

# Voltas Customer Care Life Cycle Support

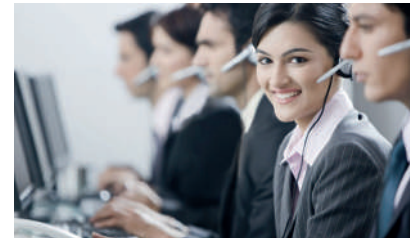
Through **MANAGED Services**



Remote Monitoring



Digital Service Reports



24x7 Helpdesk

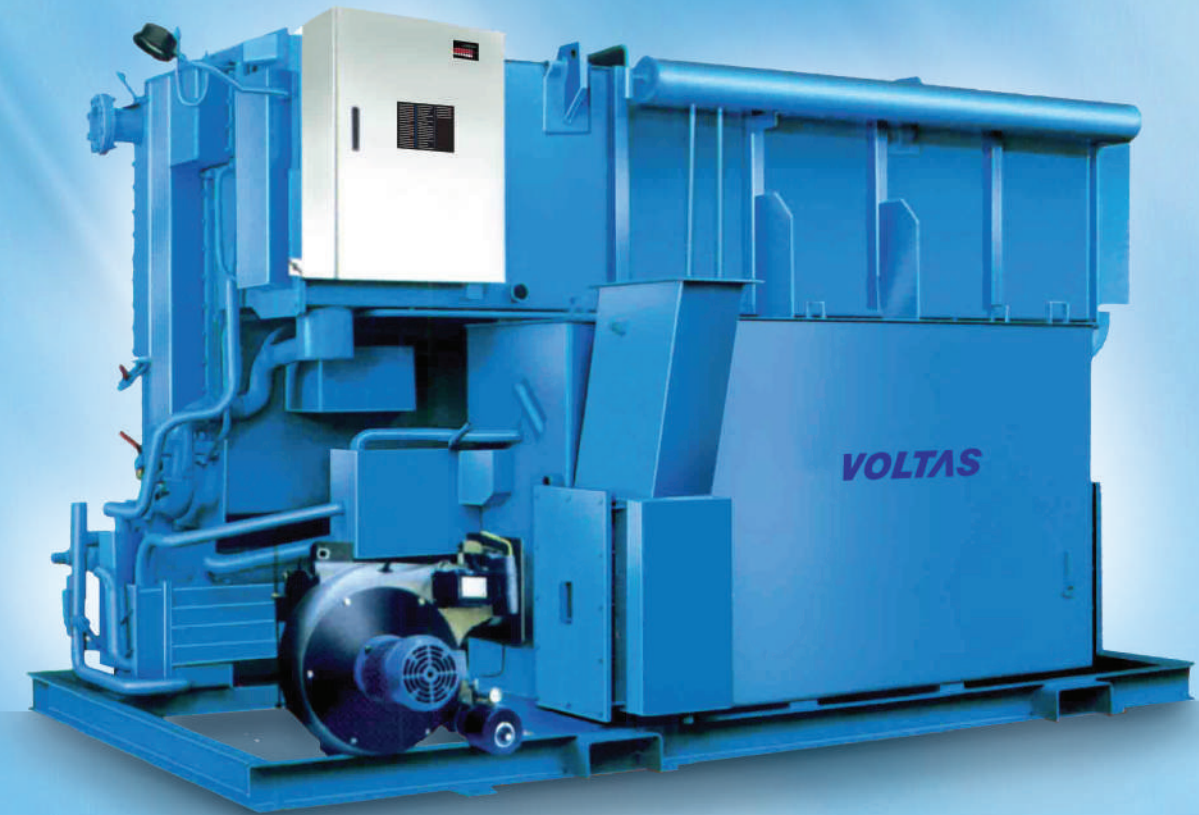


ISO 9001 : 2015 Certified

**VOLTAS**  
A TATA Product

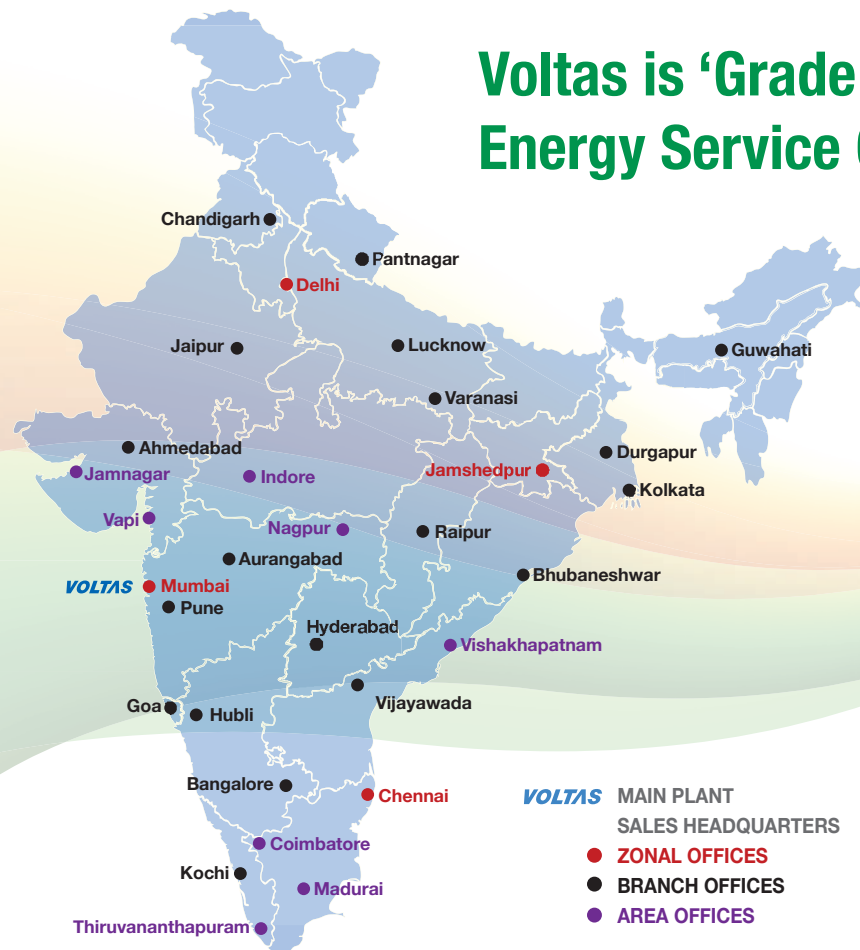
## DIRECT FIRED VAPOUR ABSORPTION MACHINES

( In technical collaboration with Hitachi Ltd., Japan )



*The most energy efficient and reliable  
advanced PARAFLOW technology.*

**Voltas is 'Grade 1'  
Energy Service Company (ESCO)**



**Voltas National Network**  
Easy Access • Quick Satisfaction

Customer Care  
**9100660100**

**MEP Services :**

- Electro-mechanical Services
- HVAC
- Refrigeration

**Water and  
Wastewater  
Management**

**Value Added  
Services**

**Overseas Authorised Distributors:**

**KALTIMEX ENERGY** - Indonesia, Phillipines, Thailand, Bangladesh, Australia

**VOLTAS**

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# VOLTAS – DIRECT FIRED VAPOUR ABSORPTION MACHINES

## SALIENT FEATURES

### Built-in PARAFLOW Reliability

Voltas Absorption Machines using advanced 'PARAFLOW' technology of HITACHI are precision-engineered and built with leak-tight design features for maintaining vacuum integrity of the machine. Each machine goes through the most stringent Helium leak tests and is also run/performance tested at the works for maximum reliability and long life.



### Lower Fuel Consumption

This unique advanced PARAFLOW design along with high performance tubes results in higher cycle efficiency (COP), and much lower fuel consumption compared to other makes.

### Higher Operating Efficiency and Lower Maintenance Costs

The PARAFLOW system is free of cycle corrosion problems due to lower solution concentrations and lower temperature cycle. This reduces fouling and

non-condensibles and improves operating efficiency and reliability.

### High Performance Finned Tubes

Voltas Vapour Absorption Machines use high performance finned tubes for enhancing heat transfer, thereby increasing efficiency of the machine. As also, lower chilled water temperature than nominal specification is achievable due to the use of such tubes and is ideally suitable for maintaining consistently desired chilled water outlet temperature at different load conditions.

### Advanced Spray Head Design

The most advanced and exclusive patented spray-head design of HITACHI is incorporated to provide extremely uniform and soft spray. This extends tube life and performance in the evaporator and absorber. It improves cycle's operating efficiency as uniform spray distribution eliminates hot and cold spots and ensures uniform heat transfer.

### Automatic Purging

This system removes non condensible gases automatically with a water ejector system (does not require manual purge pump operation). The machine operates practically without interference of

non-condensable and thus significantly improves performance and efficiency.

### Highest Quality Solution & Refrigerant Pumps

Down-time and maintenance costs are significantly reduced by using the highest quality imported canned motor pump which are hermetically sealed, self-lubricated and provided with stainless steel impeller. Special feature is, these are site servicable type.

### Fused Sight Glasses

At strategic locations on the unit, fused sight glass assembly are provided. Fused glass construction ensure no leakage from this part for life time and helps in ensuring hermetic condition of the machine.

### High Efficiency Heat Exchangers

Shell and tube Heat Exchangers with high performance finned tubes provided. For higher COP VAM, if required Plate Heat Exchangers (PHE) are provided with best approach designs.

### PLC based Control Panel

Advanced PLC based System is a standard feature in Voltas VAM, with user-friendly key board, LED facia and LCD display. On the front door of panel, its MMI is extremely user friendly.



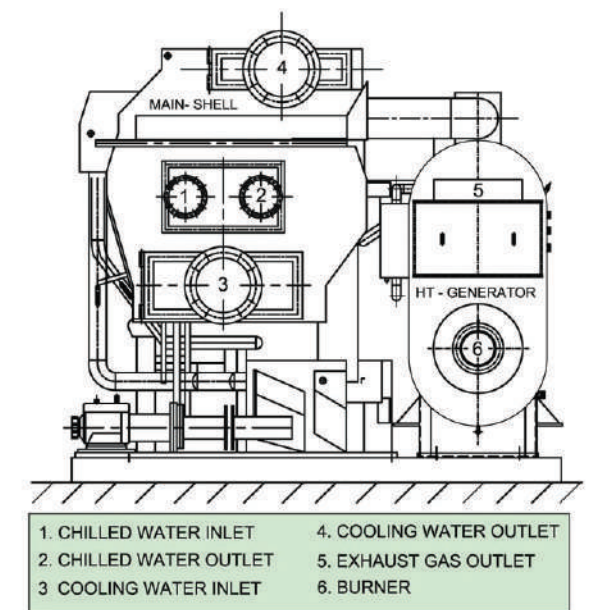
Main Shell H-Model for large capacity VAM

### Performance / Run Test

Only after a very stringent helium leak test, ever machine undergoes performance / run testing. This test is carried out to ensure performance of the machine (capacity, fuel consumption, etc.) & good working condition check prior to dispatch.

