

# DUNHAM-BUSH

Products that perform...By people who care

## WCFXHP

### Water Cooled Hermetic Screw Heat Pump



**Cooling Capacity**  
**208-2704kW**

**Heat Capacity**  
**185-3030kW**

#### Features

- Vertical hermetic screw compressor
- Flooded evaporator
- Special economic cycle
- Multi compressors with one refrigerant circuit
- Unique oil return system
- High efficiency oil balance system
- Advanced microcomputer control
- Option with environment-friendly refrigerant



**R<sub>22</sub>** **R<sub>134a</sub>**

## INTRODUCTION

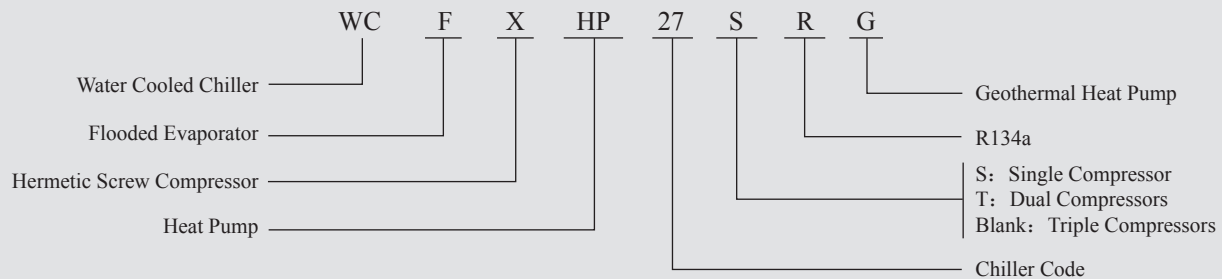
The Dunham-Bush WCFX Water-Cooled Rotary Screw Water Chillers are available from 88 to 736 tons. Their performance has been certified by the Air Conditioning and Refrigeration Institute (ARI). These units are

supplied with rotary screw compressors that are backed by 58 years of experience.

The side by side evaporator/condenser arrangement makes a split design optional for ease of movement through any standard commercial doorway.

All units are factory run tested before shipment.

## NOMENCLATURE



## STANDARD FEATURES

### Size Range

- 23 Models from 92 to 769 Rtons of cooling capacity and from 103 to 862 Rtons of heat capacity at ARI standard conditions with certified performance
- Multiple compressor units provide redundancy, and favorable partload efficiency

### Compressor

- Quiet, reliable MSC Rotary Screw Compressors
- Multiple rotary screw compressor design for fail-safe reliability and redundancy
- Hermetic Design eliminates problematic shaft seals, inspections, expensive teardowns, time consuming alignments, etc.
- Consistent unloading with dependable slide valve mechanism

### Evaporator/Condenser

- Cleanable and Removable Integral Fin Copper Tubes for easy serviceability
- One, Two or Three Water Passes Available for a wide variety of

applications

- Removable Water Heads for service
- Victaulic Groove Water Connections for quick installation and/or service
- Full Pump Down Capacity in Condenser, therefore, pump out unit not required

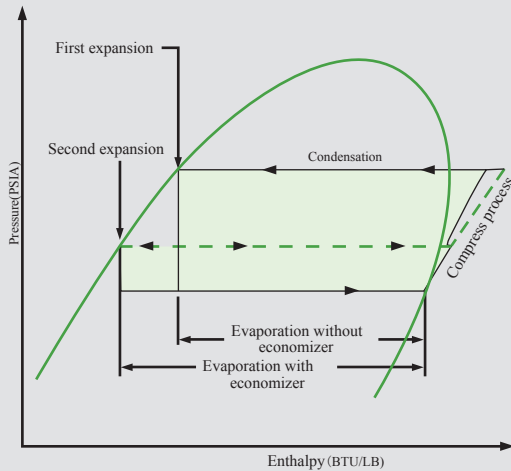
### Microcomputer

- Proactive Microcomputer Controller adapts to abnormal operating conditions
- Tolerant and accommodating of extreme conditions at start-up
- Capable of controlling multiple chillers, cooling towers, pumps, etc.
- Circuit Breaker on each multiple compressor unit
- Unit Mounted Contactor and Time Delay for reduced Inrush Start
- Current and Voltage transformers
- Under Voltage Phase Failure Relay
- Indicator lights for Compressor Overloads, High Motor Temperature, Micro Alarm, Control Power, Compressor Control Circuit

## Economizer Cycle

Liquid refrigerant from condenser passes through the first expansion device and into the flash economizer where flash gas and liquid refrigerant are separated. The gaseous refrigerant is then drawn out of the flash economizer and into the vapor injection port of the compressor. The remaining liquid refrigerant then passes through a second expansion device which reduces refrigerant pressure to evaporator levels where it is then distributed evenly into the evaporator.

By removing the flash gas from the flash economizer at an intermediate pressure, the enthalpy of the refrigerant flowing into the evaporator is reduced which increases the refrigeration effect and improves the efficiency of the refrigeration cycle about 16%.



## Shell and Tube Flooded Coolers

Flooded Coolers operate considerably different than Direct Expansion Coolers. They have the refrigerant in the shell side with the fluid to be cooled in the tubes. The liquid level of refrigerant in the shell covers the tubes with refrigerant. This direct contact enables the cooler to operate more efficiently than a direct expansion cooler by having a closer total temperature difference (TTD). Flooded Coolers employ the most advanced vessel technology available today. Special internal and external enhanced tubing provides excellent unit efficiency. The tubing is roll expanded into the tube sheets and the heads are removable and interchangeable from end-to-end for ease of tube maintenance. Vent and drain plugs are provided in each head. Two-pass coolers are supplied standard with one and three-pass optional.

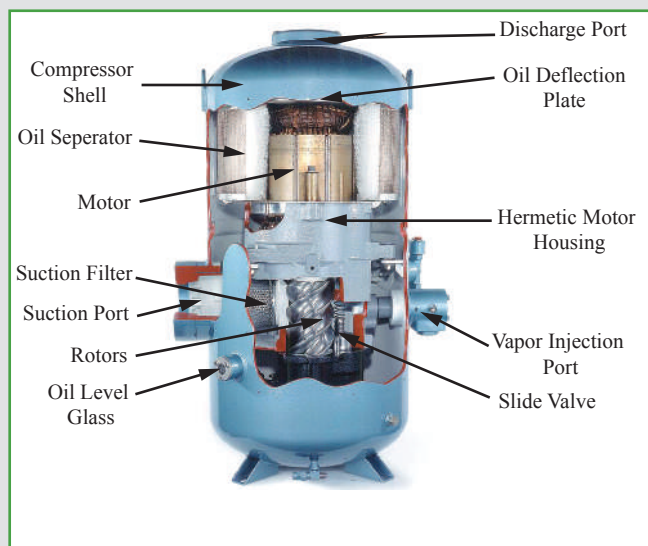
## Shell and Tube Condenser

The condenser is a cleanable "shell and tube" type with high efficiency external and internal enhanced copper tubes, mechanically expanded into heavy fixed steel tube sheets. The condenser is sized for full refrigerant pump down capacity and the shell side is equipped with dual refrigerant relief devices. Vent and drain fittings are provided in each head and the heads are removable for tube cleaning and serviceability.

## Compressor

The Dunham-Bush rotary screw compressor is a positive displacement helical-axial design for use with high pressure refrigerants.

- The compressor consists of two intermeshing helical grooved rotors, a drive rotor and a driven rotor, in a stationary housing with suction and discharge gas ports.
- Uniform gas flow, even torque and positive displacement, all provided by pure rotary motion contributes to vibration-free operation over a wide range of operating conditions. Intake and discharge cycles overlap, effectively producing a smooth, continuous flow of gas.
- No oil pump is required for lubrication or sealing purposes. Oil is distributed throughout the compressor by the pressure differential between the suction and the discharge cavities.



## Simplified Capacity Control

The slide valve mechanism for capacity modulation and part-load operation is an outstanding feature.

- The moving parts are simple, rugged and trouble-free. The slide mechanism is hydraulically actuated.
- Package capacity reduction can be down to as low as 25% without HGBP by progressive movement of slide valves away from their stops.
- Capacity reduction is programmed by an exclusive electronically initiated, hydraulically actuated control arrangement.

## Positive Displacement Direct Connected

The compressor is directly connected to the motor without any complicated gear systems to speed up the compressor and thus detract from the overall unit reliability.

## Oil Separator

Each compressor is provided with an integral oil separator located adjacent to the discharge gas port.

