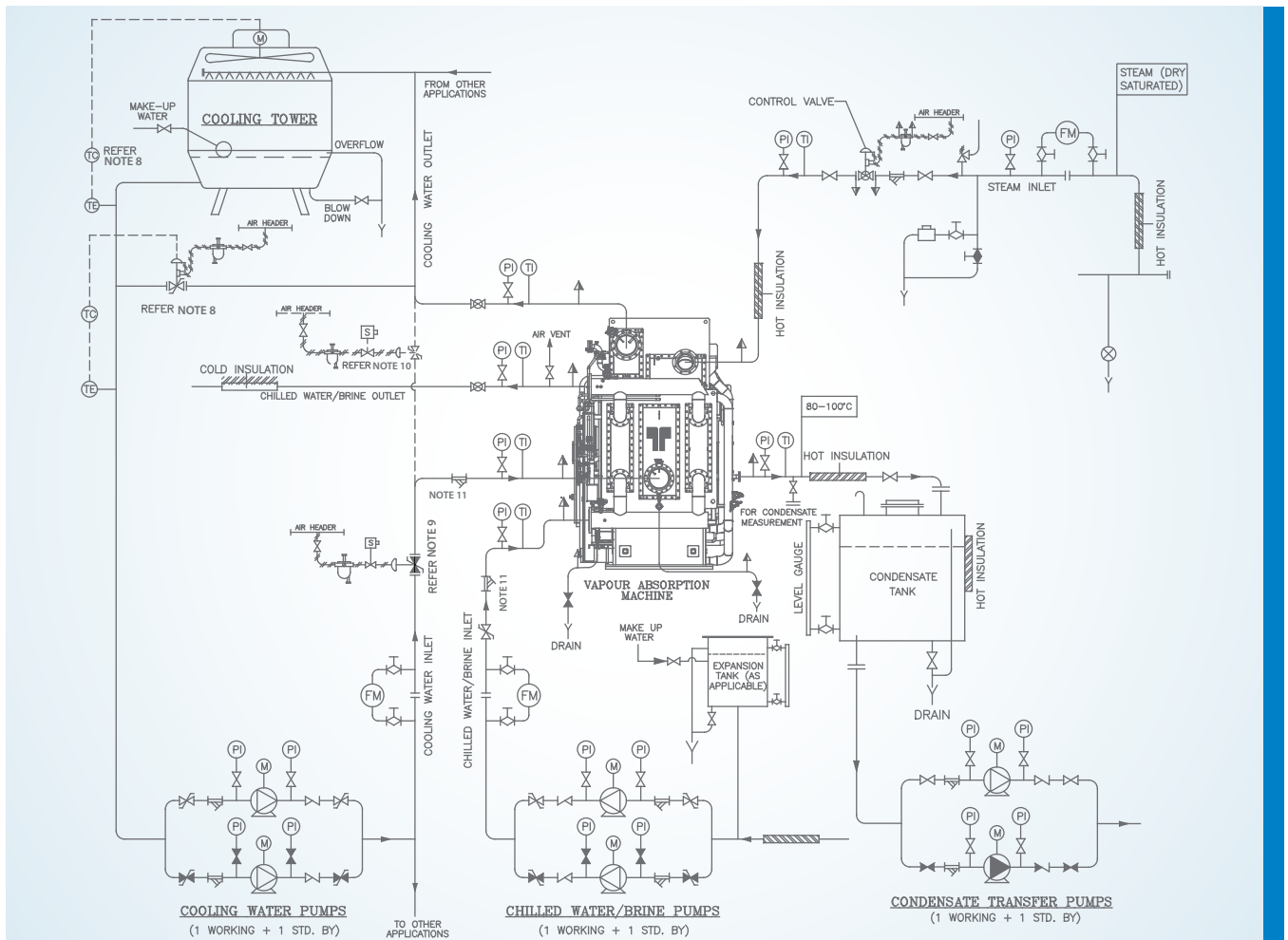
NOTES:

- Do not cover sight glass with insulation
- The total area includes the area of pipes in the machine
- Use non combustible insulation material
- Heat reclaimer and solution heat exchanger shall be insulated with 1 layer of foam
- Insulation areas given in the table have been doubled assuming 2 layers of foam will be used
- Do not cover refrigerant pump motor with insulation

