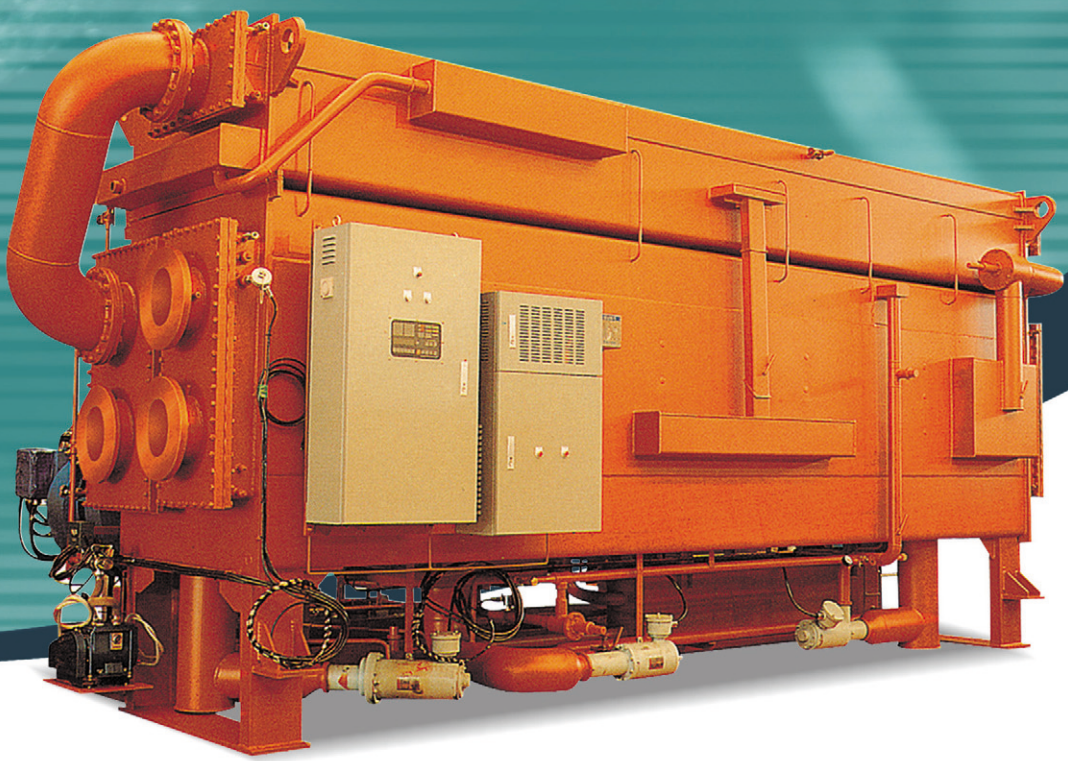
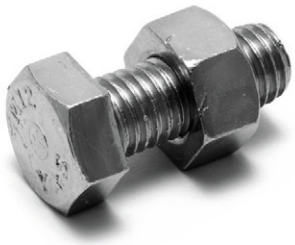
ABSORPTION CHILLING SYSTEM



HYUNDAI CLIMATE CONTROL CO., LTD.

FEATURS

1. Direct-fired absorption chiller-heater gives both heating and cooling.
2. The high efficiency associated with the absorption chilling system has reduced the space required for installation.
3. Absorption chiller gives lower running costs than eletrical chiller.
4. Ozone safe, cfc free, cooling requirements are met without chlorine based refrigerants.
5. Low noise and vibration. Hyundai absorption chilling system does not utilize a large motor-compressor, and this leads to quiet, trouble free operation.
6. Three different leak tests are performed in the shop to minimize leaks and to ensure high quality and reliability.
7. Hyundai absorption chilling system provides fully automatic control system such as stabilizer control, override control and de-crystalization system for simple, trouble-free operation.
8. Excellent for peak shaving during high electrical demand periods.



HOW IT OPERATES

The principle of refrigeration is the exchange of heat, and in direct-fired absorption chiller-heaters, there are five basic heat exchangers; evaporator, absorber, high and low pressure generators and condenser. In absorption chiller-heaters, the refrigerant is water.