### Optional Features

- High COP VAM
- Dual Fuel(oil/gas), Bio gas, LPG burner system
- Different MOC of tubes i.e. Cu-Ni, SS or others special requirements can be offered in evaporator, absorber and condenser
- Connectivity for communication, data logging, history charts, mimics to PC at remote location and or to BMS, DCS systems
- High performance tubes in absorber section
- Special features available for lower fuel consumption
- For taking the machine through narrow approach at site, if required the unit can be supplied in 2 or 3 major sections as per need
- For any further information please call the nearest Voltas Branch Office



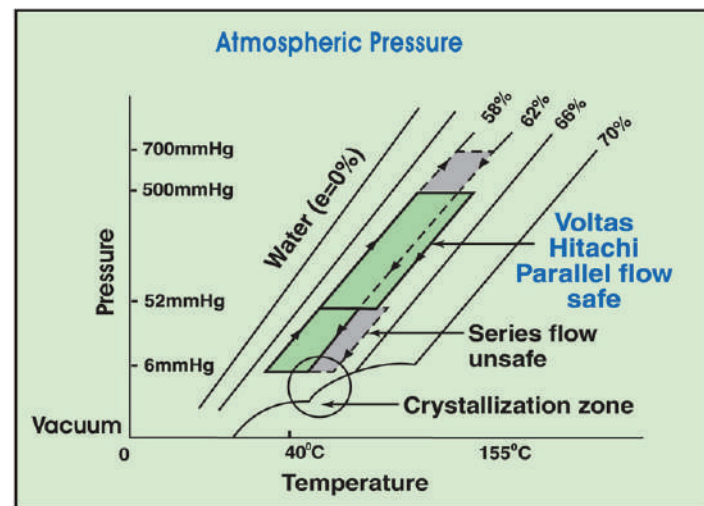
Front View



## EXCLUSIVE FEATURES

### PARALLEL FLOW SYSTEM

Dilute solution from absorber outlet is divided into two streams after the solution circulation pump discharge and both the streams are sent separately at pressure to the high-temperature and low temperature generators for reconcentration. Both the streams of concentrated solutions are then joined together before entering the absorber at a lower concentration and temperature compared to 'Series flow' or 'Reverse Flow' design.



The solution concentration at the absorber inlet (where the temperature is low in the cycle) is lower in patented parallel flow cycle, unique in Voltas-Hitachi machines thus ensuring safe operation, away from the crystallization zone, whereas series flow or reverse flow machines of other manufacturers operating at higher concentration and closer to crystallization zone, are more prone to crystallization.

### UNIT FUEL CONSUMPTION

GAS	
Higher calorific value	11,000 kcal/Nm <sup>3</sup>
Chilling period	0.245 Nm <sup>3</sup> /h-RT
Heating period	0.106 Nm <sup>3</sup> /h-10 <sup>3</sup> kcal
FUEL OIL	
Lower calorific value	10,200 kcal/kg (specific gravity 0.85)
Chilling period	0.297 litres/hr-RT
Heating period	0.12 litres/hr-10 <sup>3</sup> kcal
KEROSENE	
Lower calorific value	10,400 kcal/kg (specific gravity 0.8)
Chilling period	0.293 litres/hr-RT
Heating period	0.126 litres/hr-10 <sup>3</sup> kcal

- At CHW outlet temperature : 7° C; CW inlet temperature : 32° C
- For higher COP VAM, consumptions shall be lower than above



## WORKING CYCLE

This is the refrigeration cycle of the patented "Parallel Flow" method.

### 1) EVAPORATOR

The refrigerant pump sprays the water over the evaporator tube bundle. The water, to be chilled, circulating in the evaporator tubes gets cooled, as the refrigerant water evaporates because of extremely low pressure in the evaporator.

### 2) ABSORBER

The refrigerant water vapour goes to the absorber through the misteliminator. Concentrated LiBr-water solution is sprayed over the absorber tube bundle. The refrigerant vapour is absorbed by the strong solution being sprayed and the heat of absorption is removed by cooling water passing through the absorber tube. Weak solution from the absorber is sent by the solution to the high temperature and low temperature generators to recover the refrigerant water vapour.

### 3) HIGH TEMPERATURE GENERATOR

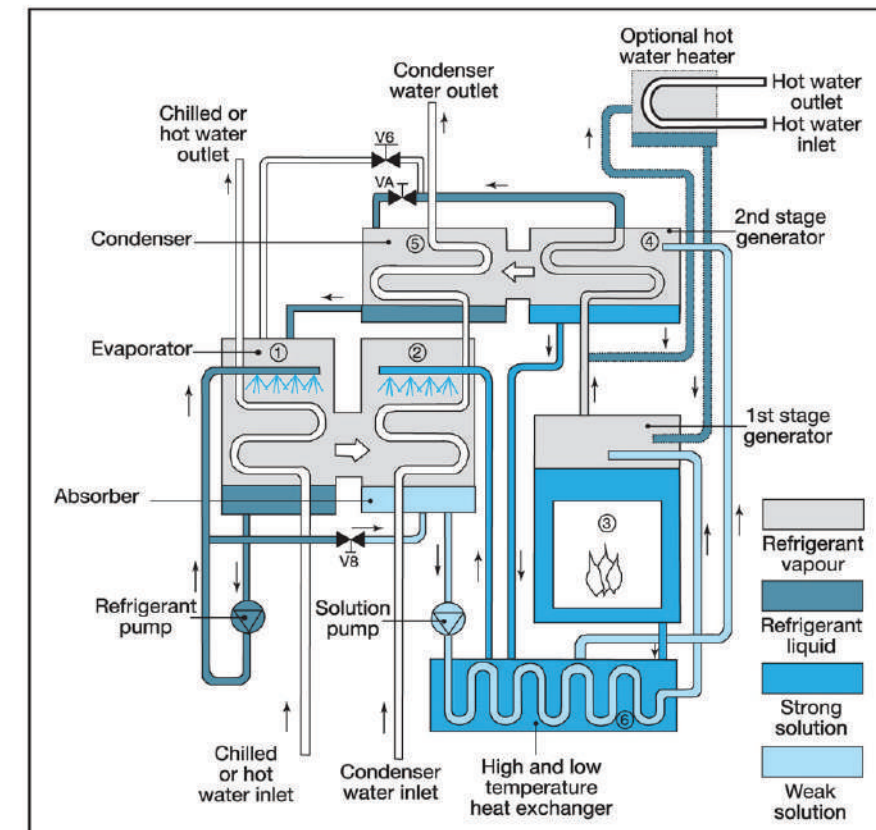
The weak solution is heated by direct firing of fuel in furnace of H. T. generator. Due to the heat supplied in the high temperature generator, the weak solution of lithium bromide and water gets concentrated and refrigerant water is separated by evaporation.

### 4) LOW TEMPERATURE GENERATOR

The hot evaporated water vapour from a high temperature generator is used to heat the weak solution that has been pumped into the low temperature generator to concentrate it even further.

### 5) CONDENSER

The water vapour evaporated in the generator at a higher temperature and pressure is condensed to liquid form in the condenser, where the heat of condensation is picked up by the cooling water from an absorber outlet circulating in the condenser tubes. The condensed refrigerant water is returned to the evaporator through an expansion device.



#### Notes:

1. Machines with optional Hot Water Heat Exchanger do not have valve V6.
2. On machines without the optional Hot Water Heater, the Chilled Water Circuit becomes the Hot Water Circuit during the Heating Cycle.

liquid form in the condenser, where the heat of condensation is picked up by the cooling water from an absorber outlet circulating in the condenser tubes. The condensed refrigerant water is returned to the evaporator through an expansion device.

### 6) HEAT EXCHANGERS

To recover the heat energy from the strong solution returning to the absorber, heat exchangers are used. The cold weak solution being pumped from the absorber picks up excess heat from the strong solution in the heat exchangers. This improves cycle efficiency.

The adjoining diagram explains the operation of the Parallel Flow cycle.

### CHILLING/HEATING CYCLE

Valve VA is open and Valves V6 and V8 are closed during the Chilling Cycle.

Valve VA is closed and Valves V6 and V8 are open during the Heating Cycle.



STANDARD SPECIFICATIONS

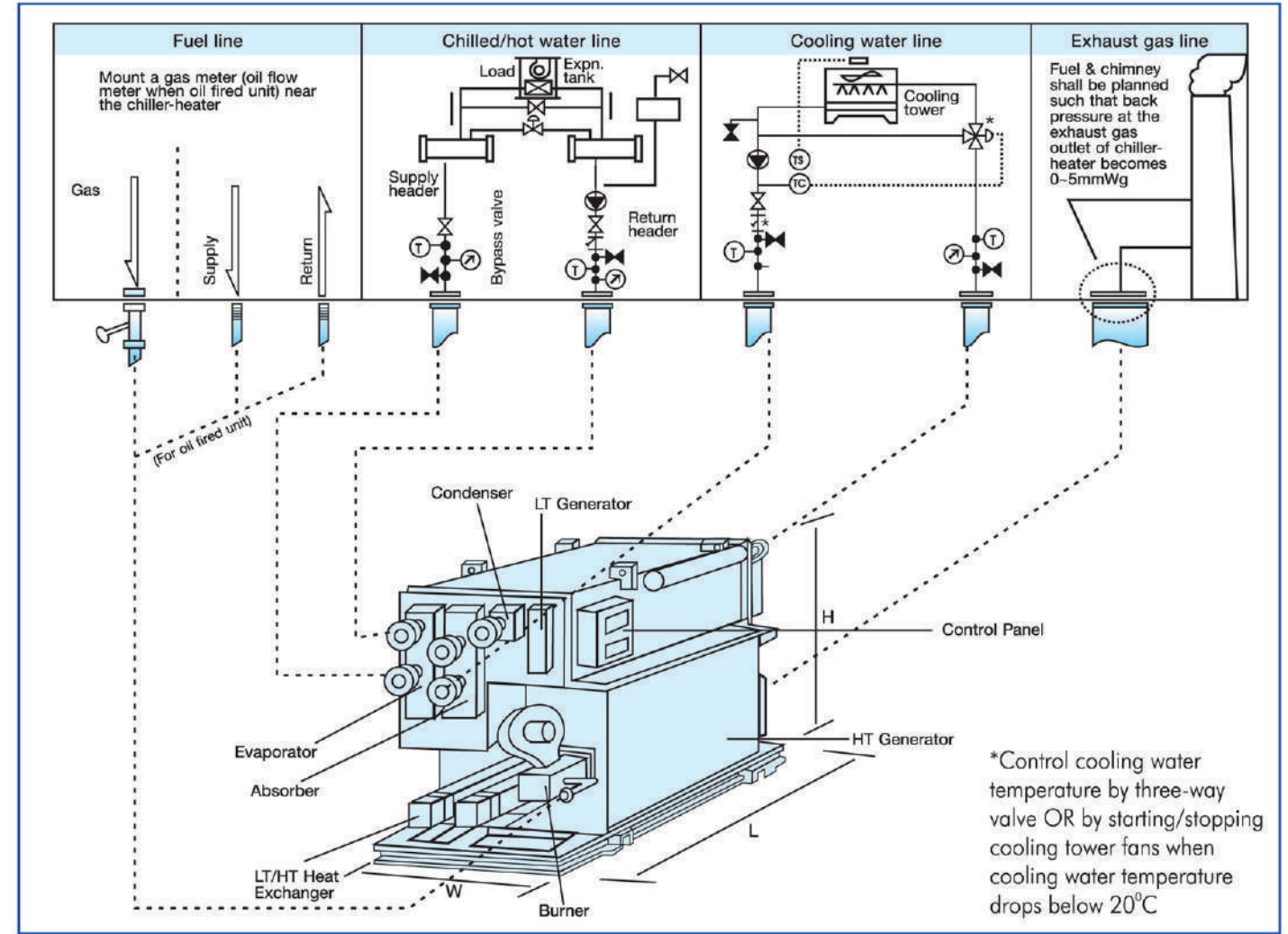
MODEL	HAU	OIL/GAS/KEROSENE-A/G/K	UNITS	NOMINAL REFRIGERATION CAPACITY												1450H	1450
				120S	200S	300S	400S	500S	600S	700S	800S	900S	1000S	1250H			
				RT	120	200	300	400	500	600	700	800	900	1000	1250	1450	
FUELS				NATURAL GAS, HSD, LDO, SKO, LEAN GAS, LPG													
CHILLER				INLET : 12°C													
WATER				TEMPERATURE												OUTLET : 7°C	
				FLOW RATE												880	
				PIPING SIZE												300	
COOLING WATER				TEMPERATURE													
				FLOW RATE												1505	
				PIPING SIZE												400	
				SOLUTION PUMP/s												14.9	
MOTOR OUTPUT				REFRIGERANT PUMP													
				BURNER (OIL/KEROSENE)												9	
				BURNER (GAS)												9	
				PURGE PUMP												0.37	
				CIRCUIT												0.30	
ELECTRICAL SUPPLY				415 V, 30, 50 Hz, 4 W													
OIL/KEROSENE PIPE SIZE (INLET/RETURN)				10/8												40/40	
EXHAUST GAS DUCT SIZE				478x528												900x1100	
OPERATING WEIGHT				TONS												60	
DIMENSIONS (OIL/GAS/KEROSENE)				LENGTH												9800	
				WIDTH												3900	
				HEIGHT												3360	
CLEARANCE FOR TUBE REMOVAL				mm												9000	
INSULATION				HOT												84	
				COLD												39	

