

- *Hot Water or Steam Fired Single Effect*
- *Warm Water Fired Single Effect*
- *Warm Water or Solar Fired Single Effect Villa Model*
- *Direct Fired Double Effect*
- *Steam or Hot Water Fired Double Effect*



### • Advantages of Absorption Chillers

The cooling process by a chiller in modern air conditioning systems making comfort conditions with clean and fresh air for people who live in crowded and polluted cities and also for most of industrial applications plays very important role. In this regards the LiBr+H<sub>2</sub>O absorption chillers with coefficient of performance (COP) greater than 0.7 because of following characteristics and many other reasons are more advisable than compression chillers.

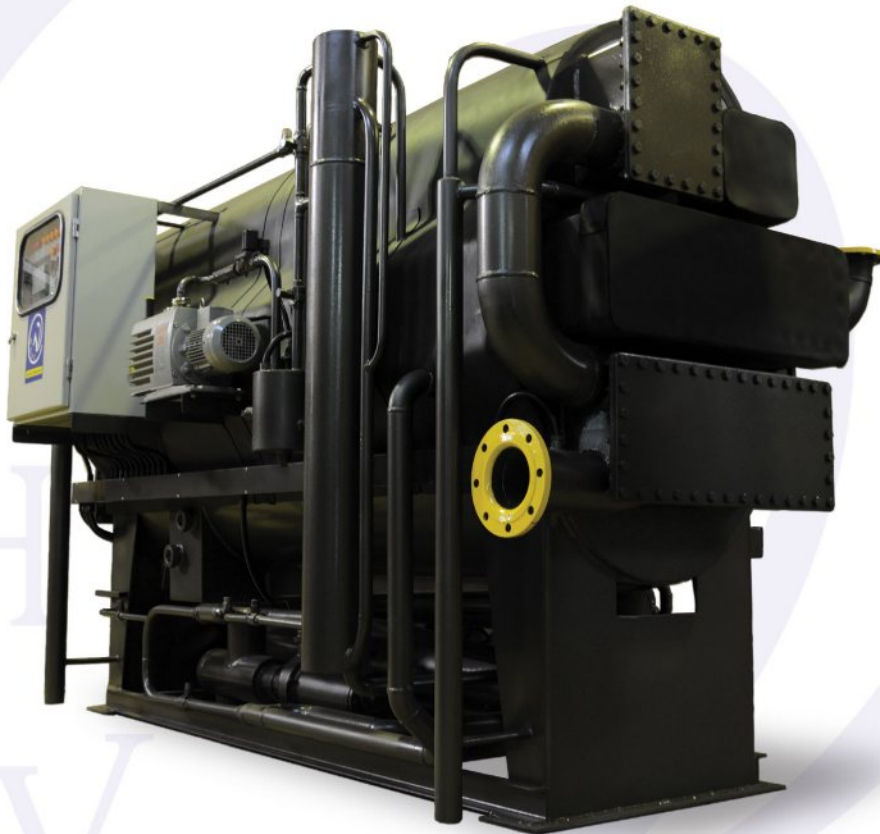
<b>Absorption Chillers in Comparison With Compression Chillers</b>	<b>a) Ozone Friendly</b>
	<b>b) Non Toxic</b>
	<b>c) Non Explosive</b>
	<b>d) Stable Cycle Working Fluid</b>
	<b>e) Minimal Electrical Power Consumption</b>
	<b>f) Minimal Total Energy Consumption</b>
	<b>g) Ability to Function with Waste Energy</b>
	<b>h) Vibration and Noise Free</b>
	<b>i) Minimal Moving Components</b>
	<b>j) Extremely Longer Operating Time</b>
	<b>k) Wide Product Range and Model Selection for Cooling Capacity</b>
	<b>l) Lower Initial Price and Operating Costs Especially from Medium to Super Models,</b>
	<b>m) Simpler Installation, Operation and Maintenance, etc....</b>

Absorption cooling cycle technology recognized as the first refrigeration cycle has been applied widely to space conditioning and process cooling since 1886 i.e. for more than 120 years ago. Absorption chillers are thermally flexible activated systems utilizing steam, hot and warm water, solar energy, clean liquid and gaseous fuels or exhausted gases to power the absorption cycle.

You Have The Best Option  
With an Unmatched Reliability

# Viuna

## Absorption Chiller



### • WHY VIUNA HVAC IND.?

The Viuna HVAC Ind. offers the widest absorption chiller size and model selection available in the HVAC industry. Eighty sizes range from 30~1750 US refrigeration (USR) tons in single effect and double effect absorption chillers:

- a) Twenty sizes range in single effect hot water or steam fired from 100~1750 USR tons,
- b) Twenty sizes range in single effect warm water fired from 30~500 USR tons,
- c) Twenty sizes range in double effect direct gas fired from 75~1500 USR tons,
- d) Twenty sizes range in double effect hot water or steam fired from 75~1500 USR tons.

Base of designing for the above mentioned absorption

chillers in Viuna factory is performed by computer software which has been developed by Viuna since 1995. Viuna, from its conception has been seriously devoted to increasing its research and development capability with regards to the mentioned product range, sizes and features of its absorption chillers.

The current product line is the results of its relentless efforts in research and development.

Viuna has utilized innovative measures in its production line as follows:

- 1) Upward holes spraying twin copper tubes technology, inside the absorber, evaporator, and generators, stops the perpetual concern with respect to the cooling capacity decrease generated thru clogging.





**Viuna Double Effect Direct Fired Absorption Chiller**

2) Automatic de crystallization technology even in sudden shut down circumstances due to electrical failure.

3) Automatic purge hook type system.

4) Special anticorrosion coating on inner surfaces.

5) PLC based control panel.

6) Special and most recent enhancing techniques applied to all components.

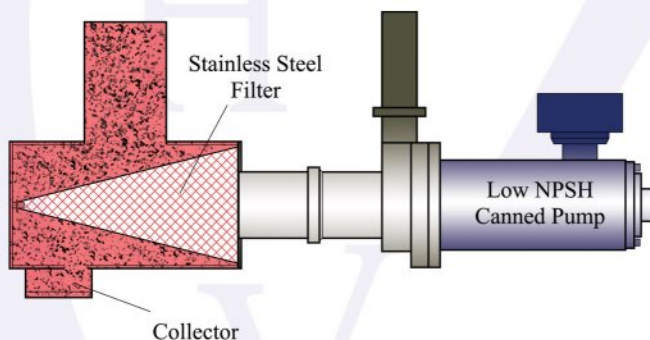
The above mentioned items are very important patents that are the crucial opening key to the world's LiBr+H<sub>2</sub>O absorption chiller industry which had been under the shadow up to recent years.

#### • General Design Features

The design features, construction and operational manuals for absorption chillers covering all various different units in operation require many pages of manuals to describe the situation at hand which is well out of the scope of this brochure. Therefore, this brochure is intended to provide the required engineering data and information for understanding what makes the Viuna absorption chillers product range including the following general design features:

- 1) Design by computer software
- 2) Single shell design for single effect cycles and double shell design for double effect cycles

3) Solution and refrigerant low NPSH canned motor pumps with filters



**Canned Pump With Filter**

4) Complete turnkey package including factory assembled and wired. For transportation, the control panel may be shipped separately and installed at site. In case of larger sizes, the unit can be broken into smaller pieces and shipped in multiple units of two or three pieces for shipment.

5) Upward holes spraying twin copper tubes technology, inside the absorber, evaporator, and generators, stops the perpetual concern with respect to the cooling capacity decrease generated thru clogging.

6) Automatic de crystallization technology even in sudden shut down circumstances due to electrical failure.

7) Automatic purging hook type system which continuously and automatically removes non condensable gases from the shell side and stores them in a tank. The purging system vacuum pump is provided as a standard feature.

8) Special anticorrosion coating on inner surfaces.

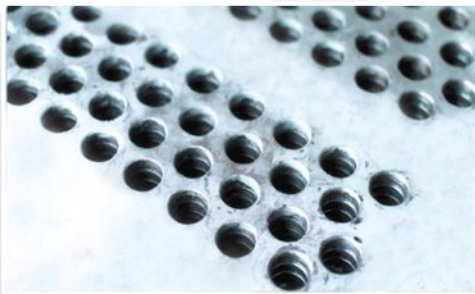
9) PLC based control panel with HMI display plus user friendly interface and data logging system.

10) Special and most recent enhancing techniques applied to all components.