But like any other refrigeration system, the absorption chiller uses evaporation and condensation to remove heat. To maintain effective evaporation and condensation, the two-stage absorption chiller-heater employs two shells or one shell partitioned into two zones.

The lower shell or zone (Evaporator and Absorber) has an internal pressure of about one-hundredth that of the outside atmosphere, or 6mm Hg, a relatively high vacuum.

The vacuum allows water (the refrigerant) to boil at a temperature below that of the liquid being chilled. Thus chilled liquid entering the evaporator can be cooled for air conditioning purposes.

1. EVAPORATOR (for cooling only)

Refrigerant enters the top of the lower shell or zone and is sprayed over the evaporator tube bundle.

Heat from the liquid being chilled evaporates the refrigerant.

2. ABSORBER

The refrigerant vapor is then drawn into the absorber side of the lower shell or zone. Here the vapor is absorbed by lithium bromide solution. Lithium bromide is, basically, similar to brine or salt water. But lithium bromide is a salt with an especially strong attraction for water. With the lithium bromide spray, it is as if hundreds of little sponges are sucking up the refrigerant vapor-called the "dilute solution" - which then collects in the bottom of the lower shell or zone.

3. HIGH PRESSURE GENERATOR

The dilute solution is then pumped through the two heat exchangers where is preheated by hot concentrated solution from the generators. The heat exchangers improve the efficiency of the cycle by reducing the amount of gas/oil consumption required to heat the dilute solution in the high pressure generator. The dilute solution then flows to the high pressure generator shell (with a burner unit), beside the upper and lower shells.

The dilute solution flows around the surfaces of the furnace tubes in the high pressure generator and is heated by gas combustion through the inside of furnace and tubes. The hot generator furnace and tubes allow the dilute solution to boil and it is further concentrated. Thus the dilute solution, straight from the high pressure generator is called the intermediate solution.

The pressure in the high pressure generator is approximately 730mm Hg.

The burner output is controlled by a valve in response to the cooling load required.

Local superheat in the high pressure generator is avoided by the well distributed flow of the dilute solution between the shell and the outside of the furnace.

4. LOW PRESSURE GENERATOR

The intermediate solution in the high pressure generator then flows to the upper shell or zone (low pressure generator & condenser) through the high temperature heat exchanger by gravity and pressure difference of both shells.

The pressure in the upper shell is approximately one tenth that of the outside atmosphere, or 55mm Hg.

The intermediate solution flows over the tubes and is reheated by refrigerant vapor-steam, generated previously in the high pressure generator. The refrigerant vapor has enough heat to make the solution more concentrated, releasing refrigerant vapor again at a lower pressure level and is drained to the condenser through a valve.

