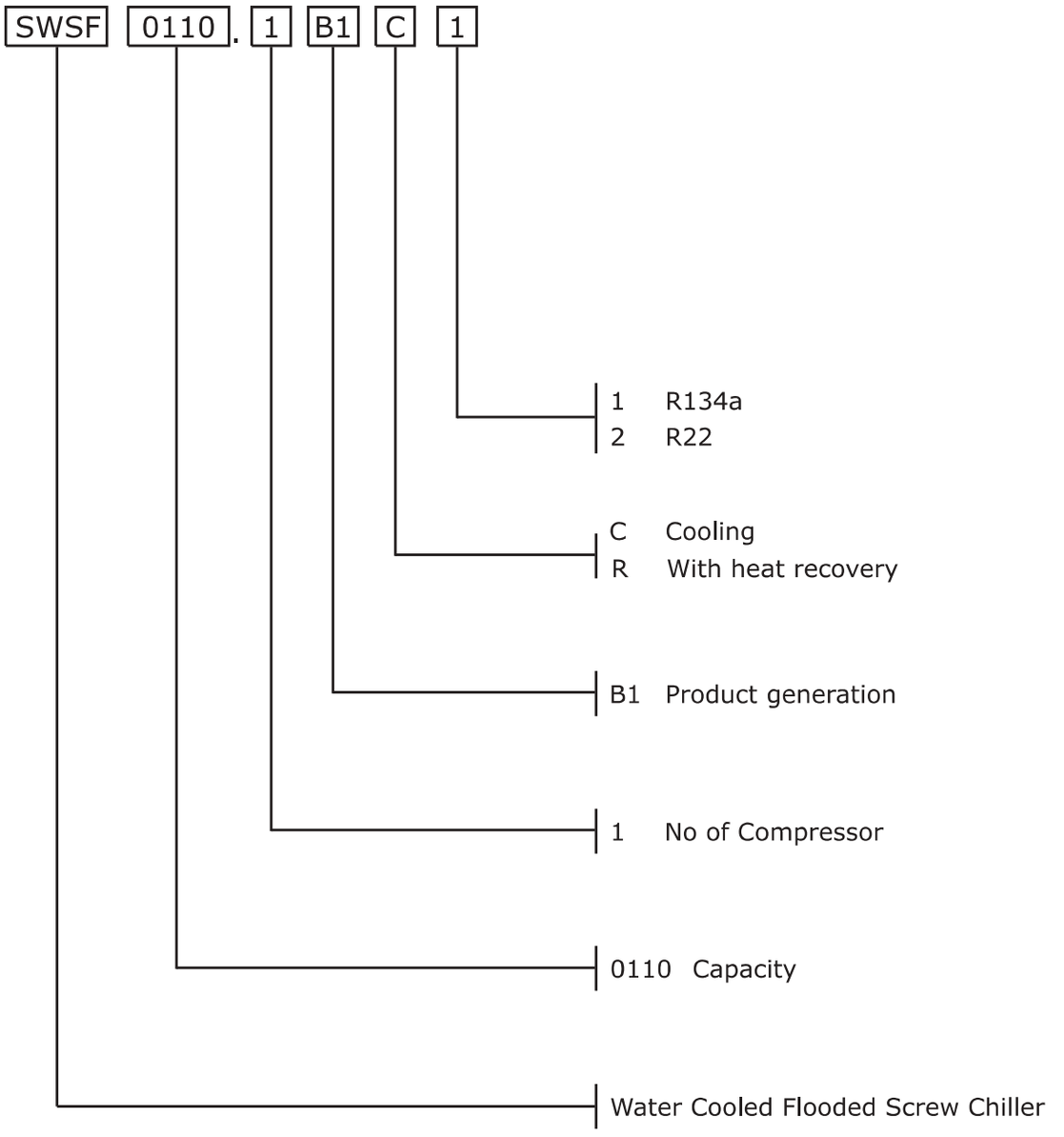
SAKURA®

Water Cooled Chiller

R410A
Eco-friendly Refrigerant

Product Nomenclature

Water Cooled Screw Chiller



Features

Stability

The system is equipped with proprietary refrigerant control technique, support by oil inducing mechanism that will ensure compressor to have sufficient oil supply all the time. The system is adopting multiple compressors with multiple circuits design that will eliminate the needs for oil balancing and as a result, a more reliable and stable performance.

High Efficiency

The compressors used in the system are specially designed for flooded chiller and from reputable compressors maker. The compressors come with a built in 2nd stage oil separator that greatly enhance the reliability of the compressor. When coupled with enhanced performance evaporator, the system is able to deliver high efficiency performance with reliability.

Energy Saving

The system is equipped with multiple capacity staging screw compressors controlled by PLC through temperature and pressure transducers. It is able to precisely control the systemt to ensure close adherence of system capacity versus load. As a result, the system is able to save energy by performing efficiently and at the same time satisfy the load requirement.

Flexibility

Wide range of products ranging from 95 to 755 RT is able to suite any size of installation and application needs.

Protection

Protections are provided for refrigerant system, electrical system and water system to ensure safe operation and to provide easy assessment of problems through effective alarm system. Example of protections are compressor's motor over-heat, compressor's motor over-current, unusual phase sequence, oil position too low, temperature discharge too high, pressure too high, pressure too low, freezing, power down, etc.

Intelligent

The system is controlled through PLC and user is able to monitor and change the system setting through user friendly touch screen panel. Connection to BMS through Ethernet, wired or wireless is possible through different type of gateways; Thus, providing the capability to monitor system operation and performance remotely.

Zero ODP

SWSF range of products offers R134a as one of its refrigerant as a commitment to reduce the emission of HCFC. Furthermore, the equipments are manufactured in a ISO14000 certified facility which complies to international standard for environmental management.

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Engineering Specifications

General Data

Model		SWSF-B1C2	0095.1	0110.1	0140.1	0180.1	0190.1	0250.1	0280.2	0315.2	0360.2	0405.2	0470.2	0500.2
Cooling Capacity		kW	338	394	494	637	668	882	987	1114	1260	1420	1655	1764
Power Source		V/Ph/Hz	380 /3 / 50											
Refrigerant			R22											
Capacity Control			Stepless Control											
Compressor	Quantity		1	1	1	1	1	1	2	2	2	2	2	2
	Nominal Running Current	A	120	134	170	201	250	287	340	366	451	500	532	574
	Locked Rotor Ampere	A	318	354	453	595	595	718	683	790	933	933	1024	1105
	Maximum Operating Current	A	162	181	230	271	338	387	459	494	609	675	718	775
	Power Input	kW	72	72	93	117	129	163	186	208	258	271	285	327
Evaporator	Design Pressure	MPa	1.0											
	Water Flow Rate	m^3/h	58	68	85	110	115	152	170	192	217	244	285	303
	Pressure Drop	kPa	35	35	40	40	40	40	75	75	75	75	80	80
	Water Pipe Diameter	DN	125			150					200			
	Design Pressure	MPa	1.0											
Condenser	Water Flow Rate	m^3/h	71	82	102	131	140	180	203	233	266	294	338	361
	Water Pressure Drop	kPa	45	45	50	50	50	50	85	85	85	85	90	90
	Water Pipe Diameter	DN	125			150					200			
Dimension	Length	mm	3345	3345	3580	3585	3585	3600	4485	4500	4500	4500	4515	4515
	Width	mm	1180	1180	1260	1340	1340	1460	1460	1460	1560	1560	1660	1660
	Height	mm	1670	1670	1670	1760	1760	1820	1820	1780	1870	1870	1920	1920
Weight		kg	2700	2950	3250	3450	3700	4200	5300	5690	6200	6710	7430	7850
Operating Weight		kg	2840	3100	3400	3600	3880	4450	5450	5875	6400	6940	7680	8400

Model		SWSF-B1C2	0500.3	0520.3	0555.3	0585.3	0700.3	0755.3
Cooling Capacity		kW	1751	1832	1952	2053	2457	2646
Power Source		V/Ph/Hz	380 / 3 / 50					
Refrigerant			R22					
Capacity Control			Stepless Control					
Compressor	Quantity		3	3	3	3	3	3
	Nominal Running Current	A	603	652	701	750	798	861
	Locked Rotor Ampere	A	1138	1138	1270	1270	1383	1493
	Maximum Operating Current	A	814	880	946	1013	1077	1162
	Power Input	kW	366	387	400	414	427	490
Evaporator	Design Pressure	MPa	1.0					
	Water Flow Rate	m^3/h	301	315	336	353	423	455
	Pressure Drop	kPa	80	80	80	80	85	85
	Water Pipe Diameter	DN	200		250			
Condenser	Design Pressure	MPa	1.0					
	Water Flow Rate	m^3/h	364	382	407	429	507	541
	Water Pressure Drop	kPa	90	90	90	90	95	95
	Water Pipe Diameter	DN	200		250			
Dimension	Length	mm	4665	4780	4780	4780	4800	4850
	Width	mm	2200	2200	2200	2200	2600	2600
	Height	mm	1970	2070	2070	2070	2070	2120
Weight		kg	8240	8380	8520	8670	9250	9690
Operating Weight		kg	8820	9000	9170	9350	10000	10500

Note:
1. Products are designed and tested in accordance to GB/T 18430.1
2. Cooling capacity is based on 12°C entering and 7°C leaving chilled water temperature; 30°C entering and 35°C leaving cooling water temperature.
3. Power supply is 380V/50Hz with allowable voltage fluctuation of ±10%
4. The manufacturer reserves the rights to make changes to the above specifications without prior notice.

General Data

Model		SWSF-B1C1	0130.1	0145.1	0160.1	0180.1	0205.1	0240.2	0260.2	290.2	0320.2	0365.2	0405.2
Cooling Capacity		kW	454	512	567	640	715	851	906	1023	1134	1280	1429
Power Source		V/Ph/Hz	380 / 3 / 50										
Refrigerant			R134a										
Capacity Control			Stepless										
Compressor	Quantity		1	1	1	1	1	2	2	2	2	2	2
	Nominal Running Current	A	195	220	240	270	305	345	390	440	480	540	610
	Locked Rotor Ampere	A	453	595	783	876	1062	583	697	873	1108	1242	1468
	Maximum Operating Current	A	263	297	324	365	412	419	489	556	651	732	813
	Power Input	kW	103	116	129	145	162	182	206	232	258	291	325
Evaporator	Design Pressure	MPa	1.0										
	Water Flow Rate	m^3/h	78	88	97	110	123	146	156	176	195	220	246
	Pressure Drop	kPa	68	68	68	68	68	70	70	70	70	70	70
	Water Pipe Diameter	DN	125	150						200			
Condenser	Design Pressure	MPa	1.0										
	Water Flow Rate	m^3/h	96	108	119	134	151	179	191	216	239	269	302
	Water Pressure Drop	kPa	75	75	75	75	75	80	80	80	80	80	80
	Water Pipe Diameter	DN	125	150						200			
Dimension	Length	mm	3285	3285	3585	3585	3600	4470	4470	4500	4500	4500	4515
	Width	mm	1300	1340	1340	1340	1400	1340	1340	1460	1560	1560	1660
	Height	mm	1710	1710	1730	1730	1790	1710	1710	1820	1870	1870	1990
Weight		kg	3660	4130	4600	4800	4900	5960	6565	7500	8120	8760	9400
Operating Weight		kg	3840	4380	4900	5130	5250	6380	6985	7950	8660	9350	10050