Model	Dimensions		Model	Dimensions	
	Cold Surface Insulation	Hot Surface Insulation		Cold Surface Insulation	Hot Surface Insulation
	sqft	sqft		sqft	sqft
TAC S1 C3	143.80	136.80	TAC S1 F2	376.80	370.40
TAC S1 C4	143.80	136.80	TAC S1 F3	376.80	370.40
TAC S1 D1	181.20	174.00	TAC S1 G1	450.00	459.70
TAC S1 D2	181.20	174.00	TAC S1 G2	450.00	459.70
TAC S1 D3	201.30	203.50	TAC S1 G3	520.70	521.90
TAC S1 D4	201.30	203.50	TAC S1 G4	520.70	521.90
TAC S1 E1	225.10	243.20	TAC S1 G5	606.10	613.40
TAC S1 E2	274.40	257.30	TAC S1 G6	606.10	613.40
TAC S1 E3	274.40	257.30	TAC S1 H1	678.40	742.70
TAC S1 E4	274.40	257.30	TAC S1 H2	678.40	742.70
TAC S1 E5	306.90	293.00	TAC S1 J1	780.80	889.60
TAC S1 E6	306.90	293.00	TAC S1 J2	780.80	889.60

Symbol	Surface	Description	Temperature Range
	COLD	1 Inch (min)thick elastomeric foam insulation	32 OF [0 °C] MIN
	HOT	1.5 Inch THICK EPDM FOAM	266 OF [130 °C] MAX

Piping and Instrumentation Guidelines



	Gate Valve (Open)		Control Valve (Open)		Air Filter Regulator		Motor
	Gate Valve (Close)		Bellow/Flexible Connection		Pressure Indicator		"Y" Strainer
	Globe Valve (Open)		Solenoid Valve		Temperature Indicator		Level Indicator
	Globe Valve (Close)		Butterfly Valve (Open)		Flow Meter		Safety Valve
	Non Return Valve		Butterfly Valve (Close)		Pneumatic Line		Pneumatic on/ off Butterfly valve
	Cock		Inverted Bucket Steam Trap		Pump		Electro-Pneumatic Globe Type Control Valve