NOTES :

- One ton of refrigeration is equal to 3024 Kcal/hr.
- Capacity range (Turn Down Ratio) for natural gas : 100% to 25% (1:4), kerosene and oil 100% to 33% (1:3)
- For export jobs suffix 'V' added & for special features like - higher COP, Spl. MOC for tubes, Shell, Controls, other special features, etc. suffix '(SP)' added to above Model Nos.
- When Fuel not as per standard specifications, please contact Voltas for details/confirmations.
- Gas supply pressure inlet to VAM 300 millibar
- For unit fuel consumption refer page-4
- Fouling factor for chilled water cooling water and hot water as 0.0001 m<sup>2</sup>hr°C/Kcal, as per JIS 8622.
- Maximum allowable operating pressure for chilled water, cooling water and hot water is 8 kg/Cm<sup>2</sup>g. Higher pressure available on request
- Burners suitable for alternate firing of oil/gas available on request (i.e. for dual fuel type)
- For export jobs 380V, 480V with option at 50 Hz. Or 60 Hz. available
- Minimum cooling water temperature recommended is 18°C and above when gas firing and 22°C & above when oil firing.
- Super large capacity VAM available in duplex construction for capacity 1600, 1800, 2000, 2500 & 3300 TR on request.
- Standard Intermediate models available within above range are 135, 180, 230, 280, 350, 450 and 550 TR.
- For conditions other than above and for intermediate models contact the nearest Voltas office

PLANNING OF CONSTRUCTION

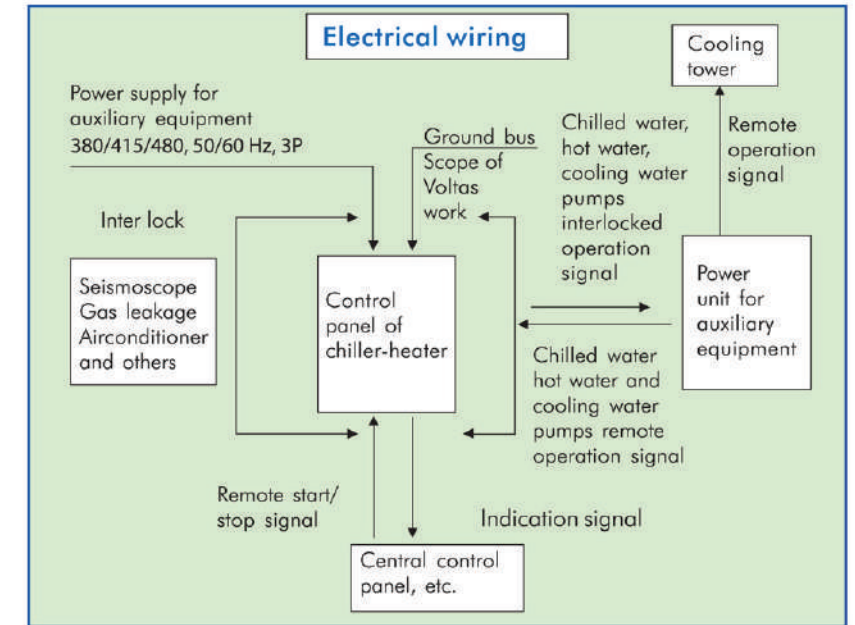
(Battery Limits)



Mating flanges, packings and bolts shall be prepared by customer.

SYMBOLS

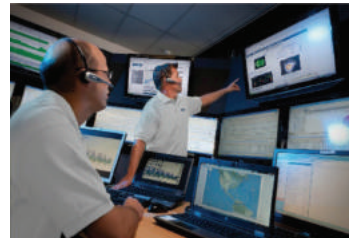
- ⊕ : Thermometer
- ⊙ : Pressure gauge
- ⊥ : Strainer
- ⊗ : Stop valve
- ⊗ : Air vent valve
- ⊗ : Drain vane
- ⊙ : Pump
- ⊗ : Three-way valve
- ⊗ : Two-way valve





# Voltas Customer Care Life Cycle Support

Through **MANAGED Services**



Remote Monitoring

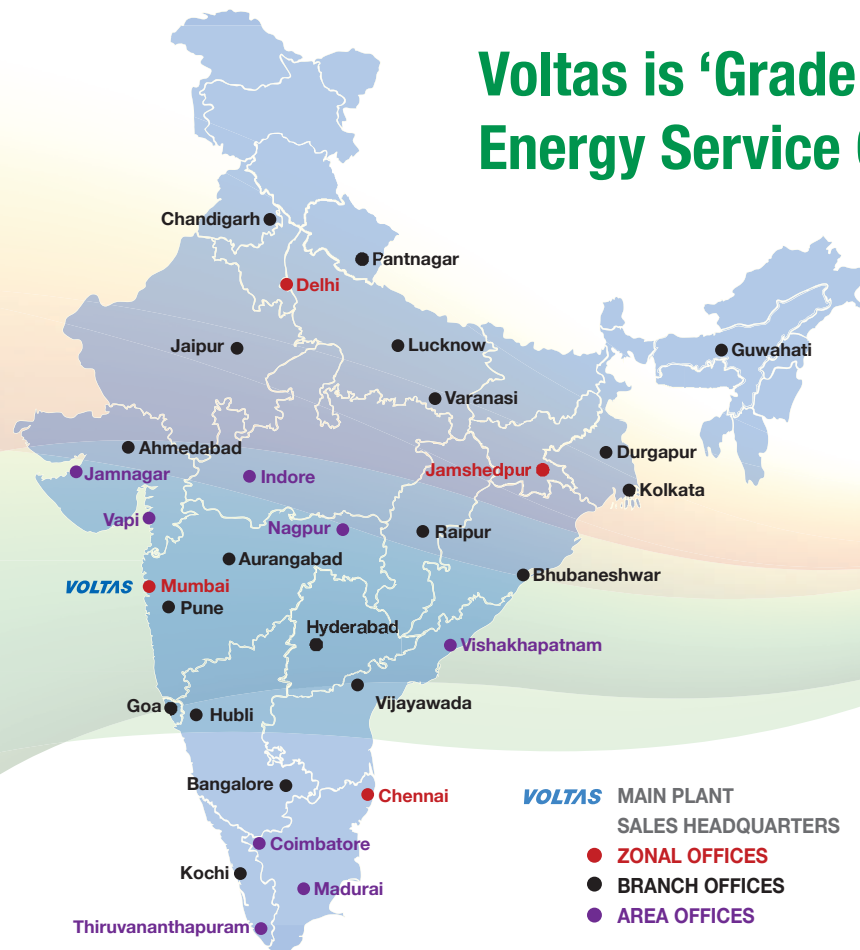


Digital Service Reports



24x7 Helpdesk

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Easy Access • Quick Satisfaction

Customer Care  
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- Electro-mechanical Services
- HVAC
- Refrigeration

**Water and Wastewater Management**

**Value Added Services**

**Overseas Authorised Distributors:**

**KALTIMEX ENERGY** - Indonesia, Phillipines, Thailand, Bangladesh, Australia



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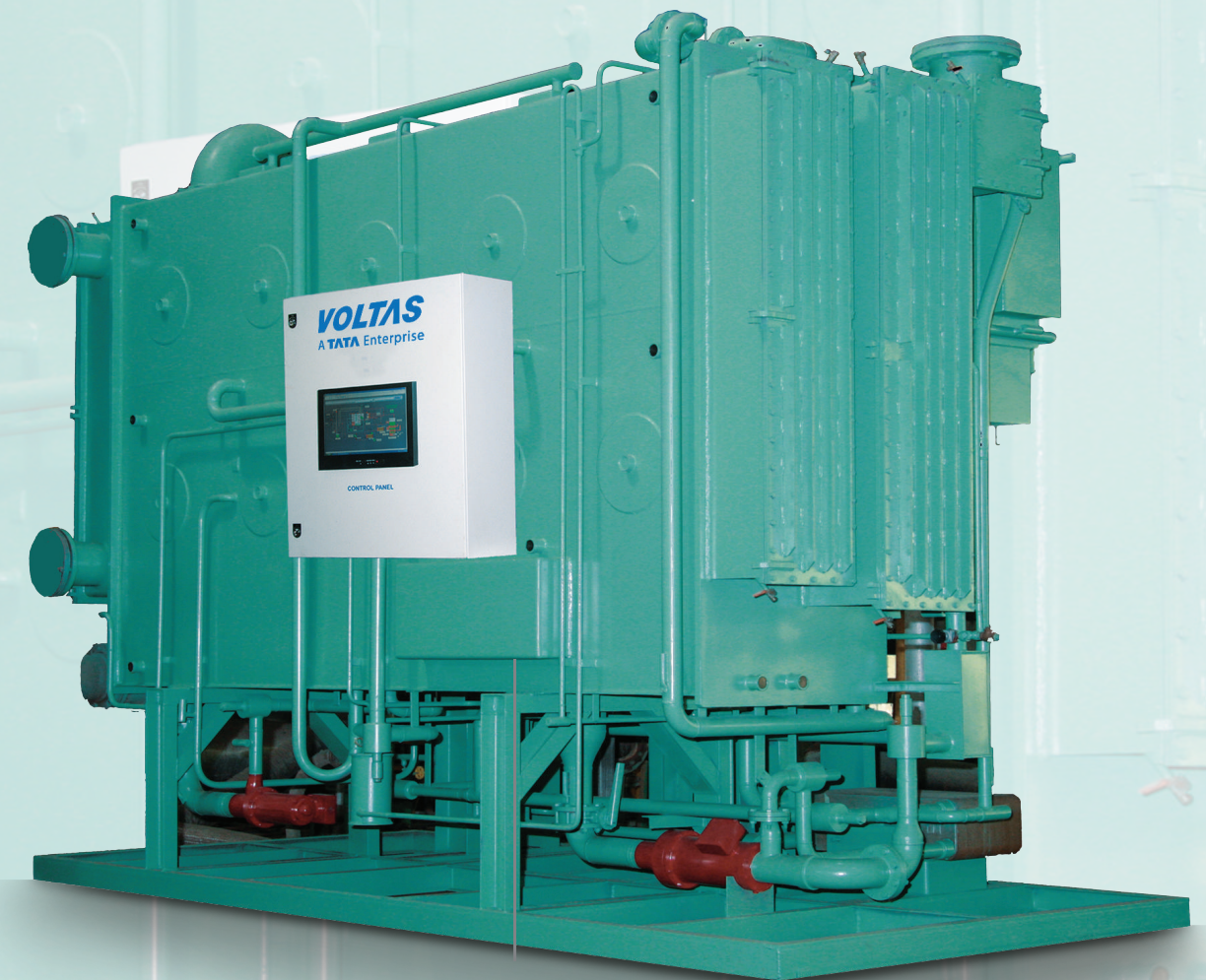
VLVAM-SF/10/19