- The separator is a multi-layered mesh element which effectively separates oil from the gas stream.
- The oil drains into the sump and the discharge gas passes around the deflection plate. An oil drain valve is located near the bottom of the oil sump.

## Main Bearings

Each rotor is fitted with a set of anti-friction tapered roller bearings. They carry both radial and thrust loads.

## Rotors

The latest asymmetrical rotor profiles of patented Dunham-Bush design assure operation at highest efficiencies. Rotors are precision machined from AISI 1141 bar stock and case hardened.

## Castings

All housings are manufactured of high grade, low porosity, cast iron. Solid State Motor Protection. The motor winding protection module used in conjunction with sensors embedded in the compressor motor windings is designed to prevent the motor from operating at unsafe operating temperatures. The overloads for the motor are also solid state.

## Display Information

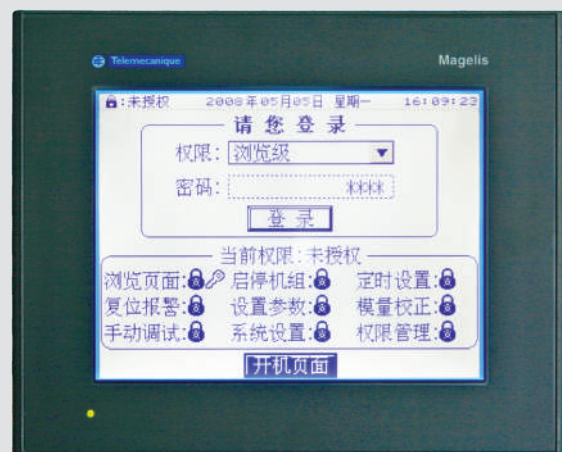
The alphanumeric liquid crystal display utilizes easy-to-understand menu-driven software. Inexperienced operators can quickly work through these menus to obtain the information they require or to modify control parameters. More experienced operators can bypass the menu systems, if desired, and move directly to their requested control function. Easily accessible measurements include:

- Leaving chilled water temperature
- Evaporator pressure
- Condenser pressure
- System voltage
- Number of compressor starts
- Compressor contactor status
- Water temperature reset value
- Water flow switch status
- External start/stop command status

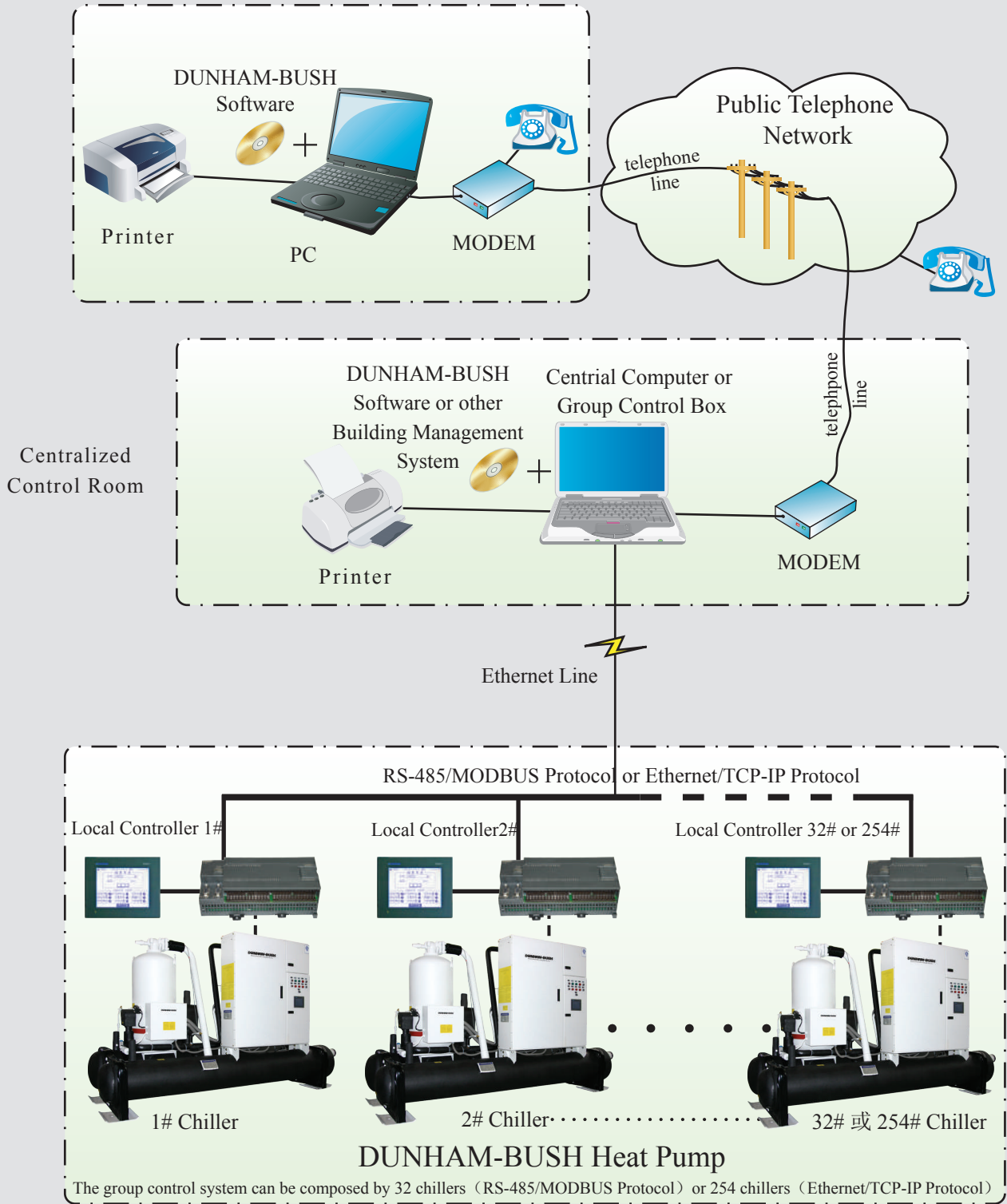
Advanced Microcomputer Control is a standard feature on all Dunham-Bush Rotary Screw Water Cooled Chillers monitoring analog and digital inputs to achieve precise control of the major operational and protective functions of the unit.

Programmable Logic Controller (PLC) allows finger-tip user interaction. Its simple-to-use push button keyboard and menu-driven software provide access to operating conditions, control setpoints and alarm history clearly displayed on a prominent multi-line alphanumeric display.

An easy-to-install, inexpensive modem option allows remote reading of operating parameter updates. The Dunham-Bush microcomputer insures its owner state-of-the-art efficiency and reliability.



## Network Topology Map for Multi Chillers Group Control and Remote Control



# WCFXHP-R22 Water Source Technical Data

MODEL	WCFXHP	10S	12S	15S	18S	20S	23S	24S	27S	30T	33T	36T	41T	46T	50T	54T	60	64	69	73	77	81
Cooling Capacity	kW	323	390	485	584	669	727	834	907	977	1081	1183	1338	1503	1668	1848	2006	2103	2304	2469	2575	2704
	RT	92	111	138	166	190	207	237	258	278	307	336	380	427	474	525	570	598	655	702	732	769
Heat Capacity	10 <sup>3</sup> kcal/h	27.8	33.5	41.7	50.2	57.5	62.5	71.7	78.0	84.0	93.0	101.7	115.1	129.3	143.4	158.9	172.5	180.9	198.1	212.3	221.5	232.5
	kW	3.62	4.35	5.41	6.49	7.47	8.08	9.30	10.06	10.88	11.95	13.08	14.79	16.62	18.46	20.46	22.32	23.45	25.76	27.58	28.84	30.30
Adjusting Range Power	RT	103	124	154	185	212	230	264	286	309	340	372	421	473	525	582	635	667	732	784	820	862
	10 <sup>3</sup> kcal/h	31.1	37.4	46.5	55.8	64.2	69.5	80.0	86.5	93.6	102.8	112.5	127.2	142.9	158.8	176.0	192.0	201.7	221.5	237.2	248.0	260.6
380V/3P/50Hz																						
12.5-100%																						
8.5-100%																						