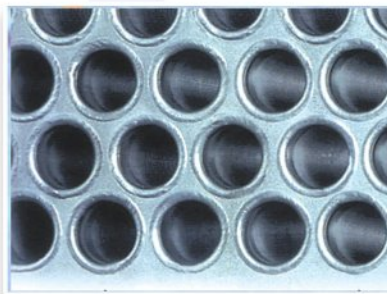
18) The units are supplied with one in single effect and two or three in double effect regenerative heat exchangers in order to increase the performance of the cycle

19) The heat exchangers are of shell and tube type with circular shell geometry according to TEMA standards and constructed with internally enhanced copper nickel tubes

20) All headers are of Carbon steel (evaporator, absorber, condenser and generators), with water connections on the side, for an easy access to the tube bundles



**Inner Grooved Tube Sheet  
With Anti Corrosion Coating**



**High Temperature Generator  
Firetube**



**Upward Type Spray Tubes for  
Absorber/Evaporator/Generator**

11) The chiller is provided with an auto-de crystallization line (overflow J shaped pipe) with PT100 temperature sensor, protecting itself from crystallization during operation

12) Stainless steel eliminator plates between evaporators to absorbers and generators to condensers

13) Sprayed twin tubes type generators for increasing the performance of the machine in order to reduce the size of generators and volume of the solution

14) Straight tubes in the generators for easy maintenance

15) Fixed and floating generator supports utilized to control tubes bundle expansion

16) Carbon steel tube sheets with inner grooved holes according to TEMA standards

17) All tubes fitted within the tube sheets duly expanded for a tight fit in along with a sealant adhesive resistant to temperature and pressure increases where all tubes are individually accessible and replaceable from either end of the chiller

21) The absorber to the condenser crossover piping is a standard feature for it reduces the piping work which also results in the overall reduction in the length of the unit, welding, and fabrication processes at the site

22) Condenser bypass connection for necessary circumstances in reducing cooling water line pressure drop has been adapted as part of the system

23) Sight glasses are provided on the evaporator, the absorber and the generator as these glasses facilitate the monitoring of the refrigerant and the solution levels for easing inspection and maintenance operations.

24) Refrigerant storage box for dilution of the cycle

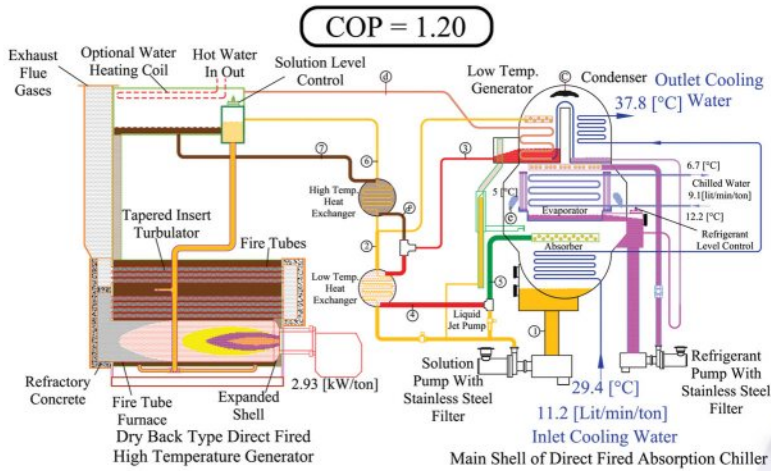
25) All the various sections of the chiller are interconnected by suitably sized seamless carbon steel piping

26) Sampling refrigerant and solution valves provided as standard feature

27) Balancing refrigerant and solution valves provided as standard feature

28) Optional isolation butterfly valves for refrigerant and solution pumps





**Viuna Double Effect Direct Fired Absorption Chiller / Heater**

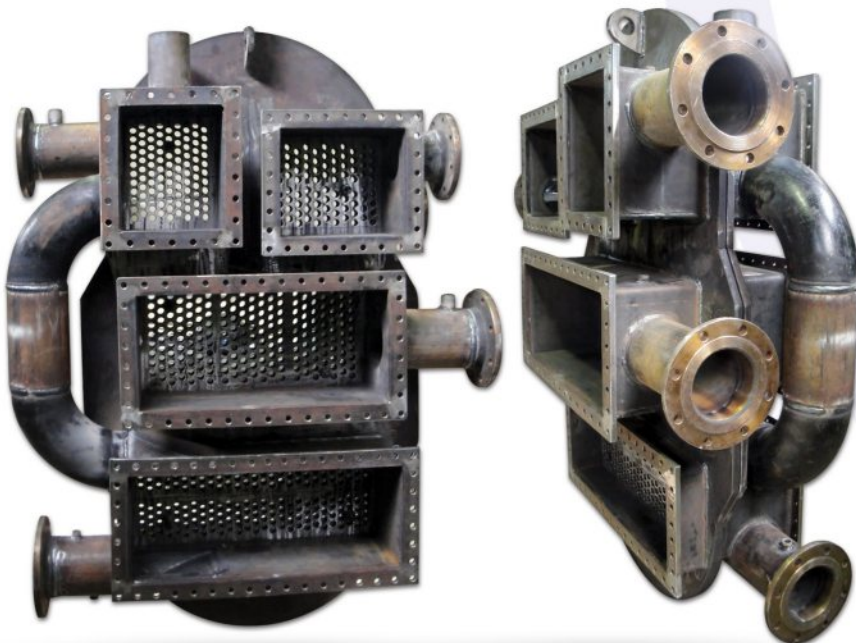
**29)** LiBr solution, refrigerant, corrosion inhibitor (Lithium Molybdate) and octyl alcohol provided separately and to be charged at site

**30)** Nitrogen is charged at a pressure slightly greater than atmospheric pressure for shipping, in order to avoid air entering the machine in case of any accidents during transport

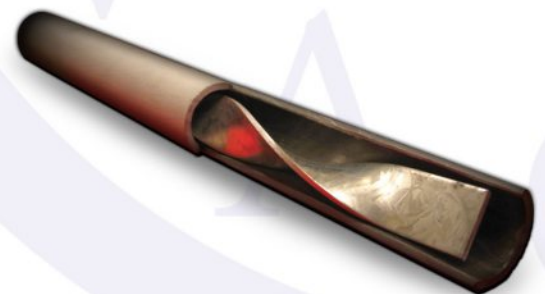
**31)** Lifting lugs provided on each side of the unit.



**Cycle Components Internally and Externally enhanced Tubes**



**Headers with Water Connections on the Side**



**High Stage Generator Fire Tube Turbulator**

## • CONTROLS & SAFETY FEATURES

- 1) PLC based control for operational logic and sequence, safety and capacity control through advanced algorithm, with touch screen HMI to input set points, and indication of the unit trip causes, sensor errors, pumps errors, and faults history
- 2) Elimination of rigid electro mechanical control components
- 3) Advanced algorithm capable of achieving part load operation from 5 to 100% step less based on leaving chilled water and entering cooling water temperatures by modulation of the hot water or steam three way or two way valve in single effect and double effect absorption model and modulation of the solution pump by inverter controls allows optimum flow of the solution to the high temperature generator

- 8) Level magnetic switch in three positions for solution level monitoring in the high stage generator, (Available only in the double effect absorption chiller type units.)
- 9) Flow switches for chilled water, cooling water, & hot water flow lines
- 10) Antifreeze protection safety
- 11) Crystallization prevention safeties including; overflow pipe for auto de crystallization, low cooling water inlet temperature cut-out, high temperature control for high temperature generator
- 12) PLC Controlled double action (leaving chilled water/entering cooling water) temperature feedback adjustment for hot water or steam valve included as standard item
- 13) Burner flame protection in double effect direct gas fired absorption chiller



- 4) Interlocks for chilled water, cooling water & hot water pumps, cooling tower fans, with individual manual start and stop switch on HMI
- 5) Temperature sensors and display for leaving chilled water, entering cooling water, evaporator pan, and generator solution over flow J shape tube
- 6) Vacuum pressure control thru pressure transmitter sensor
- 7) Level magnetic switch in three positions for refrigerant level monitoring in the evaporator tank

- 14) Stack flue gases temperature monitoring protection capability
- 15) Main circuit breaker for safety against electrical short circuit hazards
- 16) Individual motor circuit breakers and contactors for solution, refrigerant, and purge pumps
- 17) Isolation control transformer protection for control circuitry



- 18) Terminal blocks for the control of chilled water, cooling water, and hot water pumps, and cooling tower fans
- 19) Machine condition status indication on the display
- 20) Display of all data and logged alarms on HMI
- 21) Weekly unit operation time schedule setup

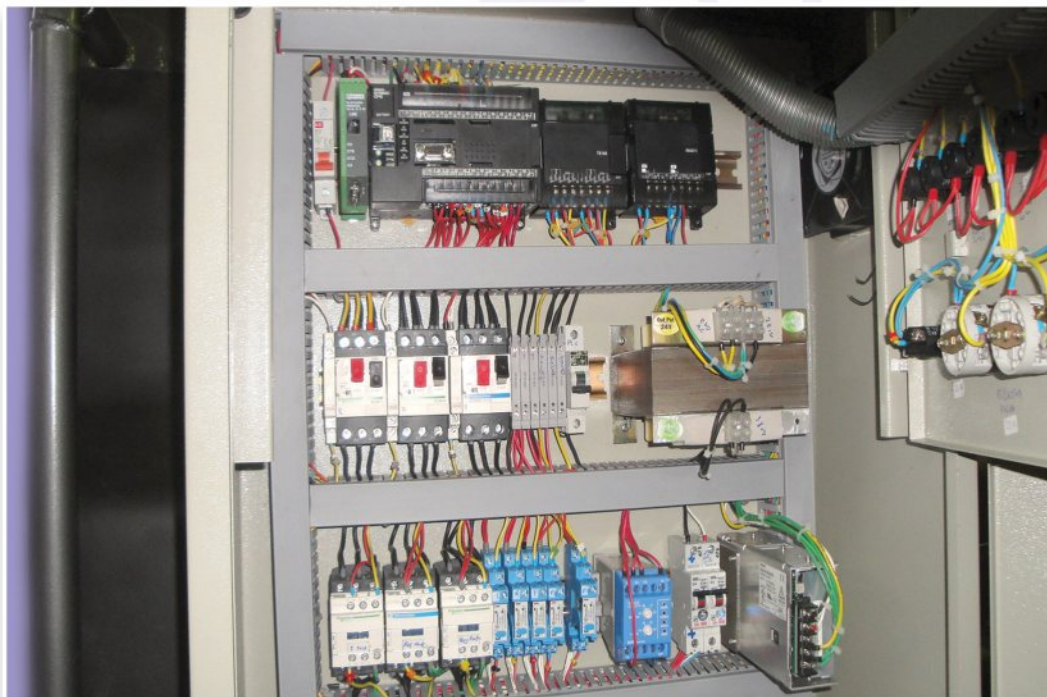
► **Optional Items**

- 22) Modem connectivity for immediate customer service call response
- 23) Connection to the building client management system
- 24) Last 24 hours logging at a sampling time rate of one hour intervals including most recent six alarms logging facility for providing better understanding on the behavior of the unit during alarm conditions providing easy diagnostics