ISO 9001 : 2015 Certified

**VOLTAS**  
A TATA Product

## VAPOUR ABSORPTION MACHINES



*The energy efficient and reliable  
advanced PARAFLOW technology.  
Uses heat source: Steam / Hot water*

( In technical collaboration with Hitachi Ltd., Japan )



VOLTAS AT ITS VERY BEST

**VOLTAS OFFERS VAPOUR ABSORPTION MACHINES WITH STATE-OF-THE-ART TECHNOLOGY**

**Versatility**

Versatility is built into Voltas Vapour Absorption Machines.

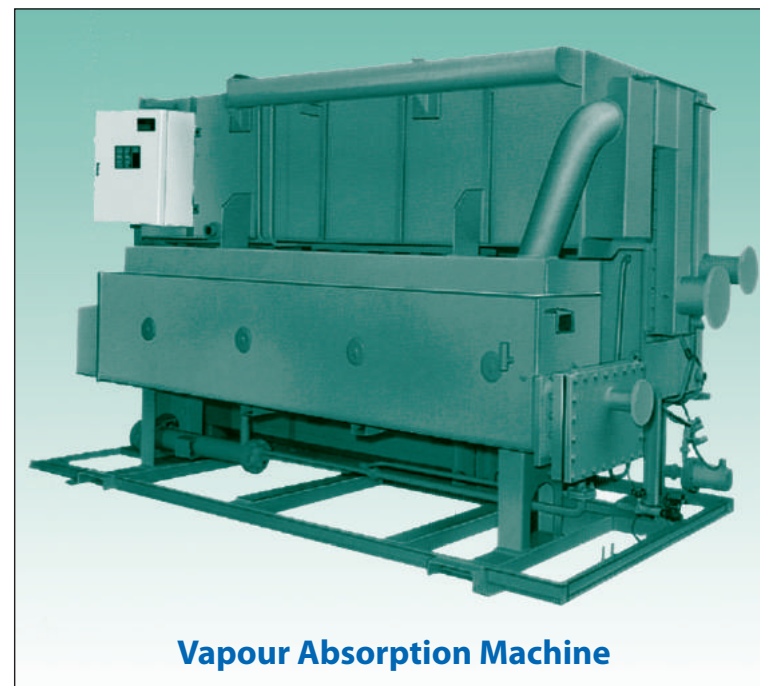
- Single Stage (Single Effect) machines can use low pressure steam as well as hot water to drive the lithium bromide absorption cycle effectively.
- Two Stage (Double Effect) machines are designed to work on parallel flow cycle using medium pressure steam for a lower steam consumption rate with reduced energy cost.

**Converting waste into worth**

Waste heat sources can be used to produce cooling. The absorption machines are also used as heat pump by utilising absorption refrigeration cycle heat energy in the hot water at outlet of absorber and condenser circuits for applications requiring simultaneous cooling and heating and in co-generation applications.

**Environment protection**

Li Br solution as absorbent, non-toxic lithium molybdate and lithium nitrate inhibitors and water as refrigerant are harmless. Also these machines are ozone-friendly since no usage of CFC.



**Vapour Absorption Machine**

**PRODUCT RANGE**

Voltas manufacturing range covers the following types of absorption machines.

Double Effect - Saturated steam (Pressure 3.5 to 9 kgs/ cm<sup>2</sup>g) : 25 Models, 40 TR to 1650 TR.

Single Effect - Saturated steam (Pressure 0.4 to 2 kg/cm<sup>2</sup>g) : 25 Models, 40 TR to 1650 TR.  
( Ultra-low Steam pressure machines also available )

Single Effect - High Temperature Hot Water (HW at 140°C) : 25 Models, 40 TR to 1650 TR.

Single Effect - Low Temperature Hot Water (HW at 85°C) : 25 Models, 20 TR to 800 TR.

Ask for: • Voltas super large capacity type VAM from 1800 TR to 3300 TR

- Voltas Direct Fired & Cogeneration type Absorption Machines 40 TR to 1650 TR using oil, gas or kerosene, hot exhaust gases.
- Double Effect High Temperature Hot Water VAM 40 TR to 1650 TR using Hot Water at 170°C

**SUPERIOR FEATURES**

**Technology**

For double effect VAM in India, only Voltas offers world's most preferred Parallel-Flow technology originally patented by Hitachi, now followed by majority of renowned manufactures in Japan, USA & other countries.

For details refer page 6, 7 & 8.

**Highest Efficiency**

Voltas Double Effect VAM offers lowest steam consumption when compared with others at identical operating parameters. Energy efficient models with lower steam consumption available.

**Large Design Margins**

Voltas offers standardisation of machine capacity with cooling water inlet temperature at 32°C having large design margins compared to machines designed at 29.4°C at identical capacity by others.

**Soft Spray System**

In evaporator & absorber section, Hitachi's patented design fo pressurised soft spray of refrigerant & absorbent for excellent heat transfer co-efficient & full coverage of heat transfer areas. Additional benefits are - no clogging and no need fo automatic cooling water shutoff valve. (Which is absolutely essential in gravity feed system).

**HTG-U-tubes**

In double effect VAM, U tube design is the best construction to take care of thermal expansion in high temperature zone. Voltas provides highest quality seamless grade SS-316 L tubes compared to others generally provide ferretic grade cheaper ERW tubes.

**Fused Sight Glasses**

At strategic locations on the unit, Sight Glass Assembly is provided, Fused glass construction ensures no leakage from this part for life time and needs no replacements.

**Inhibitors**

Backed up by Hitachi's R&D, Lithium Molybdate is used as inhibitor. This offers negligible non-condensable generation compared to other inhibitor. It is totally non-toxic and environment friendly.

**Control Panel**

Advanced Voltas branded PLC based System is a standard feature in Voltas VAM, with user-friendly colour touch screen HMI, RS-485 Communication port, modular construction Dual redundancy is provided as an optional.

**High Performance Tubes**

High performance finned tubes are provided in all sections of absorption chillers.

**Optional Features**

- Different MOC of tubes i.e. Cu-Ni, SS, Titanium (Ti) or other special requirements can be offered in evaporator, absorber and condenser.
- Connectivity for communication, data logging, history charts, mimics to PC at remote location and or to BMS, DCS Systems.
- Bearing wear monitors for canned motor pumps.
- Narrow approach at installation site exist, then unit can be supplied in 2 or 3 major sections as per need.
- Automatic purge system for effective removal of non-condensable gases as continous process.
- For any other specific optional requirements, please ask Voltas for confirmation.



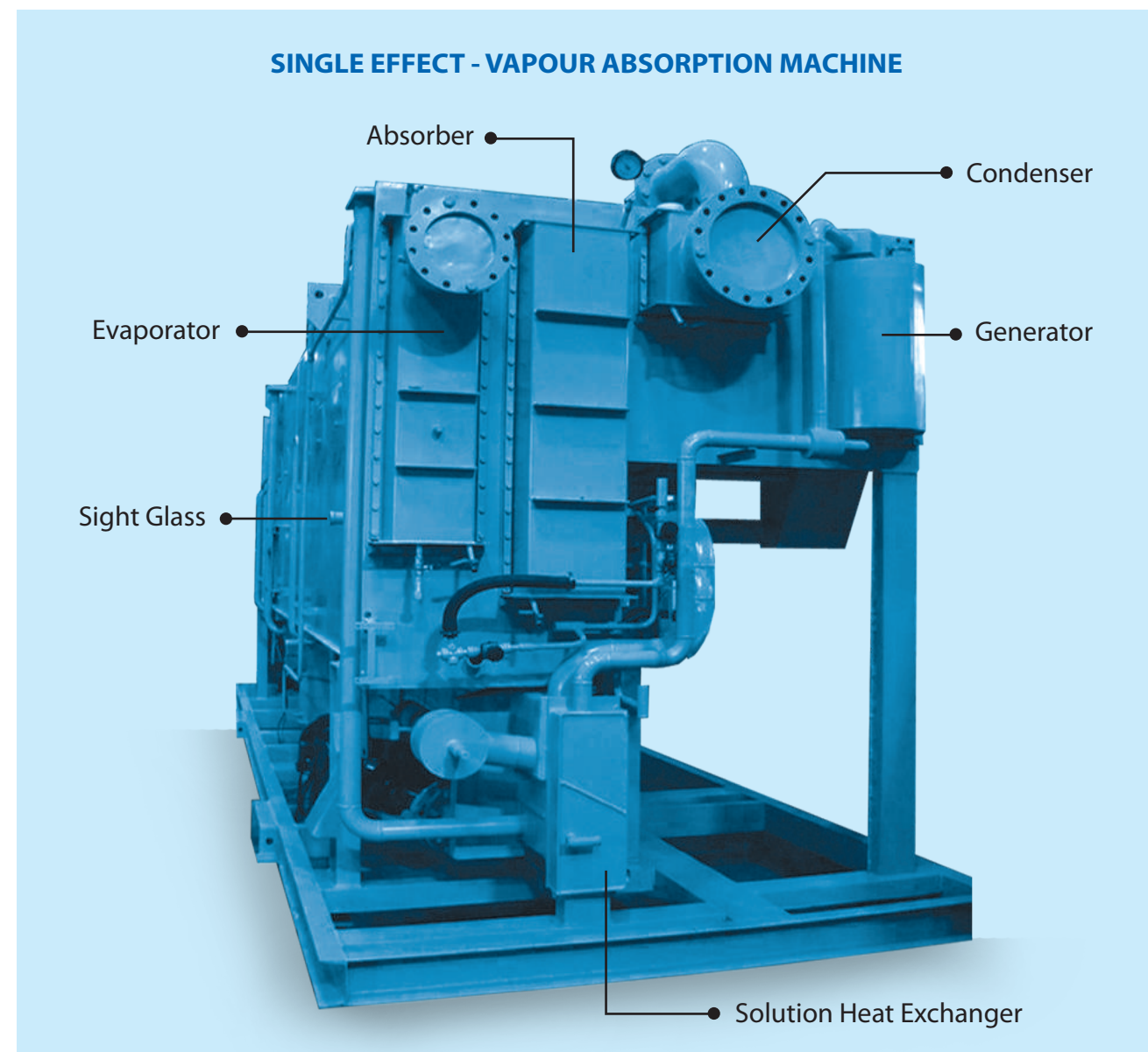
## SINGLE EFFECT MODELS HAU-H/L,D,S.

