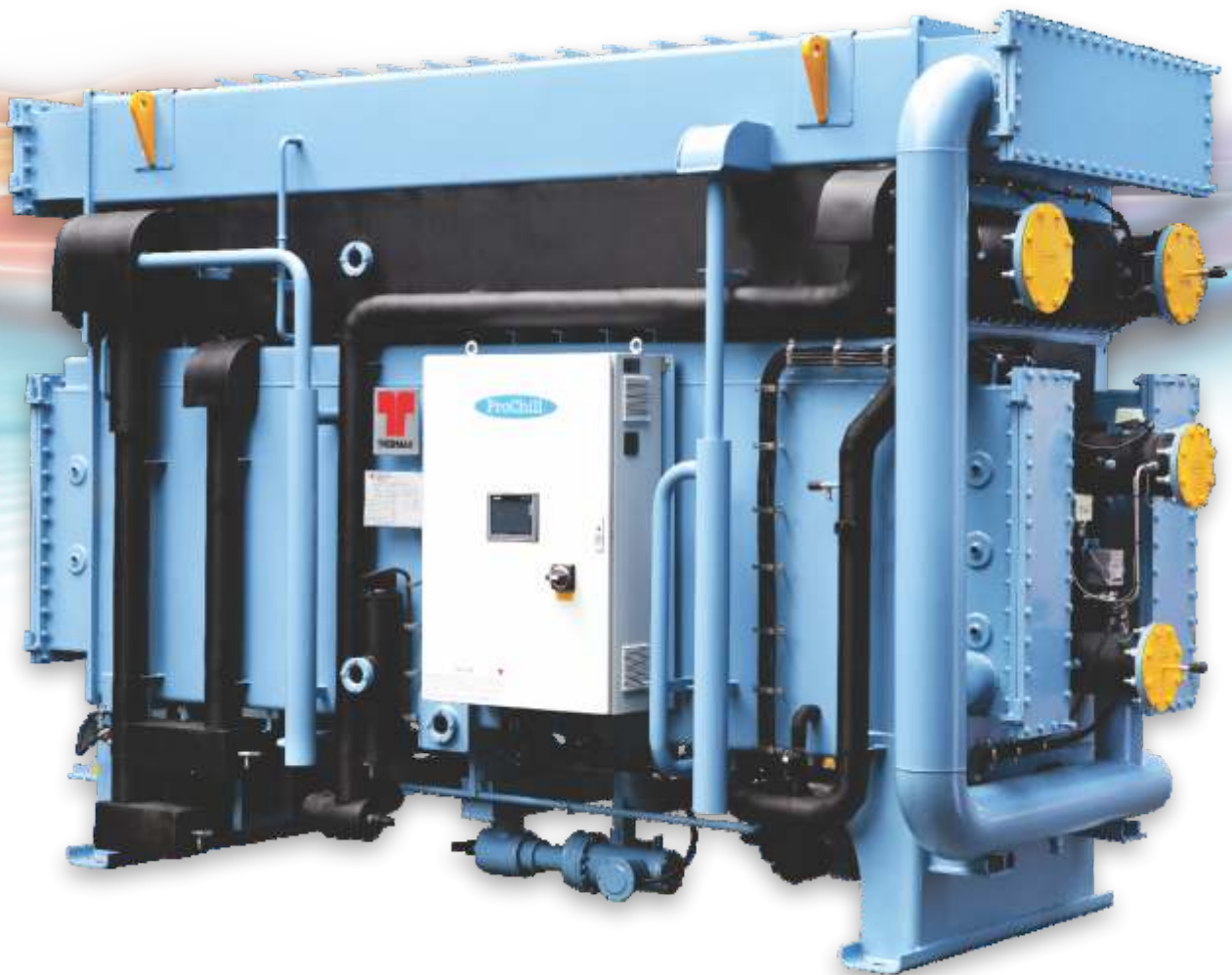


# Hot Water Vapour Absorption Chiller

207 TR to 1680 TR (725 kW to 5900 kW)





## ■ Cooling & Heating Division - Cooling SBU

The Cooling SBU of THERMAX promotes Vapor Absorption Chillers as a cost effective and environment friendly alternative to electricity driven compression chillers.

It offers expert solutions in Process Chilling & Air Conditioning for industrial as well as commercial applications. Cooling SBU's strength lies in customized solutions as per the requirements of its customers.

Unlike electrical chillers, Absorption Chillers are powered by heat. These machines can run on a variety of heat sources, e.g. steam, hot water, liquid/gaseous fuels, exhaust gases and/or a combination of above.

## ■ Thermax - Conserving Energy, Preserving the Environment

Vapor Absorption Technology from Thermax is at work for clients in more than 50 industries including Pharmaceuticals, Chemicals, Fertilizers, Steel, Textiles, Petrochemicals, Food & Beverages and Automobile industries as well as in Hotels, Commercial Complexes, Shopping Complexes, Office Buildings, Educational Institutes, Airports, Cinema halls and Medical Centers.

Manufacturing capabilities of Thermax's Cooling SBU are confirmed by the fact that, over the years, Thermax has installed thousands of machines in more than 70 countries including USA, Brazil, Germany, Spain, UK, Italy, UAE, Saudi Arabia, India, China, Australia, Thailand, Philippines, Malaysia, Russia and Nigeria with the products conforming to the respective country standards like ETL, CE, TUV, DNV, ASME etc. Thermax has its fully owned subsidiaries namely Thermax Inc. in USA, Thermax Europe Limited in UK and Thermax (Zhejiang) Cooling and Heating Engg. Company Limited in China.

Thermax believes in efficient and responsive services to its clients and exhibits in its way of business, by giving optimal and quality solutions and achieving customer delight. Thermax has a worldwide sales, service and distribution network to fulfill the needs of its valuable customers.