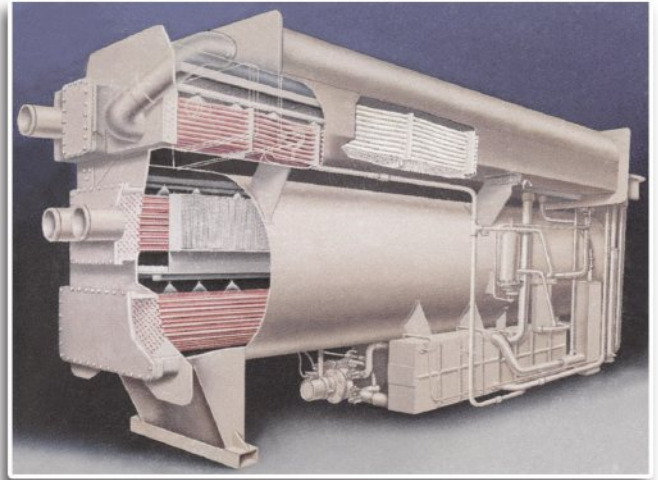
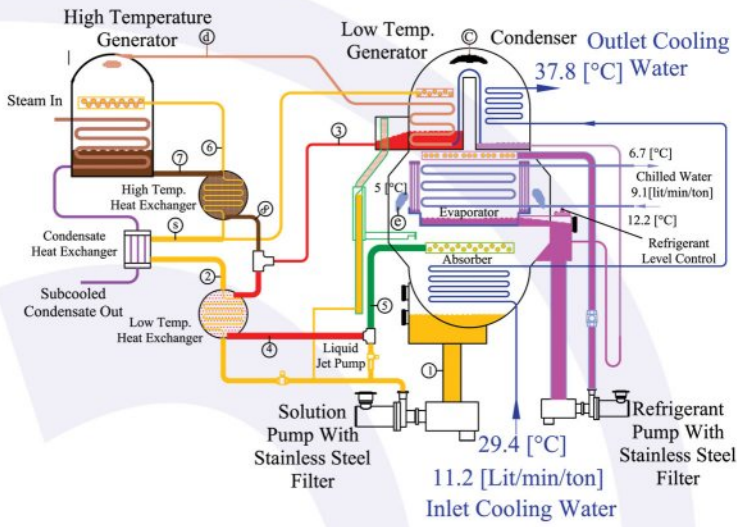
• **TESTING PROCEDURE**

The LiBr type absorption chiller units working pressure is under vacuum conditions, so producing of these units is very important with respect to leak tightness. Hence it is necessary to perform the leak detection tests as follows.

- 1) Tubes and shell sides Nitrogen test with pressure up to 3~5 [barg]
- 2) Helium test (sniffing method)
- 3) Tubes side hydraulic test with pressure up to 10 [barg] or 1.5 times of working pressure







**Typical Steam / Hot Water Fired Double Effect Absorption Chiller**



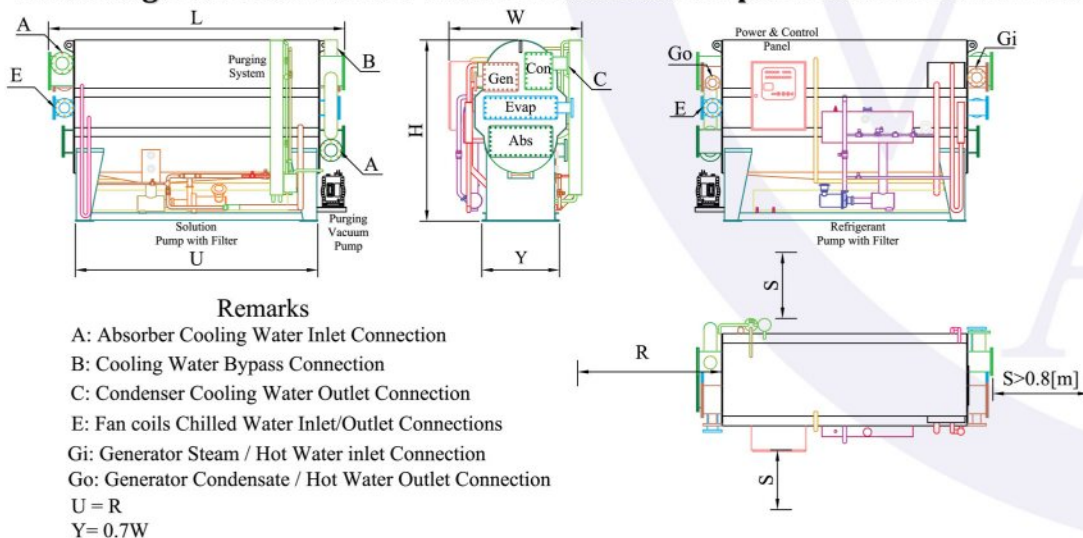
**Typical Solar Collector to produce Warm Water for Viuna Vila Model Absorption Chiller**



Viuna Single Effect Hot Water and Steam Fired Absorption Chillers Performance Data [EN]

COP = 0.730					Medium Models					Large Models					Heavy Models				
Model No.    VSEHW (ST)					35	45	55	60	70	90	110	125	140	160	180	220	250	280	320
Cooling Capacity[USRtons]					100	125	150	175	200	250	300	350	400	450	500	600	700	800	900
Chilled Water Data	Flow Rate		GPM		240	300	360	420	480	600	720	840	960	1080	1200	1440	1680	1920	2160
	Pressure Drop		psi		6	7	11	13	11	14	13	15	7	9	8	12	11	10	14
	In/out Diameter	E	Inch		4	4	5	5	5	6	6	8	8	8	8	8	10	10	10
Cooling Water Data	Flow Rate		GPM		317	396	476	555	634	793	951	1110	1268	1427	1585	1902	2219	2536	2853
	Pressure Drop		psi		6	7	9	12	9	13	13	13	8	10	7	11	11	10	12
	In/out Diameter	A	Inch		4	4	5	5	5	6	6	8	8	8	10	10	10	12	12
Hot Water Fired Generator Data																			
Hot Water Data	Flow Rate		GPM		189	236	284	331	378	473	568	663	757	852	946	1135	1324	1513	1702
	Pressure Drop		psi		3	3	4	5	5	5	6	7	7	9	7	11	11	11	15
	In/out Diameter	G	Inch		3	3	4	4	4	5	5	6	6	6	8	8	8	10	10
Steam Fired Generator Data																			
Steam Data	Flow Rate		Lb/hr		1683	2104	2525	2945	3366	4208	5049	5891	6732	7574	8415	10098	11781	13464	15147
	Pressure Drop		psi		0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.6	0.7	0.9	0.8	1	1	1.3	1.8
	Inlet Diameter	Gi	Inch		4	4	4	5	5	5	6	6	6	8	8	8	10	10	10
	Outlet Diameter	Go	Inch		1 ¼	1 ¼	1 ½	1 ½	1 ½	2	2	2	2	2 ½	2 ½	2 ½	2 ½	3	3
Electrical Consumption			kW		2	2.5	2.5	3	3	3	4	4	5.5	5.5	6.5	6.5	7.5	7.5	9
Dimension Data	Length	L	m		3.3	3.3	3.6	3.8	3.6	3.8	4	4.2	4.8	5.3	4.9	5.4	5.5	5.6	6
	Height	H	m		2	2	2	2.2	2.2	2.4	2.4	2.6	2.6	2.6	2.8	2.8	2.9	3	3
	Width	W	m		1.4	1.4	1.4	1.6	1.6	1.5	1.5	1.6	1.6	1.6	1.8	1.8	1.8	1.9	1.9
	Tube Removal	R	m		2.7	2.7	3	3.3	3	3.3	3.3	3.5	4	4.4	4	4.4	4.4	4.4	4.8
	Unit Ship Weight	t		2.9	3.4	4	4.5	4.9	5.4	5.9	6.4	7.5	8.7	9.7	11	12.7	14	15.7	
	Unit Operating Weight	t		3.9	4.5	5.4	5.8	6.3	7	7.9	8.6	9.7	11	12.3	13.8	15	16.6	17.8	