Single effect absorption machines work on low pressure steam or hot water as heat source.

A negligible amount of electrical energy is required to operate them.

### FEATURES

- Unique single shell leak tight construction maintaining excellent hermetic conditions.
- Perfect protection from thermal stresses due to floating end type generator design.
- Simple but efficient capacity control by steam condensate throttling.
- Better safety margin against crystallization.
- Efficient soft spray arrangement in evaporator and absorber sections for full coverage of heat transfer area.
- High performance tubes in evaporator for best approach there by possible to get consistent chilled water outlet temperature.



## WORKING OF SINGLE EFFECT MODELS HAU-H/L,D,S.

This is the Refrigeration cycle description.

### OPERATION

Voltas single effect absorption machine consists of two sections in one shell. The lower section houses the evaporator and the generator and the condenser. The pressure in the lower section is of the order of 6mm Hg(abs) while the pressure in the upper section is about 70mm Hg(abs). LiBr-Water combination is used in the operation of vapour absorption cycle. Water acts as the refrigerant and LiBr as the absorbent. Solution pump, refrigerant pump, heat exchanger, purge unit and the control panel complete the machine.

### EVAPORATOR

Refrigerant pump sprays the water over the evaporator tube bundle. The water to be chilled that is circulating in the evaporator tubes, gets cooled as the refrigerant water in the shell evaporates because of extremely low pressure in the evaporator shell.

### ABSORBER

The refrigerant water vapor goes to the absorber through a mist-eliminator. Concentrated LiBr-water solution is sprayed over the absorber tube bundle. The refrigerant vapour is absorbed by the strong solution being sprayed and heat of absorption is removed by cooling water passing through the

absorber tubes. The weak solution from the absorber is sent by the solution pump to the generator for recovering the refrigerant water vapour.

### GENERATOR

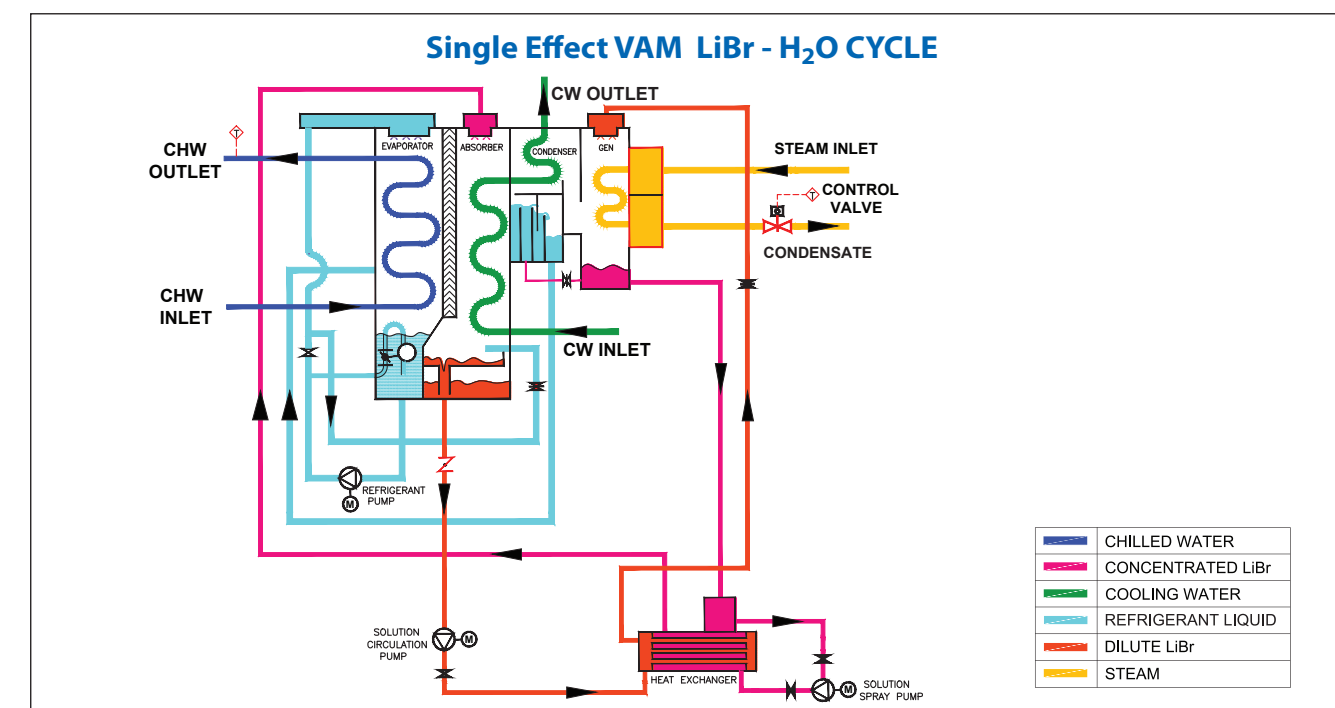
Weak solution from absorber is heated in the generator with the help of low pressure steam / hot water. The refrigerant water vapour is evaporated and goes to the condenser. The strong solution is sent down to the absorber for further absorption of water vapour.

### HEAT EXCHANGER

To recover the heat energy from the strong solution returning to absorber a heat exchanger is used. The cold weak solution being pumped from the absorber picks up heat from the strong solution. This improves cycle efficiency.

### CONDENSER

The water vapour evaporated in the generator at a higher temperature and pressure is condensed to liquid form in the condenser where the heat of condensation is picked up by the cooling water from the absorber inlet circulating in the condenser tubes. The condensed refrigerant water is returned to the evaporator through an expansion device.





## DOUBLE EFFECT MODELS HAU-W-S, H.

### INTRODUCTION

Double effect absorption machines work on medium pressure saturated steam and a negligible amount of electrical energy is required to operate them. Voltas double effect vapour absorption machines use medium pressure saturated steam (pressure of 3.5 to 9 kg/cm<sup>2</sup>g) to produce a refrigeration effect. It can also provide simultaneous heating by utilising the heat that is removed during the vapour absorption cycle.

Voltas manufactures the world famous "Parallel Flow" vapour absorption machines. These machines are surprisingly compact and are well known for their reliability and energy efficiency.

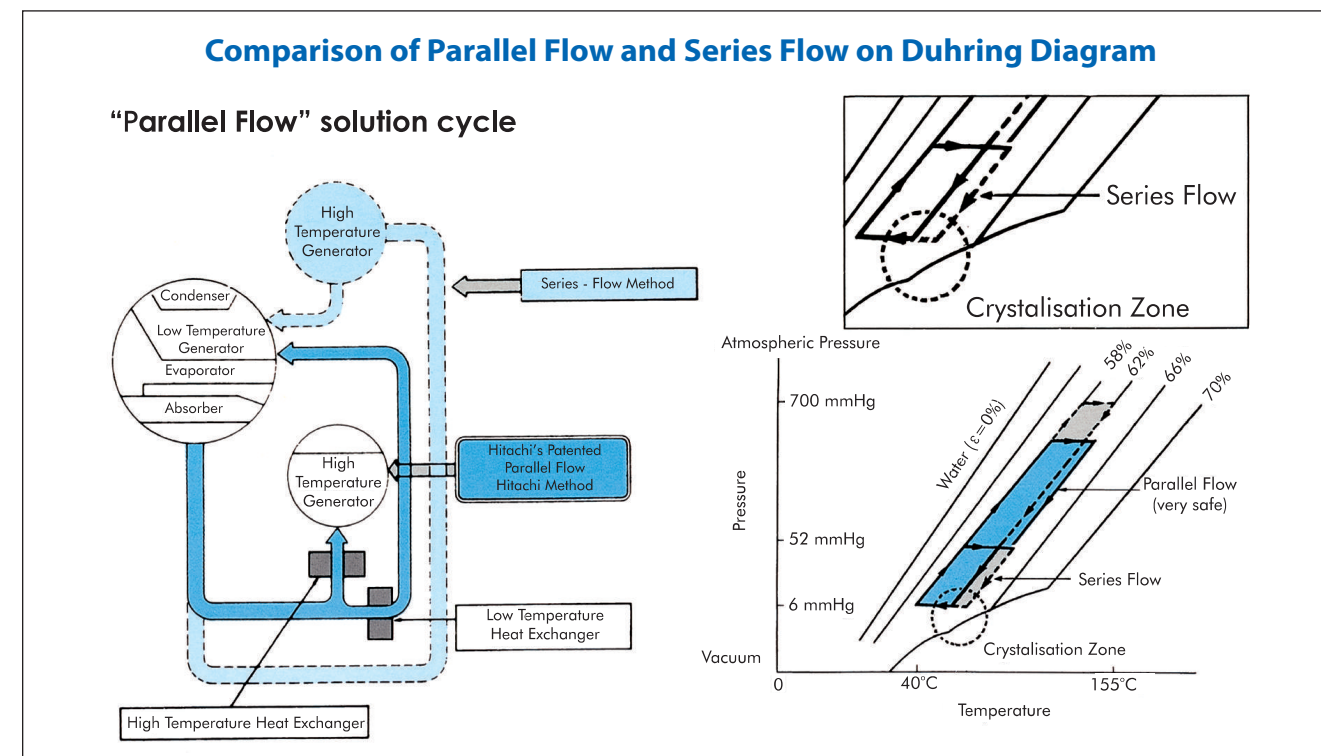
### OPERATION

"Parallel Flow" solution cycle:

In the double effect vapour absorption cycle employing the parallel flow principle, the weak solution from the absorber is pumped simultaneously to two generators, a high temperature generator and a low temperature generator. Since the solution is pumped simultaneously to the two generators, the high temperature generator can be located at a lower level.

Whereas in the "Series Flow" solution cycle used by other manufactures, the high temperature generator has to be placed above the low temperature generator to allow draining of solution from a high temperature generator to a low temperature generator. Therefore, the overall height of the Voltas parallel flow machines is greatly reduced. Furthermore, the parallel flow method also contributes to increased safety levels, reliable cycle and easy maintenance. Comparison of parallel flow and series flow cycles can be seen in the diagram given below.

THE SOLUTION CONCENTRATION AT THE ABSORBER INLET (WHERE THE TEMPERATURE IS VERY LOW IN THE CYCLE) IS LOWER IN PATENTED PARALLEL FLOW CYCLE, UNIQUE IN VOLTAS-HITACHI MACHINES THUS ENSURING SAFE OPERATION, AWAY FROM THE CRYSTALLIZATION ZONE, WHEREAS SERIES FLOW MACHINES OF OTHER MANUFACTURERS OPERATING AT HIGHER CONCENTRATION AND TEMPERATURE CLOSER TO CRYSTALLIZATION ZONE, ARE MORE PRONE TO CRYSTALLIZATION.



## WORKING OF DOUBLE EFFECT MODELS HAU-W-S, H.

This is the Refrigeration cycle of the "Parallel Flow" method.

### EVAPORATOR

The refrigerant pump sprays the water over the evaporator tube bundle. The water to be chilled, circulating in the evaporator tube gets cooled, as the refrigerant water evaporates because of extremely low pressure in the evaporator.