## ■ Vision

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

## ■ Sustainable Solutions

From Cooling to Heating, from Power Generation to Air Purification, from Water and Sewage Treatment to Speciality Chemicals, THERMAX Solutions are improving life at work in many ways.

Every year THERMAX helps generate 6,000 MW of Power, produce 100,000 tons of steam, provide 4 billion tons of Cooling and treat 1,000 million litres/day of Water and Waste.

THERMAX today is a major Engineering and Environment company with revenues of USD 800 million and with market capitalization of over USD 1 billion.

THERMAX was one of 20 Indian companies in Forbes list of "Asia's Best Under a Billion Companies" in 2005 and 2006 and was ranked "No. 1 among the top 21 wealth creators" in India over the last 5 years by a leading investment journal.

THERMAX brings to customers enriched experience of industrial applications, and expertise through technological partnerships and strategic alliances.

Operating from its Headquarters in Pune (Western India), Thermax has built an international sales & service network spread over South East Asia, Middle East, Africa, Russia, UK, US and China. It has full fledged ISO 9001:2000 and ISO 14000 accredited manufacturing setups.



## ■ Manufacturing & Testing

Thermax manufactures environment friendly and energy efficient vapor absorption chillers at its plant in Pune, India and China. Its state-of-the-art manufacturing facility is awarded with ISO 9001 and ISO 14001 certifications. Stringent quality control procedures along with a skilled workforce ensure that a highly reliable product leaves the factory. The equipment and manufacturing processes conform to International standards.

Thermax Pressure part manufacturing has been approved by ASME and bears S, U, H, R stamps. The Vapor absorption chillers are CE certified for European Union and ETL listed for US and Canadian market. They conform to the Kyoto Protocol & are in absolute tandem with Clean Development Mechanism Code (CDM). Thermax also conforms to Environmental Management System standard 14001 & OHSAS 18001.



CNC twin spindle drilling machine with high speed and direct feed technology ensures fine tube hole finish and accuracy, which is important for leak tight expansion and effective heat transfer.

A Helium leak detection test ensures there is no leak at welding joints.



Welding robot for high precision automatic welding.



CNC gas cutting machine for plate cutting ensures precision cutting of shell plates and profile cut tube plates.



Press Brake Machine





## Salient Features

### ► Unique two stage absorption technology

Thermax chillers are designed based on unique two stage absorption technology, with two stage evaporation and two stage condensation.

Benefits

- Higher COP (0.75 to 0.8) even at low hot water outlet temperature.
- Larger temperature difference on both chilled water and hot water circuits.

This ensures that the specific heat input is one of the lowest in the industry, resulting in higher cooling output from the same heat input.

### ► Isolation valves

Double seal isolation valves and bolted pumps facilitate easy maintenance of machine mounted canned motor pumps without any loss of vacuum in the system by avoiding exposure to atmosphere.

### ► Lowest chilled water/ brine temperature

Thermax chillers can deliver chilled water temperatures down to 3.5°C and chilled brine solution down to 0°C, enabling absorption chillers to be used for applications where low chilled water/brine temperatures are required.

### ► Non-Toxic corrosion inhibitor

Thermax chillers use new generation non-precipitating, non-toxic molybdenum based corrosion inhibitor which is more effective than conventional inhibitors based on chromate and nitrate which are carcinogenic in nature and are prohibited in several countries.

### ► 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.

### ► PLC based control panel

Thermax chillers are provided with state-of-the-art PLC based control panel, user friendly operator interface and data logging system.

### ► Low installation space

Thermax absorption chillers are designed in such a way that they have the smallest footprint amongst the contemporary chillers available in the market without compromising the ease of maintenance. This feature makes it an ideal choice for basement installation, easy access to the basement, replacement jobs etc. Also the chillers can be shipped in multiple pieces further enhancing the ease of transportation and installation.

### ► BAS/DCS connectivity

Direct connectivity of 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.

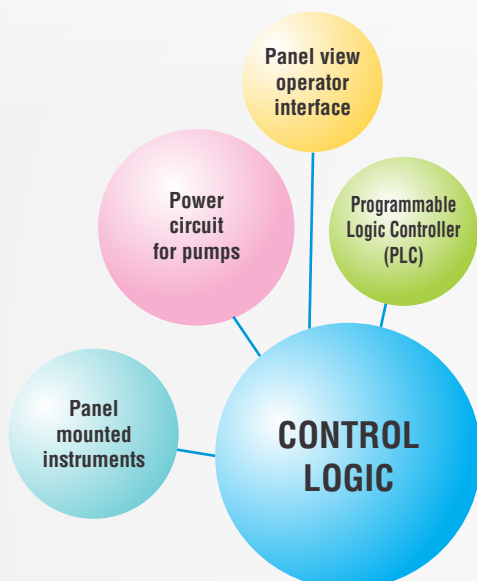
### ► 10-100% stepless modulation

For cooling loads ranging from 10% to 100% of the designed capacity of the chiller, the 3-way diverting valve automatically varies hot water flow in order to maintain the temperature of chilled water leaving the chiller. This ensures better part load performance.

### ► On-line purging

Thermax chillers come with factory fitted high efficiency purge system, which continuously removes non-condensable gases from the chiller into the storage tank, while in operation.