Viuna Single Effect Hot Water and Steam Fired Absorption Chillers Dimension [SI]

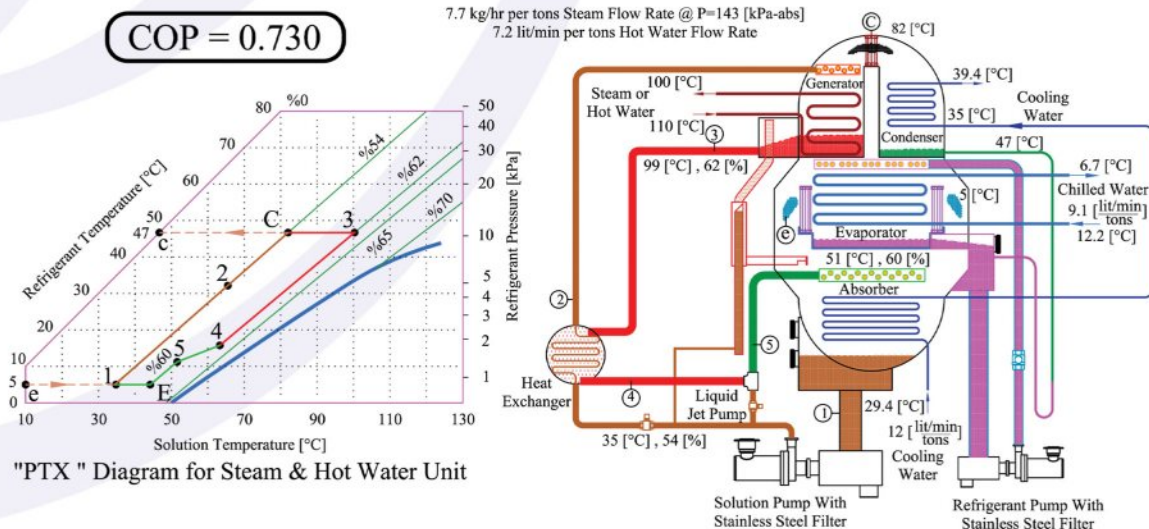




## Viuna Single Effect Hot Water and Steam Fired Absorption Chillers Performance Data [EN]

COP = 0.730				Super Models					General Conditions			
Model No. VSEHW (ST)				350	400	460	530	600	1- Rated Chilled Water Outlet/Inlet Temperature: 44 / 54 [°F] 2- Rated Cooling Water Inlet/Outlet Temperature: 85 / 103 [°F] 3- Rated Hot Water Inlet/Outlet Temperature: 230 / 212 [°F] 4- Rated Steam Pressure / Degree of Subcooling: 6[psig]/18[°F] 5- Lowest Permitted Outlet Temperature for Chilled Water : 40[°F] 6- Pressure Limit For Chilled, Cooling, & Hot Water Except Special Orders: 120[psi] 7- Fouling Factor For Chilled & Cooling Water: 0.5[°F.ft²/MBH] 8- And for Hot Water: 0.25 [°F. ft²/MBH] 9- Adjustable Chilled, Cooling, & Hot Water Flow Rate: 70~120[%] 10- LiBr Solution Concentration: 54 [%] 11- Machine Room Temperature: 40 ~ 110 [°F] & Relative Humidity <85%			
Cooling Capacity[USRtons]				1000	1150	1300	1500	1750				
Chilled water data	Flow Rate		GPM	2400	2760	3120	3600	4200	1- Rated Chilled Water Outlet/Inlet Temperature: 44 / 54 [°F] 2- Rated Cooling Water Inlet/Outlet Temperature: 85 / 103 [°F] 3- Rated Hot Water Inlet/Outlet Temperature: 230 / 212 [°F] 4- Rated Steam Pressure / Degree of Subcooling: 6[psig]/18[°F] 5- Lowest Permitted Outlet Temperature for Chilled Water : 40[°F] 6- Pressure Limit For Chilled, Cooling, & Hot Water Except Special Orders: 120[psi] 7- Fouling Factor For Chilled & Cooling Water: 0.5[°F.ft²/MBH] 8- And for Hot Water: 0.25 [°F. ft²/MBH] 9- Adjustable Chilled, Cooling, & Hot Water Flow Rate: 70~120[%] 10- LiBr Solution Concentration: 54 [%] 11- Machine Room Temperature: 40 ~ 110 [°F] & Relative Humidity <85%			
	Pressure Drop		psi	8	10	14	13	13				
	In/out Diameter	E	Inch	12	12	12	12	14				
Cooling water data	Flow Rate		GPM	3170	3646	4121	4755	5548				
	Pressure Drop		psi	9	11	14	14	14				
	In/out Diameter	A	Inch	12	12	14	14	14				
Hot Water Fired Generator Data												
Hot water data	Flow Rate		GPM	1890	2174	2457	2835	3310				
	Pressure Drop		psi	8	11	14	13	13				
	In/out Diameter	G	Inch	3	3	4	4	4				
Steam Fired Generator Data												
Steam data	Flow Rate		lb/hr	16830	19355	21879	25245	29453				
	Pressure Drop		psi	1	1.3	1.8	1.7	1.6				
	Inlet Diameter	Gi	Inch	10	10	12	12	12				
	Outlet Diameter	Go	inch	3	3	3	4	4				
Electrical Consumption			kW	9	12	12	15	15			Cycle Components Heat Capacity (H.C.) based on chiller capacity(USRtons)	
Dimension data	Length	L	m	6	6.5	7.2	7.2	7.4				
	Height	H	m	3	3	3.2	3.2	3.2				
	Width	W	m	2	2	2	2.2	2.2				
	Tube Removal	R	m	5	5.5	6	6	6				
	Unit Ship Weight	t	18	20.7	22.8	24.7	27.5					
	Unit Operating Weight	t	21	23.8	26.2	28.6	31.2					
1-Chilledwater H.C: Q <sub>chw</sub> =USRtons×12[MBH] 2-Cooling water H.C.: Q <sub>clw</sub> = Q <sub>chw</sub> ×(1+COP <sup>-1</sup> ) 3-Generator H.C.: Q <sub>gen</sub> = Q <sub>chw</sub> ×COP <sup>-1</sup>												
Conversion Table												
1 m³/hr = 4.4 GPM                      1 MBH = 252 kcal/hr 1°F=1.8 ×°C + 32                      1 USRtons = 3.517 kW 1 psi = 6895 Pa                      1 lb = 0.454 kg												

## Viuna Single Effect Hot Water and Steam Fired Absorption Chillers Actual Cycle [SI]

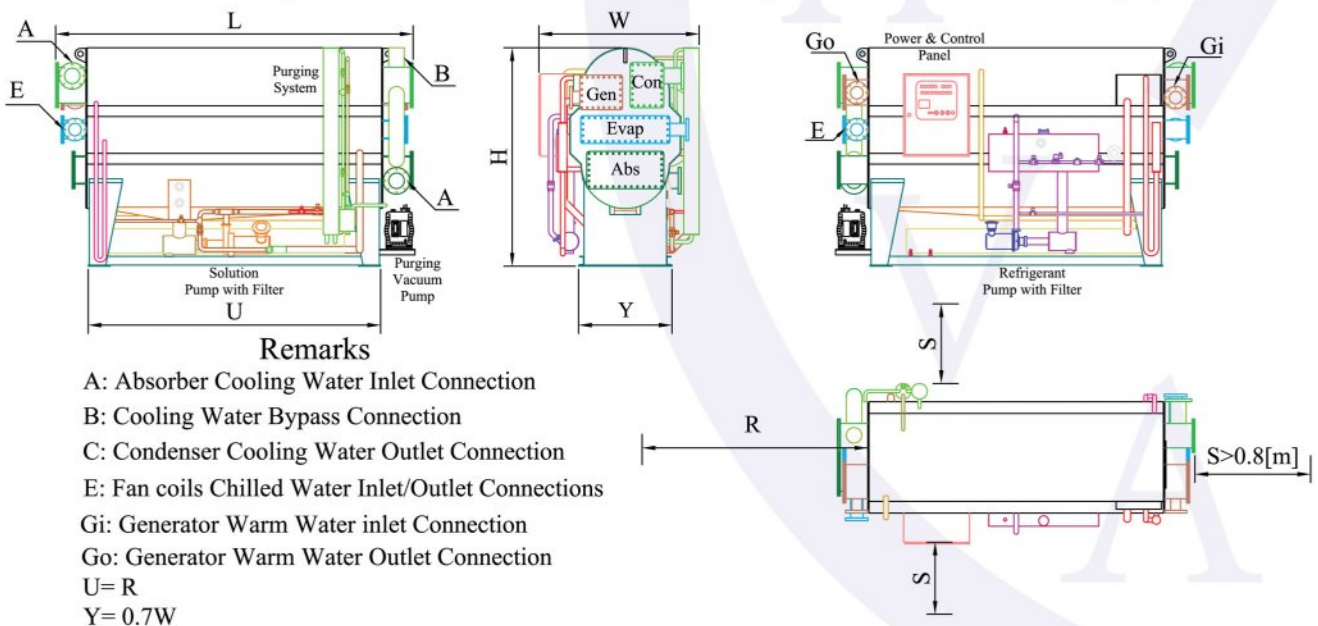




Viuna Single Effect Warm Water Fired Absorption Chillers Performance Data [EN]