## Compressor

Compressor Model	(QTY)	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3			
Input Power (kW)	Refrigeration	52.6	62.4	77.8	91.7	107.6	113.7	133.0	141.1	154.7	165.6	180.8	206.7	230.0	255.9	284.5	315.7	335.5	371.8	396.4	419.4	440.6	465.9	484.3	536.6	572.0	605.3	635.9
Rated Current (A)	Heat Pump	75.9	90.0	112.3	132.3	155.3	164.1	191.9	203.6	223.3	239.0	260.9	295.4	332.0	369.3	410.6	455.5	484.3	536.6	572.0	605.3	635.9	668.8	726	768	807	847	887
	Refrigeration	96	114	142	168	197	208	243	258	283	303	331	378	421	468	521	578	614	681	726	768	807	847	908	948	1011	1069	1123
Starting Current (A)	Heat Pump	134	159	198	234	274	290	339	360	395	422	461	522	587	652	725	805	887	948	1011	1069	1123	1190	1260	1338	1425	1511	1598
	Refrigeration	398	448	497	650	938	938	1190	1190	1190	497	497/650	650	650/938	938	938/1190	1190	938	938/1190	938/1190	1190	938/1190	1190	938/1190	938/1190	1190	938/1190	1190

## Evaporator

Temperature (°C)	Inlet water temperature 12°C, Onlet water temperature 7°C																										
Cooling Water	56	69	83	100	115	125	143	153	168	186	203	230	258	281	310	345	360	393	425	443	465	487	510	533	556	579	602
Heat Resource Water	29	35	44	53	61	66	76	82	88	97	107	121	135	150	167	181	191	209	224	234	246	258	270	282	294	306	318
Design Pressure at Water Side (MPa)	1.05																										
Pipeline Size (in)	5	5	5	6	6	6	6	6	6	6	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	10	10

## Condenser

Temperature (°C)	Inlet water temperature 18°C, Onlet water temperature 29°C																										
Cooling Water	29	35	44	53	61	66	76	82	88	97	107	121	135	150	167	181	191	209	224	234	246	258	270	282	294	306	318
Hot Water	56	69	83	100	115	125	143	153	168	186	203	230	258	281	310	345	360	393	425	443	465	487	510	533	556	579	602
Design Pressure at Water Side (MPa)	1.0																										
Pipeline Size (in)	4	4	4	5	6	6	6	6	6	6	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	10	10

## Dimension Data

Length (mm)	3160	3160	3050	3200	3790	3790	3680	3680	3680	3680	3850	3850	3850	4400	4400	4260	4680	4680	4720	4640	4520
Width (mm)	1070	1070	1100	1150	1230	1230	1230	1250	1250	1300	1300	1330	1330	1370	1370	1470	1525	1525	1560	1585	1610
Height (mm)	1850	1850	1980	2030	2320	2290	2320	2350	2190	2240	2240	2400	2450	2450	2510	2560	2560	2600	2600	2600	2650
Weight (kg)	1380	1520	1850	2200	2960	3090	3120	3540	3700	4170	4270	4730	5320	5520	6100	7550	7900	8100	8470	8860	8940
Running Weight (kg)	1550	1660	1980	2410	3220	3320	3360	3870	4030	4500	4600	5080	5670	5910	6500	8400	8600	8800	9470	9860	9950
R22 Weight (kg)	70	85	110	125	140	160	176	200	215	235	260	280	320	330	390	420	440	470	510	550	590

Note: Fouling Factor at water side of evaporator and condenser is 0.086m<sup>2</sup>/kW.



# WCFXHP-R134a Water Source Technical Data

Model	WCFXHP	10SR	12SR	15SR	18SR	20SR	23SR	24SR	27SR	30SR	33TR	36TR	41TR	46TR	50TR	54TR	57TR	60TR	64R	69R	73R	75R	77R	81R	
Cooling Capacity	kW	210	262	314	382	451	506	556	617	679	717	789	898	1008	1121	1246	1325	1404	1455	1564	1677	1735	1802	1868	
	RT	60	74	89	109	128	144	158	175	193	204	224	255	287	319	354	377	399	414	445	477	493	512	531	
Heat Capacity	10kcal/h	18.1	22.5	27.0	32.9	38.8	43.5	47.8	53.1	58.4	61.7	67.9	77.2	86.7	96.4	107.2	114.0	120.7	125.1	134.5	144.2	149.2	155.0	160.6	
	kW	235	293	349	426	503	562	621	686	757	795	874	995	1119	1245	1383	1471	1559	1623	1746	1871	1936	2011	2086	
Adjusting Range	RT	67	83	99	121	143	160	177	195	215	226	249	283	318	354	393	418	443	461	496	532	550	572	593	
	10kcal/h	20.2	25.2	30.0	36.6	43.3	48.3	53.4	59.0	65.1	68.4	75.2	85.6	96.2	107.1	118.9	126.5	134.1	139.6	150.2	160.9	166.5	172.9	179.4	
Power		25~100%												12.5~100%						8.5~100%					
Compressor		380V/3P/50Hz																							

Compressor Model	(QTY)	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	
Input Power	Refrigeration (kW)	34.1	42.2	49.6	60.5	72.0	79.4	89.2	97.1	107.6	111.1	122.0	138.9	156.8	174.8	194.1	206.4	218.9	232.5	250.4	267.7	277.4	288.4	299.6			
Rated Current (A)	Heat Pump	49.3	60.8	71.6	87.4	103.9	114.6	128.8	140.1	155.3	160.3	176.0	200.4	226.3	252.2	280.2	297.9	316.0	335.5	361.4	386.3	400.3	416.2	432.3			
	Refrigeration	62	77	91	111	132	145	163	178	197	203	223	254	287	320	355	378	401	426	458	490	508	528	548			
Starting Current (A)	Heat Pump	87	107	126	154	184	202	228	248	274	283	311	354	400	446	495	526	558	593	638	682	707	735	764			
	Refrigeration	252	252	360	360	708	708	854	854	991	360	360	360/708	708	708/854	854	708	708	708/854	708/854	854	854/991	854/991	854/991	991		

Evaporator		Inlet water temperature 12°C, Outlet water temperature 7°C																									
Cooled Water	Temperature (°C)	Inlet water temperature 12°C, Outlet water temperature 7°C																									
	Flow (m <sup>3</sup> /h)	36	45	54	66	78	87	96	106	117	123	136	154	173	193	214	228	241	250	269	288	298	310	321			
Heat Resource Water	Pressure Drop at Water Side (kPa)	<100																									
	Temperature (°C)	Inlet water temperature 15°C, Outlet water temperature is determined by its flow																									
Design Pressure at Water Side (MPa)	Flow (m <sup>3</sup> /h)	19	24	28	35	41	46	50	56	61	65	71	81	91	101	113	120	127	132	142	152	157	163	169			
	Pressure Drop at Water Side (kPa)	<100																									
Pipeline Size (m)	Design Pressure at Water Side (MPa)	1.05																									
	Temperature (°C)	Inlet water temperature 18°C, Outlet water temperature 29°C																									

Condenser		Inlet water temperature 18°C, Outlet water temperature 29°C																									
Cooling Water	Temperature (°C)	Inlet water temperature 18°C, Outlet water temperature 29°C																									
	Flow (m <sup>3</sup> /h)	19	24	28	35	41	46	50	56	61	65	71	81	91	101	113	120	127	132	142	152	157	163	169			
Hot Water	Pressure Drop at Water Side (kPa)	<100																									
	Temperature (°C)	Outlet water temperature 45°C, Inlet water temperature is determined by its flow																									
Design Pressure at Water Side (MPa)	Flow (m <sup>3</sup> /h)	36	45	54	66	78	87	96	106	117	123	136	154	173	193	214	228	241	250	269	288	298	310	321			
	Pressure Drop at Water Side (kPa)	<100																									
Pipeline Size (m)	Design Pressure at Water Side (MPa)	1.0																									
	Temperature (°C)	Inlet water temperature 18°C, Outlet water temperature 29°C																									

Dimension Data		Inlet water temperature 18°C, Outlet water temperature 29°C																										
Length	(mm)	3120	3120	3120	3200	3770	3770	3770	3790	3790	3790	3680	3680	3680	4400	4400	4400	4430	4430	4700	4600	4780	4780	4780	4700			
	Width (mm)	1025	1065	1100	1150	1175	1175	1175	1250	1250	1220	1220	1280	1330	1370	1410	1370	1370	1370	1400	1465	1500	1500	1500	1560			
Height	(mm)	1850	1850	1990	2030	2320	2290	2320	2340	2340	2180	2180	2400	2400	2450	2555	2455	2455	2455	2490	2560	2600	2600	2600	2600			
	(kg)	1340	1480	1800	2150	2800	2890	2930	3150	3300	3440	3560	4420	4780	5010	5330	5620	5760	6630	7020	7260	7450	7730	8020				
Running Weight	(kg)	1480	1630	1960	2350	3200	3250	3320	3570	3700	3850	3960	4920	5300	5600	5910	6300	6440	7230	7620	7880	8070	8350	8640				
	R22 Weight (kg)	70	85	110	115	130	145	160	180	200	210	230	265	290	325	360	380	400	425	460	490	500	520	540				