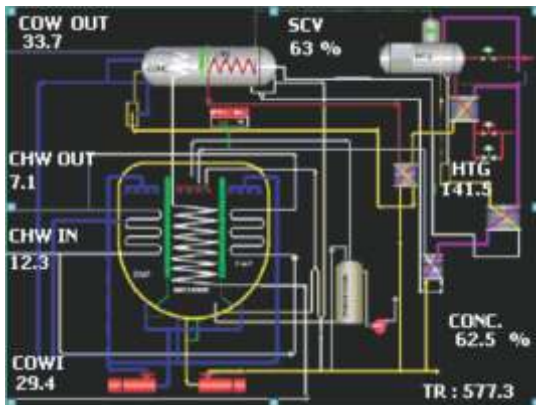
## Instrumentation and Safety Features



## ■ Customized Features

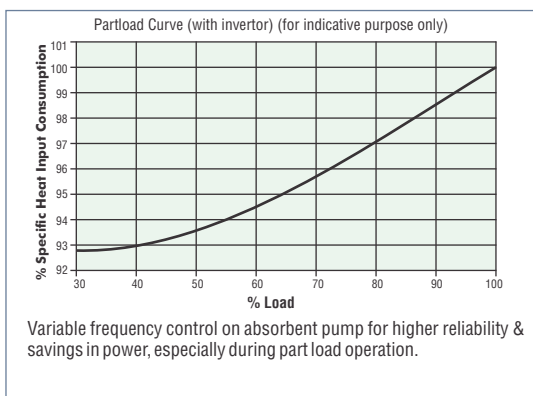


### ▶ Zero crystallisation



Unique state-of-the-art concentration control and display that practically eliminates crystallization and is distinctly different from the auto decrystallization offered by other manufacturers. This permits the VAM to operate even at 10°C cooling water inlet temperature.

### ▶ Variable Frequency drive



Variable frequency control on absorbent pump for higher reliability & savings in Power, especially during part load operation.

### ▶ Scheduler

Operation of chiller based on working hours / days can be defined, thereby reducing manual intervention.

### ▶ Connectivity

Connectivity to third party monitoring systems can also be provided via Profibus, Ethernet or BacNet.

### ▶ Customised tube metallurgy



Special tube materials like Cupro Nickel, SS-316L, Titanium depending on water quality on site. This not only improves the reliability and efficiency but also makes the chiller suitable for special applications involving sea water and brackish water

### ▶ Remote Performance Monitoring System (RPMS)



Advanced feature that monitors the chiller performance and provides data via Internet. This feature enables the facility manager or Thermax engineer to monitor the performance remotely. It also offers features like e-Log book, status, trends, maintenance schedules, alerts etc.

### ▶ Multi-sectional Shipment Arrangement

For convenience of shipping and rigging, the Absorption Chillers can be shipped in two or more sections depending upon the site requirements. This is particularly convenient for retrofit jobs.

# Operating Principle

## Basic Principle

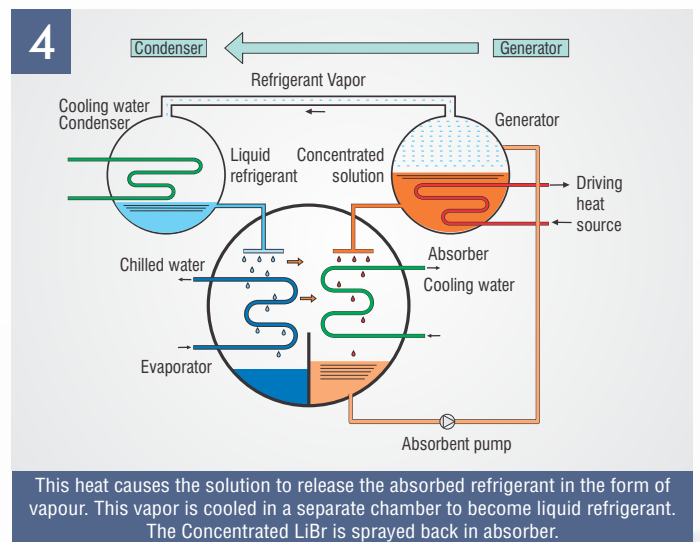
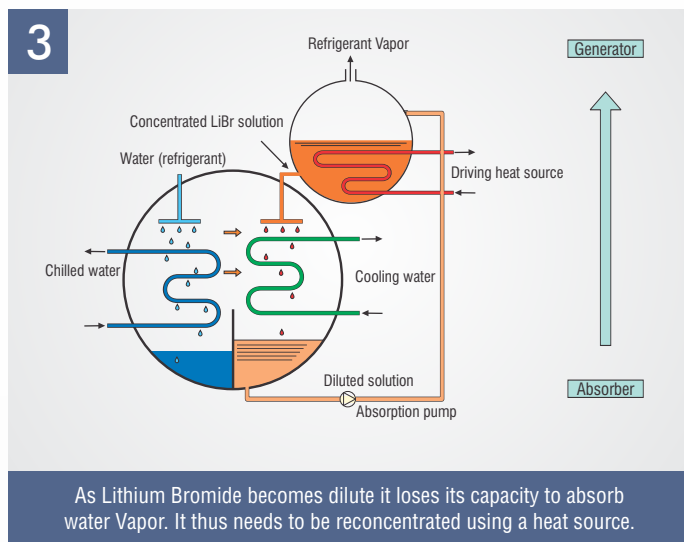
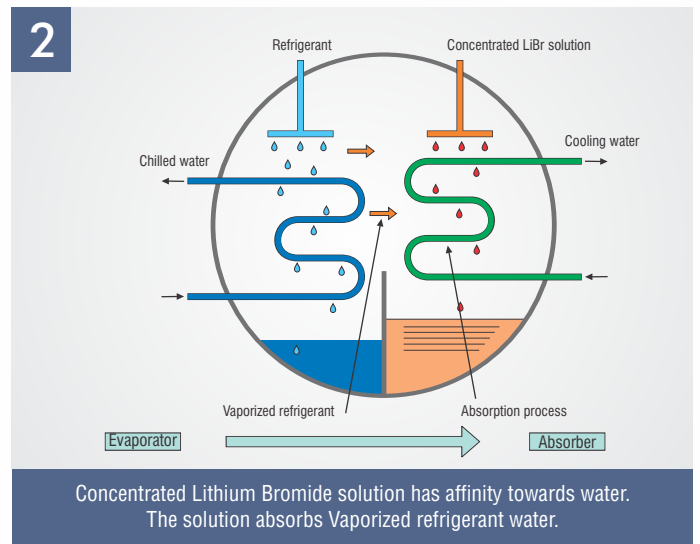
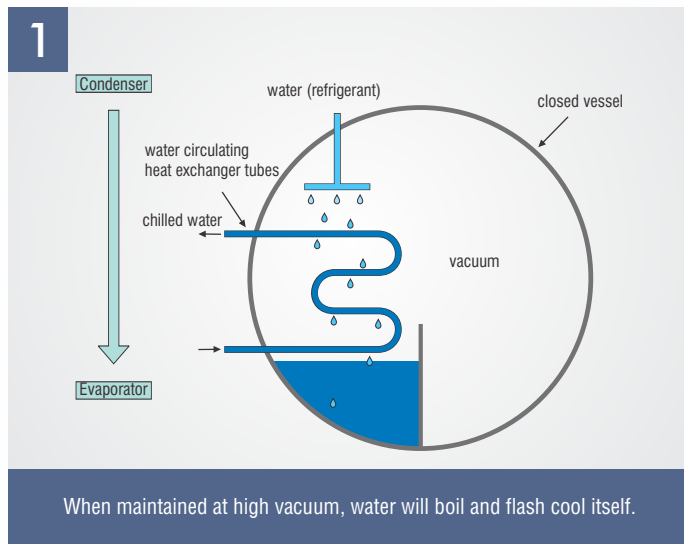
Boiling point of water is a function of pressure. At atmospheric pressure, water boils at 100°C. At lower pressure it boils at lower temperature. The boiling point of water at 6 mm of Mercury absolute, is only 3.9°C.