Note:
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2. Cooling capacity is based on 12°C entering and 7°C leaving chilled water temperature; 30°C entering and 35°C leaving cooling water temperature.
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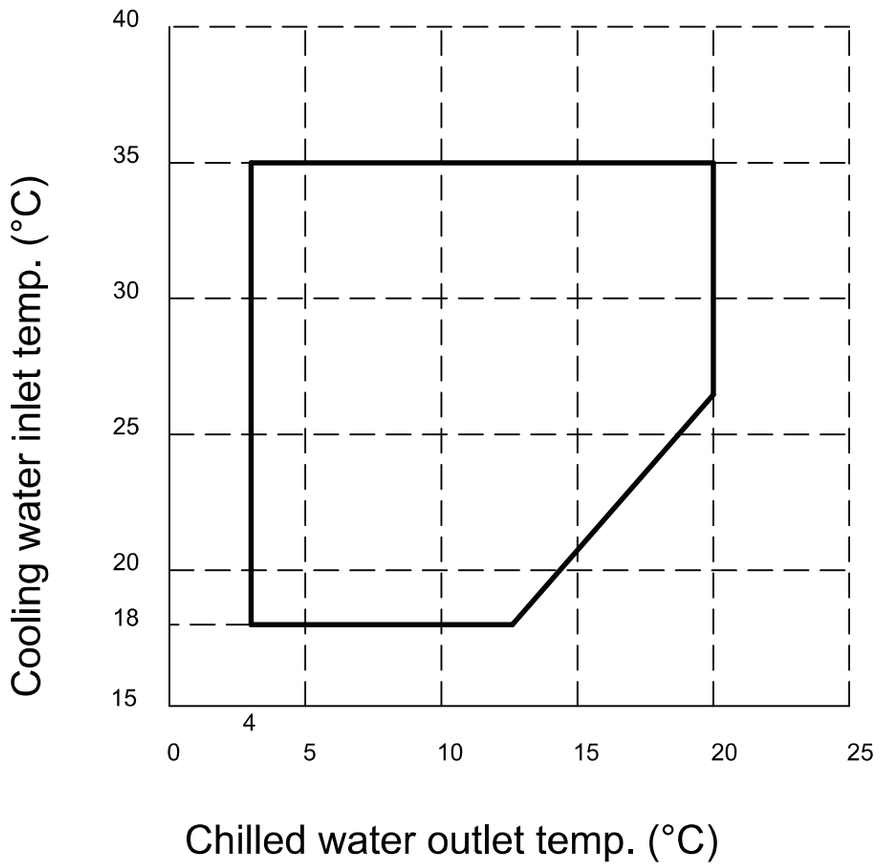
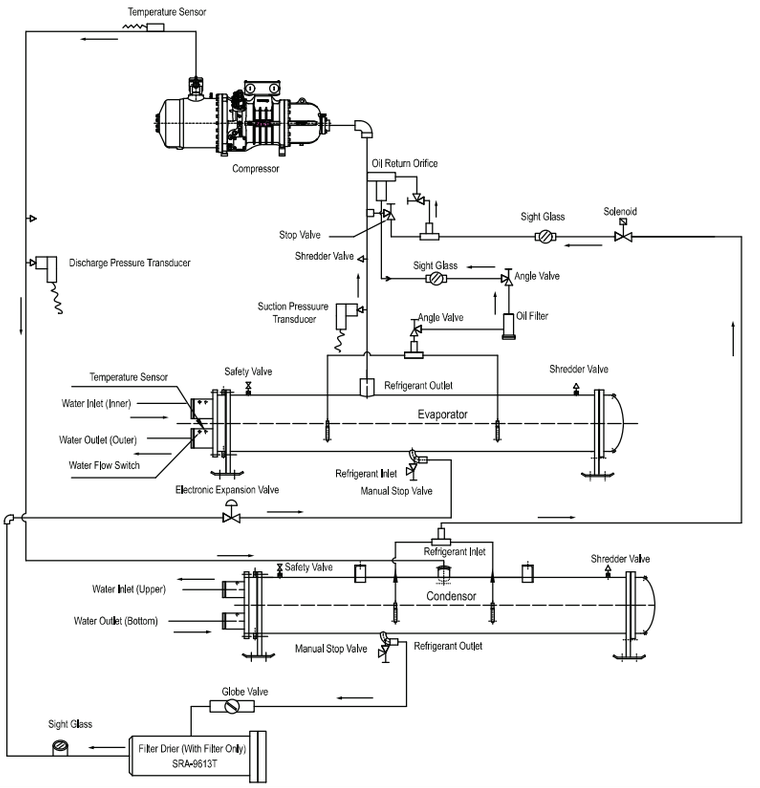
Operating Range

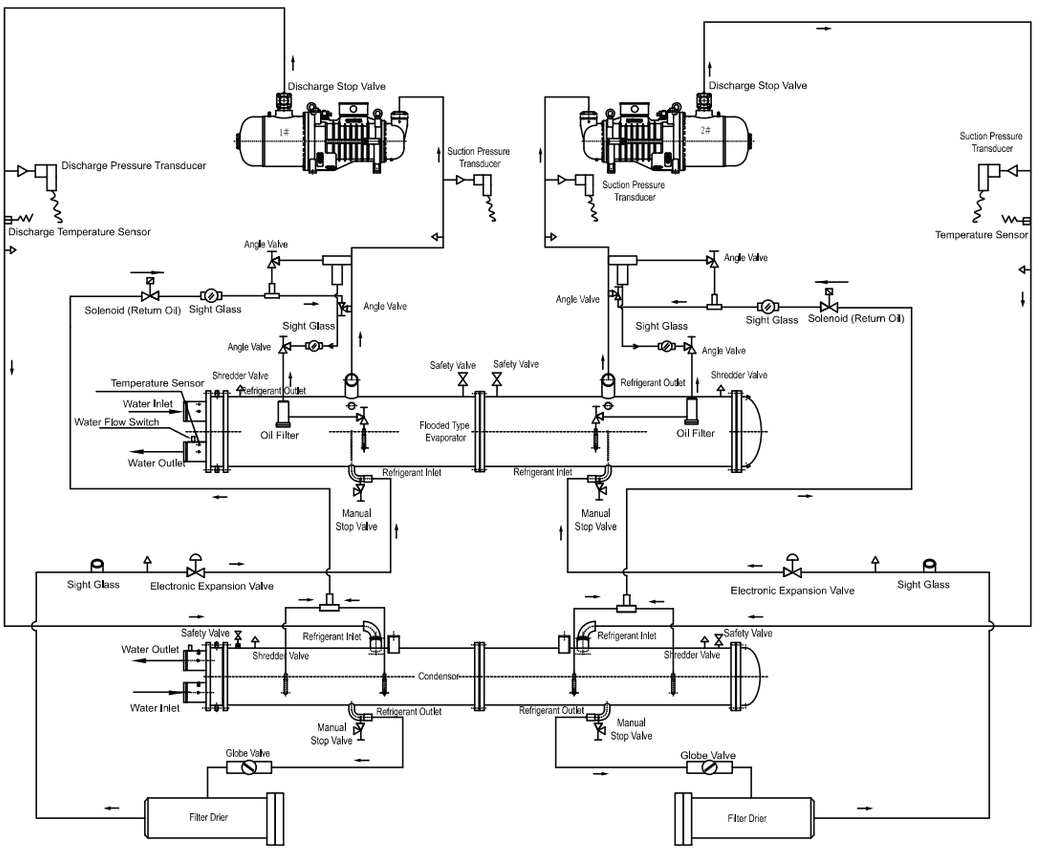


System Schematic Diagram

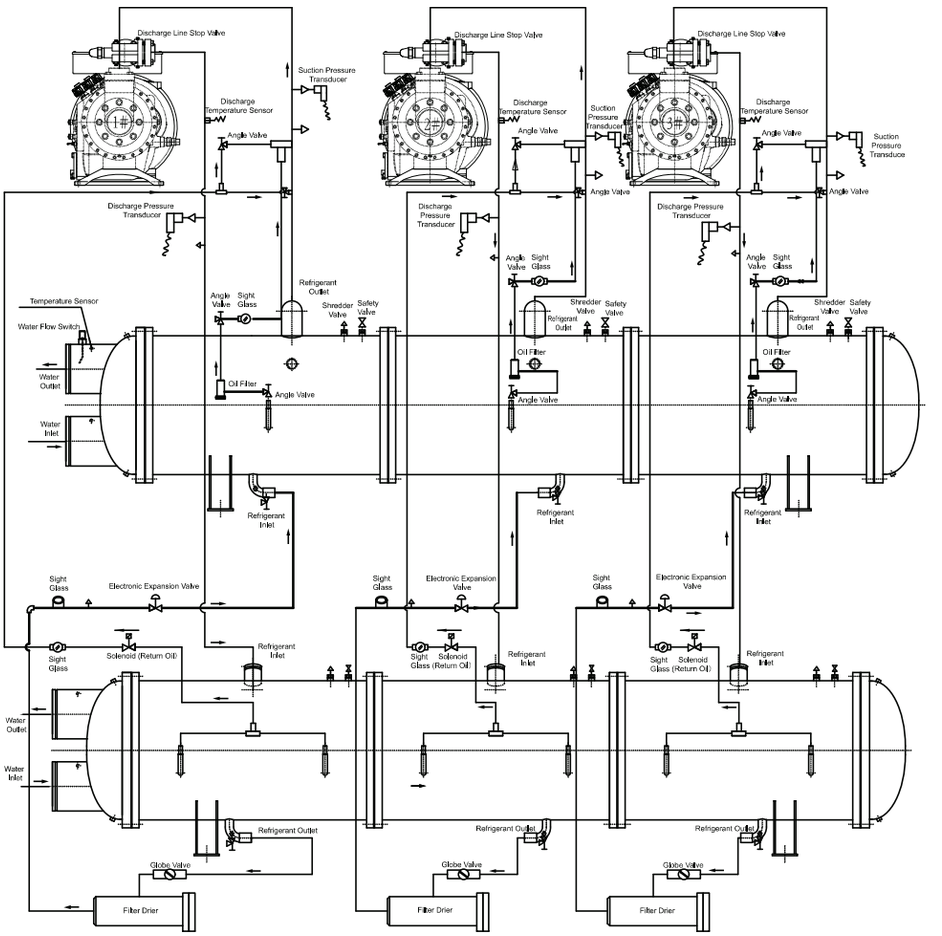
Single Compressor System



Twin Compressors System



Three Compressors System



Controller Features and Algorithm

PLC (Programmable Logic Controller) is used as the primary control for the system. The PLC is attached to a Touch Screen Panel, which allows the user to monitor or set the operating parameters. At the same time, the Touch Screen Panel also capable of displaying messages and also provide alrams if the system is diagnosed to be in trouble. In the following paragraph, the detail functions of each screen of the Tuuch Screen Panel are explained.

1) Start Up Screen

In this start up screen, unit model name is shown with the brand logo and web site. User needs to touch the screen once to go to the next screen.