Note: Fouling Factor at water side of evaporator and condenser is 0.086m<sup>2</sup>·°C/kW

# WCFXHP-R22 Geothermal Heat Pump Technical Data

MODEL	WCFXHP	10SG	12SG	15SG	18SG	20SG	23SG	24SG	27SG	30TG	33TG	36TG	41TG	46TG	50TG	54TG	60G	64G	69G	73G	77G	81G										
Cooling Capacity	kW	320	386	480	579	662	720	826	898	968	1070	1172	1325	1488	1652	1830	1987	2082	2282	2446	2550	2679										
	RT	91	110	136	165	188	205	235	255	275	304	333	377	423	470	520	565	592	649	695	725	762										
Heat Capacity	10 <sup>3</sup> kcal/h	27.5	33.2	41.3	49.8	56.9	61.9	71.0	77.2	83.2	92.0	100.8	114.0	128.0	142.1	157.4	170.9	179.1	196.3	210.4	219.3	230.4										
	kW	284	341	425	509	587	633	730	789	854	936	1024	1159	1302	1446	1603	1750	1840	2022	2164	2265	2379										
Adjusting Range	RT	81	97	121	145	167	180	208	224	243	266	291	330	370	411	456	498	523	575	615	644	676										
	10 <sup>3</sup> kcal/h	24.4	29.3	36.6	43.8	50.5	54.4	62.8	67.9	73.4	80.5	88.1	99.7	112.0	124.4	137.9	150.5	158.2	173.9	186.1	194.8	204.6										
25-100%											12.5-100%											8.5-100%										
Power																																
380V/3P/50Hz																																

Compressor Model	(QTY)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Input Power (kW)	Refrigeration	54.4	64.4	80.4	94.7	111.2	117.4	137.3	145.7	159.8	171.1	186.7	211.4	237.6	264.3	293.9	326.1	346.6	384.1	409.4	433.2	455.1
Rated Current (A)	Heat Pump	72.1	85.5	106.7	125.7	147.6	155.9	182.3	193.4	212.1	227.1	247.8	280.6	315.4	350.9	390.1	432.8	460.0	509.7	543.4	575.0	604.1
	Refrigeration	100	118	147	173	204	215	251	267	293	313	342	387	435	484	538	597	634	703	749	793	833
Starting Current (A)	Heat Pump	127	151	189	222	261	275	322	342	375	401	438	496	557	620	689	765	813	901	960	1016	1067
	Refrigeration	398	448	497	650	938	1190	1190	497	497/650	650	650/938	938	938/1190	1190	938	938/1190	938/1190	938/1190	938/1190	938/1190	1190

Evaporator	Inlet water temperature 12°C, Outlet water temperature 7°C																						
Cooled Water	Temperature (°C)	55	69	83	100	114	124	142	153	166	184	202	228	256	281	310	342	360	393	421	439	461	
	Flow (m <sup>3</sup> /h)	55	69	83	100	114	124	142	153	166	184	202	228	256	281	310	342	360	393	421	439	461	
Heat Resource Water	Pressure Drop at Water Side (kPa)	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
	Temperature (°C)	70	84	105	126	145	157	180	195	211	232	254	287	323	358	397	432	454	498	534	558	586	
Design Pressure at Water Side (MPa)	Flow (m <sup>3</sup> /h)	70	84	105	126	145	157	180	195	211	232	254	287	323	358	397	432	454	498	534	558	586	
	Pressure Drop at Water Side (kPa)	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
Pipeline Size (in)	Temperature (°C)	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	
	Flow (m <sup>3</sup> /h)	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	

Condenser	Inlet water temperature 25°C, Outlet water temperature 30°C																						
Cooling Water	Temperature (°C)	70	84	105	126	145	157	180	195	211	232	254	287	323	358	397	432	454	498	534	558	586	
	Flow (m <sup>3</sup> /h)	70	84	105	126	145	157	180	195	211	232	254	287	323	358	397	432	454	498	534	558	586	
Hot Water	Pressure Drop at Water Side (kPa)	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
	Temperature (°C)	55	69	83	100	114	124	142	153	166	184	202	228	256	281	310	342	360	393	421	439	461	
Design Pressure at Water Side (MPa)	Flow (m <sup>3</sup> /h)	55	69	83	100	114	124	142	153	166	184	202	228	256	281	310	342	360	393	421	439	461	
	Pressure Drop at Water Side (kPa)	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
Pipeline Size (in)	Temperature (°C)	4	4	4	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	
	Flow (m <sup>3</sup> /h)	4	4	4	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	

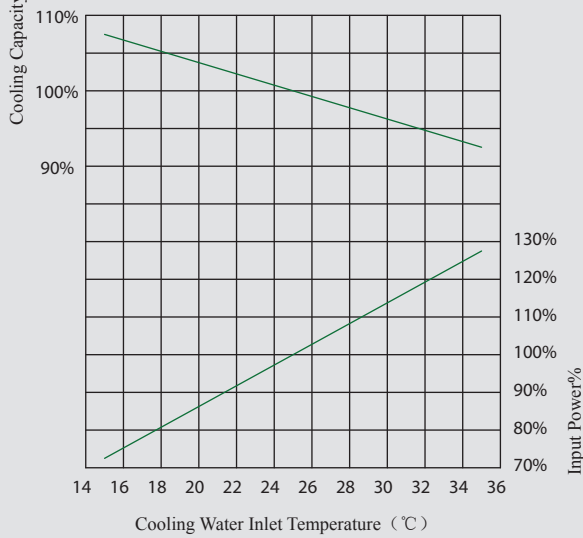
总技术参数																						
Length	(mm)	3160	3160	3050	3200	3790	3790	3680	3680	3680	3850	3850	3850	3850	4400	4400	4260	4680	4680	4720	4640	4520
	Width (mm)	1070	1070	1100	1150	1230	1230	1230	1230	1250	1250	1300	1300	1330	1370	1370	1470	1525	1525	1560	1585	1610
Height	(mm)	1850	1850	1980	2030	2320	2290	2320	2350	2190	2240	2240	2400	2450	2450	2510	2560	2560	2600	2600	2650	2650
	(kg)	1380	1380	1520	1850	2200	2960	3090	3120	3540	3700	4170	4270	4730	5320	5520	6100	7550	7900	8100	8470	8860
Running Weight R22 Weight	(kg)	1550	1660	1980	2410	3220	3320	3360	3870	4030	4500	4600	5080	5670	5910	6500	8400	8600	8800	9470	9860	9950
	(kg)	70	85	110	125	140	160	176	200	215	235	260	280	320	330	390	420	440	470	510	550	590

Notes:  
 1. Fouling Factor at water side of evaporator and condenser is 0.086m<sup>2</sup>·C/kW.  
 2. The secondary refrigerant is glycol solution which volume concentration is 25%.





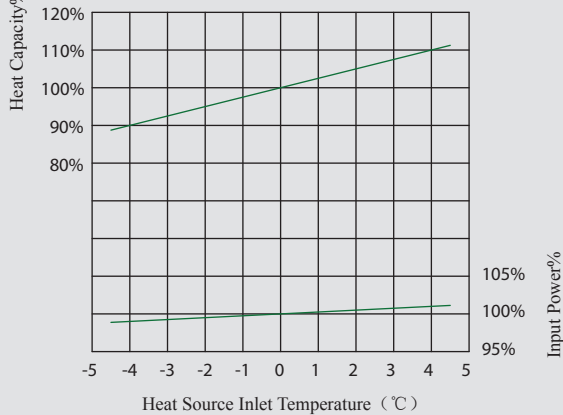
### Performance curve of the geothermal heat pump in refrigeration condition



Note:

- When the cooling capacity is 100%, the following is inlet/outlet temperature at different port: cooling water inlet/outlet temperature is 25/30°C, Cooled water inlet/outlet temperature is 12/7°C.
- The performance curves are obtained by the cooling water inlet/outlet temperature being 12/7°C, and inlet/outlet temperature difference being 5°C, if the value of temperature and the difference is changed, the curve will be changed too.
- The secondary refrigerant is glycol solution which volume concentration is 25%, if it is water, please refer to the curve of water source heat pump