Lithium Bromide (LiBr) salt has the property to absorb water due to its chemical affinity. It is soluble in water. As the concentration of LiBr increases its affinity towards water increases. Also with increase in Temperature of LiBr this affinity decreases.

There is a large difference between Vapor pressure of LiBr and water.

## Operating Principle

The Vapor absorption chiller produces chilled water by utilizing hot water as the driving heat source. The heat from the circulating chilled water is used as the latent heat of evaporation by the refrigerant water to produce cooling. Unlike a compression chiller which uses a compressor to pressurize the Vaporized refrigerant (Freon) and condenses it by using cooling water, the absorption chiller uses an absorbent (LiBr) to absorb the Vaporized refrigerant (water). The refrigerant is then released from the absorbent when heated by an external source.





## ■ Holistic Customer Care

Cooling Unit of C&H division has a wide network of Service Centers throughout the globe to ensure quick response to customers. With a cumulative service experience of over 4000 VACs operating for more than 25 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.

For the benefit of its customers Thermax offers various value added services like:

- Preventive maintenance contract
- Operations & manning
- Localized customer training programs



## ■ Testing Procedure

As the Vapor absorption chillers work under vacuum conditions, the manufacturing of these chillers is very critical with respect to leak tightness. Hence it is necessary to follow stringent quality control procedures and also perform leak detection test. Understanding the importance, Thermax carries out the leak detection test in the following sequence:

### ▶ Helium shroud test:

In this test, the chiller is fully covered by a polythene sheet and helium is passed from below, to observe the cumulative leak rate of the entire chiller. It can detect leakage to the tune of  $5.0 \times 10^{-7}$  std cc/sec.

### ▶ Helium spray test:

Helium, the next smallest molecule after Hydrogen, can leak through very minute holes. In this test helium is sprayed on all the joints of the chiller. As the chiller is under vacuum conditions, leakages, if any, will result in helium entering into the chiller and thus will be displayed on the screen of helium leak detector. Every machine has to clear this test before it is shipped to the customer.



## ■ Performance Testing Facility

Thermax has a state-of-the-art test bay capable of testing various types of vapour absorption chillers - steam driven, hot water driven, fuel fired, exhaust driven and a combination of these up to a capacity of 3500 TR (12300 kW). The entire testing facility is centrally operated by sophisticated Distributed Control Systems (ABB make) and can be operated by the touch of a button.

- ▶ Steam : 50 - 3500 TR (175 kW to 12300 kW)
- ▶ Exhaust : 50 - 3500 TR (175 kW to 12300 kW)
- ▶ Hot Water : 10 - 1730 TR (35 kW to 6080 kW)
- ▶ Fuel Fired : 50 - 3000 TR (175 kW to 10540 kW)

This is one of the largest testing facility for absorption chillers available in the world.

# Specification Sheet

Model Number	UNIT	5G 3L C	5G 3M C	5G 4K C	5G 4L C	5G 5M C	5G 5K C	5G 5L C	5G 5M C	5G 5N C		
Cooling Capacity	TR	207	248	278	316	345	389	429	484	527		
Chilled Water Circuit	Flow Rate	m <sup>3</sup> /hr	124.9	149.6	167.7	190.6	208.1	234.7	258.8	292.0	317.9	
	Pressure loss	m LC	2.2	3.6	3.6	3.7	4.0	3.5	3.5	6.6	6.9	
	Connection Diameter	mmNB	150				200					
Cooling Water Circuit	Flow Rate	m <sup>3</sup> /hr	207	248	278	316	345	389	429	484	527	
	Pressure loss	m LC	4.9	7.6	8.1	8.5	9.1	7.8	8.1	6.9	7	
	Connection Diameter	mmNB	200				250					
Hot Water Circuit	Flow Rate	m <sup>3</sup> /hr	83	100	112	127	139	157	174	195	213	
	Pressure loss	m LC	0.5	0.8	0.7	0.8	0.8	0.8	0.9	1.4	1.5	
	Connection Diameter	mmNB	150				200					
Overall Dimensions	Length (L)	mm	4005	4615	4660			4750		5920		
	Width (W)	mm	1925	1925	2090			2270		2350		
	Height (H)	mm	2755	2755	3045			3210		3310		
Dry weight	ton	8.5	9.4	10.9	11.2	11.5	13	13.3	15.7	16.1		
Max Shipping weight	ton	9.9	11	12.7	13.1	13.5	15.2	15.6	18.5	19.1		
Operating weight	ton	11.8	13.1	15.2	15.8	16.3	18.8	19.4	23.0	23.7		
Flooded weight	ton	16.4	18.6	22.8	23.2	23.4	27.2	27.5	33.9	34.3		
Clearance for Tube Removal	mm	3500	4300					5340		5340		
Electrical data	Absorbent Pump	kW (A)	1.5 (5.0)			3.7 (11.0)		3.7 (11.0)		5.5 (14.0)		
	Refrigerant Pump	kW (A)	0.3 (1.4)									
	Purge Pump	kW (A)	0.75 (1.8)									
	Total power consumption	kVA	6.9			11.2		11.2		13.4		
	Power Supply		415 V( ±10%), 50 Hz (±5%), 3 Phase+N									