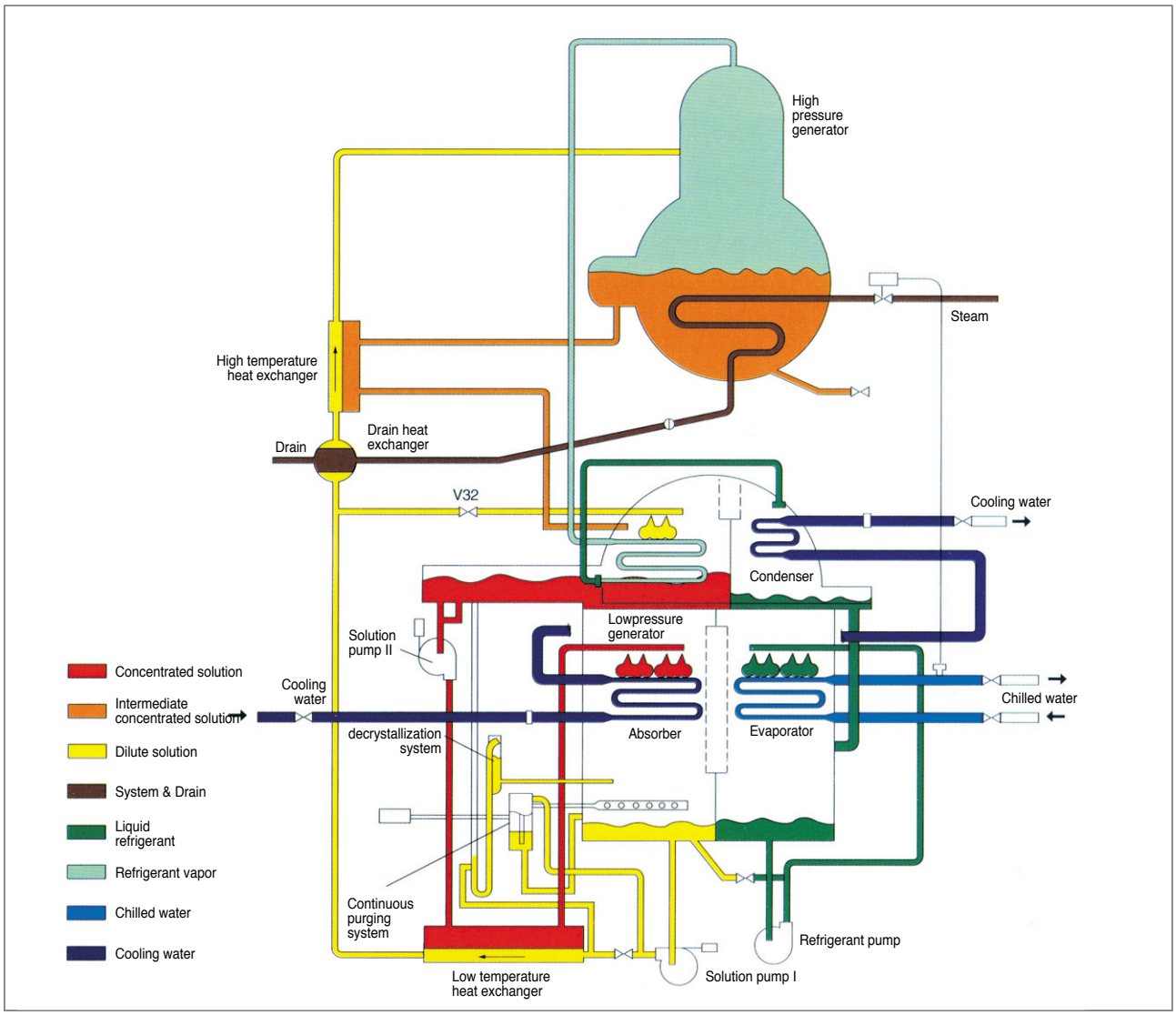
The solution is now concentrated and flows through the heat exchanger, to the educator which is used to mix this solution with the re-diluted solution delivered from the solution pump. Then the mixed solution is sprayed on the absorber tubes.

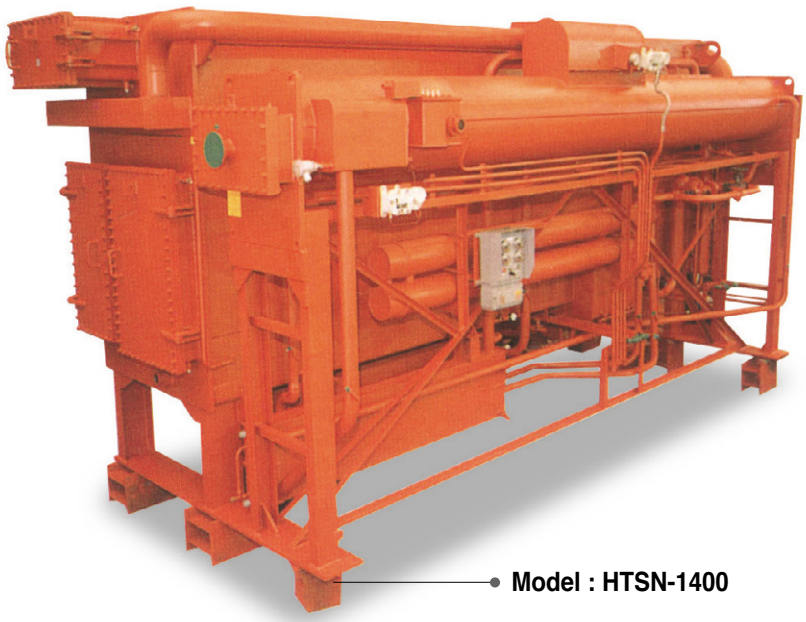
5. CONDENSER

The refrigerant flows to the condenser and is condensed. The liquid refrigerant, with the drained liquid from the low pressure generator, flows back to the lower shell, and is once again sprayed over the evaporator. The refrigerant cycle has been completed.