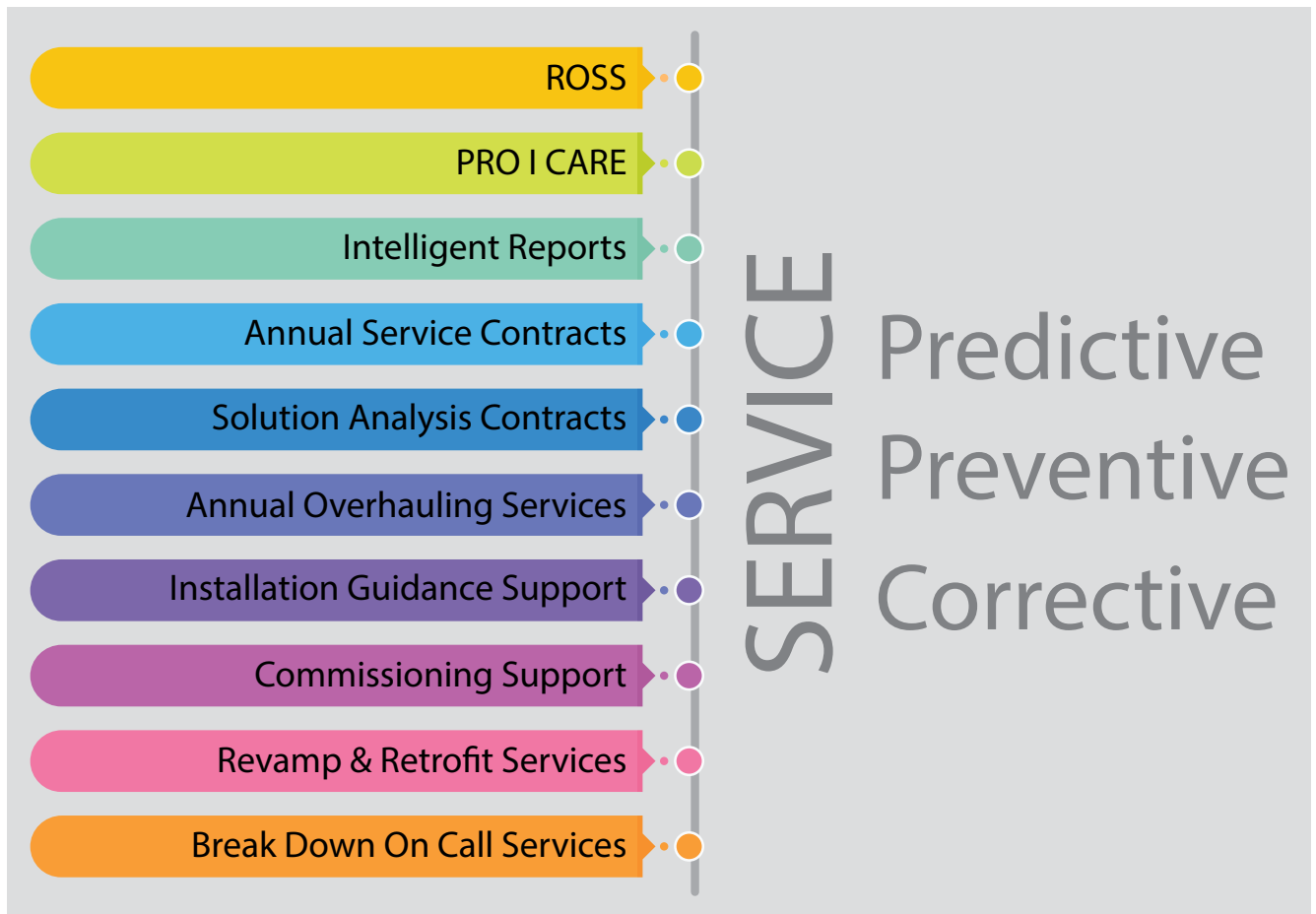
Client Scope ↓ Thermax Scope

NOTES:

- Plant room temperature to be maintained between 41°F to 113°F.
- Pressure reducing station and a safety valve to be provided on steam inlet line, if the design / operating pressure is more than 50.76psi(g).
- De-superheating station to be installed on steam inlet line if the degree of superheat of steam exceeds 59°F.
- The back pressure in the condensate drain line should not be more than 394 InWC.
- Automatic arrangements should be provided to stop cooling water flow through the machine, if the chilled water/brine flow stops.
- Maximum working pressure in water headers is 116psi(g). This should be noted for design of chilled brine and cooling water system.
- Clean & dry compressed air supply to the instruments to be 72.5psi(g).
- Necessary arrangements to be made to maintain constant cooling water inlet temperature to chiller. Minimum allowable cooling water inlet temperature is 50°F.
- Install automatic shut off valve on the cooling water inlet line, if cooling water pumps are not dedicated to the machine.
- If cooling water pumps are dedicated to the machine and chilled water/brine temperature is < 40.1°F install cooling water automatic shut off valve only on the bypass line between cooling water inlet and outlet.
- Additional Y-strainers (20 mesh) should be installed on chilled water and cooling water inlet line close to the machine, to prevent choking & tube failure due to foreign particles.

Global Service Support – Cooling

Thermax has a wide network of Service Centers throughout the globe to ensure quick response to customers. With a cumulative service experience of over 6000 VACs operating for more than 30 years, Thermax service personnel are equipped to deliver the right solution to the users. Thermax has developed specific modules for different types of users depending on their usage pattern, conforming to our proactive approach.



PROiCARE

PROiCARE is next generation AI based remote monitoring system. This feature enables the facility manager or Thermax engineer to monitor the performance remotely using internet. It offers features like e-logbook, status, trends, abnormal start-stops, maintenance schedules,

alerts etc and keep track of their chiller. It's a round the clock service that gives you a unified view so you can track the performance of your machine from anywhere and resolve issues faster.(This feature is available on request)

Remote Services at Your Fingertip

This technology offers a single point window to access and monitor the chiller performance along with easy and secure remote access to real-time operations, performance data, and historical analysis.

Advanced Monitoring

ROSS offers a wide range of services which includes remote monitoring, advance trend analysis, data logging and diagnostic, enabling Thermax to provide proactive and well advance recommendation to keep the chiller performance intact and eliminating any future downtime.

Expert Opinion

Real-time data and historical data from the chiller is collected and analyzed by Thermax experts, which enables identification of a potential threat to the chiller and provides resolution to the problem in time to enable unhindered continuous process by smooth operation of the chiller. In case of any major breakdown, the data analytics provides insight into the nature of the problem and hence enables a quick turnaround time.