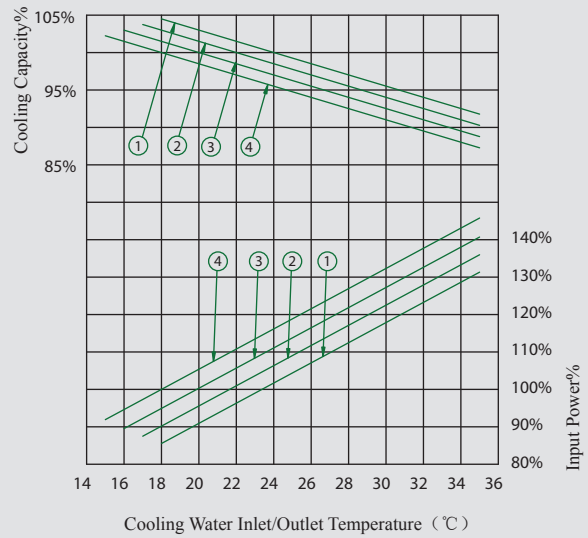
### Performance curve of the geothermal heat pump in heat condition



Note:

- When the cooling capacity is 100%, the following is inlet/outlet temperature at different port: hot water inlet/outlet temperature is 40/45°C, Heat source water inlet/outlet temperature is 0/-3°C.
- The performance curves are obtained by the hot water inlet/outlet temperature being 40/45°C, and heat source inlet/outlet temperature difference being 3°C, if the value of temperature difference is changed, the curve will be changed too.
- The secondary refrigerant is glycol solution which volume concentration is 25%, if the heat source is high and using water as cooling water, please refer to the curve of water source heat pump
- Only part parameters are marked in the curve.

### Performance curve of the water source heat pump in refrigeration condition

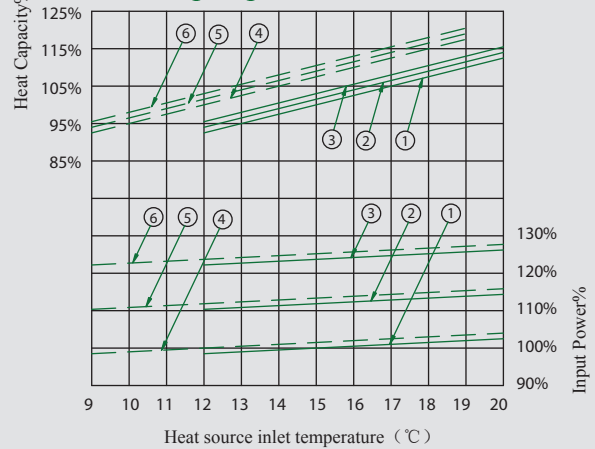


- Curve 1: Cooling water inlet/outlet temperature difference is 5°C.
- Curve 2: Cooling water inlet/outlet temperature difference is 7°C.
- Curve 3: Cooling water inlet/outlet temperature difference is 9°C.
- Curve 4: Cooling water inlet/outlet temperature difference is 11°C.

Notes:

- When the cooling capacity is 100%, the inlet/outlet cooling water temperature is 18/29°C, and the inlet/outlet cooled water temperature is 12/7°C
- The performance curves are obtained by the cooled water inlet/outlet temperature being 12/7°C, if the value of temperature difference is changed, the curve will be changed too.
- Only part parameters are marked in the curve.

### Performance curve of the water source heat pump in heat condition

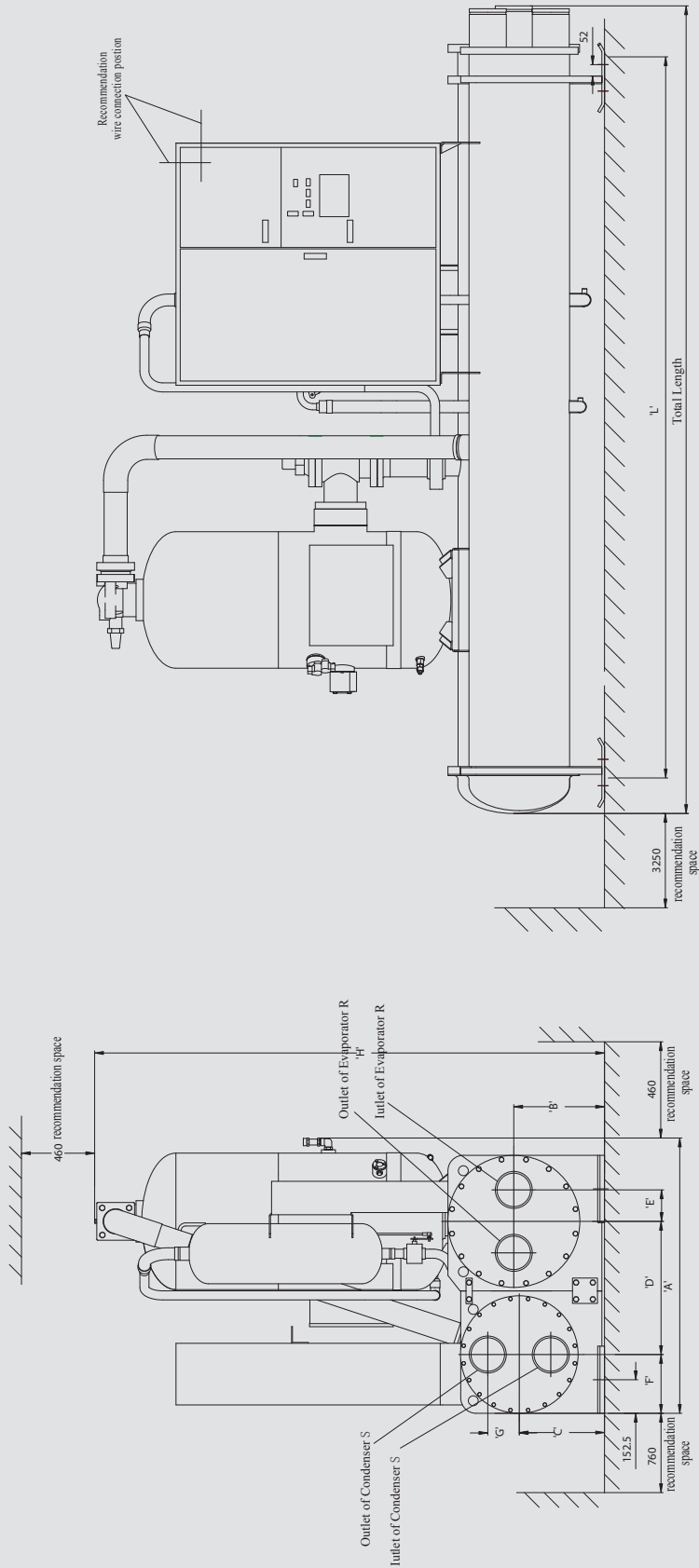


- Curve 1: Hot water outlet temperature is 45°C, and heat source water inlet/outlet temperature difference is 8°C.
- Curve 2: Hot water outlet temperature is 50°C, and heat source water inlet/outlet temperature difference is 8°C.
- Curve 3: Hot water outlet temperature is 55°C, and heat source water inlet/outlet temperature difference is 8°C.
- Curve 4: Hot water outlet temperature is 45°C, and heat source water inlet/outlet temperature difference is 5°C.
- Curve 5: Hot water outlet temperature is 50°C, and heat source water inlet/outlet temperature difference is 5°C.
- Curve 6: Hot water outlet temperature is 55°C, and heat source water inlet/outlet temperature difference is 5°C.

Note:

- When the cooling capacity is 100%, the following is inlet/outlet temperature at different port: hot water inlet/outlet temperature is 40/45°C, Heat source water inlet/outlet temperature is 15/7°C.
- The performance curves are obtained by the hot water inlet/outlet temperature being 40/45°C, if the value of temperature difference is changed, the curve will be changed too.
- Only part parameters are marked in the curve.