### ABSORBER

The refrigerant water vapour goes to the absorber through the mist-eliminator. Concentrated LiBr-water solution is sprayed over the absorber tube bundle. The refrigerant vapour is absorbed by the strong solution being sprayed and the heat of absorption is removed by cooling water passing through the absorber tube. Weak solution from the absorber is sent by the solution pump to the high temperature and low temperature generators to recover the refrigerant water vapour.

### HIGH TEMPERATURE GENERATOR

The weak solution is heated by the steam from the generator tubes. Due to the heat supplied in the high temperature generator, the weak solution of lithium bromide gets concentrated and refrigerant water is separated by evaporation.

### LOW TEMPERATURE GENERATOR

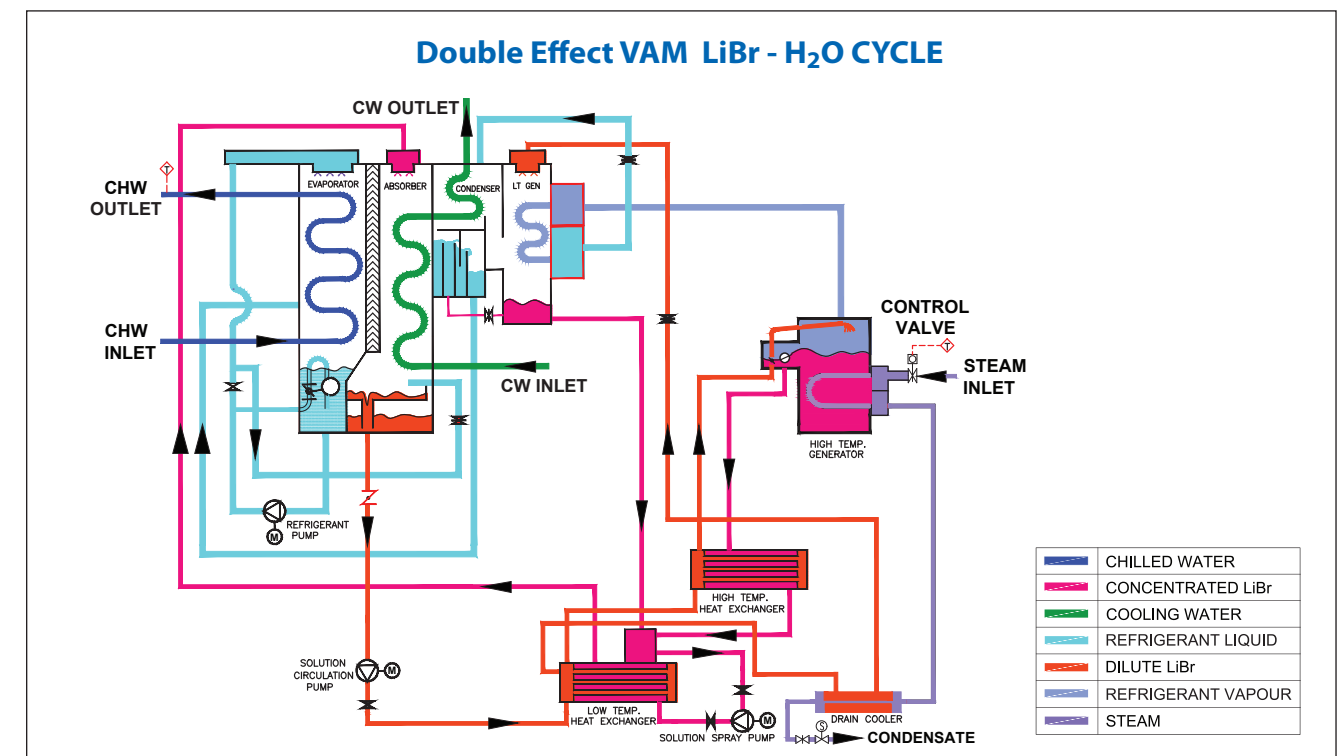
The hot evaporated water vapour from high temperature generator is used to heat the weak solution that has been pumped into the low temperature generator to concentrate it.

### CONDENSER

The water vapour evaporated in the generator at a higher temperature and pressure is condensed to liquid form in the condenser, where the heat of condensation is picked up by the cooling water from an absorber outlet circulating in the condenser tubes. The condensed refrigerant water is returned to the evaporator through an expansion device.

### HEAT EXCHANGERS

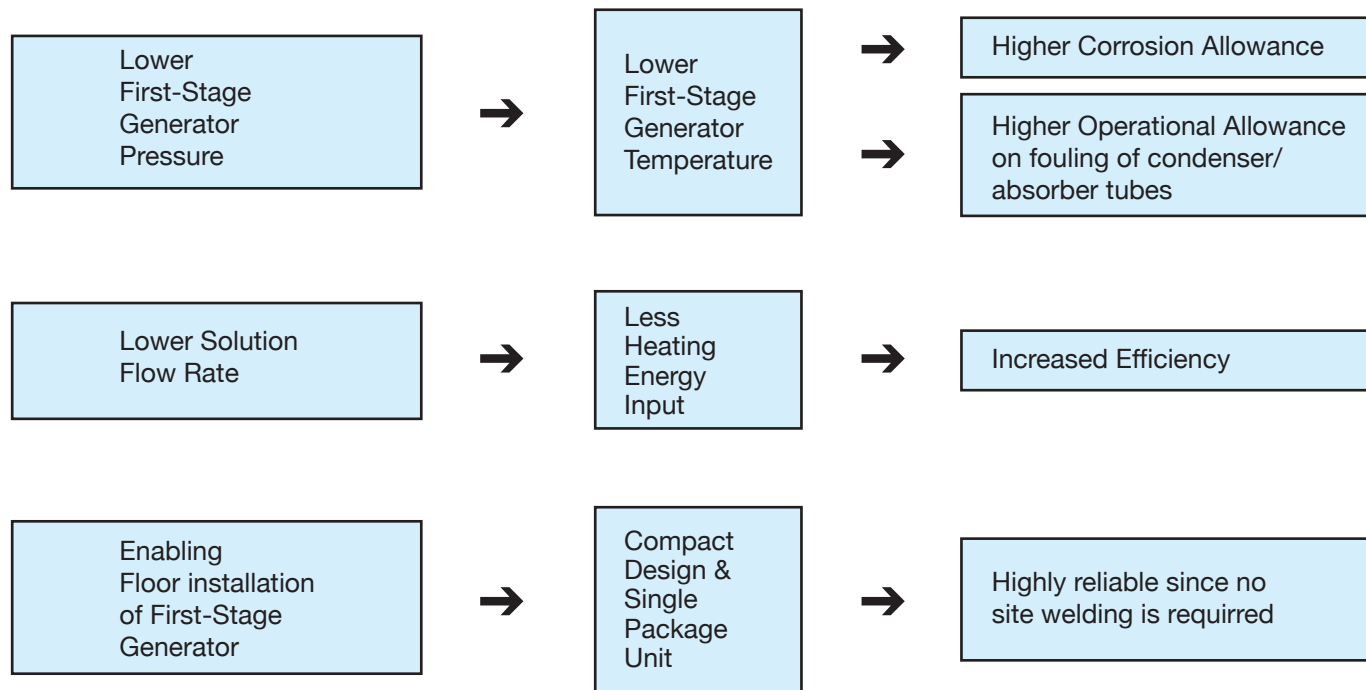
To recover the heat energy from the strong solution returning to the absorber, two heat exchangers are used. The cold weak solution being pumped from the absorber picks up excess heat from the strong solution in the heat exchangers. This improves cycle efficiency. The adjoining diagram explains the operation of the Parallel Flow cycle.





## EXCLUSIVE FEATURES

### Exclusive Features of Voltas Parallel Flow Cycle



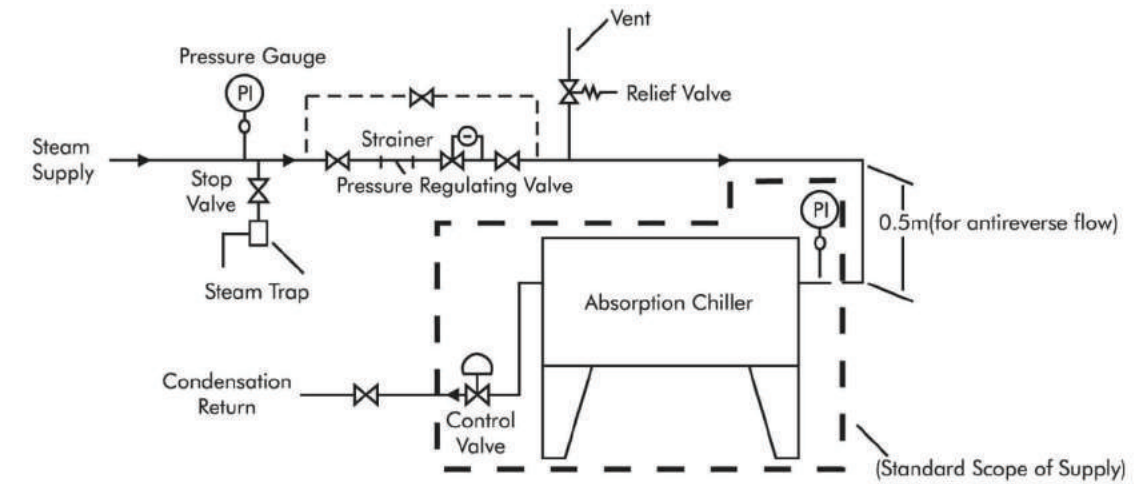
### Scope of Supply

	Items	Scope of supply	Remarks
	Absorption chiller main unit	0	Factory supply
<b>1. Equipment</b>	Cooling water connection piping	0	Piping between absorber and condenser
	Foundation bolts	x	
	Vibration-isolator (rubber pads)	x	Optional item
	Refrigerant water	0	First charge only
	Steam inlet control valve	0	Pneumatic type (loose supply)
	Steam inlet pressure guage	x	
	Steam inlet shut-off valve	x	
	Drainage back pressure setting valve	x	
	Steam-safety valve	x	
	Other safety and control devices	0	For details refer to Voltas
	LiBr solution	0	First charge only
<b>2. Transportation</b>	Shipping	x	Shipped on truck or trailer (optional)
	Unloading etc.	x	Optional items

Note: "0" indicates "Scope of supply by Voltas"  
 "x" indicates "Out of scope of supply by Voltas"