Now the concentrated lithium bromide solution flows from the low pressure generator back to the absorber in the lower shell ready to absorb more refrigerant. Its cycle has also been completed.

DOUBLE EFFECT ABSORPTION
CHILLER SCHEMATIC





Model : HTSN-1400

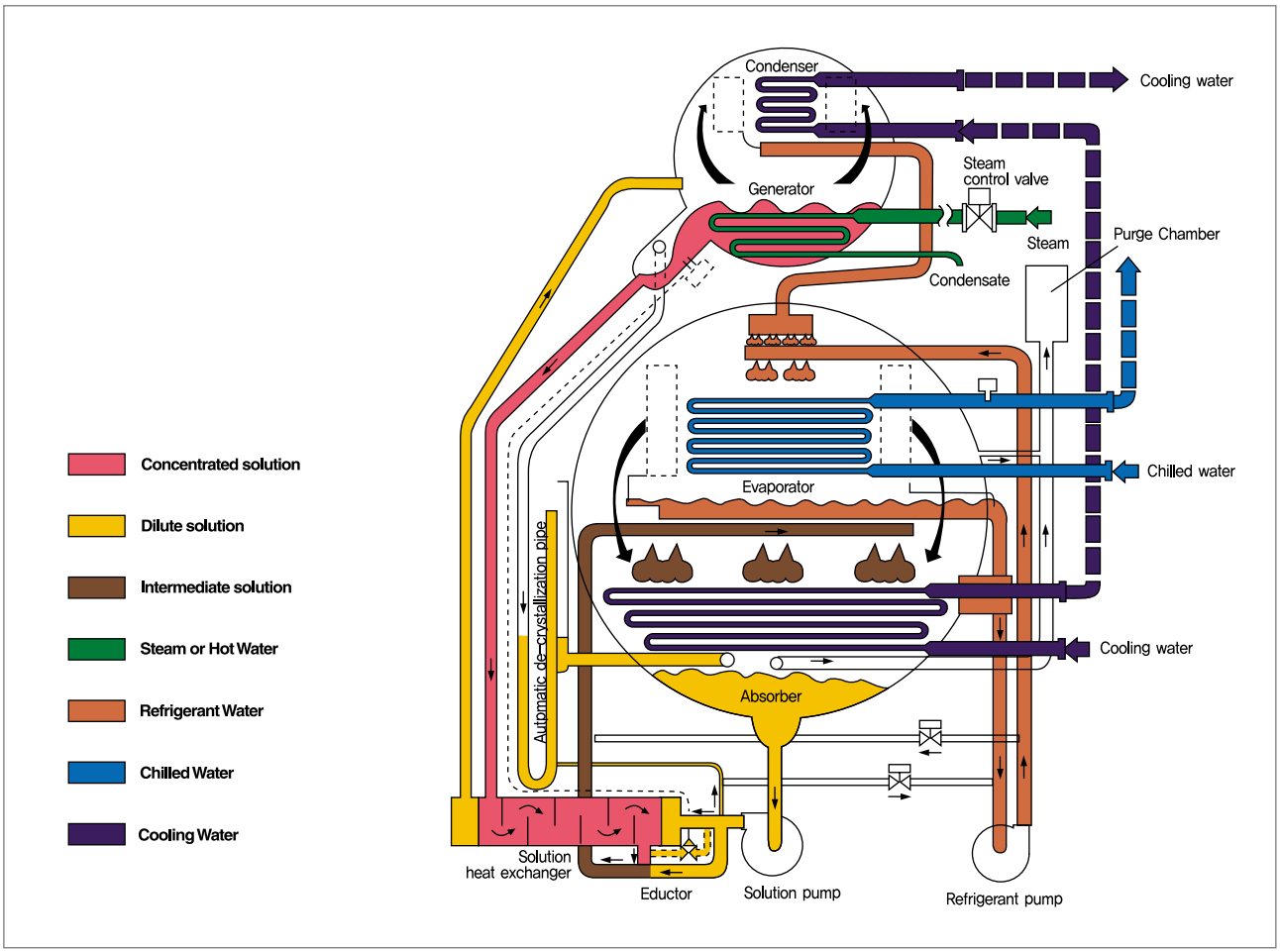
STANDARD RATING
DOUBLE EFFECT ABSORPTION CHILLER

Item			HTSN Model	HTSN-100	HTSN-125	HTSN-150	HTSN-180	HTSN-210	HTSN-260	HTSN-310	HTSN-360	HTSN-400	HTSN-450	HTSN-500	HTSN-600	HTSN-700	HTSN-800	HTSN-900	HTSN-1000	HTSN-1100	HTSN-1250	HTSN-1400
Cooling Capacity			USRT	100	125	150	180	210	260	310	360	400	450	500	600	700	800	900	1000	1100	1250	1400
CHILLED W.	Inlet Temp.		℃	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Outlet Temp.		℃	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Flow Rate		m^3/h	60.5	75.6	90.7	108.9	127.0	157.2	187.5	217.7	241.9	272.2	302.4	363.0	423.5	484.0	544.5	605.0	665.5	756.2	847.0
	No. of Pass		-	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1
	Pressure Drop		mAq	7.4	7.0	7.1	7.7	7.4	7.4	7.5	7.0	7.0	7.0	7.0	7.3	6.2	8.5	7.2	6.6	6.7	6.8	6.8
	Nozzle Size		A	80	100	100	125	125	150	150	200	200	200	200	250	250	250	300	300	300	350	350
COOLING W.	Inlet Temp.		℃	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
	Outlet Temp.		℃	37.5	37.5	37.5	37.5	27.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
	Flow Rate	ABS.	m^3/h	100	125	150	180	210	260	310	360	400	450	500	600	700	800	900	1000	1100	1250	1400
	No. of	COND.	-	6	4	4	4	4	3	3	2	2	2	2	3	2	2	2	2	2	2	2
	Pass		-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Pressure Drop		mAq	8.0	7.8	8.4	7.5	8.1	8.2	9.3	6.4	6.4	6.4	6.4	7.8	5.6	7.6	6.4	8.4	10.7	7.8	10.3
	Nozzle Size		A	100	125	125	150	150	200	200	250	250	250	250	300	300	300	350	350	350	400	400
STEAM	Inlet Temp.		kg/cm^2G	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Outlet Temp.		℃	174.7	174.7	174.7	174.7	174.7	174.7	174.7	174.7	174.7	174.7	174.7	174.7	174.7	174.7	174.7	174.7	174.7	174.7	174.7