# WCFXHP10S-27S DIMENSION DATA

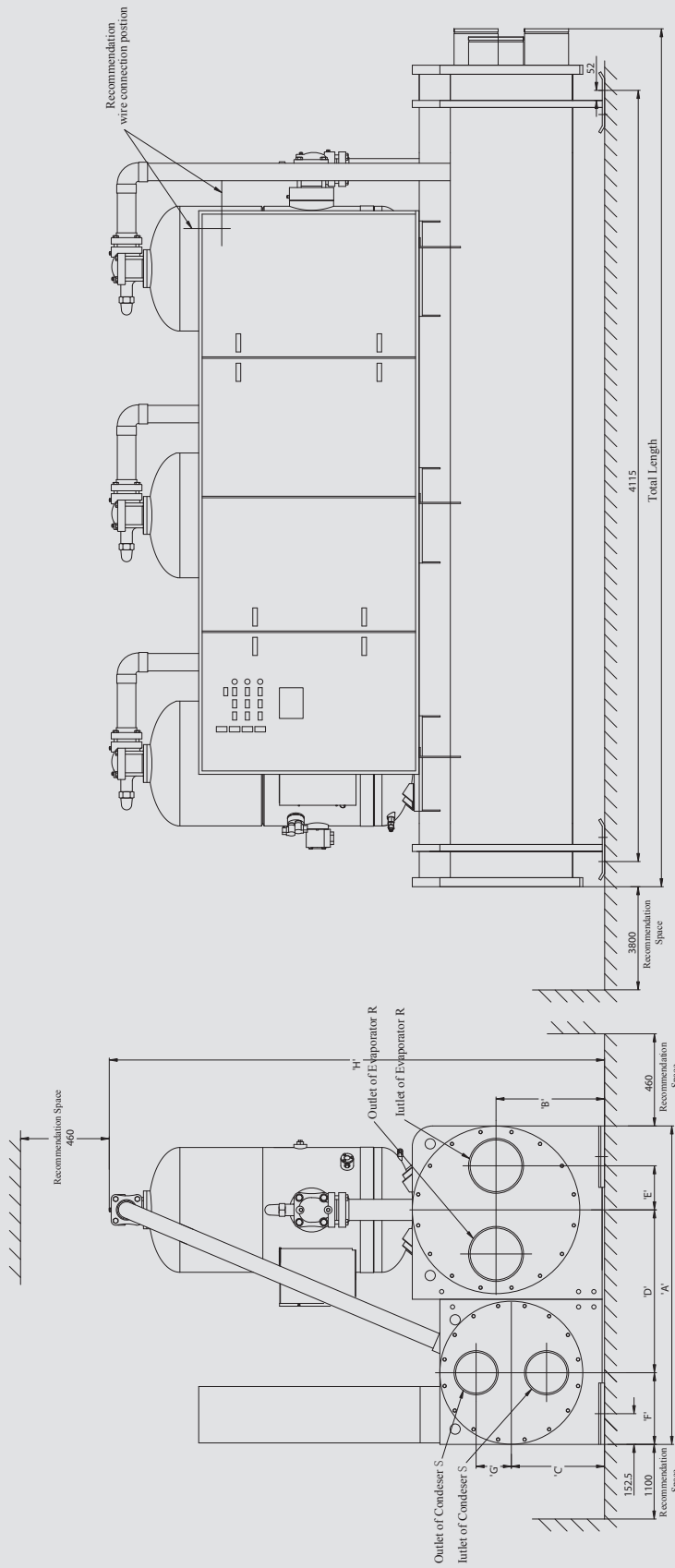


MODEL	Total Length	A	B	C	D	E	F	G	H	L	R	S
WCFXHP10S	3160	1070	348	321	540	102	200	100	1850	2693	5"	4"
WCFXHP12S	3160	1070	348	321	540	102	200	100	1850	2693	5"	4"
WCFXHP15S	3050	1100	374	333	546	130	200	118	1980	2693	5"	4"
WCFXHP18S	3200	1150	387	336	580	143	216	102	2030	2693	6"	5"
WCFXHP20S	3790	1230	417	391	606	143	241	115	2320	3277	6"	6"
WCFXHP23S	3790	1230	387	361	606	143	241	115	2290	3277	6"	6"
WCFXHP24S	3680	1230	417	417	581	143	267	143	2320	3277	6"	6"
WCFXHP27S	3680	1250	412	387	605	143	267	143	2350	3277	6"	6"

- Note:
1. Water Piping To Be Supported To Minimize Load On Unit.
  2. Expect water pipe dimension is in inch, the others are in millimeter.
  3. Vent and drain connections provided on evaporator and condenser.
  4. Sufficient room must be allowed for evaporator and condenser water connections.
  5. When looking at (2) pass evaporator head connections, water outlet is left connection, water inlet is right connection as supplied by factory. Customer may reverse this arrangement, but leaving water temperature sensor must be relocated to water outlet. All water nozzles are IPS, with victaulic grooves.
  6. DWG shows 2 pass right hand arrangement on both Con. and Evap.



# WCFXHP60-81 DENSION DATA



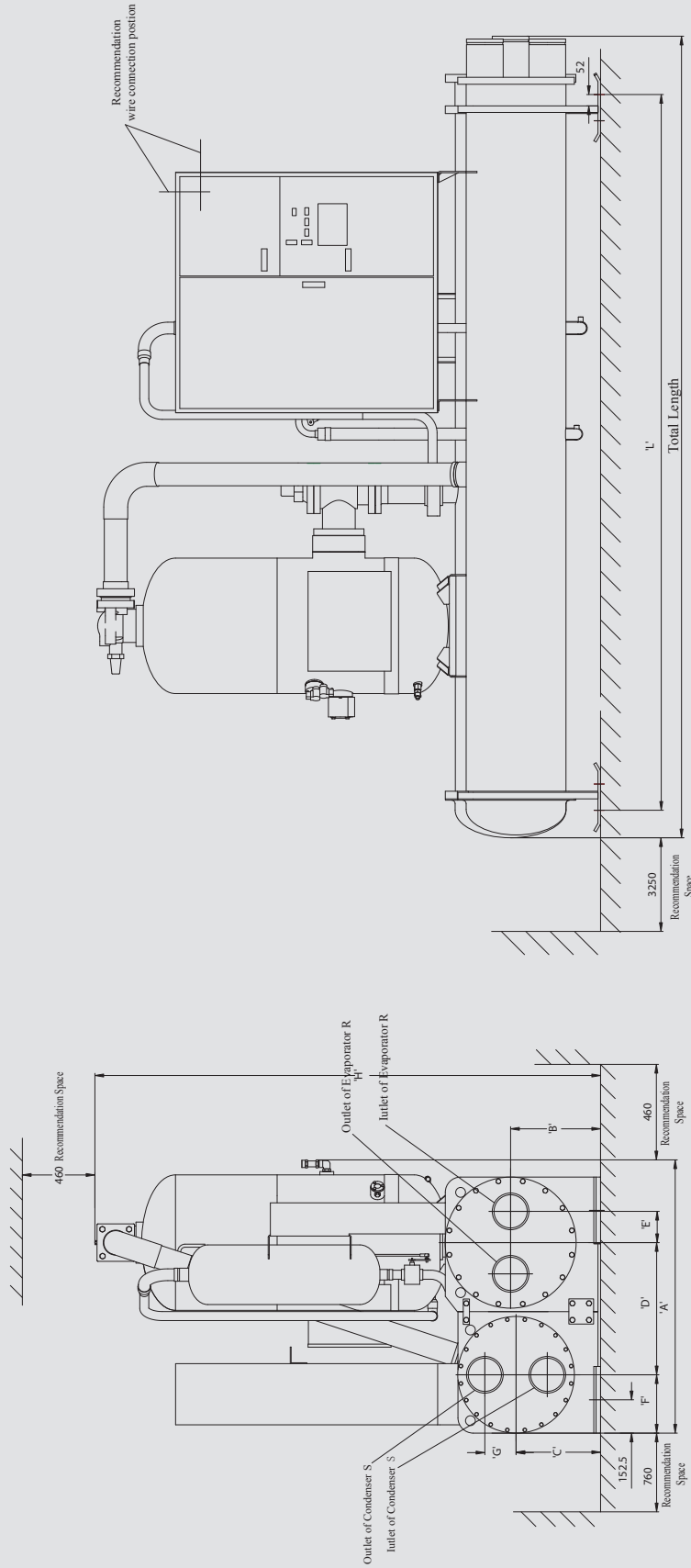
**Note:**

1. Water Piping To Be Supported To Minimize Load On Unit.
2. Expect water pipe dimension is in inch, the others are in millimeter.
3. Vent and drain connections provided on evaporator and condenser.
4. Sufficient room must be allowed for evaporator and condenser water connections.
5. When looking at (2) pass evaporator head connections, water outlet is left connection, water inlet is right connection as supplied by factory. Customer may reverse this arrangement, but leaving water temperature sensor must be relocated to water outlet. All water nozzles are IPS, with victaulic grooves.
6. DWG shows 2 pass right hand arrangement on both Com. and Evap.