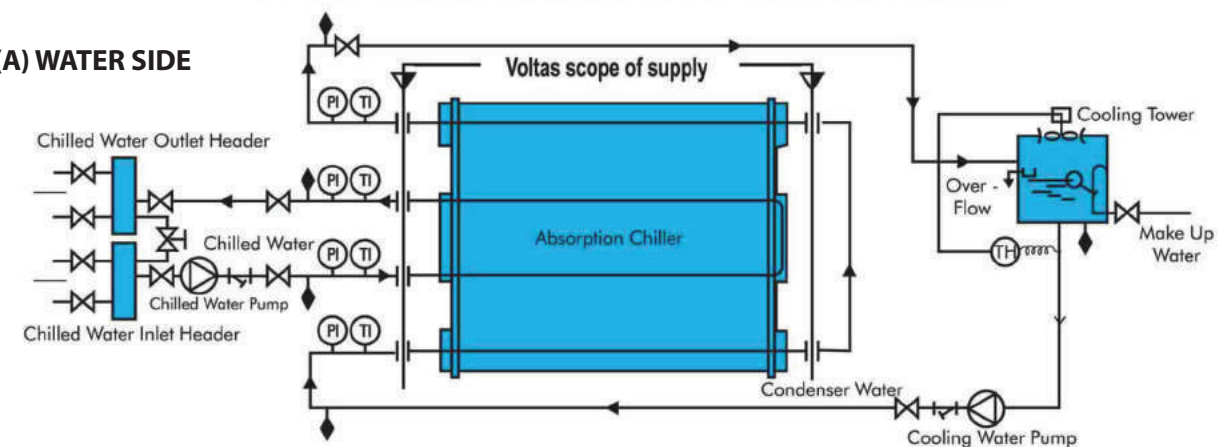
## PLANNING AND CONSTRUCTION

### STEAM PIPING SCHEMATIC FOR SINGLE EFFECT MACHINE

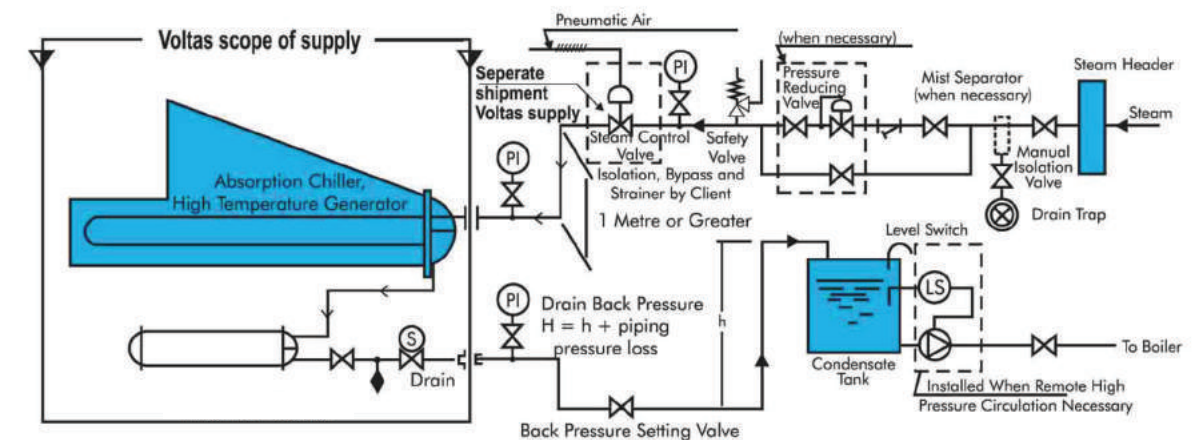


### PIPING SCHEMATIC FOR DOUBLE EFFECT MACHINE

#### (A) WATER SIDE

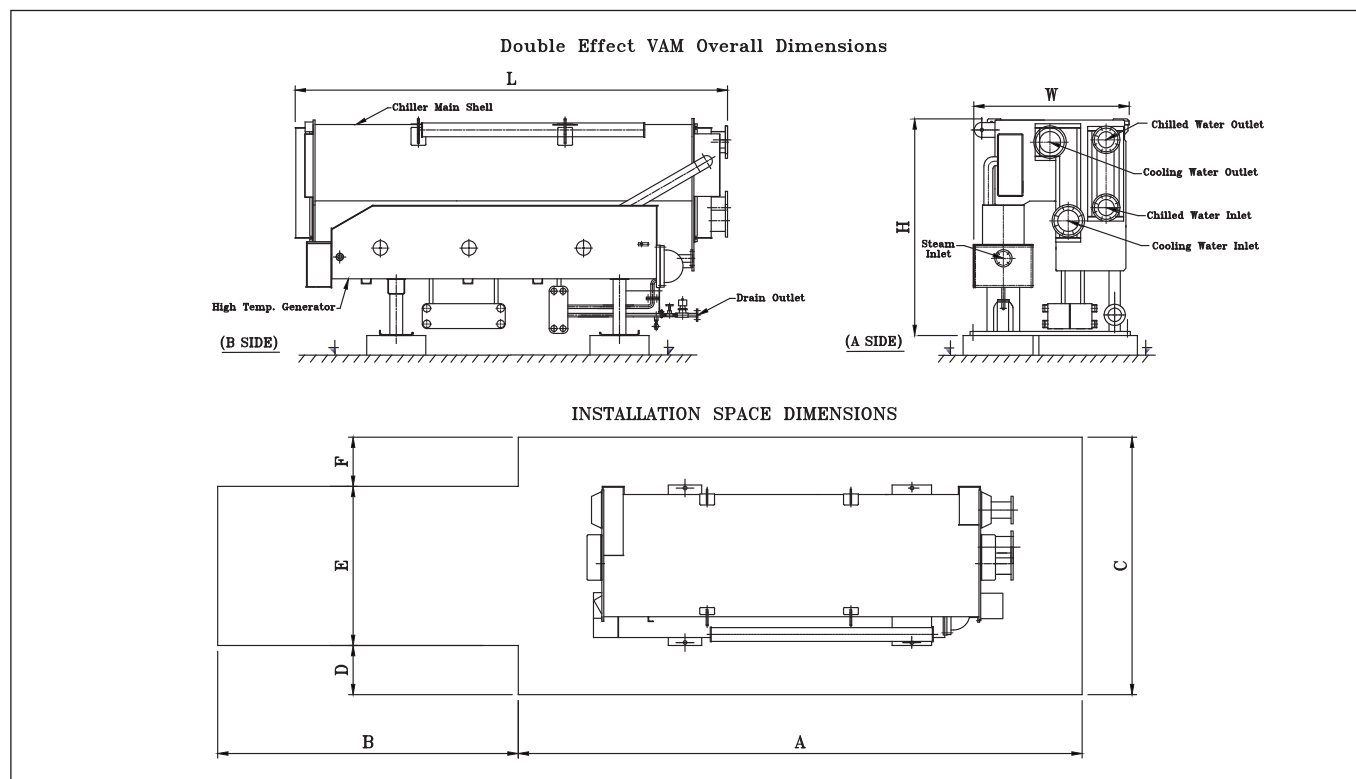
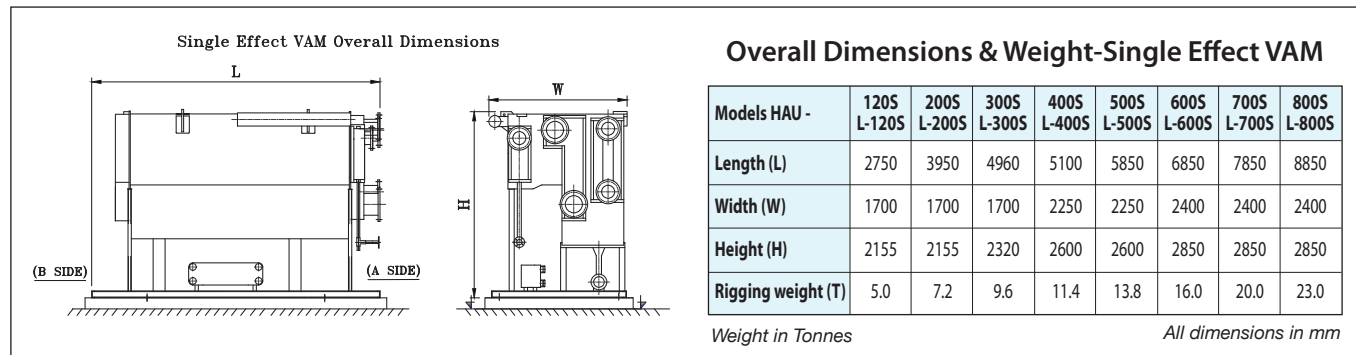


#### (B) STEAM AND CONDENSATE SIDE





## DIMENSIONS



### Overall Dimensions and Weight - Double Effect VAM

Model: HAU - W -	80S	120S	200S	300S	400S	500S	600S	700S	800S	1000H <sub>25</sub>	1250H <sub>25</sub>	1450H <sub>25</sub>	1650H <sub>25</sub>
Length (L)	2460	2750	3950	4850	4850	5850	6850	7850	8850	8800	8800	9800	9800
Width (W)	1500	1750	1750	1750	2200	2250	2300	2550	2550	2670	3150	3150	3850
Height (H)	1930	2150	2180	2200	2510	2650	2900	2950	2950	2830	3350	3350	3800
Rigging weight (T)	4.7	5.5	8.2	10.5	14.0	16.8	20.0	24.0	27.0	30.0	42.0	50.0	60.0

### Installation Layout Requirements

Model: HAU - W -	80S	120S	200S	300S	400S	500S	600S	700S	800S	1000H <sub>25</sub>	1250H <sub>25</sub>	1450H <sub>25</sub>	1650H <sub>25</sub>
A	4460	4750	5950	6850	6850	7850	8850	9850	10850	10800	10800	11800	11800
B	800	1200	2400	3200	3200	4200	5200	6200	7200	7200	7200	8200	8200
C	2500	2750	2950	3450	3900	3950	4000	4250	4550	4670	5150	5150	5850
D	500	500	600	850	850	850	850	850	1000	1000	1000	1000	1000
E	1500	1750	1750	1750	2200	2250	2300	2550	2550	2670	3150	3150	3850
F	500	500	600	850	850	850	850	850	1000	1000	1000	1000	1000

Note : The specifications are subject to change without notice

Weight in Tonnes

All dimensions in mm

## STANDARD SPECIFICATIONS

### Double Effect Steam Models : HAU-W-S,H

MODEL	Units	HAU-W : Double Effect Steam VAM													
		80S	120S	200S	300S	400S	500S	600S	700S	800S	1000H <sub>25</sub>	1250H <sub>25</sub>	1450H <sub>25</sub>	1650H <sub>25</sub>	
Chilling capacity (Nominal)	TR	80	120	200	300	400	500	600	700	800	1000	1250	1450	1650	
Steam pressure (saturated)	Kg/cm <sup>2</sup> g	8.0													
Chilled Water	Temperature	12°C In / 7°C Out													
	Flow rate	m <sup>3</sup> /hr	49	73	121	182	242	302	363	423	484	605	756	877	998
	Piping size	Inch	3	4	6	6	8	8	10	10	10	12	14	14	16
Cooling Water	Temperature	32°C In / 37.4°C Out													
	Flow rate	m <sup>3</sup> /hr	80	120	200	300	400	500	600	700	800	1000	1250	1450	1650
	Piping size	Inch	4	6	6	8	10	10	12	12	14	14	16	18	18
Elect. Reqt. (415V, 50HZ, 3Ph)	KW	1.9	2.3	4.1	4.1	6.0	6.7	8.5	9.2	9.2	10.7	13.4	17.1	17.1	
Steam	Flow rate*	Kg/hr	312	468	780	1170	1560	1950	2340	2730	3120	3900	4875	5655	6435
	steam piping size	Inch	2	2.5	2.5	3	4	4	4	6	6	6	8	8	
	Drain piping size	Inch	3/4	3/4	3/4	3/4	3/4	1	1	1	1.5	2	2	2	

(\*Steam Flow rate range (Kg/hr. TR) :3.5 ~ 3.9)