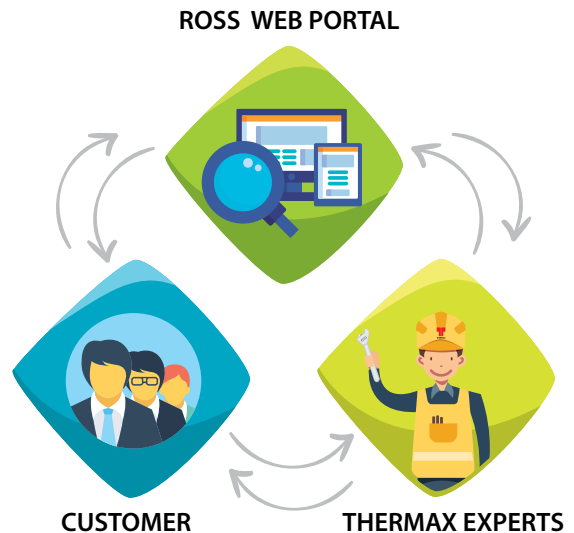
Multi-layered security

ROSS operates on an optimum level of security for remote connections and runs on VPN network, eliminating any security breach along with two point authentication and advanced user management ensures that data remains in safe hands at any given point.

Analytical Reports

Customized reports are being generated with the intent to make a precise decision regarding the process, ensuring the optimum performance is delivered.

Architecture



A tailor-made offering for your specific needs

FEATURES	BASIC	ADVANCED	PRO
REMOTE ACCESS (24*7*365 days easy real-time access to the chiller)	✓	✓	✓
ALARM NOTIFICATION (Notification with the set of customized alarms)	✓	✓	✓
DATA LOGGING (Timely data logging of equipment)	✓	✓	✓
CORRECTIVE ACTION (Expert opinion & intervention whenever required to maximize the uptime of chiller)	✓	✓	✓
EVENT STATISTICS (Analysis of any recurring alarm & abnormality)		✓	✓
REPORTING (Precised reports)		✓	✓
OPERATIONAL DATA INSIGHT (Operational data analysis)			✓
EQUIPMENT PERFORMANCE ANALYSIS (Overall chiller performance analysis)			✓

We believe in increasing uptime, reducing unscheduled interruption and optimizing chiller efficiency.

Our Prestigious Installations

PepsiCo, India

Pepsi Co., a global leader in F&B industry is using Thermax 500TR ultra low pressure vapour absorption chiller for the comfort cooling in their packaging area, The Vapours used to run the chillers are from the Potato Fryers.



Petronas, Malaysia

Petronas, a Malaysian oil and gas company is using Thermax's five low-pressure steam driven chillers of total 8500 TR capacity for their RAPID (Refinery and Petrochemical Integrated Development) project. The chillers find application in MEG (Mono-Ethylene Glycol) process for condensation of ethylene oxide gases at their refinery plant using the waste steam.



Eastern Petrochemical Company - Sharq, KSA

Thermax chillers with a cumulative capacity of 3070TR is being used by the Eastern Petrochemical Company - Sharq, KSA for comfort cooling.



Brookdale Hospital Medical Center, USA

Thermax Single effect steam fired absorption chiller with a capacity of 1660 TR is installed at Brookdale Hospital Medical Center in state of New York, USA for air-conditioning of the hospital building. These chillers run on steam from the boiler.



Made In India for the World

Thermax adopts a partnering relationship with customers to address their energy and environmental challenges and enhance their performance and profits. With integrated energy-environment expertise and a proven track record in global markets, Thermax is the preferred partner of enterprises across industrial sectors in more than 85 countries.

Automobile



- BMW (Germany)
- Ducati (Italy)
- Volkswagen (Germany)
- Ford Motors (India)
- Honda (Thailand)

Healthcare



- Niguarda Hospital (Italy)
- Brookedale Hospital (USA)
- DM Hospital (India)
- VallD'Herbron Hospital (Spain)
- Royal Free Hospital

Refinery & Petrochemical



- SABIC (KSA)
- Essar Oil (UK)
- Petrobras (Brazil)
- Reliance Industries (India)
- Covestro (USA)

Breweries



- Karmeliten Brauerei (Germany)
- Carlsberg (India)
- Guinness Brewery (Nigeria)
- Peroni Brewery (Italy)
- United Breweries (India)

Education



- Fordham University (USA)
- University Of Central Florida (USA)
- University of Magna Graecia (Italy)
- Shanghai Tech University (China)
- Michigan State University (USA)

Pharma



- GSK (India)
- Novartis (China)
- Sanofi (Italy)
- Astra Zeneca (UK)
- Zydus Cadilla (India)

Chemicals



- Nirma (India)
- Celanese Corporation (USA)
- Gulf Flour (UAE)
- JBF RAK (UAE)
- Yaroslavl Paraffin Plant (Russia)