2) Main Menu

Submenus:

1. Basic Operations
2. Para. Setting (Parameters Setting)
3. Alarm Para. (Alarm Parameters)
4. Current Alarms
5. Status Inquiries
6. Calibration
7. System Para. (System Parameters)
8. Alarms History

Basic Operations – This sub-menu is to be used by operator of equipment for daily operation. Functions included in this sub-menu are unit on/off, basic parameters setting and basic data monitoring.

Para. Setting – To be used by engineer who operates the equipment. In this sub-menu, user is able to set the operating parameters and limit the setting of some parameters. Password needed in order to access.

Alarm Para. – This sub-menu is not available to user, factory setting only. In this sub-menu, factory is able to set the current, discharge temperature, discharge pressure, etc. Factory password needed in order to access.

Current Alarms – This sub-menu allows the user to view all the current alarms. No password needed in order to access.

Status Inquiries – To be used by engineer who operates the equipment. In this sub-menu, user is able to check all the operating parameters. Password needed in order to access.

Calibration – To be used by engineer who operates the equipment. In this sub-menu, user is able to calibrate all measured parameters. Password needed in order to access.

System Para. – This sub-menu allows the user to set system parameters such as communication parameters setting. Password needed in order to access.

Alarms History – This sub-menu allows the user to view all the past alarms in chronological order. No password needed in order to view but factory password is required to delete.

Note: Remember to press [Exit] after checking or modifying the parameters to prevent any accidental change of parameters.

3) [Basic Operations] Screen

i) Basic Operations (Page 1)

System Operation – To show system status. "ON" when system is in operation, "OFF" when system is not operating.

Chilled Water Flow Switch – To show external chilled water flow switch ON/OFF status. When system is in operation, make sure chilled water flow is according to the system requirement.

Cooling Water Flow Status – To show cooling water flow switch ON/OFF status. Make sure cooling water flow normally during operation.

Power Protection – To show power supply protection status. When there is a problem relating to phase reverse, phase imbalance or large fluctuation in voltage, the system will stop operation and display alarm message.

Chilled Water Outlet – To show evaporator leaving water temperature.

Calculation of total capacity – The calculation of capacity demand base on the set temperature and operating temperatures.

Outside Ambient Temperature – To show the ambient temperature.

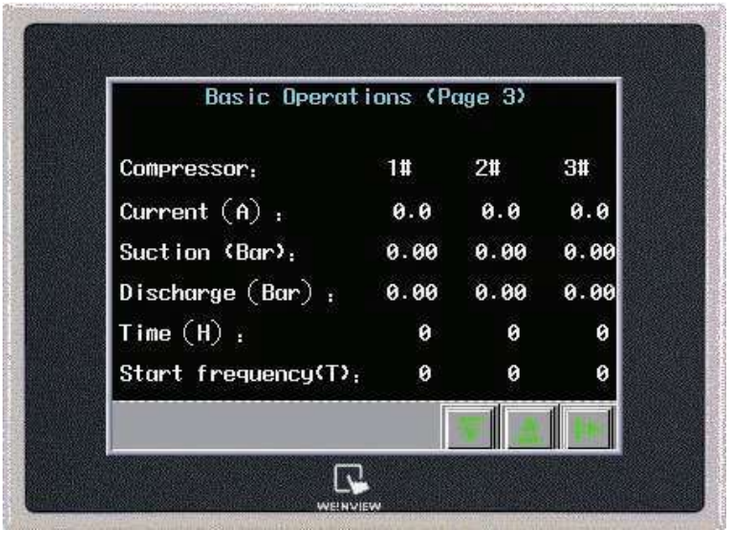
ii) Basic Operations (Page 2)

1#, 2#, 3# Compressor Status – To show the operating status of compressor 1, 2 and 3. Status: ON/OFF and Normal/Standby.

Compressor Operating Parameters:

Target – The target capacity to achieve.
Actual Capacity – The current actual operating capacity.
Standby – Time left for compressor to restart after shut down. It will be allowed to restart when the standby time reaches 0 second.

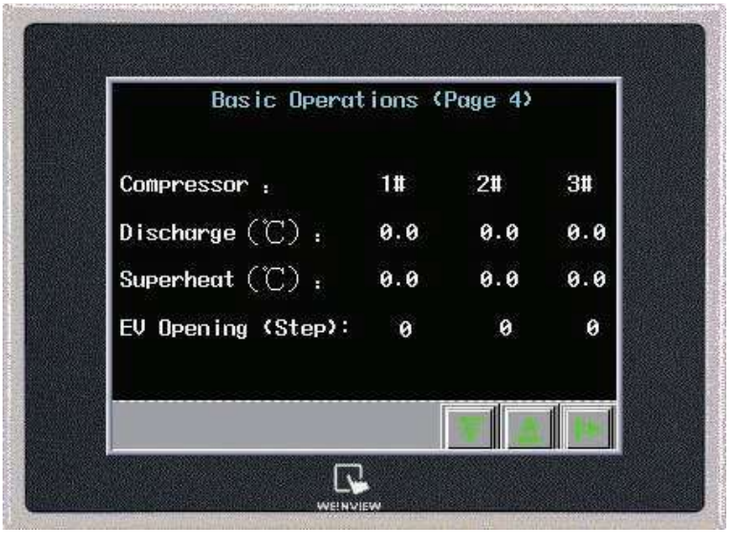
iii) Basic Operations (Page 3)



Compressor Parameters:

Current (A) – Current running ampere.
Suction (Bar) – Current suction pressure.
Discharge (Bar) – Current discharge pressure.
Time (H) – Elapsed time of operation.
Start Frequency (T) – Frequency of start.

iv) Basic Operation (Page 4)



Compressor Parameters:

Discharge (°C) – Discharge temperature.
Superheat (°C) – Superheat temperature.
EV Opening – Expansion valve opening.

v) Basic Operations (Page 5)

Temperature Setting For Cooling – To control the cooling temperature base on the chilled water leaving temperature.

When the unit is on, if the chilled water leaving temperature is higher than the set temperature, unit will increase output capacity. If the chilled water leaving temperature is lower than the set temperature, unit will unload and decrease the output capacity. The allowable water temperature setting is ranging from 5°C to 25°C. Default factory setting is 7°C.

Dead Zone Temperature – To set the temperature offset from the set temperature to decide the loading and unloading of compressors.

If the chilled water leaving temperature ≥ Set Temperature + Dead Zone Temperature, compressor will start loading. If the chilled water leaving temperature ≤ Set Temperature - Dead Zone Temperature, compressor will be unloading. Compressor will shut down when system operates at the lowest load to save energy. Temperature difference for dead zone should not be set to be too low as it will cause the compressor to start and stop frequently which will shorten the lifespan of compressor and cause additional energy consumption. It is advisable to set a the Dead Zone Temperature in the range of 0.5°C to 5°C and factory default setting for Dead Zone Temperature is 1.5°C.

vi) Basic Operations (Page 6)

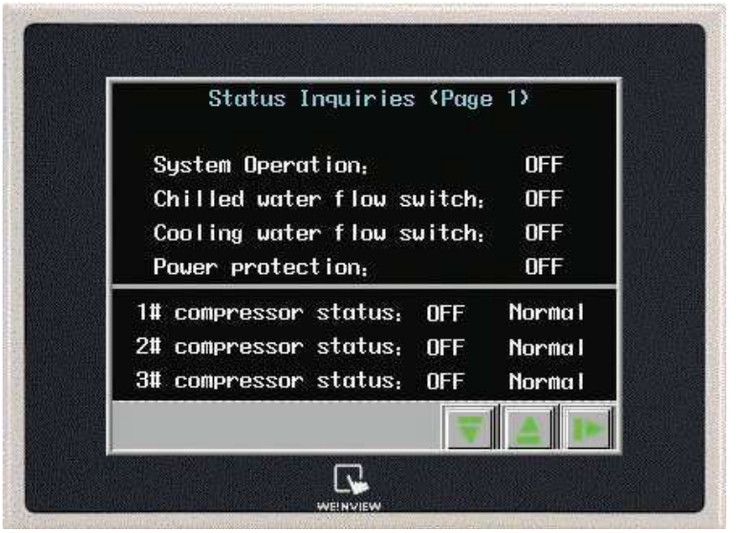
Energy-Saving Settings:

Enable/Disable	–	When it is enabled, the system will automatic adjust the leaving water temperature base on the changes of ambient temperature to achieve more energy saving.
Ambient Temperature Change	–	To set the range of ambient temperature.
Water Set Temperature Change	–	To set the corresponding range of water set temperature.
Current Ambient Temperature	–	Current ambient temperature.
Current Water Set Temperature	–	Current water set temperature.

4) [Status Inquiries] Screen

Under this menu, user will be able to check the readings of various snesors, status of compressors and other system information. User also able to modify some parameters for operating conditions monitoring.

i) Status Inquiries (Page 1)

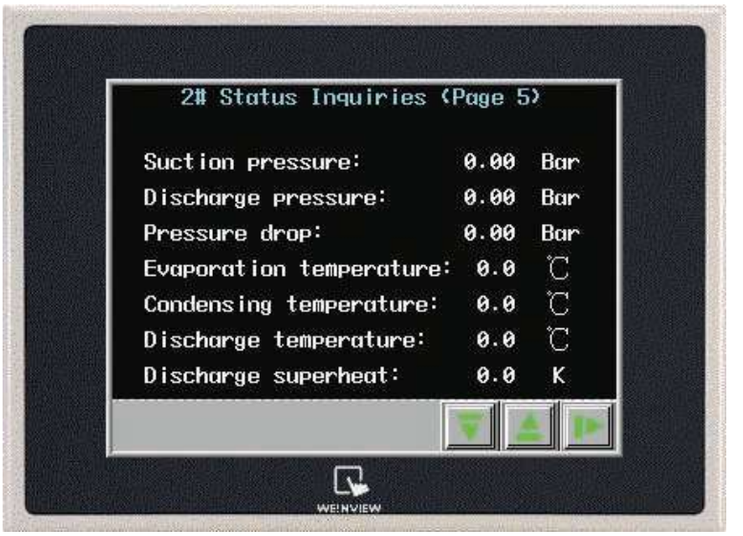


ii) Status Inquiries (Page 2)

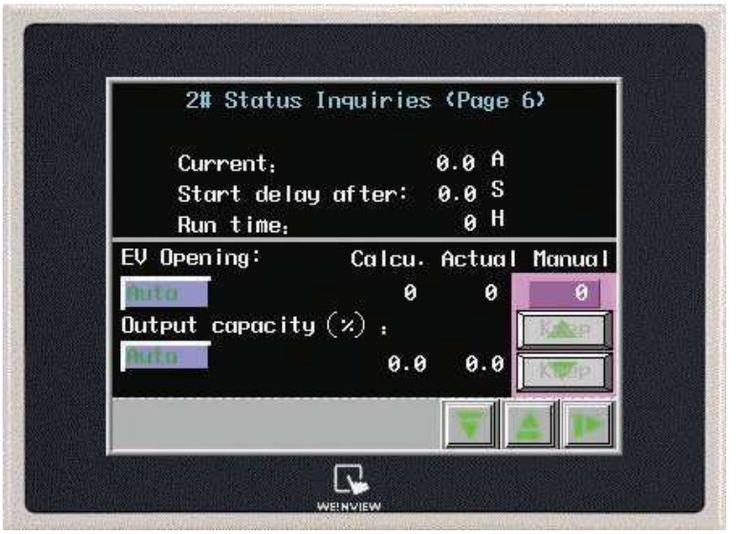
iii) Status Inquiries (Page 3)

iv) Status Inquiries (Page 4)

v) Status Inquiries (Page 5)