Model Number	UNIT	5G 6K C	5G 6L C	5G 7K C	5G 7L C	5G 7M C	5G 8K C	5G 8L C	5G 8M C	5G 8N C		
Cooling Capacity	TR	631	689	815	879	960	1078	1163	1295	1398		
Chilled Water Circuit	Flow Rate	m <sup>3</sup> /hr	380.6	415.6	491.6	530.2	579.1	650.3	701.5	781.2	843.3	
	Pressure loss	m LC	5.0	5.3	4.6	4.7	4.9	4.6	4.8	7.7	8.0	
	Connection Diameter	mmNB	250			300			350			
Cooling Water Circuit	Flow Rate	m <sup>3</sup> /hr	631	689	815	879	960	1078	1163	1295	1398	
	Pressure loss	m LC	5.3	5.6	8.4	8.9	9.2	7.6	8	11.9	12.4	
	Connection Diameter	mmNB	300			350			400			
Hot Water Circuit	Flow Rate	m <sup>3</sup> /hr	253	277	328	354	388	434	487	519	560	
	Pressure loss	m LC	2.7	2.7	3.4	3.4	3.6	3.6	3.7	2.2	2.2	
	Connection Diameter	mmNB	250				300					
Overall Dimensions	Length (L)	mm	7375			7380			7510		8760	
	Width (W)	mm	2425			2845			3160		3160	
	Height (H)	mm	3500			3870			4080		4080	
Dry weight	ton	19.8	20.3	26.9	27.5	28.3	32.5	33.3	36.2	37.2		
Max Shipping weight	ton	23.6	24.3	31.8	32.5	33.5	38.9	40	43.7	45.1		
Operating weight	ton	29.0	30.0	39.8	40.8	42.3	49.7	51.4	55.8	57.8		
Flooded weight	ton	43.6	44.2	60.0	60.5	61.4	73.9	74.9	85.1	86.2		
Clearance for Tube Removal	mm	6700			6910				8220			
Electrical data	Absorbent Pump	kW (A)	6.6 (17)			4.5 (13.0)			5.5 (17.0)			
	Refrigerant Pump	kW (A)	1.5 (5.0)					1.5 (5.0)				
	Purge Pump	kW (A)	0.75 (1.8)									
	Total power consumption	kVA	18.1			15.2			18.1			
	Power Supply		415 V( ±10%), 50 Hz (±5%), 3 Phase+N									

\* Please contact Thermax for higher capacities/ customized specifications.

## Notes

- 1) Model Nos. - 5G XX C: Low temperature hot water fired twin type chiller.
- 2) Chilled water inlet / outlet temperature = 12 / 7 °C.
- 3) Cooling water inlet temperature / Outlet temperature = 29.4 / 36.4°C .
- 4) Hot water inlet / outlet temperature = 90 / 80°C.
- 5) Minimum Chilled water outlet temperature is 0°C.
- 6) Minimum Cooling water inlet temperature is 20°C.
- 7) Ambient condition shall be between 5 to 45°C.
- 8) Maximum Allowable pressure in chilled / cooling / hot water system = 8 kg/cm<sup>2</sup>(g).
- 9) Control panel Electric Input = 1kVA.
- 10) All Water Nozzle connections to suit ASME B16.5 Class 150.
- 11) Above Specifications are valid for insulated machine.
- 12) Technical specification is based on JIS B 8622.