	Rated Consumption		kg/h	440	550	660	792	924	1,144	1,364	1,584	1,760	1,980	2,200	2,640	3,080	3,520	3,960	4,400	4,840	5,500	6,160
	Max. Consumption		kg/h	550	688	825	990	1,155	1,430	1,705	1,980	2,200	2,475	2,750	3,300	3,850	4,400	4,960	5,500	6,050	6,880	7,700
	No. of Pass		H.P Gen	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Nozzie Size	Inlet	A	40	40	40	65	65	65	65	80	80	80	80	80	80	80	100	100	100	100	100
		Outlet	A	25	25	25	40	40	40	40	50	50	50	50	50	50	50	80	80	80	80	80
	Control V/V Size		A	40	40	40	40	40	50	50	65	65	65	65	80	80	80	100	100	100	100	125
ELECTRICITY	Solution Pump I		kW	1.1	1.1	2.2	3.0	3.0	3.0	3.0	3.7	3.7	5.5	5.5	5.5	5.5	6.6	7.5	7.5	11.0	11.0	11.0
	Solution Pump II		kW	-	-	-	-	-	-	-	2.2	2.2	2.2	3.0	2.2	3.0	3.0	3.7	3.7	3.7	5.5	5.5
	Refrigerant Pump		kW	0.4	0.4	0.4	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	2.2	2.2	2.2	3.7	3.7	3.7	3.7	3.7
	Vacuum Pump		kW	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	Total		kW	1.7	1.7	2.8	4.15	4.15	4.15	4.15	7.05	7.05	8.85	9.65	10.3	11.1	12.2	15.3	15.3	18.8	20.6	20.6
	Cable Size		mm^2	3.5	3.5	3.5	5.5	5.5	5.5	5.5	14.0	14.0	14.0	22.0	22.0	22.0	22.0	50.0	50.0	50.0	50.0	50.0
Dimension	Lengh(L)		mm	2,407	3,328	3,328	3,378	3,378	4,753	4,753	4,911	4,911	4,911	4,911	5,316	5,964	6,464	6,214	6,814	7,414	6,822	7,422
	Width(W)		mm	1,670	1,670	1,670	1,910	1,910	1,910	1,910	2,030	2,030	2,200	2,200	2,641	2,641	2,641	2,911	2,911	2,911	3,037	3,037
	Height(H)		mm	2,043	2,043	2,043	2,200	2,200	2,200	2,200	2,496	2,496	2,587	2,587	3,110	3,110	3,110	3,370	3,370	3,370	3,830	3,830
Weights	Operating		ton	5.3	6.2	6.6	7.9	8.2	10.1	10.8	14.9	15.3	16.8	17.4	24.0	25.8	28.0	30.7	33.3	35.7	42.2	45.6
	Machinery		ton	4.0	4.7	5.0	6.0	6.1	7.2	7.8	11.3	11.5	12.6	13.0	18.1	19.4	20.5	22.1	23.8	25.3	30.0	32.1