COP = 0.730				Small Models						Medium Models					Large Models				
Model No.		VSELW		11	14	18	21	25	28	32	35	45	55	60	70	80	90	100	
Cooling Capacity[USRtons]				30	40	50	60	70	80	90	100	125	150	175	200	225	250	275	
Chilled water data	Flow Rate		GPM	72	96	120	144	168	192	216	240	300	360	420	480	540	600	660	
	Pressure Drop		psi	6	6	7	8	6	9	11	6	7	10	13	11	14	13	13	
	In/out Diameter	E	Inch	3	3	3	3	4	4	4	4	4	5	5	5	5	6	6	
Cooling water data	Flow Rate		GPM	114	152	190	228	266	304	342	380	476	571	666	761	856	951	1046	
	Pressure Drop		psi	7	7	8	8	7	10	12	7	6	8	12	8	11	10	11	
	In/out Diameter	A	Inch	3	3	3	3	4	4	4	5	5	5	5	6	6	8	8	
Warm Water Fired Generator Data																			
Warm water data	Flow Rate		GPM	68	90	113	136	158	181	203	226	282	339	395	451	508	564	621	
	Pressure Drop		psi	3	3	4	4	3	4	4	4	4	4	5	3	4	4	4	
	In/out Diameter	G	Inch	2 ½	2 ½	2 ½	3	3	3	3	3	4	4	4	5	5	5	6	
Electrical Consumption			kW	1.7	1.8	1.8	2	2	2	2.5	2.5	3.5	3.5	3.5	4.5	4.5	6	6	
Dimension data	Length		L	m	2.1	2.1	2.1	2.1	2.7	3	3	3.4	3.4	3.6	3.8	3.7	3.8	3.8	3.8
	Height		H	m	1.9	2	2	2	2	2	2	2	2	2.1	2.2	2.2	2.2	2.5	2.5
	Width		W	m	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.6	1.6	1.6	1.7	1.7
	Tube Removal		R	m	1.6	1.6	1.6	1.6	2.2	2.5	2.5	2.7	2.7	3	3.3	3	3.3	3.3	3.3
	Unit Ship Weight			t	1.5	1.6	1.8	2	2.6	3	3.4	3.9	4	4.5	5	6.3	6.9	8	8.7
	Unit Operating Weight			t	2.0	2.2	2.5	2.8	3.6	4.3	4.5	5.3	5.8	6.3	7	8.5	9.2	10.3	11

Viuna Single Effect Warm Water Fired Absorption Chillers Dimension [SI]



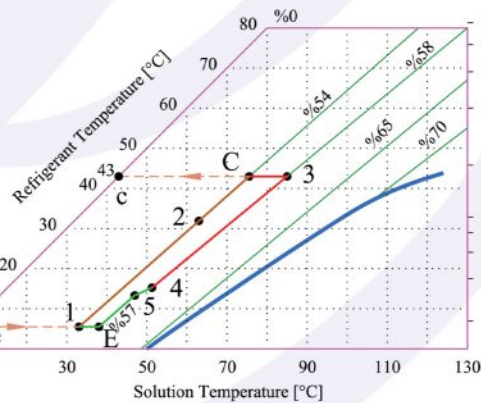


## Viuna Single Effect Warm Water Fired Absorption Chillers Performance Data [EN]

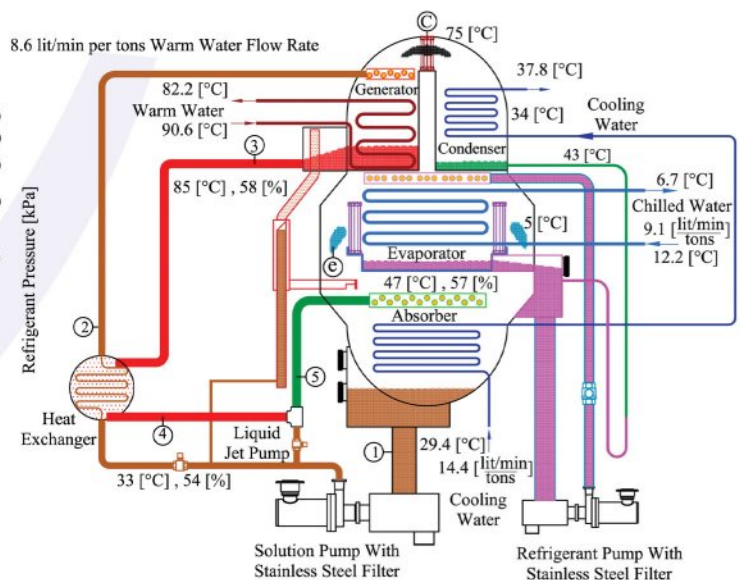
COP = 0.730					Heavy Models					General Conditions
Model No. VSELW					110	125	140	160	180	1- Rated Chilled Water Outlet/Inlet Temperature: 44/54 [°F] 2- Rated Cooling Water Inlet/Outlet Temperature: 85/100 [°F] 3- Rated Hot Water Inlet/Outlet Temperature: 195/180 [°F] 4- Lowest Permitted Leaving Chilled Water Temp.: 40[°F] 5- Pressure Limit For Chilled, Cooling, & Hot Water Except Special Orders: 100[psig] 6- Fouling Factor For Chilled, Cooling Water: 0.5[°F.ft²/MBH] 7- And for Hot Water: 0.25 [°F. ft²/MBH] 8- Adjustable Chilled, Cooling, & Hot Water Flow Rate: 70~120[%] 9- LiBr Solution Concentration: 54 [%] 10- Machine Room Temperature: 40 ~ 110 [°F] & Relative Humidity <85%
Cooling Capacity[USRtons]					300	350	400	450	500	
Chilled water data	Flow Rate		GPM		720	840	960	1080	1200	
	Pressure Drop		psi		13	13	6	9	6	
	In/out Diameter	E	Inch	6	8	8	8	8		
Cooling water data	Flow Rate		GPM		1141	1331	1521	1712	1902	
	Pressure Drop		psi		10	10	6	9	8	
	In/out Diameter	A	Inch	8	8	10	10	10		
Warm Water Fired Generator Data										
Warm water data	Flow Rate		GPM		677	790	903	1016	1128	
	Pressure Dron		nsi		4	4	5	6	5	
	In/out Diameter	G	Inch	6	6	8	8	8		
Electrical Consumption			kW		6	8	8	10	10	
Dimension data	Length	L	m	4	4	4.8	5.3	4.9	Cycle Components Heat Capacity (H.C.) based on chiller capacity(USRtons)  1-Chilledwater H.C: $Q_{chw}=USRtons \times 12[MBH]$ 2-Cooling water H.C.: $Q_{clw} = Q_{chw} \times (1+COP^{-1})$ 3-Generator H.C.: $Q_{gen} = Q_{chw} \times COP^{-1}$	
	Height	H	m	2.5	2.6	2.6	2.6	2.8		
	Width	W	m	1.7	1.8	1.8	1.8	1.8		
	Tube Removal	R	m	3.3	3.3	4	4.4	4	Conversion Table  1 m³/hr = 4.4 GPM 1 MBH = 252 kcal/hr 1 °F=1.8 ×°C + 32	
	Unit Ship Weight	t		9.3	10.5	12	13	14.5		1 USRtons = 3.517 kW 1 psi = 6895 Pa 1 lb = 0.454 kg
	Unit Operating Weight	t		11.8	13.6	15.8	17	19		

## Viuna Single Effect Warm Water Fired Absorption Chillers Actual Cycle [SI]

COP = 0.730



"PTX" Diagram for Warm Water Unit

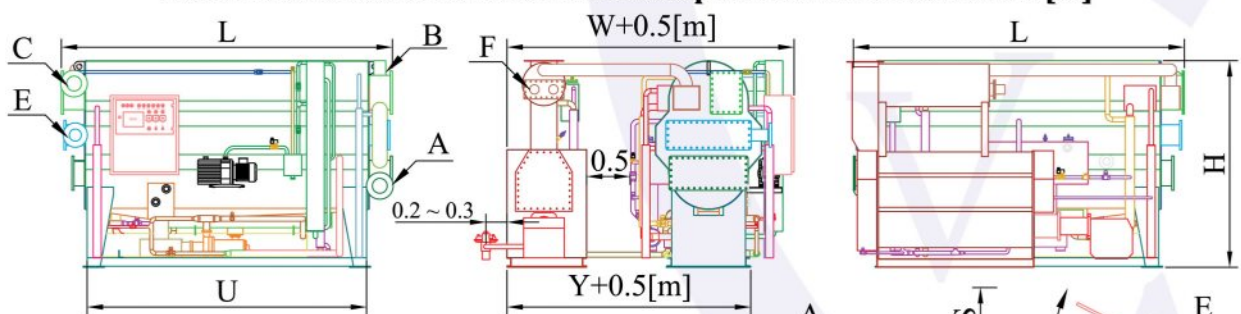




Viuna Double Effect Direct Fired Absorption Chillers / Heaters Performance Data [EN]