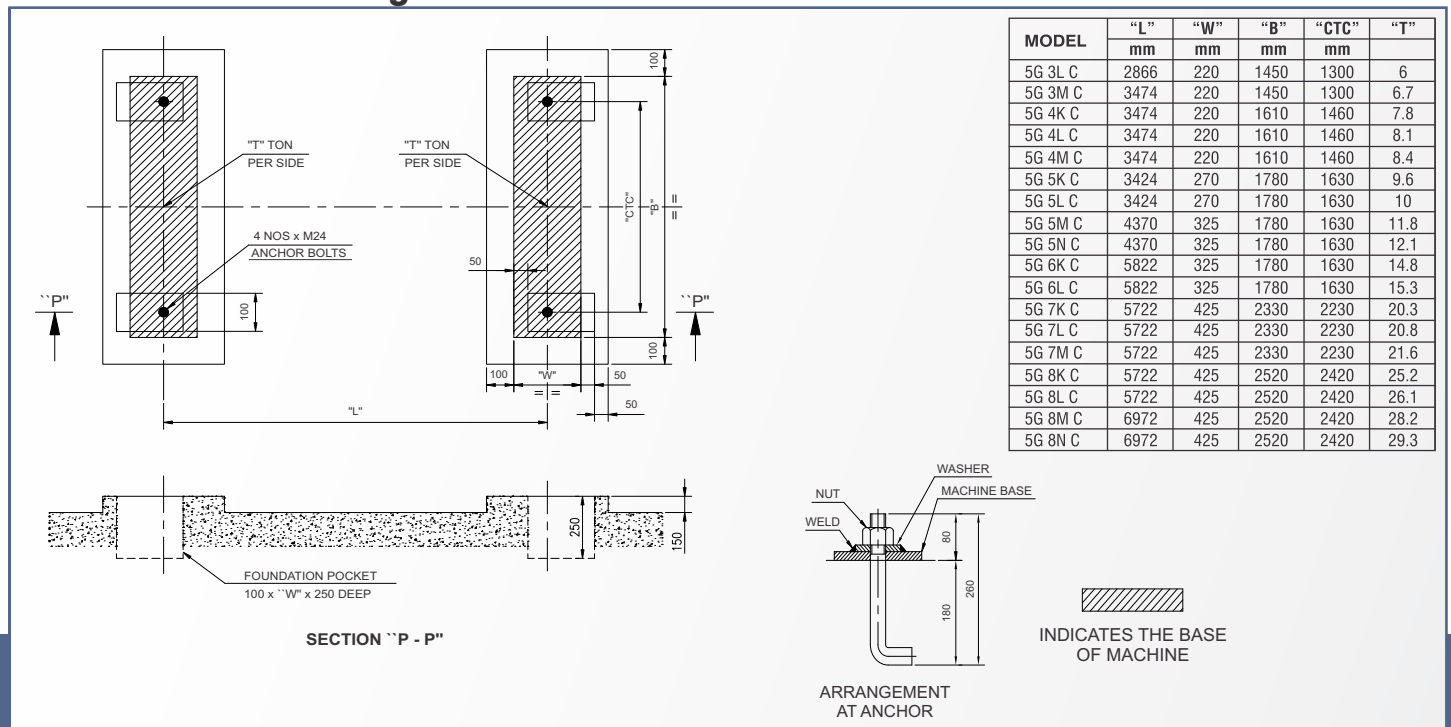


## Scope of work

Item / Activity Chiller	Thermax	Customer	Remarks
Chiller Manufacturing with Accessories	✓		Refer to scope of supply in the offer
<b>Testing</b>			
Factory Testing	✓		Thermax Optional Feature
On-site Erection		✓	
Supervision of commissioning	✓	✓	Customer to assist, Thermax Representative will supervise the commissioning
<b>Transportation</b>			
Loading at Thermax Factory	✓		
Factory to Port	✓		
Port in India to Port of Destination *		✓	Optional
Port to Job-site		✓	
Unloading at Job-site		✓	
Storage at Job-site		✓	If required
<b>Construction and Installation</b>			
Handling at Job-site		✓	Rigging, Shifting to actual location
Civil Foundation		✓	
Piping outside Battery Limits*		✓	Refer to scope of supply in the offer
Chiller Insulation*		✓	
Electrical Connections outside Battery Limits		✓	Refer to scope of supply in the offer
Assembly and On-site Connections		✓	For Multi-Sectional Shipment (Optional).
<b>Operation and Maintenance</b>			
Training of Customer's Operators during commissioning	✓		
Operation		✓	

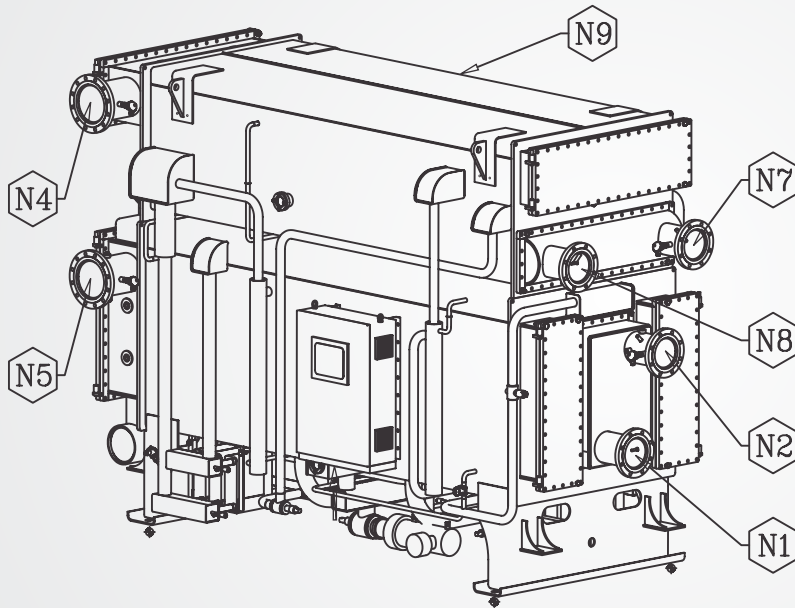
Note: \*Indicates that the scope of supply can also be included by Thermax, as an option.

## Foundation Drawing



- Note:**
- The above drawing indicates the dimensions of the equipment base frame and foundation bolt pockets and suggested size of the footings.
  - The foundation shall be designed to suit the soil conditions and other design considerations at site.
  - For project specific data, please contact thermax representative.