NOTE1

- Chilled Water Temperature : 12℃ → 7℃
- Cooling Water Temperature : 32℃ → 37.5℃
- Chilled/Cooling Water Fouling Factor : 0.0001m^2h℃/kal
- Steam Pressure : 8kg/cm^2G(Saturated)
- Standard supply voltage for main circuit : 220V/380V/440(50Hz, 60Hz)
- Maximum Working Pressure (Chilled Water, Cooling Water, Steam) : 10kg/cm^2G
- If other specification except the shown on the above is needed, please consult with our engineer.

SINGLE EFFECT ABSORPTION
CHILLER SCHEMATIC



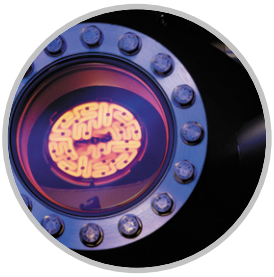
Model : HSS-200

STANDARD RATING
SINGLE EFFECT ABSORPTION CHILLER

Item			Model	HSS SERIES																				
				HSS-120	HSS-150	HSS-180	HSS-200	HSS-240	HSS-270	HSS-300	HSS-340	HSS-360	HSS-400	HSS-460	HSS-520	HSS-570	HSS-630	HSS-710	HSS-820	HSS-950	HSS-980	HSS-1200	HSS-1240	HSS-1350
CHD WATER	Capacity		USRT	122	157	187	206	242	276	313	341	367	412	462	522	570	638	715	820	948	979	1,186	1,241	1,350
	Outlet Temp.		℃	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Flow Rate		m³/h	74	95	109	125	146	167	189	206	222	249	279	315.7	345	386	432	496	573	592	717	751	817
	Pressure Drop		mAq	11.0	9.0	12.9	6.1	13.0	6.0	8.3	10.5	16.0	7.1	9.5	13.0	7.6	9.8	13.5	9.4	13.5	16.5	13.5	15.6	6.4
	Flange Size		inch	5	5	5	5	6	6	6	6	6	8	8	8	8	8	8	10	10	10	12	12	16
	Pass		-	4	3	3	2	3	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	1
COOL'G WATER	Inlet Temp.		℃	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
	Flow Rate		m³/h	115	148	169	194	227	259	295	321	344	387	433	490	535	599	672	769	890	919	1,118	1,165	1,268
	Pressure Drop		mAq	5.7	10.9	13.6	8.0	7.4	7.3	10.2	14.2	16.5	8.2	11.4	15.6	8.6	11.3	15.2	10.4	15.1	6.2	14.3	17.9	8.4
	Flange Size		inch	6	6	6	6	8	8	8	8	10	10	10	10	10	10	10	12	12	12	14	14	14
	Pass	ABS.	-	3	3	3	2	2	2	2	2	3	2	2	2	2	2	2	2	2	1	2	2	1
		COND.	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
STEAM	Inlet. Pressure		kg/㎠G	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Consumption		kg/h	1,035	1,331	1,526	1,749	2,052	2,334	2,654	2,891	3,112	3,488	3,905	4,415	4,820	5,397	6,051	6,932	8,015	8,280	10,030	10,493	11,448