Beverages



- Coca Cola (KSA)
- Silver Mill Natural Beverages (Sri Lanka)
- Cardinal Agri (Philippines)
- Niagra Bottling (USA)
- Tata Global Beverages (India)

Metal



- Maklada Prestressed Steel (Tunisia)
- Vedanta Alumina Limited (India)
- PT Jindal Stainless Steel (Indonesia)
- TATA Steel (India)
- Arcelor Mittal Steel (KSA)

Commercial / Hospitality



- Hyatt Plaza (Qatar)
- Carlyle Hotel (USA)
- Hudson Yards (USA)
- Atlantic City Casino (USA)
- Gardens by the Bay (Singapore)

Food Processing



- Ferrero (Italy)
- Cadburys (Nigeria)
- Perfetti Van Melle (Bangladesh)
- PepsiCo (South Africa)
- Tipco Foods (Thailand)

Dairy



- PT Santos Krimer (Indonesia)
- Lilongwe Dairy (Malawi)
- Alpro (Belgium)
- Mother Dairy (India)
- Milkfarm Bahnitz (Germany)

Airport



- Rome Airport (Italy)
- Perth Airport (Australia)
- Berlin Airport (Germany)
- Istanbul Ataturk Airport (Turkey)
- Venice Airport (Italy)

Textile



- Polyplex (Turkey)
- DeMillus (Brazil)
- Gildan TM (Honduras)
- Envoy Textiles (Bangladesh)
- Indorama (Thailand)

Edible Oil



- Cargill (Brazil)
- Shabnam Vegetable Oil (Bangladesh)
- Malabon Soap & Oil (Philippines)
- PZ Wilmar (Nigeria)
- Pan Century Edible Oils (Malaysia)

Recommended Water Quality

Water quality is a critical factor for the smooth operation of the machine. Poor water quality can result in scaling of tubes, corrosion, choking or failure of tubes. Hence

it is highly recommended that proper water quality be maintained throughout the life of the VAM.

Allowable Range for Circulating Water in Chilled water and cooling water (< 104°F)

Items	Units	Copper	Cu:Ni (90:10)	SS316L	Titanium
pH (25°C)		6.8 - 8.5	6.8 - 8.5	6.8 - 8.5	6.8 - 8.5
TDS	ppm	< 600	< 20000	< 2500	4.00%
Turbidity	NTU	< 10	< 10	< 10	< 10
M Alkalinity	ppm	< 100	< 100	< 100	< 100
Chloride Ion Cl ⁻	ppm	< 300	< 10000	< 200	< 25000
Sulphates Ion SO ⁴	ppm	< 300	< 300	< 300	< 300
Silica	ppm	< 50	< 75	< 50	< 50
Total Hardness	ppm	< 300	< 300	< 300	< 300
Calcium Hardness	ppm	< 200	< 200	< 200	< 200
Total Iron Fe	ppm	< 0.5	< 0.5	< 0.5	< 0.5
Sulphide Ion S ⁻	ppm	ND	ND	ND	ND
Ammonium Ion NH ₄ ⁺	ppm	< 1	< 1	NA	NA
Biological Oxygen Demand	ppm	< 50	< 50	< 50	< 50
Chemical Oxygen Demand	ppm	< 100	< 100	< 100	< 100
Free Chlorine	ppm	< 0.2	< 0.2	< 0.2	< 0.2
Oil & Grease	ppm	< 1	< 1	< 1	< 1
Free Carbon dioxide	ppm	< 3	< 3	< 3	< 3
Phenol, cyanide, lead, manganese etc.	ppm	ND	ND	< 0.1	< 0.1

*ND – Not Detected

*NA – Not Applicable

NOTES:

- Avoid stagnant water in Machine for longer period. In case of more than 1 day of shut down, circulate water for 30 minutes in the Machine every day. For longer duration, drain the water from Machine and keep the Machine in dry conditions. There should be no stagnant zone in the water circuit near the Machine
- When the temperature is high (104°F or higher), generally the corrosion behaviour is noticeable, and when especially the steel material is directly in contact with water without the protective coating, the effective corrosive protection, such as the addition of corrosion inhibitor, degassing treatment should be applied.





THERMAX

Sustainable Solutions in
Energy & Environment

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Thermax Business Portfolio

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-  Cooling
-  Power
-  Air Pollution Control
-  Chemicals
-  Water and Wastewater Solutions
-  Solar
-  Specialised Services



This brochure presents only some of our products and we reserve the right to amend any product details without notice. The photographs used in the brochure are indicative and may not match the actual plant.

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