COP = 1.200				Small Models								Medium Models								Large Models				
Model No. VDEDF				11	14	18	21	25	28	32	35	45	55	60	70	80	90	100	110	125	140	160	180	
Cooling Capacity [USRTons]				30	40	50	60	70	80	90	100	125	150	175	200	225	250	275	300	350	400	450	500	
Heating Capacity [MBH]				300	400	500	600	700	800	900	1000	1250	1500	1750	2000	2250	2500	2750	3000	3500	4000	4500	5000	
Chilled Water Data	Flow Rate		GPM	72	96	120	144	168	192	216	240	300	360	420	480	540	600	660	720	840	960	1080	1200	
	Pressure Drop		psi	6	6	7	8	6	9	11	6	7	10	13	11	14	13	13	13	13	6	9	6	
	In/Out Diam.	E	Inch	3	3	3	3	4	4	4	4	4	5	5	5	5	6	6	6	8	8	8	8	
Cooling Water Data	Flow Rate		GPM	89	118	148	177	207	236	267	295	369	443	516	590	664	738	811	885	1033	1180	1328	1475	
	Pressure Drop		psi	7	7	8	8	7	10	12	7	6	8	12	8	11	10	11	10	10	6	9	8	
	In/Out Diam.	A	Inch	3	3	3	3	4	4	4	5	5	5	5	6	6	6	6	8	8	8	8	10	
Heating Water Data	Flow Rate		GPM	60	80	100	120	140	160	180	200	250	300	350	400	450	500	550	600	700	800	900	1000	
	Pressure Drop		psi	7	7	8	9	7	9	11	7	8	10	13	11	14	13	13	13	13	7	10	7	
	In/Out Diam.	F	Inch	2 ½	2 ½	2 ½	3	3	3	3	4	4	4	4	5	5	5	6	6	6	8	8	8	
Natural Gas Flow	Cooling/Heating		CFM	6	8	10	12	14	16	18	20	25	30	35	40	45	50	55	60	70	80	90	100	
	Min. Inlet Pressure		Psig	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
	Exhaust Dim.	G	Inch	6	6	6	7	7	8	8	9	9	10	10	12	12	12	14	14	14	16	16	18	
Electrical Consumption			kW	2.2	2.2	2.2	2.5	2.5	2.5	3.2	3.2	4.5	4.5	4.5	6	6	7	8	8	9	10	11	11	
Dimension Data [SI]	Length		L	m	2.1	2.1	2.1	2.1	2.7	3	3	3.4	3.4	3.6	3.8	3.7	3.8	3.8	3.8	4	4	4.8	5.3	4.9
	Height		H	m	1.9	2	2	2	2	2	2	2	2	2	2.2	2.2	2.2	2.2	2.4	2.4	2.5	2.5	2.6	2.6
	Width		W	m	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.2	2.3	2.4	2.5	2.6
	Tube Removal		R	m	1.6	1.6	1.6	1.6	2.2	2.5	2.5	2.7	2.7	3	3.3	3	3.3	3.3	3.3	3.3	3.3	4	4.4	4
	Unit Ship Weight		t		1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.3	3.5	3.9	4.3	4.6	4.9	5.3	5.6	6.5	7.2	7.9	8.6	9.5
	Unit Operating Weight		t		2.5	2.8	3.2	3.5	3.8	4	4.4	4.8	5.2	5.8	6.3	6.7	7.2	7.8	8.4	9.5	10.4	11.5	12.7	13.9

Viuna Double Effect Direct Fired Absorption Chillers Dimension [SI]



## Remarks

- A: Absorber Cooling Water Inlet Connection
- B: Cooling Water Bypass Connection
- C: Condenser Cooling Water Outlet Connection
- E: Fan coils Chilled Water Inlet/Outlet Connections
- F: Fan coils Hot Water Inlet/Outlet Connections (Optional)
- G: Flue Gases Outlet Connection
- U=R
- Y=0.85W

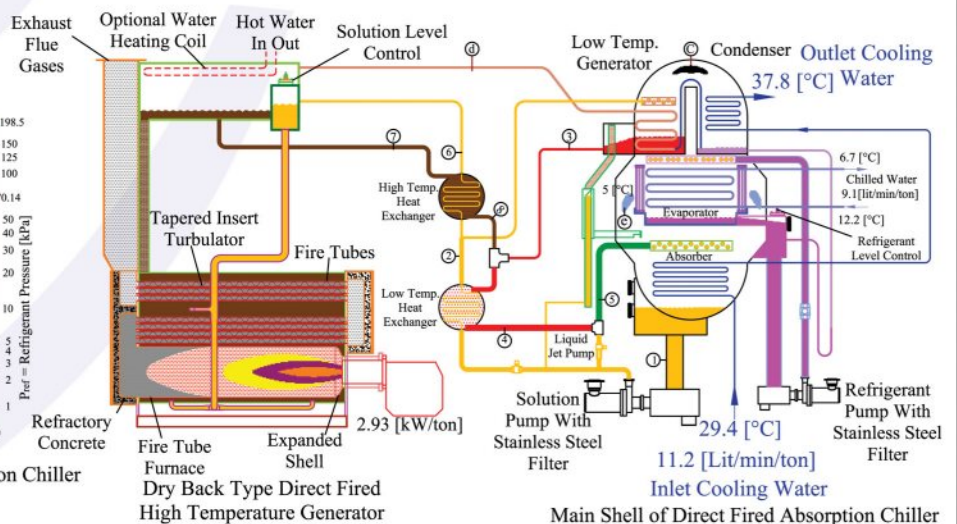
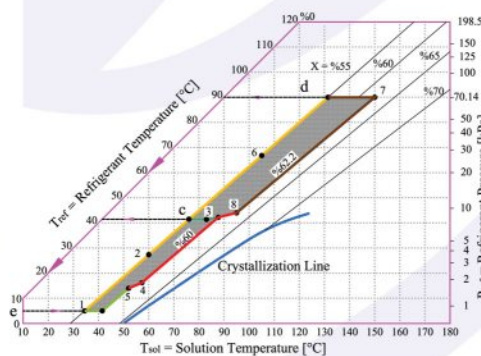


## Viuna Double Effect Direct Fired Absorption Chillers / Heaters Performance Data [EN]

COP = 1.200				Heavy Models							General Conditions				
Model No. <b>VDEDF</b>				<b>220</b>	<b>250</b>	<b>280</b>	<b>320</b>	<b>350</b>	<b>400</b>	<b>460</b>	1- Rated Chilled Water Outlet/Inlet Temperature: 44/54 [°F] 2- Rated Cooling Water Inlet/Outlet Temperature: 85/100 [°F] 3- Rated Heating Water Outlet / Inlet Temperature: 150/140 [°F] 4- Lowest Permitted Outlet Temperature for Chilled Water : 40[°F] 5- Pressure Limit For Chilled, Cooling, & Heating Water Except Special Orders: 120[psi] 6- Fouling Factor For Chilled , Cooling & Heating Water: 0.5[°F.ft²/MBH] 7- Adjustable Chilled, Cooling, & Heating Water Flow Rate: 70~120[%] 8- Natural gas consumption is calculated by heating value: 50[MBH/CFM] or 7400 [kcal/m³] 9- LiBr Solution Concentration: 54 [%] 10- Machine Room Temperature: 40 ~ 110 [°F] & Relative Humidity <85%				
Cooling Capacity [USRtons]				<b>600</b>	<b>700</b>	<b>800</b>	<b>900</b>	<b>1000</b>	<b>1150</b>	<b>1300</b>					
Heating Capacity [MBH]				<b>6000</b>	<b>7000</b>	<b>8000</b>	<b>9000</b>	<b>10000</b>	<b>11500</b>	<b>13000</b>					
Chilled Water Data	Flow Rate		GPM	1440	1680	1920	2160	2400	2760	3120					
	Pressure Drop		psi	12	11	10	14	8	10	14					
	In/Out Diam.	E	Inch	8	10	10	10	12	12	12					
Cooling Water Data	Flow Rate		GPM	1770	2065	2360	2655	2950	3393	3835					
	Pressure Drop		psi	10	10	9	10	8	10	12					
	In/Out Diam.	A	Inch	8	10	10	10	12	12	12					
Heating Water Data	Flow Rate		GPM	1200	1400	1600	1800	2000	2300	2600					
	Pressure Drop		psi	8	9	8	10	8	9	12					
	In/Out Diam.	F	Inch	6	8	8	8	10	10	10					
Natural Gas Flow	Cooling / Heating		CFM	120	140	160	180	200	230	260					
	Min. Inlet Pressure		psig	0.5	0.5	0.5	0.5	0.5	0.5	0.5					
	Exhaust Dim.	G	Inch	18	20	20	22	24	26	28					
Electrical Consumption				kW	12	13	14	16	18	22	26	Cycle Components Heat Capacity (H.C.) based on chiller capacity(USRtons)			
Dimension Data [SI]	Length		L	m	5.4	5.5	5.6	6	6	6.5	7.2				
	Height		H	m	2.8	2.9	3.0	3.0	3.0	3.0	3.2				
	Width		W	m	2.8	3.0	3.0	3.2	3.2	3.4	3.4				
	Tube Removal		R	m	4.4	4.4	4.4	4.8	5	5.5	6.0				
	Unit Ship Weight		t	13.0	14.8	16.0	17.8	19.8	22.0	24.0					
	Unit Operating Weight		t	17.8	19.8	21.5	23.5	25.5	28.0	30.0					
												Conversion Table			
												1 m³/hr = 4.4 GPM 1°F=1.8 ×°C + 32 1 psi = 6895 Pa 1CFM = 1.699 m³/hr		1 MBH = 252 kcal/hr 1 USRtons = 3.517 kW 1 lb = 0.454 kg 1 inch = 25.4 mm	