# Typical General Arrangement



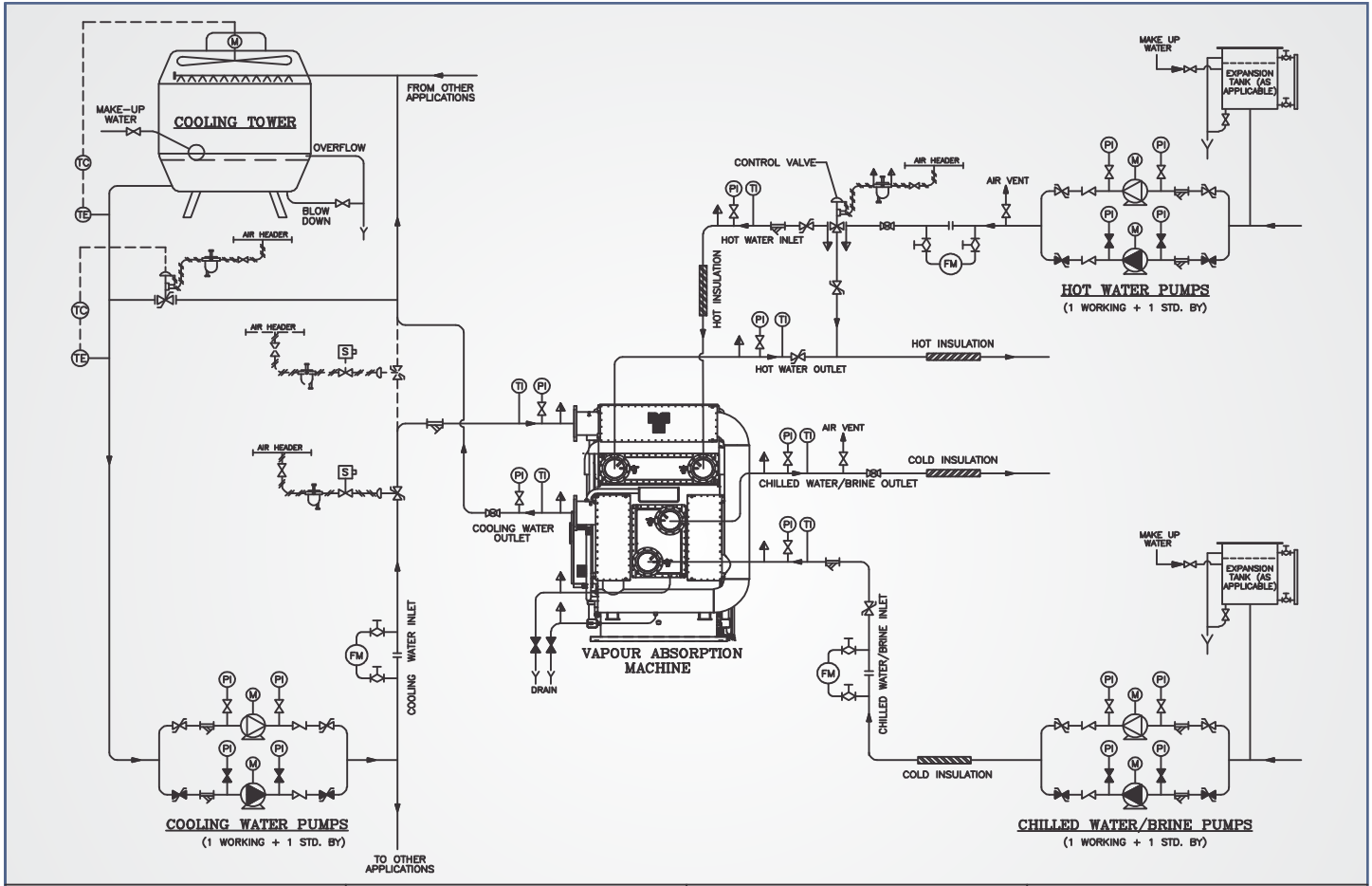
NOZZLE SCHEDULE		
NOZZLE	NOZZLE FL. RATING	DESCRIPTION
N1	ASA 150	CHILLED WATER INLET
N2	ASA 150	CHILLED WATER OUTLET
N3	-	CHILLED WATER DRAIN PLUGGED
N4	ASA 150	COOLING WATER INLET
N5	ASA 150	COOLING WATER OUTLET
N6	-	COOLING WATER DRAIN PLUGGED
N7	ASA 150	HOT WATER INLET
N8	ASA 150	HOT WATER OUTLET
N9	ASA 150	RUPTURE DISK OUTLET

- NOTES :**
- ◆ INDICATES THE POSITION OF ANCHOR BOLTS.
  - ↓ INDICATES THE POSITION OF THE POWER SUPPLY CONNECTION ON CONTROL PANEL.
  - MINIMUM INSTALLATION CLEARANCE.  
CONTROL PANEL SIDE : 1200 mm  
TOP : 250 mm  
OTHERS : 500 mm
  - MACHINE TOLERANCES :
 

L (MTR)	TOL. (MM)
0 - 3	4
3 - 5	5
5 - 7	7
7 - 10	10
OVER 10	15
  - RUPTURE DISK OUTLET TO BE PIPED OUT ACCORDING TO THE LOCAL RULES AND REGULATIONS. MAXIMUM PIPING ELEVATION SHALL NOT EXCEED THE HEIGHT OF MACHINE.

\*\* TYPICAL ILLUSTRATION - FOR INDICATIVE PURPOSE ONLY

# Typical System P & I Diagram



<ul style="list-style-type: none"> <li>◇ GATE VALVE (OPEN)</li> <li>◊ GATE VALVE (CLOSE)</li> <li>⊘ GLOBE VALVE (OPEN)</li> <li>◐ GLOBE VALVE (CLOSE)</li> <li>⊔ COCK</li> <li>⊕ CONTROL VALVE (OPEN)</li> <li>⊖ CONTROL VALVE (CLOSE)</li> </ul>	<ul style="list-style-type: none"> <li>∇ NON RETURN VALVE</li> <li>⊘ BUTTERFLY VALVE (OPEN)</li> <li>◐ BUTTERFLY VALVE (CLOSE)</li> <li>⊔ AIR FILTER REGULATOR</li> <li>⊕ "Y" STRAINER</li> <li>⊖ BELLOW/FLEXIBLE CONNECTION</li> </ul>	<ul style="list-style-type: none"> <li>Ⓟ PRESSURE INDICATOR</li> <li>Ⓣ TEMPERATURE INDICATOR</li> <li>Ⓜ FLOW METER</li> <li>⊔ PNEUMATIC LINE</li> <li>⊕ PUMP</li> <li>Ⓜ MOTOR</li> </ul>	<ul style="list-style-type: none"> <li>⊔ LEVEL INDICATOR</li> <li>⊔ SOLENOID VALVE</li> <li>⊔ PNEUMATIC ON/OFF BUTTERFLY VALVE</li> <li>⊔ ELECTRO-PNEUMATIC 3 WAY CONTROL VALVE</li> <li>⊔ CLIENT SCOPE</li> <li>⊔ THERMAX SCOPE</li> </ul>
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## ■ References