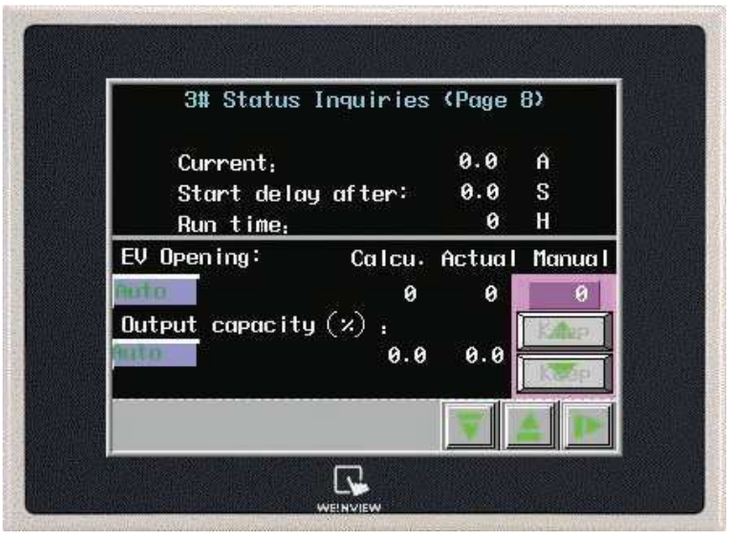


vi) Status Inquiries (Page 6)



vii) Status Inquiries (Page 7)

viii) Status Inquiries (Page 8)



5) [Para. Setting] Screen (Parameters Setting)
This is the menu for user to set the operating and control parameters of the system.

i) Para. Setting (Page 1)

Temperature Setting For Cooling – Refer to Basic Operations (page 5).
Dead Zone Temperature – Refer to Basic Operations (page 5)
Temperature Control_P, I, D – Temperature control PID setting allow system to operate in a more stable and reliable condition. Temperature Control_P range is from 5 to 600 and the factory default setting is 25. Temperature Control_I range is from 0.5 to 10 and the factory default setting is 2. Temperature Control_D range is from 0 to 10 and the factory setting is 0. It is advisable to set the Temperature Control_D value to 0 to prevent system unstable.

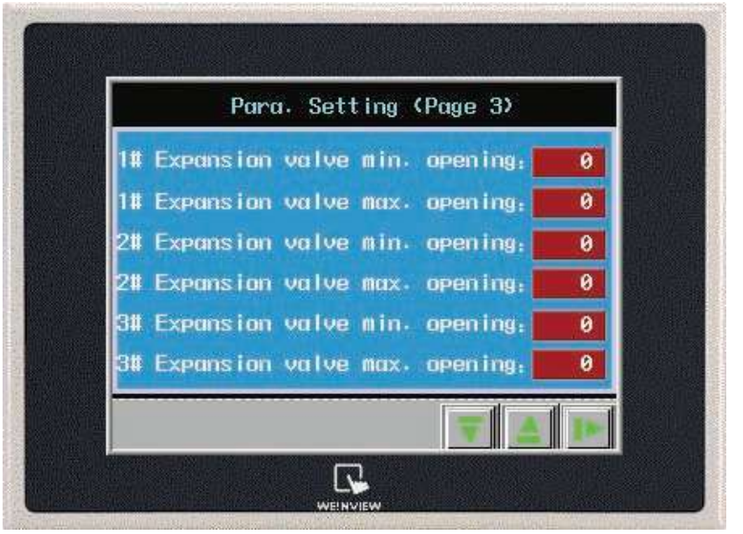
ii) Para. Setting (Page 2)

Note: Each compressor has its own superheat setting depends on the evaporating condition.

n# System Superheat – To set the superheat temperature for system 'n'. The superheat setting range is from 10°C to 35°C and at default, it has been set base on the factory testing condition.

System Superheat_P, I, D – Superheat PID setting allow system to operate in a more stable and reliable condition. System superheat_P range is from 5 to 600 and factory default setting is 12. System superheat_I range is from 0.5 to 10 and factory default setting is 1.8. System superheat_D range is from 0 to 10 and factory default setting is 0. It is advisable to set the D value as 0 to prevent system unstable.

iii) Para. Setting (Page 3)



n# Expansion Valve Min/Max Opening - To set the maximum and minimum opening of expansion valve for system 'n' to prevent vibration during superheat adjustment.

The minimum opening is set slightly smaller than the valve opening correspond to when compressor is running at lowest load. The maximum opening is set slightly higher than the valve opening correspond to when compressor is running highest load.

iv) Para. Setting (Page 4)

n# Compressor full load current – To set the full load current of 'n' compressor.

v) Para. Setting (Page 5)

Running Capacity Restriction – To limit the total running capacity of the system.

Running Capacity Maximum Restrictions – To set the maximum running capacity restriction. This restriction can be activated proportionally through an external 0-5V signal.

Compressor ON/OFF control:

A) To switch ON the first compressor:
   a) Start signal received, and
   b) If chilled water leaving temperature ≥ Set Temperature + Dead Zone Temperature, and
   c) Load demand > 30% of a single compressor's capacity

Action: Start the compressor with the least cumulative operating hours

B) To switch ON the second compressor:
a) If load requirement > 110% of a single compressor's capacity

Action: *i) Start second compressor with lowest cumulative operating hours among the idling compressors*
ii) First compressor will balance its load with second compressor by decreasing or increasing their output capacity respectively.

C) To switch ON the third compressor:
a) If load requirement > 210% of a single compressor's capacity

Action: *i) Start the third compressor*
ii) First 2 compressors will balance their load with third compressor by decreasing or increasing their output capacity respectively.

D) To switch OFF compressor:
If total capacity output of 3 compressors is 50% lesser than a single unit compressor's capacity, the compressor with longest cumulative operating hours will be shut down automatically. The rest of the compressors will increase their capacity output to 90% and increase/decrease the output capacity according to the load requirement. If the load requirement keeps dropping, the compressor will shut down 1 by 1 until all the compressors have been shut down. If any of the compressor breakdown, the idling compressor will automatically be activated to replace it.

6) [Calibration] Screen
This is very important screen especially during commissioning and maintenance. These screens shows the values transmitted from the sensors installed in the system. by using external calibrated sensors, user will be able to calibrate the system installed sensor or to identify the faulty sensor.

i) Calibration (Page 1)

ii) Calibration (Page 2)

iii) Calibration (Page 3)

iv) Calibration (Page 4)

7) [System Para.] Screen (System Parameters)
Under this screen, user is able to set the communication settings for the touch screen panel.

MODBUS Function – To enable or disable communication between MODBUS and the system.
MODBUS Address – To set MODBUS address.
Baud Rate – To set baud r ate.
Even/Odd Parity – To set whether Even or Odd parity check.
Communination Delay – To set communication delay.

8) [Current Alarms] Screen

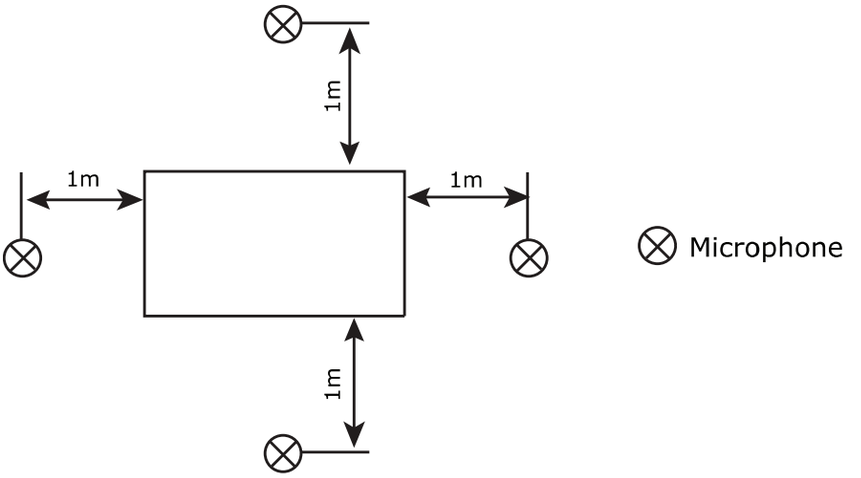
To view all the current problems detected by the system.

9) Alarms History

Allow user to view all alarms recorded in the system. Password will be reuired if user wanted to delete the records in the [Alarms History] screen.

Sound Data

Sound Pressure Testing Setup



Testing standard : GB/T 18430

Sound Pressure Level

Model	1/1 Octave Sound Pressure Level (dB, ref 20μPa)							Overall (dBA)
	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
SWSF0095.1B1C2	36.8	48.1	68.7	75.0	67.1	61.2	52.2	77
SWSF0110.1B1C2	33.0	48.4	72.1	77.7	70.3	57.7	47.3	79
SWSF0140.1B1C2	33.5	48.5	72.5	79.0	69.1	57.3	47.3	80
SWSF0180.1B1C2	35.5	49.4	73.2	75.9	70.9	57.3	46.5	79
SWSF0190.1B1C2	35.2	50.2	73.5	76.0	70.5	56.8	46.6	79
SWSF0250.1B1C2	66.0	74.4	71.0	73.7	76.4	71.7	55.6	81
SWSF0280.2B1C2	36.0	51.4	75.1	80.7	73.3	60.7	50.3	82
SWSF0315.2B1C2	38.1	52.6	76.4	78.9	73.9	60.6	50.2	82
SWSF0360.2B1C2	38.2	53.1	76.5	79.0	73.5	59.8	49.6	82
SWSF0405.2B1C2	38.2	53.2	76.5	79.0	73.5	59.8	49.6	82
SWSF0470.2B1C2	68.8	77.1	73.7	76.4	79.1	74.4	58.4	84
SWSF0500.2B1C2	69.0	77.4	74.0	76.7	79.4	74.7	58.6	84
SWSF0500.3B1C2	40.3	54.2	78.0	80.7	75.7	62.1	51.3	83
SWSF0520.3B1C2	40.3	54.2	78.0	80.7	75.7	62.1	51.3	83
SWSF0555.3B1C2	40.2	54.2	78.0	80.7	75.7	62.0	51.3	83
SWSF0585.3B1C2	40.0	55.0	78.3	80.8	75.3	61.6	51.4	83
SWSF0700.3B1C2	70.6	78.9	75.5	78.2	80.9	76.2	60.2	85
SWSF0755.3B1C2	70.8	79.2	75.8	78.5	81.2	76.5	60.4	86
SWSF0130.1B1C1	33.7	47.8	65.1	64.0	66.0	69.3	64.8	73
SWSF0145.1B1C1	32.1	46.2	63.5	62.4	64.4	67.7	63.2	72
SWSF0160.1B1C1	53.2	78.0	80.5	80.3	77.1	69.0	60.0	85
SWSF0180.1B1C1	54.3	79.5	82.1	81.9	78.7	70.4	61.3	87
SWSF0205.1B1C1	54.9	80.2	83.0	81.9	79.5	70.4	61.3	87
SWSF0240.2B1C1	37.0	51.1	68.4	67.3	69.3	72.6	68.1	77
SWSF0260.2B1C1	36.7	50.8	68.1	67.0	69.0	72.3	67.8	76
SWSF0290.2B1C1	35.1	49.2	66.5	65.4	67.4	70.7	66.2	75
SWSF0320.2B1C1	56.2	81.0	83.5	83.3	80.1	72.0	63.0	88
SWSF0365.2B1C1	57.3	82.5	85.1	84.9	81.7	73.4	64.3	90
SWSF0405.2B1C1	57.9	83.2	86.0	84.9	82.5	73.4	64.3	90