### Single Effect Low Temp. Hot Water Models : HAU-L-S

MODEL	Units	HAU-L : Single Effect Low Temp. Hot Water VAM						HAU-L : Single Effect Low Temp. Hot Water VAM							
		200S	300S	400S	500S	600S	800S	200S	300S	400S	500S	600S	700S	800S	
Chilling capacity (Nominal)	TR	100	150	200	250	300	400	100	150	200	250	300	350	400	
Chilled Water	Temperature	12°C In / 7°C Out						12°C In / 7°C Out							
	Flow rate	m <sup>3</sup> /hr	61	91	121	151	182	242	61	91	121	151	182	212	242
	Piping size	Inch	6	6	6	6	6	8	4	6	6	6	6	8	8
Cooling Water	Temperature	31°C In / 36°C Out						31°C In / 36°C Out							
	Flow rate	m <sup>3</sup> /hr	150	225	300	374	450	600	150	225	300	374	450	524	600
	Piping size	Inch	6	8	8	10	10	12	6	8	8	10	10	12	12
Elect. Reqt. (415V, 50HZ, 3Ph)	KW	4.1	4.1	6.0	6.7	8.5	9.2	4.1	4.1	6.0	6.7	8.5	9.2	9.2	
Hot water	Flow rate	m <sup>3</sup> /hr	86	129	172	215	258	344	42	63	84	105	126	147	168
	Piping size	Inch	6	6	6	8	8	10	3	4	6	6	6	6	
	H.W. Temp	°C	85°C In / 80°C Out						90°C In / 80°C Out						

### Single Effect Steam Models : HAU-S

MODEL	Units	Single Effect Steam Models : HAU-S								
		120S	200S	300S	400S	500S	600S	700S	800S	
Chilling capacity (Nominal)	TR	120	200	300	400	500	600	700	800	
Steam pressure (saturated)	Kg/cm <sup>2</sup> g	1.0								
Chilled Water	Temperature	12°C In / 7°C Out								
	Flow rate	m <sup>3</sup> /hr	73	121	182	242	302	363	423	484
	Piping size	Inch	4	6	6	8	8	10	10	10
Cooling Water	Temperature	31°C In / 41°C Out								
	Flow rate	m <sup>3</sup> /hr	102	170	255	340	425	510	595	680
	Piping size	Inch	6	6	8	10	10	10	12	12
Elect. Reqt. (415V, 50HZ, 3Ph)	KW	2.3	4.1	4.1	6.0	6.7	8.5	9.2	9.2	
Steam	Flow rate*	Kg/hr	912	1520	2280	3040	3800	4560	5320	6080
	Piping size	Inch	4	6	6	8	8	8	10	10
	Drain piping size	Inch	1	1.25	1.5	2	2	3	3	3

(\*Steam Flow rate range (Kg/hr. TR) : 7.0 ~ 7.6)

#### Notes :

- Intermediate capacity models are available.
- Steam pressure and steam flow rates mentioned above are for Dry Saturated steam.
- Fouling factor for CHW, CW and HW considering as 0.0001 metric units.
- Above are the nominal cooling capacities based on duty conditions given in the table. For capacities, steam consumption, etc, at duty conditions other than above, contact your nearest Voltas office or refer quotations.
- Lowest Chilled Water temperature : Upto 1°C with water and -5°C with Brine.
- Applicable standard : JIS B 8622
- Due to continuous R&D, specifications are subject to change without notice.



**The Cooling Effect of Voltas - VAM is effectively utilised at :**

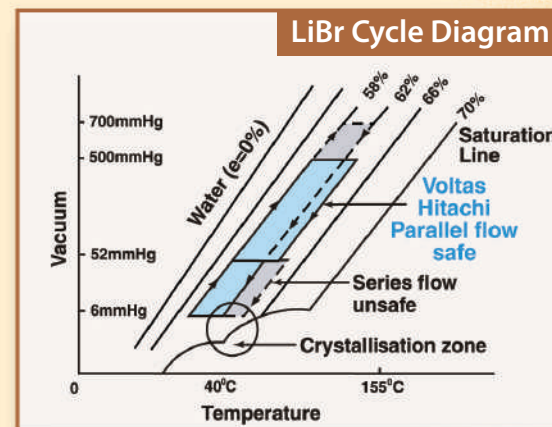
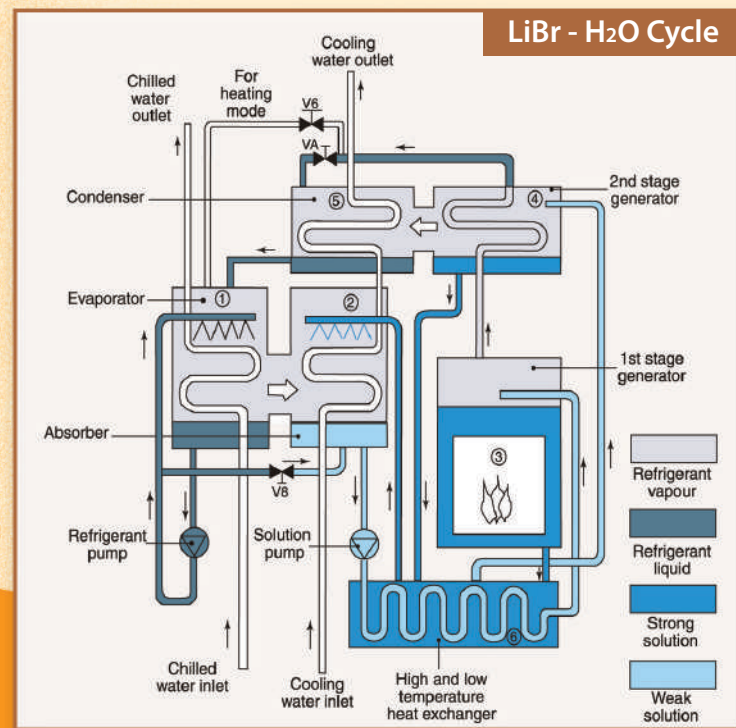
**India**

- ★ **Larsen & Toubro (RIL), Gujarat**  
(8 X 1000 TR Steam fired)
- ★ **Unilever Ltd. Kolkata & Khamgoan**  
(4 X 200 TR Steam fired)
- ★ **Aventis Pharma Ltd. Gujarat**  
(4 X 400 TR Steam fired & Co-generation)
- ★ **Alok Industries, Gujarat**  
(12 X 500 TR Hot water fired)
- ★ **Meghmani Organics, Gujarat**  
(2 X 400 TR Co-generation)
- ★ **BHEL, Bhopal**  
(1 X 310 TR Steam fired)
- ★ **ITC, Bhadrachalam, AP**  
(2 X 600 TR Steam fired)
- ★ **Glaxo, Nasik**  
(2 X 500 TR Steam fired)
- ★ **Tisco, Jamshedpur**  
(3 X 600 TR Single effect)
- ★ **Century Rayon, Kalyan**  
(3 X 700 TR Steam fired)  
(1 X 700 TR Single effect)
- ★ **Taj Mahal Hotel, Mumbai & Delhi**  
(2 X 600 TR Steam fired)
- ★ **State Bank of India, Delhi**  
(1 X 120 TR Oil fired)

**Overseas**

- ★ **Al - Ittefaq Steel Co., Jeddah & Dammam**  
(3 X 700 TR Oil fired)
- ★ **Obeikan Fibers, Riyadh**  
(3 X 600 TR Oil / Gas fired)
- ★ **Dynaplast, Indonesia**  
(1 X 300 TR Co-generation)
- ★ **Quest Vitamins, Dubai**  
(1 X 300 TR Gas fired)
- ★ **Eco Oil SDN, Malaysia**  
(1 X 100 TR Steam fired)
- ★ **Titas Dennim, Bangladesh**  
(1 X 200 TR Steam fired)

... and many more reputed clients



**Major Salient Features:**

- Paraflow Technology from Hitachi - Japan having
  - Safe LiBr cycle
  - Higher energy efficiency
- Low Concentration cycle - longer life
- Advanced Microprocessor based control panel as standard supply
- All units performance tested in factory prior to dispatch

(Product development is a continuous process in Voltas, hence specifications and technical data are subject to alterations without notice)

**Overseas Authorised Distributors:**

**KALTIMEX ENERGY** - Indonesia, Phillipines, Thailand, Bangladesh, Australia

**Customer Care**  
**9100660100**



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binodpatra@voltas.com, Website: www.voltas.com

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VL/VAM/PDTRNG/10/19

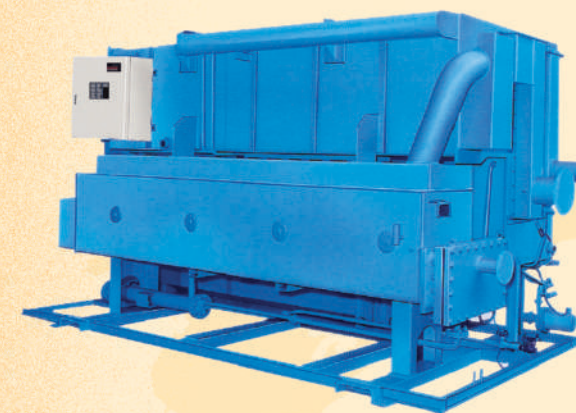
**VAPOUR ABSORPTION MACHINES**

The New Generation Machines with Advanced Paraflow Technology Featuring High Reliability & Efficiency



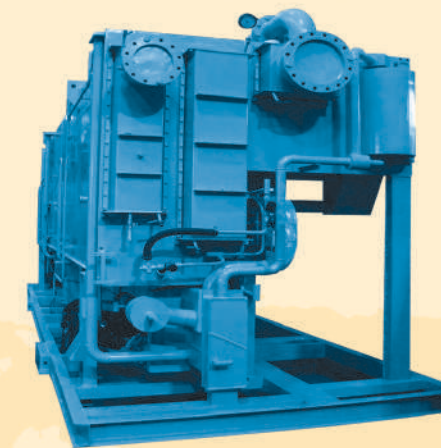
ISO 9001 : 2015 Certified

Voltas Absorption Chillers are manufactured and tested in state-of-the-art facilities in India, to the highest standards.



**Double Effect, Steam Fired**

Range : 40 TR - 1650 TR  
Heat source : Saturated Steam 8kg/cm<sup>2</sup>g  
Special Range upto 3300 TR



**Single Effect, Steam & Hot Water Fired**

Range: 40 TR - 1650 TR  
20 TR - 800 TR  
40 TR - 1650 TR  
Heat source: Saturated Steam at 1.0kg/cm<sup>2</sup>g  
Low Temp. at 85°C Hot Water  
High Temp. at 140°C Hot Water  
Special range upto 3300 TR



**Direct Fired & Co-generation**

Range : 120 TR - 1650 TR  
Heat source : HSD/LDO/SKO  
Natural Gas/Bio Gas/LPG  
Clean Exhaust Fuel Gases  
Special range upto 3300 TR



**Small Direct Fired (Koala Series)**

Range : 40 TR - 115 TR  
Heat source : HSD/LDO/SKO  
Natural Gas/Bio Gas/LPG  
Exhaust Gas

Reliability  
Efficiency

PRODUCT RANGE...

**Advantages of VAM:**

- Driven by thermal energy sources i.e., steam, hot water, oil/gas & exhaust gas
- Environment friendly (no CFC)
- Lower operating costs in certain applications
- Negligible maintenance
- Noiseless operation
- Clear option where electricity is scarce or high cost