MODEL	Total Length	A	B	C	D	E	F	G	H	R	S
WCFXHP60	4680	1525	538	513	758	190	356	202	2560	10"	10"
WCFXHP64	4680	1525	538	513	758	190	356	202	2560	10"	10"
WCFXHP69	4680	1525	538	513	758	190	356	202	2560	10"	10"
WCFXHP73	4720	1560	564	513	784	206	356	202	2600	10"	10"
WCFXHP77	4640	1585	564	538	809	206	359	190	2600	10"	10"
WCFXHP81	4520	1610	589	538	834	219	359	190	2650	10"	10"



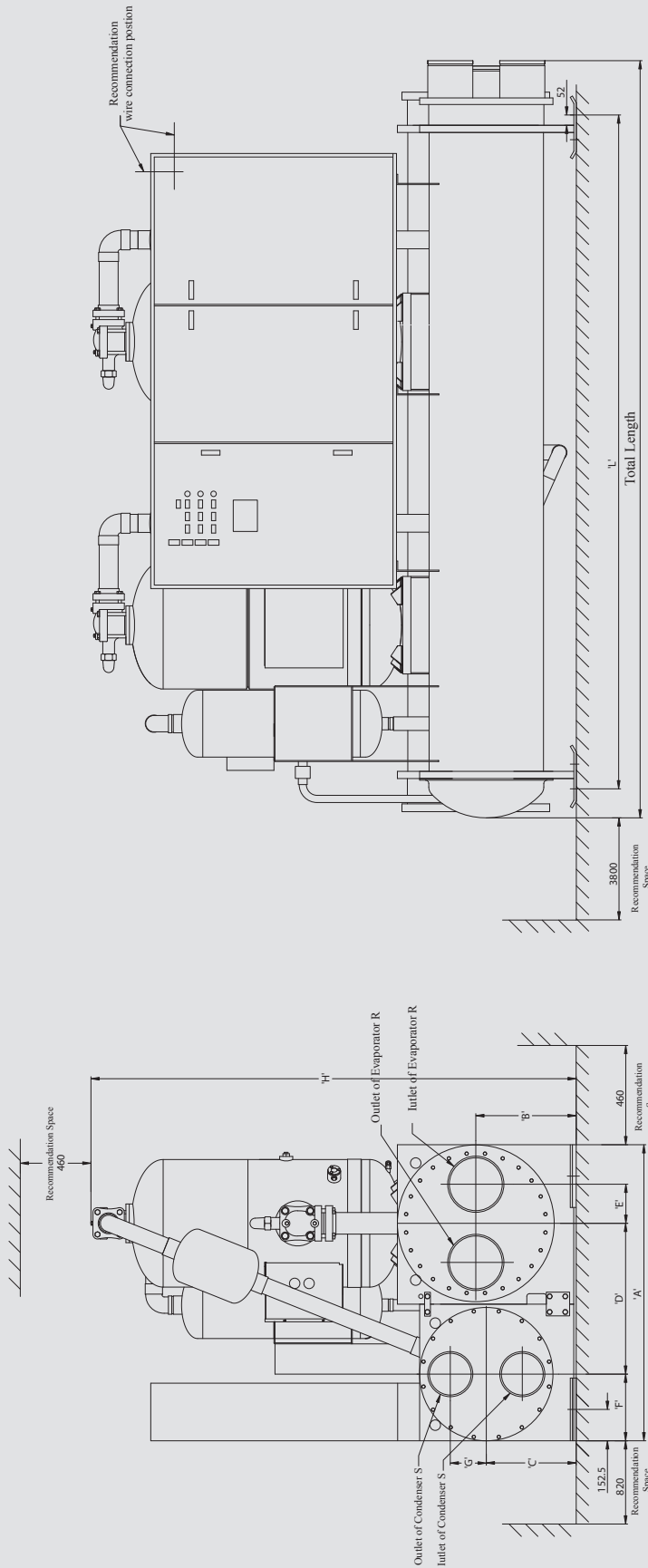
# WCFXHP10SR-30SR DIMENSION DATA



MODEL	Total Length	A	B	C	D	E	F	G	H	L	R	S
WCFXHP10SR	3120	1025	348	294	524	102	176	86	1850	2693	4"	4"
WCFXHP12SR	3120	1065	348	321	540	102	200	100	1850	2693	4"	4"
WCFXHP15SR	3120	1100	374	321	541	130	200	100	1990	2693	4"	4"
WCFXHP18SR	3200	1150	387	336	580	143	216	102	2030	2693	5"	5"
WCFXHP20SR	3770	1175	417	366	580	143	216	102	2320	3277	5"	5"
WCFXHP23SR	3770	1175	387	336	580	143	216	102	2290	3277	5"	5"
WCFXHP24SR	3770	1175	417	366	580	143	216	102	2320	3277	5"	5"
WCFXHP27SR	3790	1175	412	361	630	143	241	115	2340	3277	6"	6"
WCFXHP30SR	3790	1250	412	361	630	143	241	115	2340	3277	6"	6"

- Note:**
1. Water Piping To Be Supported To Minimize Load On Unit.
  2. Expect water pipe dimension is in inch, the others are in millimeter.
  3. Vent and drain connections provided on evaporator and condenser.
  4. Sufficient room must be allowed for evaporator and condenser water connections.
  5. When looking at (2) pass evaporator head connections, water outlet is left connection, water inlet is right connection as supplied by factory. Customer may reverse this arrangement, but leaving water temperature sensor must be relocated to water outlet. All water nozzles are IPS, with vicatulle grooves.
  6. DWG shows 2 pass right hand arrangement on both Con and Evap.

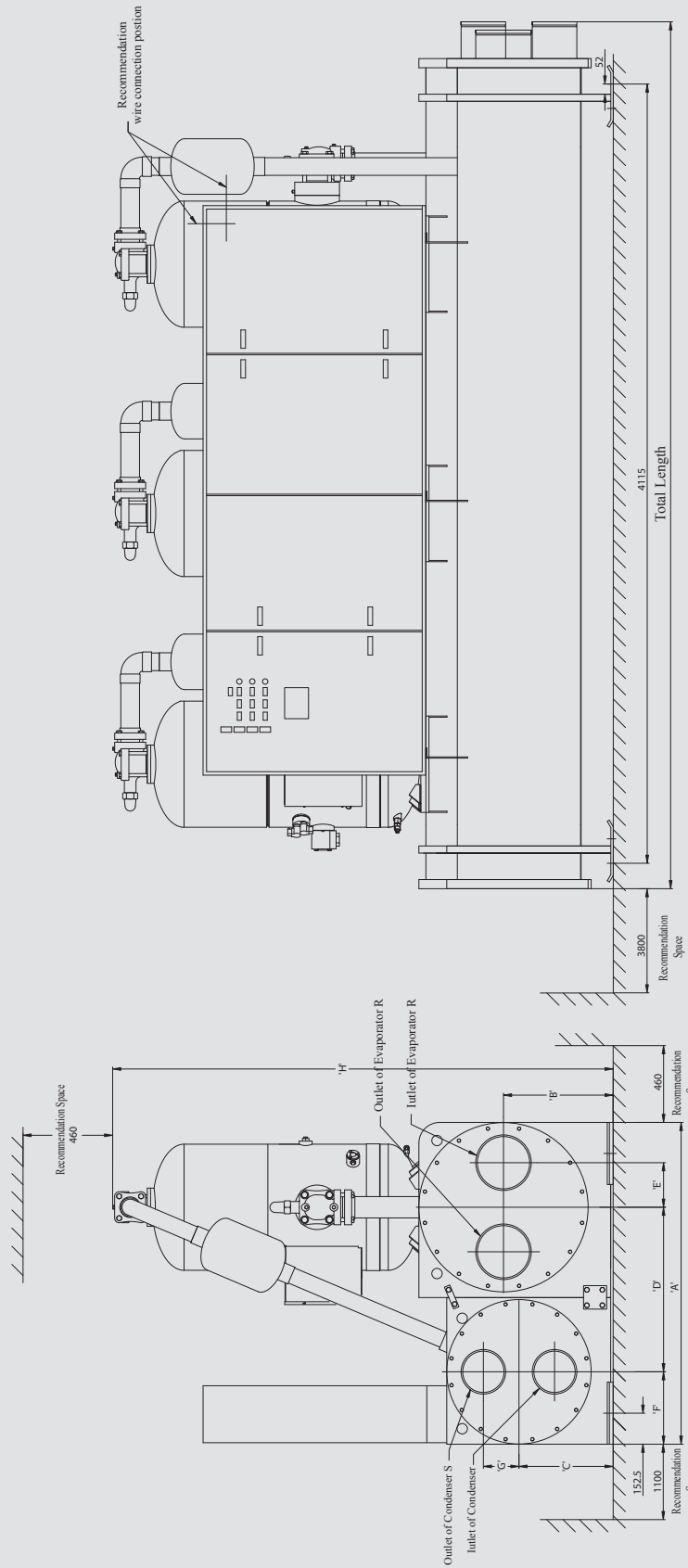
# WCFXHP33TR-60TR DIMENSION DATA



MODEL	Total Length	A	B	C	D	E	F	G	H	L	R	S
WCFXHP33TR	3790	1220	412	361	630	143	241	115	2180	3277	6"	6"
WCFXHP36TR	3680	1220	412	387	605	143	267	143	2180	3277	6"	6"
WCFXHP41TR	3690	1280	437	387	632	175	267	143	2400	3277	8"	6"
WCFXHP46TR	4400	1330	437	412	657	175	299	155	2400	3277	8"	8"
WCFXHP50TR	4400	1370	463	412	682	175	299	155	2450	3277	8"	8"
WCFXHP54TR	4400	1410	538	412	707	188	299	155	2555	3277	8"	8"
WCFXHP57TR	4430	1370	463	412	682	175	299	155	2455	3836	8"	8"
WCFXHP60TR	4430	1370	463	412	682	175	299	155	2455	3836	8"	8"