Sound Power Level

Model	1/1 Octave Sound Power Level (dB,ref 1pW)							Overall (dBA)
	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
SWSF0095.1B1C2	43.8	56.1	76.7	83.0	76.1	69.2	60.2	85
SWSF0110.1B1C2	40.0	56.4	80.1	85.7	79.3	65.7	55.3	88
SWSF0140.1B1C2	40.5	56.5	80.5	87.0	79.9	65.3	55.3	89
SWSF0180.1B1C2	42.5	57.4	81.2	83.9	79.5	65.3	54.5	87
SWSF0190.1B1C2	42.2	58.2	81.5	84.0	85.1	64.8	54.6	89
SWSF0250.1B1C2	73.0	82.4	79.0	81.7	85.4	79.7	63.6	89
SWSF0280.2B1C2	43.0	59.4	83.1	88.7	82.3	68.7	58.3	91
SWSF0315.2B1C2	45.1	60.6	84.4	86.9	82.9	68.6	58.2	90
SWSF0360.2B1C2	45.2	61.1	84.5	87.0	82.5	67.8	57.6	90
SWSF0405.2B1C2	45.2	61.2	82.0	87.0	82.5	71.0	57.6	89
SWSF0470.2B1C2	75.8	85.1	81.7	84.4	88.1	82.4	66.4	92
SWSF0500.2B1C2	76.0	60.0	84.0	84.7	88.4	82.7	62.0	92
SWSF0500.3B1C2	47.3	62.2	86.0	88.7	84.7	70.1	59.3	92
SWSF0520.3B1C2	47.3	62.2	86.0	88.7	84.7	69.0	63.0	92
SWSF0555.3B1C2	47.2	62.2	86.0	88.7	84.7	70.0	59.3	92
SWSF0585.3B1C2	47.0	61.0	86.3	88.8	84.3	69.0	64.0	92
SWSF0700.3B1C2	77.6	86.9	83.5	86.2	89.9	84.2	68.2	94
SWSF0755.3B1C2	77.8	61.0	83.8	86.5	90.2	69.0	68.4	93
SWSF0130.1B1C1	40.7	55.8	73.1	72.0	75.0	77.3	72.8	81
SWSF0145.1B1C1	39.1	54.2	71.5	70.4	73.4	75.7	71.2	80
SWSF0160.1B1C1	60.2	86.0	88.5	88.3	87.7	77.0	68.0	94
SWSF0180.1B1C1	61.3	87.5	90.1	89.9	88.5	78.4	69.3	95
SWSF0205.1B1C1	61.9	88.2	91.0	89.9	78.3	78.4	69.3	95
SWSF0240.2B1C1	44.0	59.1	76.4	75.3	78.0	80.6	76.1	85
SWSF0260.2B1C1	43.7	58.8	76.1	75.0	78.0	80.3	75.8	84
SWSF0290.2B1C1	42.1	57.2	74.5	73.4	76.4	78.7	74.2	83
SWSF0320.2B1C1	63.2	89.0	91.5	91.3	89.1	80.0	71.0	97
SWSF0365.2B1C1	64.3	90.5	93.1	92.9	90.7	81.4	72.3	98
SWSF0405.2B1C1	64.9	91.2	94.0	92.9	91.5	81.4	72.3	99

Equipment Selection

Selection Procedures

To rate the performance of the water cooled flooded screw chiller at different conditions, the System Performance Table which provided in the following pages should be referred to. The performance data is based on ambient temperature and leaving water temperature. To select water cooled flooded screw chiller, the following information will be required:

1. Cooling or Heating load.
2. Leaving water temperature.
3. Entering water temperature.
4. Water flow rate.

Knowing the chiller capacity, the leaving water temperature and either the entering water temperature or water flow rate, unknowns can be determine by following formula:

Chilled water flowrate:

$$\dot{V} = \frac{3.6 \times Q}{4.18 \times \Delta T} \quad (1)$$

Cooling water flowrate:

$$\dot{V} = \frac{3.6 \times (Q+P)}{4.18 \times \Delta T} \quad (2)$$

$\dot{V}$ = Water Flow Rate, m³/h
ΔT = Water temperature difference, ºC
Q = Capacity, kW
P = Input Power, kW

By knowing the above data, the suitable unit can be selected though System performance table. The water pressure drop can be found in pressure drop charts. Apply correction factors for altitude to the capacity and power input.

Example:
For model SWSF0130.1B1C1, the data under standard condition is as following:

a) Cooling capacity = 454kW
b) Power input = 103kW
c) Evaporator water flow rate = 78m3/h
d) Chilled water entering temperature = 12°C
e) Chilled water leaving temperature = 7°C
f) Condenser water flow rate = 96m3/h
g) Cooling water entering temperature = 30°C
h) Cooling water leaving temperature = 35°C.

From the Capacity Correction Factors table, we will be able to determine that for 6°C chilled water leaving temperature and 32°C cooling water entering temperature, the correction factors are as following:

a) Cooling capacity correction factor = 0.951
b) Power input correction factor = 1.010

Base on the correction factors,

i) The corrected capacity equals 454kW x 0.951 = 431.8kW
ii) The corrected power input equals 103kW x 1.010 = 104.0kW

To determine the pressure drop, first we need to determine water flow rate via Formula

Chilled water flow rate,

$$\dot{V} = \frac{3.6 \times Q}{4.18 \times \Delta T} = \frac{3.6 \times 431.8}{4.18 \times 5} = 74.4 \text{ m3/h}$$

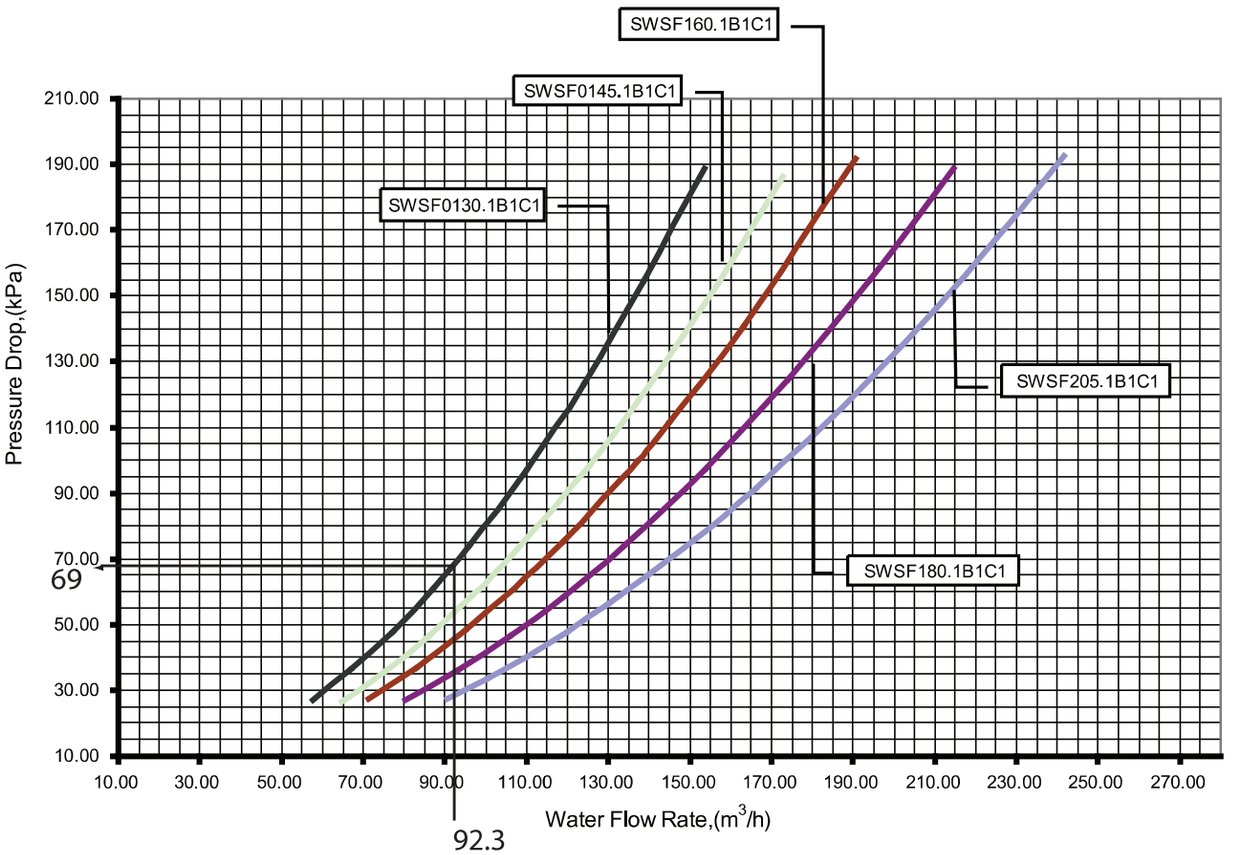
Cooling water flow rate,

$$\dot{V} = \frac{3.6 \times (Q+P)}{4.18 \times \Delta T} = \frac{3.6 \times (431.8+104)}{4.18 \times 5} = 92.3 \text{ m3/h}$$