## Viuna Double Effect Direct Fired Absorption Chillers Actual Cycle [SI]

COP = 1.20

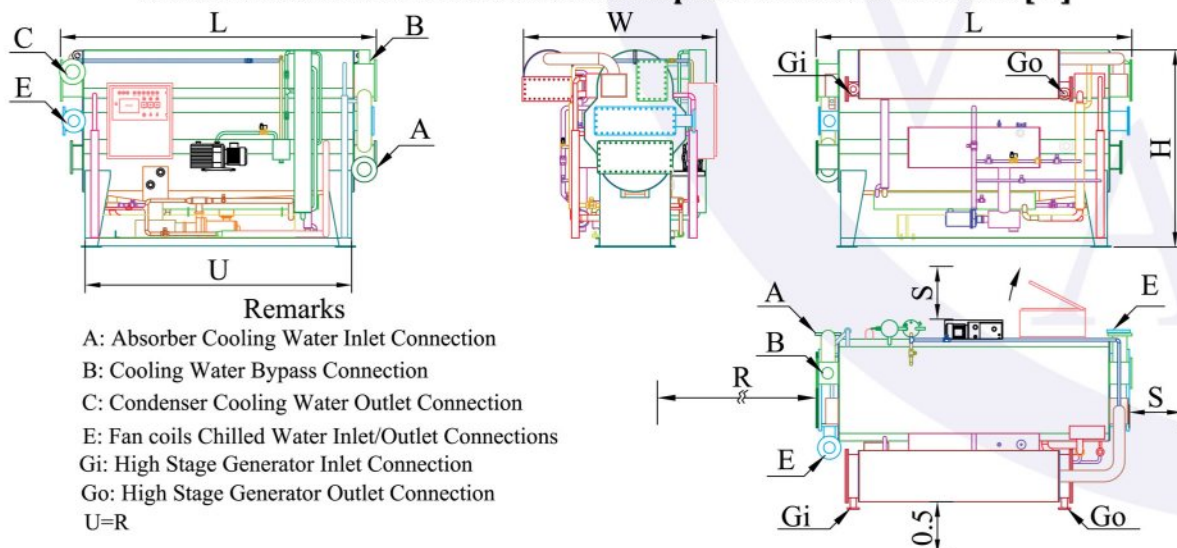




Viuna Double Effect Steam Fired Absorption Chillers Performance &amp; Dimension Data [EN]

COP = 1.200			Medium Models				Large Models				Heavy Models					Super Models						
Model No. <b>VDEST(HW)</b>			35	55	70	90	110	125	140	160	180	220	250	280	320	350	400	460	530	600	700	
Cooling Capacity [USRtons]			100	150	200	250	300	350	400	450	500	600	700	800	900	1000	1150	1300	1500	1750	2000	
Chilled Water Data (54 °F → 44 °F Fouling Factor 0.5 [R.ft²/MBH])																						
Chilled Water Data	Flow Rate		GPM	240	360	480	600	720	840	960	1080	1200	1440	1680	1920	2160	2400	2760	3120	3600	4200	4800
	Pressure Drop		psi	6	11	11	14	13	15	7	9	8	12	11	10	14	8	10	14	13	13	13
	In/Out Diam.	E Inch	4	5	5	6	6	8	8	8	8	8	8	10	10	10	12	12	12	12	14	14
Cooling Water Data (85 °F → 100 °F Fouling Factor 0.5 [R.ft²/MBH])																						
Cooling Water Data	Flow Rate		GPM	295	443	590	738	885	1033	1180	1328	1475	1770	2065	2360	2655	2950	3393	3835	4425	5163	5900
	Pressure Drop		psi	7	8	8	10	10	10	6	9	8	10	10	9	10	8	10	12	12	13	14
	In/Out Diam.	A Inch	4	5	5	6	6	8	8	8	8	8	8	10	10	10	12	12	12	12	14	14
Hot Water Fired Generator Data (320 °F→302°F Fouling Factor 0.25 [R.ft²/MBH])																						
Hot Water Data	Flow Rate		GPM	118	177	236	295	354	413	472	531	590	708	826	944	1062	1180	1357	1534	1770	2065	2360
	Pressure Drop		psi	3	4	4	5	5	6	6	7	7	9	10	11	12	7	9	11	10	11	12
	In/Out Diam.	G Inch	3	4	4	5	5	6	6	6	6	8	8	8	10	10	10	10	10	12	12	12
Steam Fired Generator Data (74 [PSIg], 320°F → 203°F)																						
Steam Data	Flow Rate		Lb/hr	986	1479	1972	2465	2958	3451	3944	4437	4930	5916	6902	7888	8874	9860	11339	12818	14790	17255	19720
	Pressure Drop		psi	0.2	0.2	0.3	0.4	0.3	0.4	0.5	0.6	0.6	0.8	0.8	1	1.2	0.8	1	1.2	1.4	1.4	1.8
	Inlet Diameter	Gi Inch	2½	2½	3	3	3	4	4	4	4	5	5	5	6	6	6	6	8	8	8	8
	Outlet Diameter	Go Inch	1	1	1¼	1¼	1¼	1½	1½	1½	1½	2	2	2	2½	2½	2½	2½	3	3	3	3
Electrical Consumption			kW	3	4	5.5	6.5	7	8	9	10	11	12	13	14	15	16	18	20	22	24	26
Dimension Data [SI]	Length		L m	3.4	3.6	3.7	3.8	4.0	4.0	4.8	5.3	4.9	5.4	5.5	5.6	6.0	6.0	6.5	7.2	7.2	7.4	8.0
	Height		H m	2	2	2.2	2.2	2.4	2.5	2.5	2.6	2.6	2.8	2.9	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2
	Width		W m	1.8	1.8	2.0	2.0	2.3	2.3	2.3	2.5	2.5	2.5	2.7	2.7	2.8	2.8	2.8	3.0	3.0	3.0	3.0
	Tube Removal		R m	2.7	3	3	3.3	3.3	3.3	4.0	4.4	4.0	4.4	4.4	4.4	4.8	5.0	5.5	6.0	6.0	6.0	6.6
	Unit Ship Weight		t	3.0	3.5	4	4.5	5.5	6.2	7	7.8	9	10.5	13	14.5	16	18	20	22	24	26	28
	Unit Operating Weight		t	4.0	4.6	5.2	5.8	7	7.7	8.3	9	10	11.5	12.8	14	15	17	18	20	22	24	26

Viuna Double Effect Steam Fired Absorption Chillers Dimension [SI]





**Viuna Villa Model Warm Water Fired Absorption Chillers Performance Data [EN]  
(Special Model for Operating with Solar System)**

COP=0.750				Performance Data					General Conditions	
Model No.: VSEV				2	4	6	8	10	1. Rated Chilled Water Outlet/Inlet Temperature: 44 / 54 [°F] 2. Rated Cooling Water Inlet/Outlet Temperature: 85/95 [°F] 3. Rated Hot Water Inlet/Outlet Temperature: 185/175 [°F] 4. Fouling Factor For Chilled, Cooling and Warm Water: 0.25 [°F.ft²/MBH]. 5. Electrical Specification:50[HZ]x1[PH] x 220 [Volt]	
Cooling Capacity [USRtons]				5	10	15	20	25		
Chilled Water Data	Flow Rate		GPM	12	24	36	48	60		
	Pressure Drop		psi	8	10	10	12	12		
	Inlet/Outlet Connection		E Inch	1 ½	1 ½	2	2	2 ½		
Cooling Water Data	Flow Rate		GPM	28	56	84	112	140	Cycle Components Heat Capacity (H.C.) based on chiller capacity(USRtons)  1-Chilledwater H.C: $Q_{chw}$ =USRtons×12[MBH] 2-Cooling water H.C.: $Q_{clw}$ = $Q_{chw}$ ×(1+COP <sup>-1</sup> ) 3-Generator H.C.: $Q_{gen}$ = $Q_{HotWater}$ = $Q_{chw}$ ×COP <sup>-1</sup>	
	Pressure Drop		psi	10	12	10	10	12		
	Inlet/Outlet Connection		A Inch	2	2	2 ½	2 ½	3		
Warm Water Data	Flow Rate		GPM	16.5	33	49.5	66	82.5	Conversion Factor  1 m³/hr = 4.4 GPM 1°F=1.8 ×°C + 32 1 psi = 6895 Pa 1 MBH = 252 kcal/hr 1 USRtons = 3.517 kW 1 lb = 0.454 kg	
	Pressure Drop		psi	6	7	7	8	9		
	Inlet/Outlet Connection		G Inch	1 ½	1 ½	2	2	2 ½		
Electrical Consumption			kW	0.35	0.45	0.55	0.65	0.75	Viuna Villa Model Absorption Chillers Actual Cycle [SI]	
Dimension Data	Length		L m	1.1	1.2	1.4	1.6	1.8		
	Height		H m	1.7	1.7	1.8	1.8	1.9		
	Width		W m	1.0	1.0	1.2	1.4	1.4		
	Unit Operating Weight		kg	550	750	900	1000	1200		