BBC Studios, UK



Michelin Tyres, France



Ferrero Rocher, Italy



Paramount Pictures, USA



Pan Century, Malaysia



Tata Chemicals, India



Rome Airport, Italy



Southampton University, UK



Reliance Industries, India



Fiat, Italy



Moserbaer, India



Atlantic City Casino, USA



Sun Pharma, India



Petrobras, Brazil



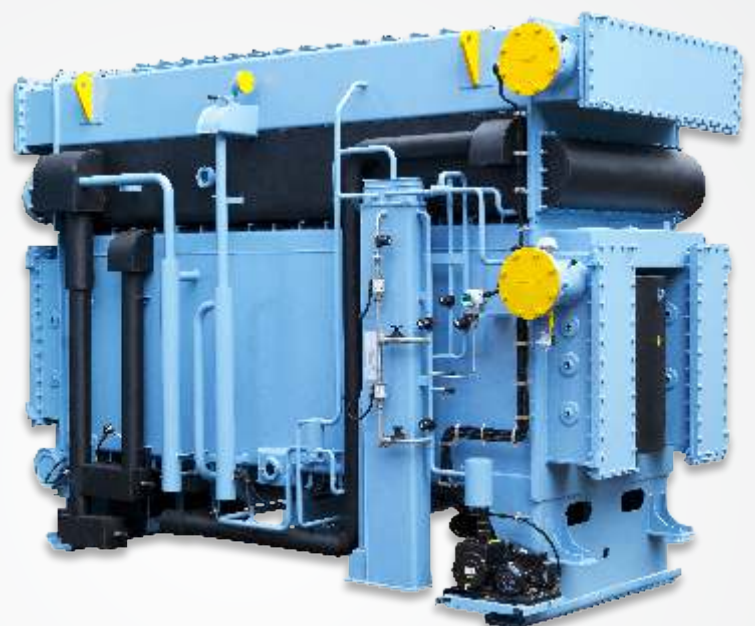
Kingston Hospital, UK



ITPL, India

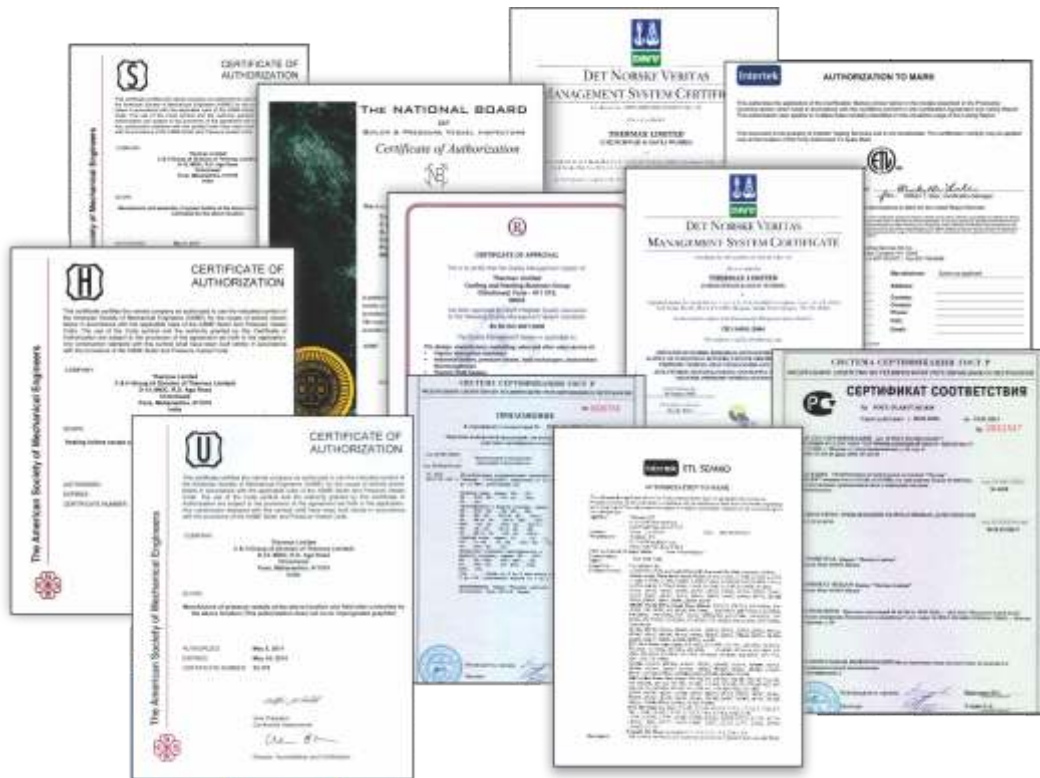
## ■ Applications

- ▶ Chemicals
- ▶ Commercial Centers
- ▶ Dairy & Confectionary
- ▶ District Cooling
- ▶ Edible Oils
- ▶ Educational Institutes
- ▶ Electronics
- ▶ Engineering
- ▶ Hospitals
- ▶ Hotels
- ▶ Paper & Pulp
- ▶ Petrochemicals
- ▶ Pharmaceuticals
- ▶ Refineries
- ▶ Steel
- ▶ Super Markets
- ▶ Textiles





## ■ Global Quality Standards



## ■ Contact Us



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