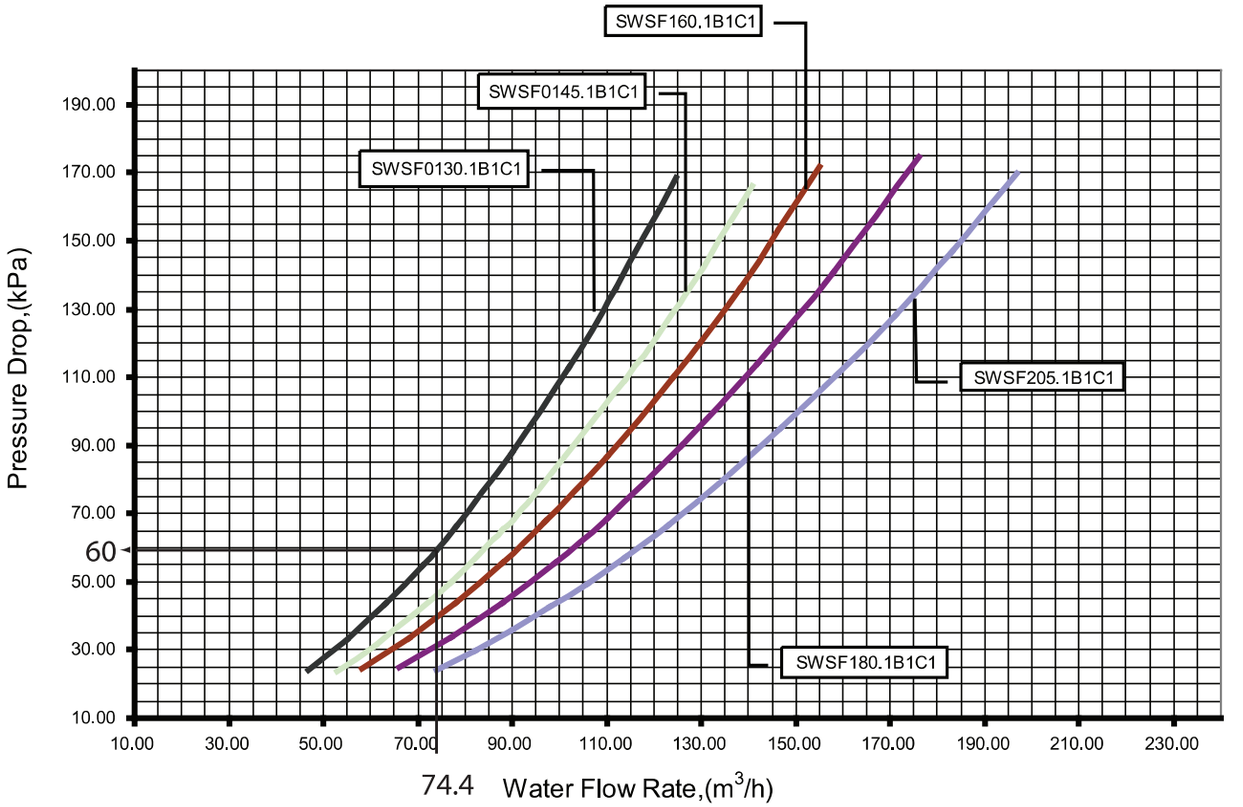
From the pressure drop chart,

a) Condenser pressure drop = 68 kPa
b) Evaporator pressure drop = 60 kPa

Condenser Pressure Drop - SWSF-1B1C1



Evaporator Pressure Drop - SWSF-1B1C1



Capacity Correction Factors

Model	Chilled water leaving temperature (°C)	Cooling water entering temperature (°C)											
		20		25		28		30		32		35	
		Cooling Capacity	Power Input	Cooling Capacity	Power Input	Cooling Capacity	Power Input	Cooling Capacity	Power Input	Cooling Capacity	Power Input	Cooling Capacity	Power Input
SWSF-B1C2	4	0.985	0.825	0.945	0.888	0.921	0.936	0.904	0.972	0.886	1.008	0.860	1.064
	5	1.017	0.833	0.977	0.900	0.952	0.948	0.936	0.980	0.917	1.016	0.890	1.076
	6	1.051	0.845	1.010	0.908	0.985	0.956	0.967	0.992	0.949	1.028	0.922	1.084
	7	1.085	0.853	1.043	0.920	1.018	0.968	1.000	1.000	0.981	1.036	0.953	1.096
	8	1.120	0.865	1.077	0.932	1.051	0.976	1.033	1.012	1.014	1.048	0.986	1.104
	9	1.155	0.876	1.113	0.944	1.086	0.988	1.068	1.024	1.048	1.060	1.019	1.116
	10	1.192	0.888	1.148	0.952	1.120	1.000	1.101	1.032	1.082	1.068	1.052	1.127
SWSF-B1C1	4	0.972	0.855	0.940	0.899	0.918	0.928	0.903	0.952	0.887	0.981	0.862	1.024
	5	1.005	0.870	0.972	0.913	0.951	0.942	0.935	0.966	0.918	0.995	0.892	1.039
	6	1.040	0.884	1.006	0.928	0.983	0.957	0.967	0.981	0.951	1.010	0.923	1.053
	7	1.075	0.903	1.041	0.942	1.017	0.976	1.000	1.000	0.983	1.024	0.956	1.068
	8	1.111	0.918	1.075	0.961	1.051	0.990	1.035	1.014	1.017	1.039	0.988	1.082
	9	1.148	0.937	1.111	0.976	1.087	1.005	1.069	1.029	1.051	1.058	1.022	1.097
	10	1.186	0.957	1.148	0.995	1.123	1.024	1.105	1.048	1.086	1.072	1.056	1.116

Altitude Correction Factors

Altitude (m)	Cooling Capacity Factor	Power Input Factor
0	1.000	1.000
300	0.992	1.004
600	0.985	1.008
1200	0.972	1.020
1500	0.966	1.025
1800	0.959	1.030

Fouling Factors

Fouling Factors (m^2°C/kW)	Cooling Capacity Factor	Power Input Factor
≤ 0.017	1.044	0.973
0.044	1.021	0.985
0.086	1.000	1.000
0.132	0.096	1.012

Heat Recovery Capacity

Model	Cooling Capacity (kW)	Heat Recovery Capacity (kW)			
	Entering/Leaving Chilled Water Temperature	Leaving Cooling Water Temperature			
	12/7°C	45°C	50°C	55°C	60°C
SWSF0095.1 B1R2	338	169	101	51	34
SWSF0110.1 B1R2	394	197	118	59	39
SWSF0140.1 B1R2	494	247	148	74	49
SWSF0180.1 B1R2	637	319	191	96	64
SWSF0190.1 B1R2	668	334	200	100	67
SWSF0250.1 B1R2	882	441	265	132	88
SWSF0280.2 B1R2	987	494	296	148	99
SWSF0315.2 B1R2	1114	557	334	167	111
SWSF0360.2 B1R2	1260	630	378	189	126
SWSF0405.2 B1R2	1420	710	426	213	142
SWSF0470.2 B1R2	1655	827	496	248	165
SWSF0500.2 B1R2	1764	882	529	265	176
SWSF0500.3 B1R2	1751	876	525	263	175
SWSF0520.3 B1R2	1832	916	550	275	183
SWSF0555.3 B1R2	1952	976	586	293	195
SWSF0585.3 B1R2	2053	1026	616	308	205
SWSF0700.3 B1R2	2457	1229	737	369	246
SWSF0755.3 B1R2	2646	1323	794	397	265
SWSF0130.1 B1R1	454	227	136	68	45
SWSF0145.1 B1R1	512	256	154	77	51
SWSF0160.1 B1R1	567	284	170	85	57
SWSF0180.1 B1R1	640	320	192	96	64
SWSF0205.1 B1R1	715	358	215	107	72
SWSF0240.2 B1R1	851	426	255	128	85
SWSF0260.2 B1R1	906	453	272	136	91
SWSF0290.2 B1R1	1023	512	307	153	102
SWSF0320.2 B1R1	1134	567	340	170	113
SWSF0365.2 B1R1	1280	640	384	192	128
SWSF0405.2 B1R1	1429	715	429	214	143

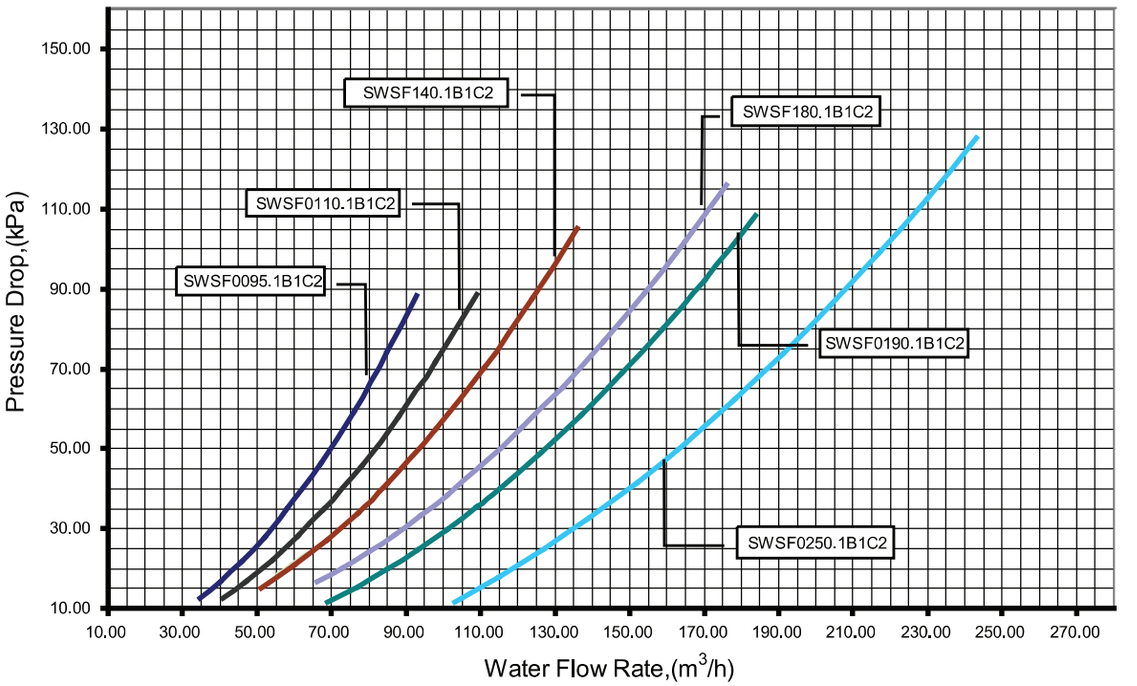
IPLV

Model	Full Load Capacity (kW)	Full Load Power Input (kW)	Full Load COP	IPLV
SWSF0095.1B1C2	338.1	72.0	4.7	6.2
SWSF0110.1B1C2	393.8	81.0	4.9	6.4
SWSF0140.1B1C2	493.5	98.0	5.0	6.6
SWSF0180.1B1C2	637.4	122.0	5.2	6.9
SWSF0190.1B1C2	667.8	147.0	4.5	6.0
SWSF0250.1B1C2	882.0	167.0	5.3	6.9
SWSF0280.2B1C2	987.0	195.0	5.1	5.9
SWSF0315.2B1C2	1114.1	238.0	4.7	5.5
SWSF0360.2B1C2	1260.0	284.0	4.4	5.2
SWSF0405.2B1C2	1419.6	290.0	4.9	5.7
SWSF0470.2B1C2	1654.8	313.0	5.3	6.2
SWSF0500.2B1C2	1764.0	334.0	5.3	6.2
SWSF0500.3B1C2	1751.4	366.0	4.8	5.5
SWSF0520.3B1C2	1832.3	391.0	4.7	5.4
SWSF0555.3B1C2	1952.0	416.0	4.7	5.4
SWSF0585.3B1C2	2052.8	441.0	4.7	5.4
SWSF0700.3B1C2	2457.0	489.0	5.0	5.8
SWSF0755.3B1C2	2646.0	501.0	5.3	6.1
SWSF0130.1B1C1	453.6	102.0	4.4	5.8
SWSF0145.1B1C1	511.7	115.1	4.4	5.8
SWSF0160.1B1C1	566.8	126.7	4.5	5.9
SWSF0180.1B1C1	639.9	141.6	4.5	5.9
SWSF0205.1B1C1	714.5	160.9	4.4	5.8
SWSF0240.2B1C1	850.5	193.0	4.4	5.2
SWSF0260.2B1C1	906.2	204.0	4.4	5.2
SWSF0290.2B1C1	1023.4	230.2	4.4	5.2
SWSF0320.2B1C1	1133.5	253.4	4.5	5.3
SWSF0365.2B1C1	1279.8	283.2	4.5	5.3
SWSF0405.2B1C1	1429.1	328.0	4.4	5.1