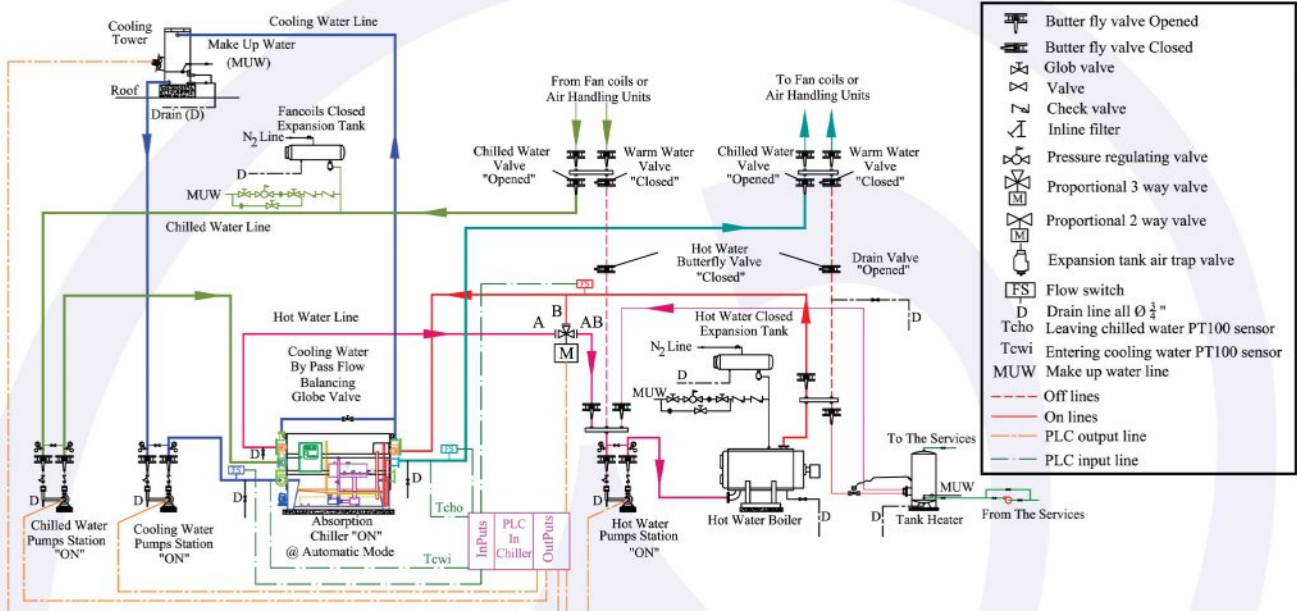


Viuna Vila model have the same function as the Viuna outdoor packages but with low capacities between 5 to 25 USRtons. The features are as follows.

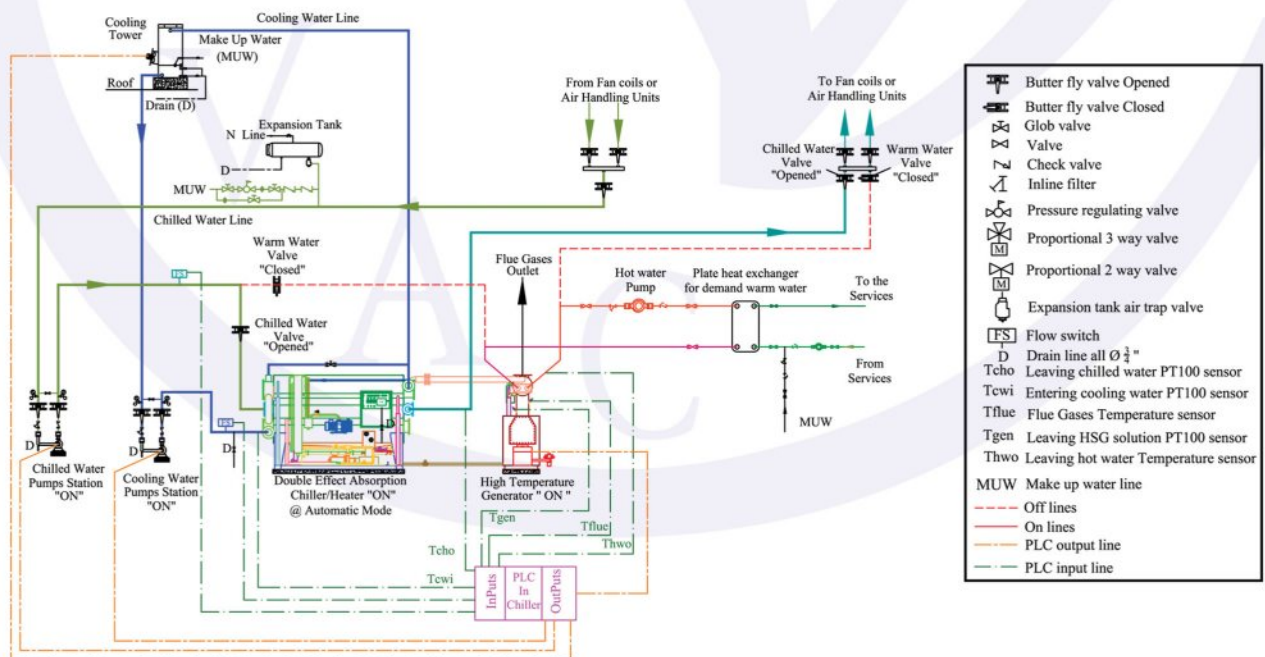
- [1] Easy installation, when the chiller is delivered to jobsite, only the chilled water pipe, cooling water pipe, and warm water pipe are connected to the chiller.
- [2] No location requirement, chiller can be located on the rooftop or margin of the building.
- [3] Portable chiller, it can be carried on a vehicle and used for temporary exhibitions or other areas.
- [4] Special model, it can be operated with solar system.

# • Typical Piping System

## Viuna Single Effect Hot or Warm Water Fired Absorption Typical Piping System (Summer Condition)



## Viuna Double Effect Direct Fired Absorption Typical Piping System (Summer Condition)





## • *Technical Notes to Engineers*

<b>Location</b>	It is possible to locate the chiller in the basement on the same level, on the floor for its safety and proper operation with the feature of little vibration and low noise. It is recommended that the chiller machine room should be separated from boilers and pumps room as possible. Well ventilation of machine room is strongly recommended. The chillers foundation must be on a higher level with load capacity as 1.5 times the operation weight in the machine room.
<b>Quantities</b>	To decide the quantity, you should take cooling capacity, cooling capacity fluctuating, building function, installation site and economic factors in to consideration. You need not consider the stand by unit because continuous operation is better for the life time than intermittent operation, but in high cooling capacity chillers with stand by canned pumps may be suggested.
<b>Special dimensions</b>	If your machine room or entrance is smaller than the mentioned dimensions, please contact Viuna to discuss for a solution and finally chiller dimensions are adjustable.
<b>Split shipment</b>	If it's limited by transportation or machine room entrance height, split shipment shall be selected.
<b>Low chilled water temperature</b>	Provide chilled water at 32[°F] for special processing requirements. For example food and fruit plant, medical plant, power station cooling system, etc...
<b>Seawater</b>	Use seawater as cooling water, applications to coastal buildings, ship's air conditioning and seawater desalination plant.
<b>Piping system</b>	<ul style="list-style-type: none"> <li>[1] Soft connector must be installed at inlet / outlet of chilled, cooling, and hot water. The weight of the piping system can never be borne by the chiller.</li> <li>[2] Cooling tower must be equipped with a protective screen to prevent foreign matters from entering the cooling water system.</li> <li>[3] The cooling tower must be far away from heat resource and dust resource.</li> <li>[4] No pipes or valves must hang over the chiller to prevent the chiller from being damaged during installation, maintenance, or valve leakage.</li> </ul>

## • *Technology Extension*

<b>Outdoor package</b>	Viuna outdoor packages are warm and hot water types small and medium models additionally equipped with hot water boiler, cooling tower, cooling water pumps, chilled water pumps, and hot water pumps.
<b>CCHP system</b>	The perfect combination between Viuna absorption chillers and turbo generator or Diesel generator made in the U.S.A., Europe or any other countries can increase the energy efficiency greatly.



**Gas Turbine CCHP Plant**



**CO2 Production Plant**

**Advanced Absorption Chiller Accompanying with CO2 Production Plant Converts Gas Turbine or Gas Diesel Engines Exhaust to Air Conditioning or to Refrigeration Plant and finally to CO2**



**Typical Installation Room With Viuna Absorption Chillers**

Address : No. 52, Shahid Zamiraei (18)Ave.  
Etehad St., Damavand(Abali) IRAN-TEHRAN  
Tel : (+98) 21 77349741 - (+98) 21 77340621  
Fax: (+98) 21 77356359 Mob:(+98) 9122274092  
E-mail: mhj\_abyaneh@viunahvac.com  
Website: www.viunahvac.com