- Note:
1. Water Piping To Be Supported To Minimize Load On Unit.
  2. Expect water pipe dimension is in inch, the others are in millimeter.
  3. Vent and drain connections provided on evaporator and condenser.
  4. Sufficient room must be allowed for evaporator and condenser water connections.
  5. When looking at (2) pass evaporator head connections, water outlet is left connection, water inlet is right connection as supplied by factory. Customer may reverse this arrangement, but leaving water temperature sensor must be relocated to water outlet. All water nozzles are IPS, with victaulic grooves.
  6. DWG shows 2 pass right hand arrangement on both Con. and Evap.

# WCFXHP64R-81R DIMENSION DATA

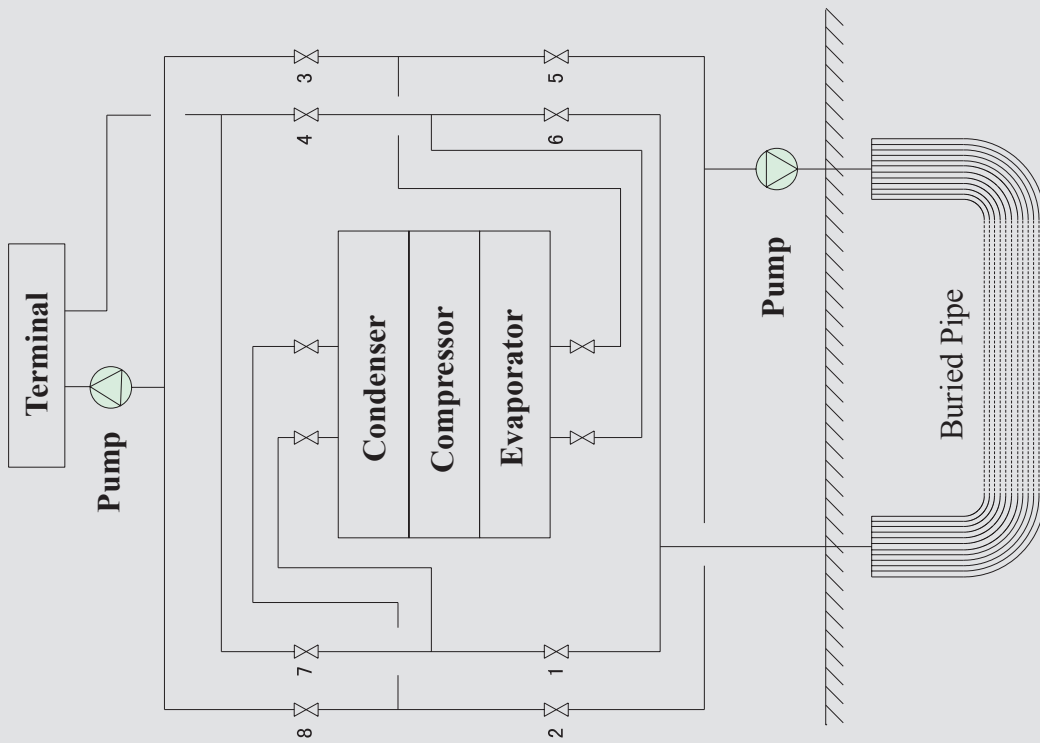


**Note:**

1. Water Piping To Be Supported To Minimize Load On Unit.
2. Expect water pipe dimension is in inch, the others are in millimeter.
3. Vent and drain connections provided on evaporator and condenser.
4. Sufficient room must be allowed for evaporator and condenser water connections
5. When looking at (2) pass evaporator head connections, water outlet is left connection, water inlet is right connection as supplied by factory. Customer may reverse this arrangement, but leaving water temperature sensor must be relocated to water outlet. All water nozzles are IPS, with vitaulite grooves.
6. DWG shows 2 pass right hand arrangement on both Con. and Evap.

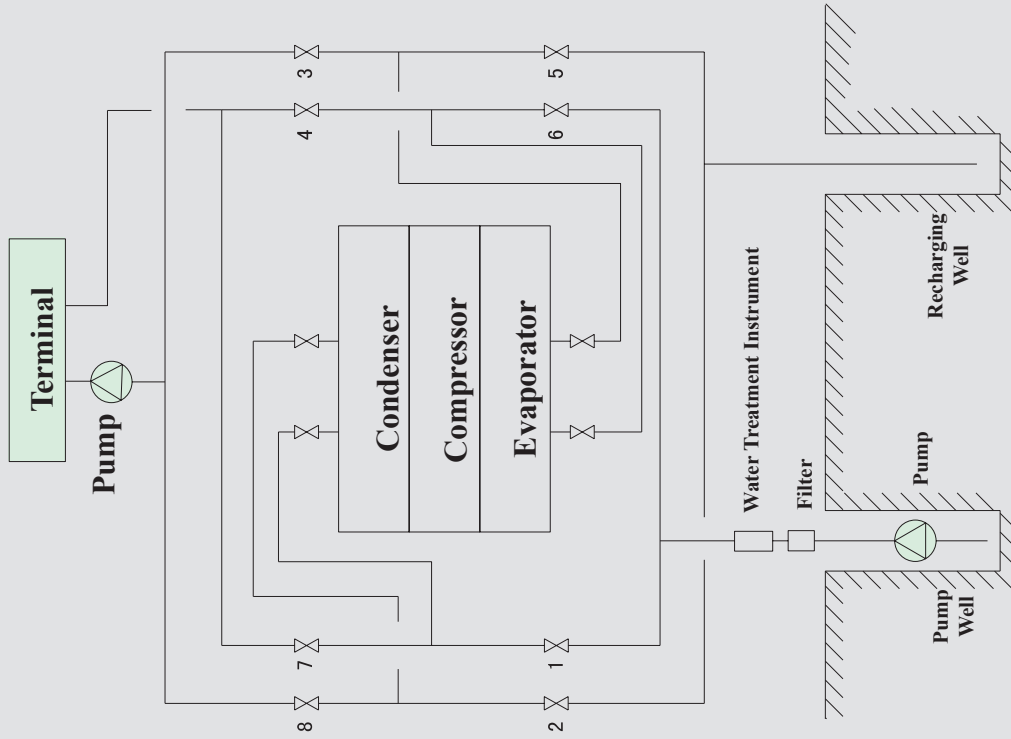
MODEL	Total Length	A	B	C	D	E	F	G	H	R	S
WCFXHP64R	4700	1400	513	462	682	175	299	155	2490	8"	8"
WCFXHP69R	4600	1465	538	487	733	188	324	175	2560	8"	8"
WCFXHP73R	4780	1500	564	487	759	206	324	202	2600	10"	10"
WCFXHP75R	4780	1500	564	487	759	206	324	202	2600	10"	10"
WCFXHP77R	4780	1500	564	487	759	206	324	202	2600	10"	10"
WCFXHP81R	4700	1560	564	513	784	206	356	202	2600	10"	10"

## Appendix A: Geothermal Heat Pump Water System



Refrigeration Condition : 1, 2, 3, 4 Valve Open; 5, 6, 7, 8 Valve Close  
 Heat Condition : 5, 6, 7, 8 Valve Open; 1, 2, 3, 4 Valve Close

## Appendix B: Water Source Heat Pump Water System



Refrigeration Condition : 1, 2, 3, 4 Valve Open; 5, 6, 7, 8 Valve Close  
 Heat Condition : 5, 6, 7, 8 Valve Open; 1, 2, 3, 4 Valve Close

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