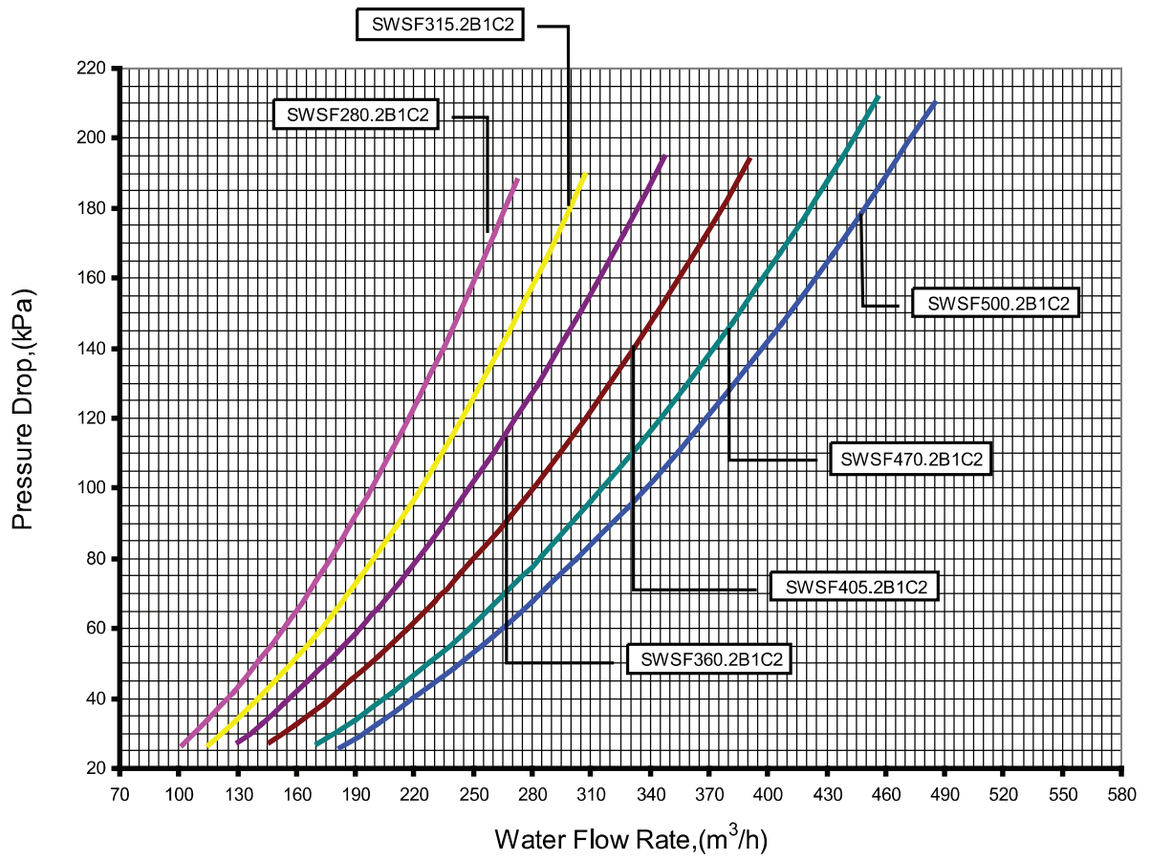
Note: IPLV data is base on ARI 550/590-1998

Evaporator Pressure Drop

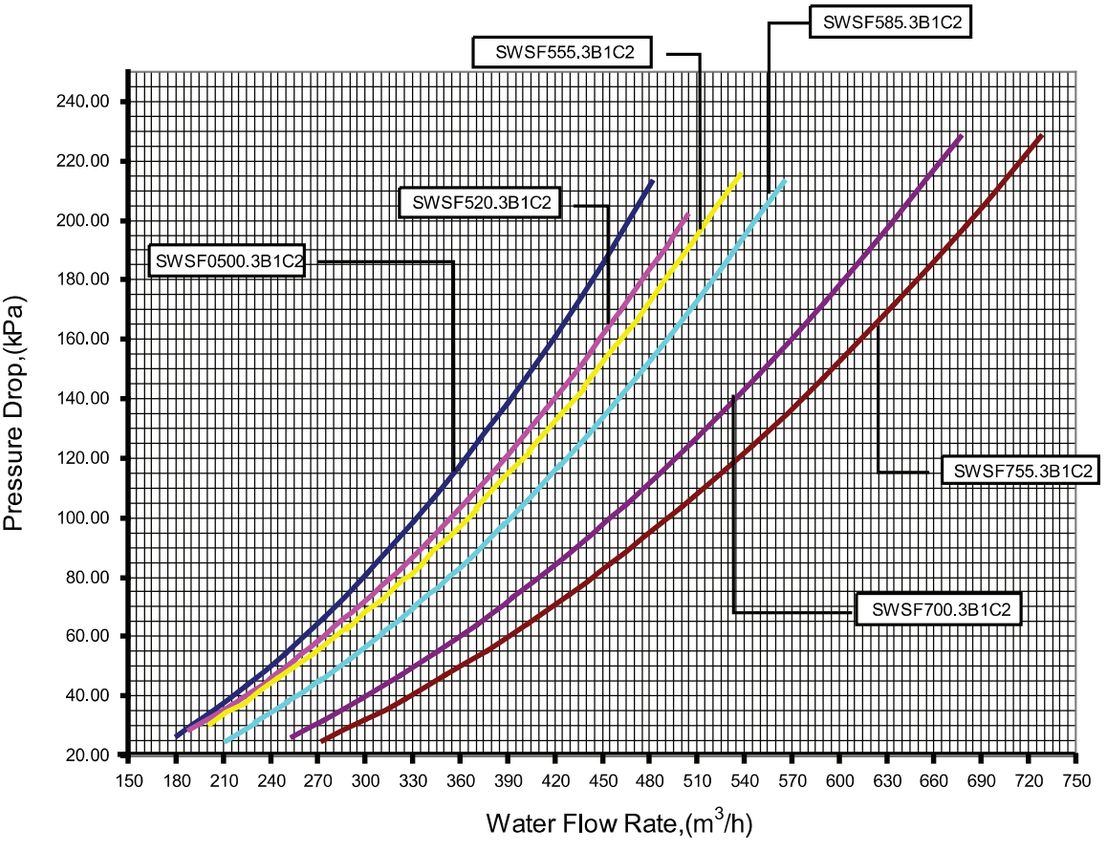
Single Compressor System (R22)



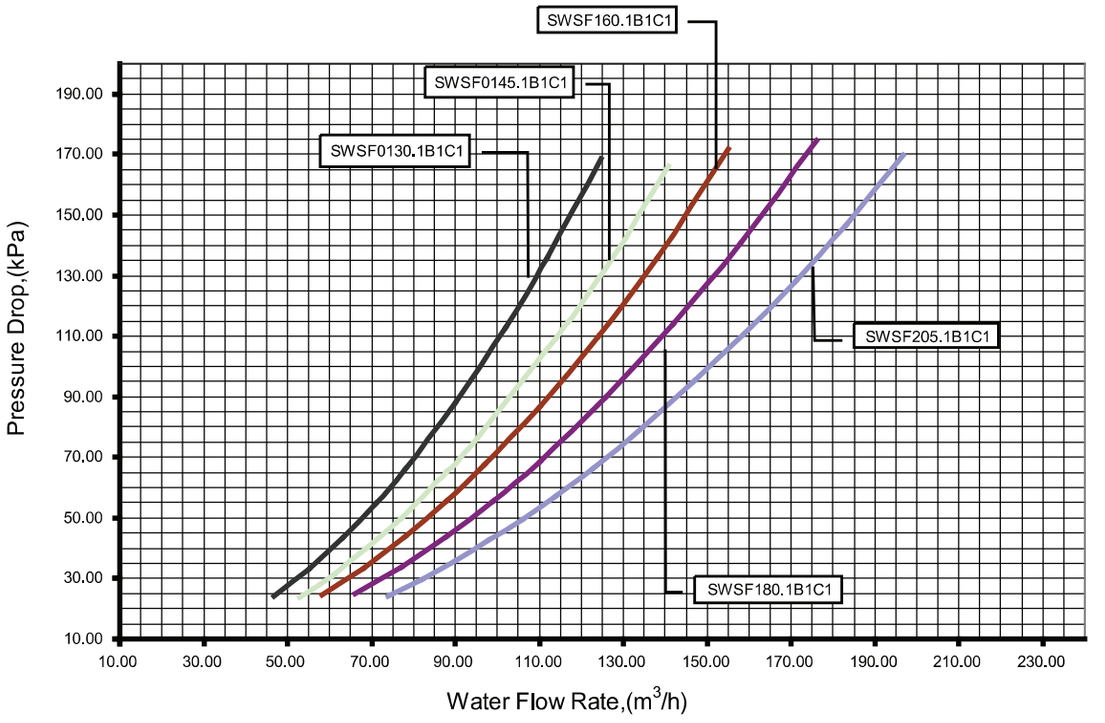
Twin Compressors System (R22)



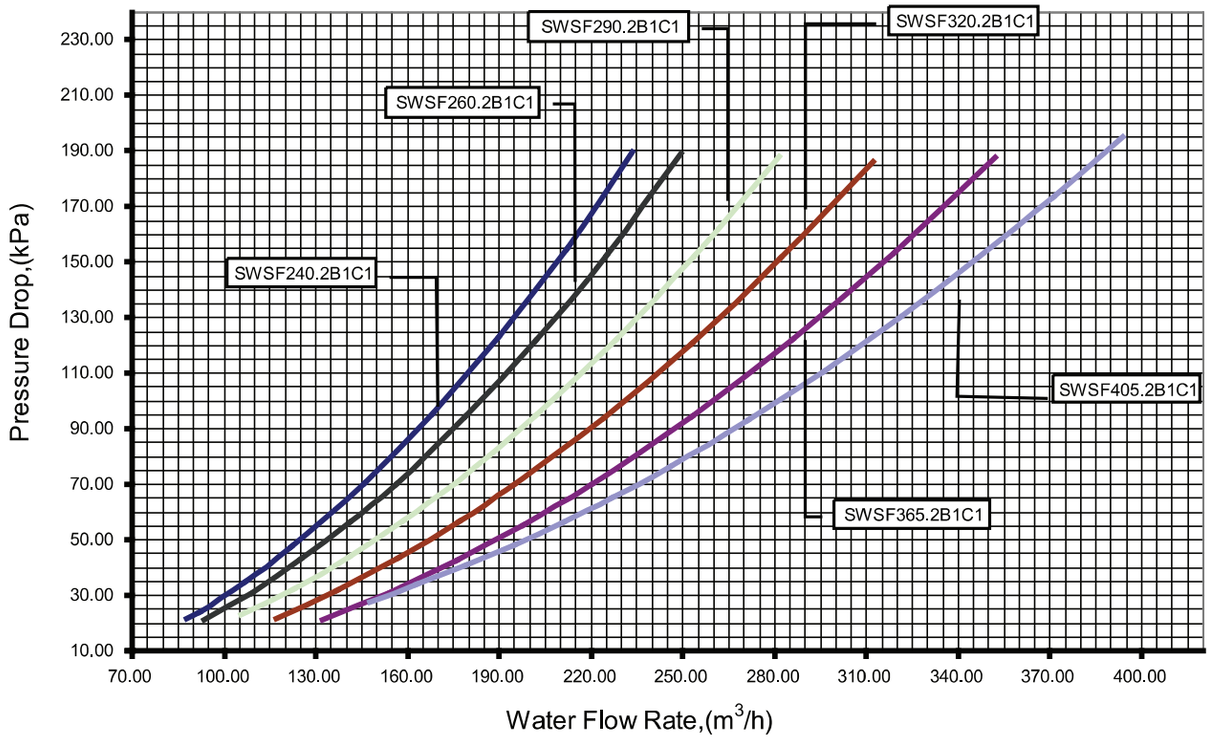
Three Compressors System (R22)