	Boiler Mx. Capacity		kg/h	1,295	1,665	1,910	2,190	2,565	2,920	3,320	3,615	3,890	4,360	4,885	5,520	6,025	6,750	7,565	8,665	10,020	10,350	12,540	13,120	14,310
	FLG. Size	Inlet	inch	5	5	5	5	5	5	5	5	6	6	6	6	8	8	8	8	8	8	10	10	10
		Outlet	inch	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3
	Pass			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Control V/V FLG.Size		inch	3	3	4	4	4	4	5	5	5	6	6	6	6	8	8	8	8	8	10	10	10
	Drain-trap Capacity		kg/h	1,555	2,000	2,290	2,625	3,080	3,500	3,980	4,340	4,670	5,325	5,860	6,625	7,230	8,100	9,080	10,400	12,025	12,420	15,045	15,740	17,175
ELECTRICITY	Solution Pump		kW	2.2	2.2	2.2	2.2	2.2	2.2	2.2	3.7	3.7	3.7	3.7	3.7	3.7	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
	REF. Pump		kW	1.5	1.5	1.5	1.5	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	3.7	3.7	3.7	3.7	5.5	5.5
	Vacuum Pump		kW	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.4
	Total		kW	3.9	3.9	3.9	3.9	4.6	4.6	4.6	6.1	6.1	6.1	6.1	6.1	6.1	7.9	7.9	9.6	9.6	9.6	9.6	11.4	11.4
DIM.	Length		mm	3,556	4,166	4,775	5,385	4,775	5,385	5,994	6,604	5,385	5,994	6,604	7,366	5,994	6,604	6,604	6,706	7,468	8,230	7,468	8,230	8,992
	Width		mm	1,735	1,506	1,380	1,380	1,625	1,535	1,535	1,535	1,715	1,715	1,715	1,715	1,715	2,050	2,050	2,260	2,260	2,260	2,460	2,460	2,460
	Height		mm	2,318	2,318	2,318	2,318	2,635	2,635	2,635	3,016	3,016	3,016	3,016	3,016	3,537	3,537	3,537	3,835	3,835	3,835	4,229	4,229	4,229

NOTE1

- Chilled Water temp 12℃ – 7℃
- Cooling Water temp 32℃ – 40℃
- Fouling factor 0.0001m²h℃/kcal(Chilling & cooling Water)
- Hot water temp 140℃ – 110℃
- Standard Electric Source : 220V/3PH/50Hz, 60Hz, 380V, 400V, are available



HYUNDAI CLIMATE CONTROL CO., LTD.

Head Office

51-51, Mohwa-Ri, Oedong-Eup, Kyongju-si,
Kyongbuk, Korea

- TEL : 82. 54. 745. 8661~5
- FAX : 82. 54. 745. 8677
- Homepage : http://www.hdcc.co.kr
- E-mail : hdcc@hdcc.co.kr

Seoul Office

Anam Tower #1116, #702-10, Yeoksam-Dong,
Kangnam-Gu, Seoul, Korea

- TEL : 82. 2. 2009. 3121~2
- FAX : 82. 2. 2009. 3120