Single Compressor System (R134a)

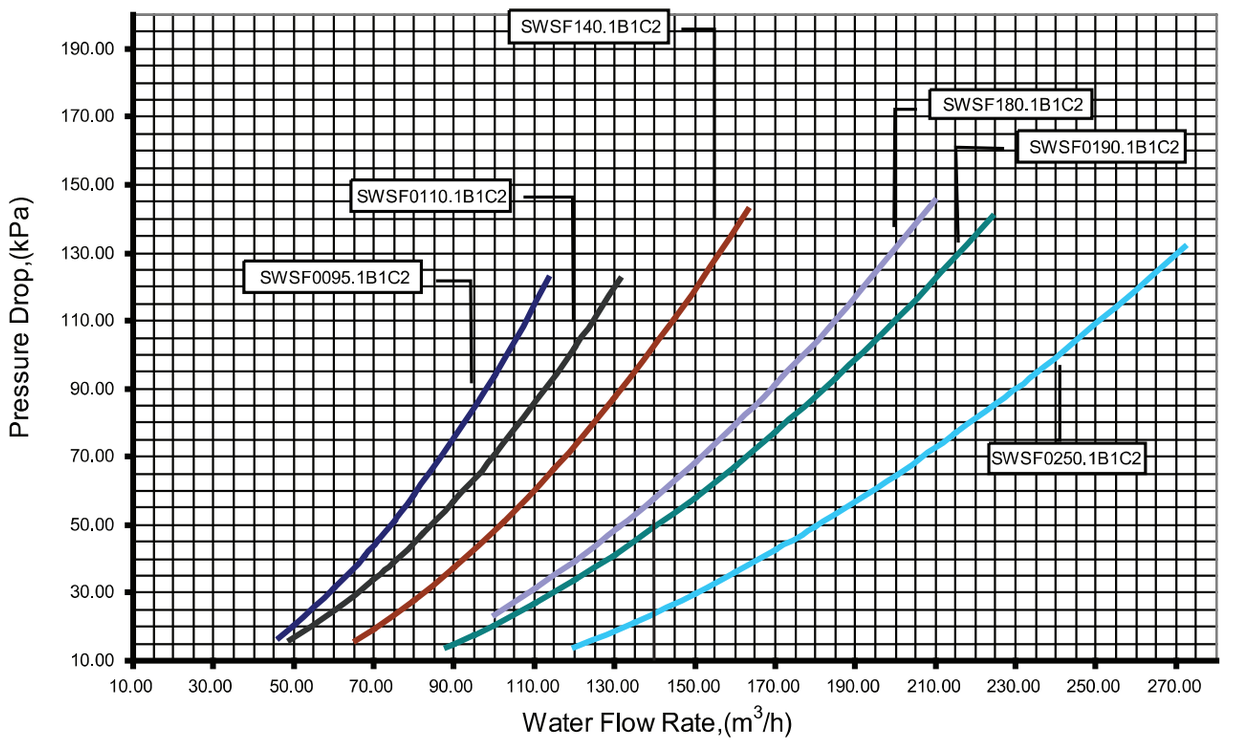


Twin Compressors System (R134a)

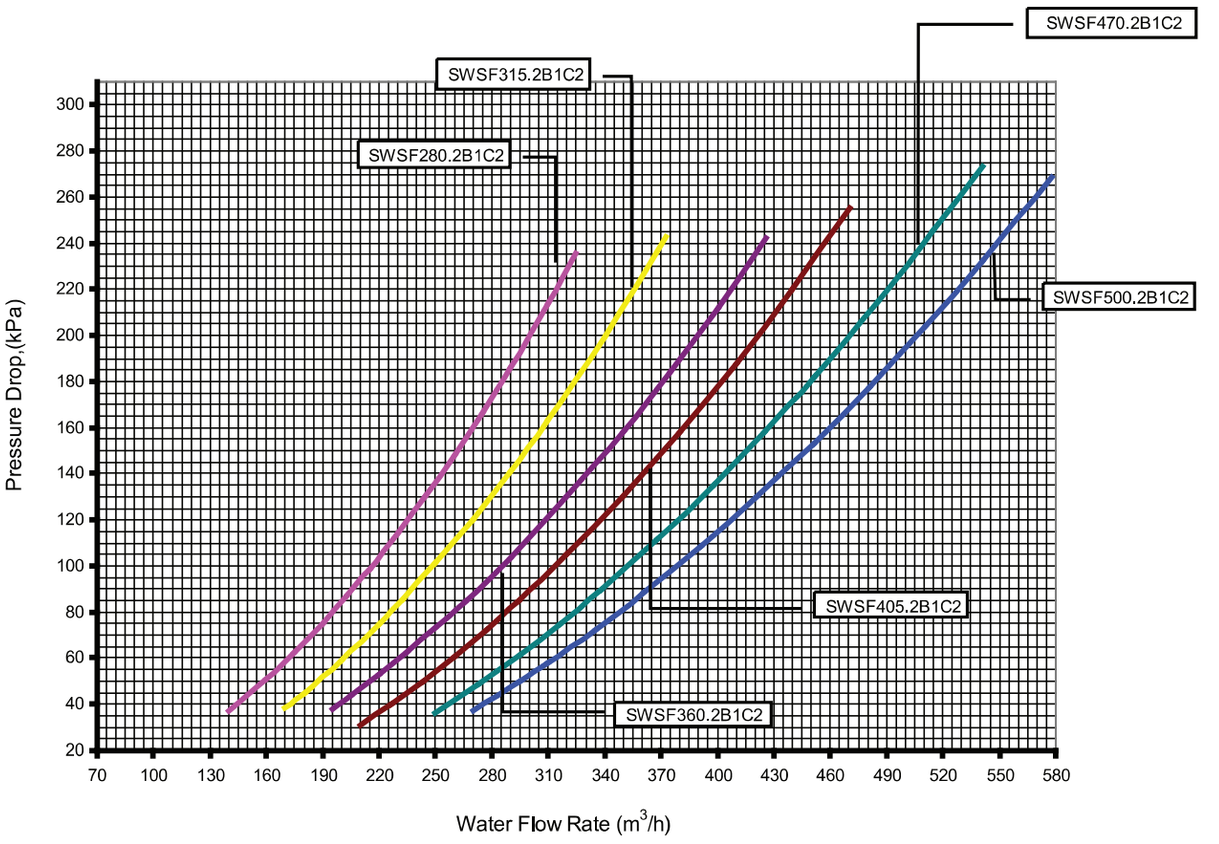


Condenser Pressure Drop

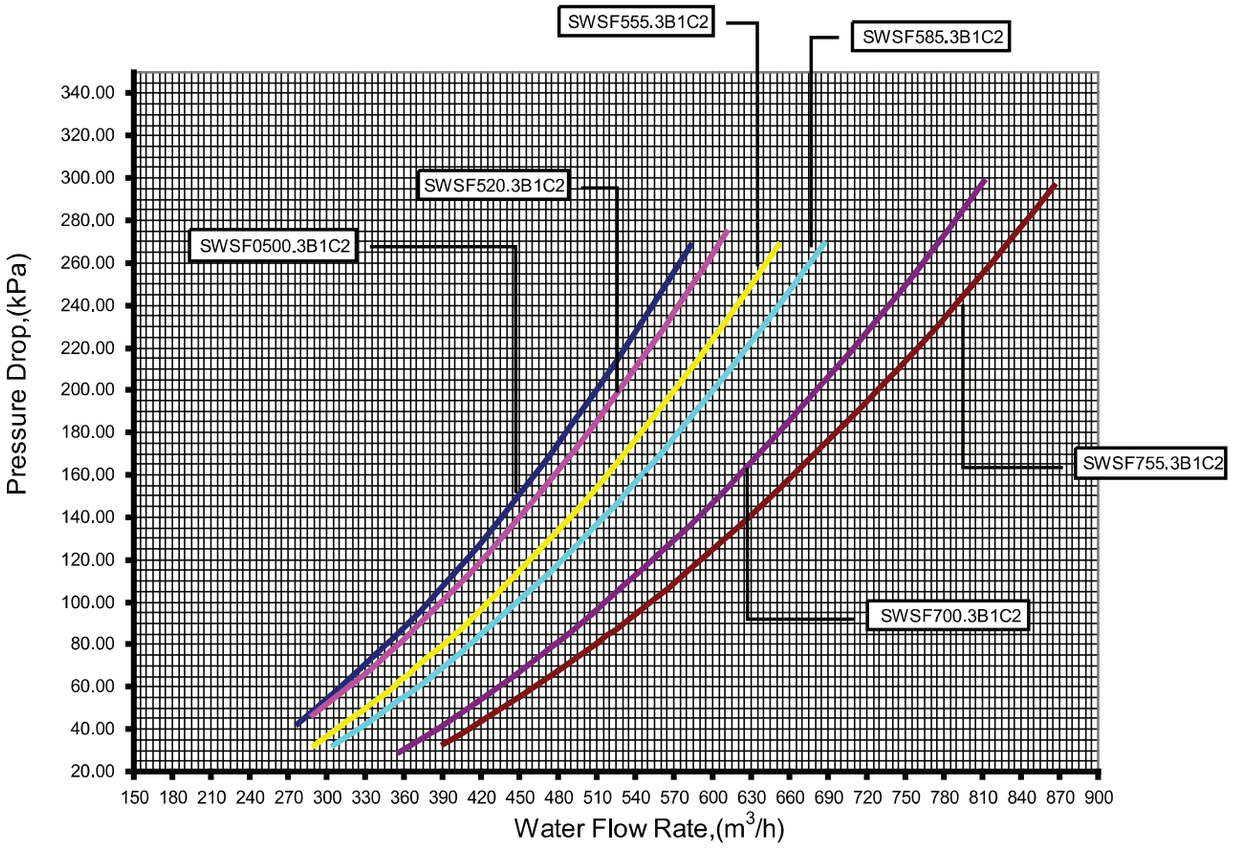
Single Compressor System (R22)



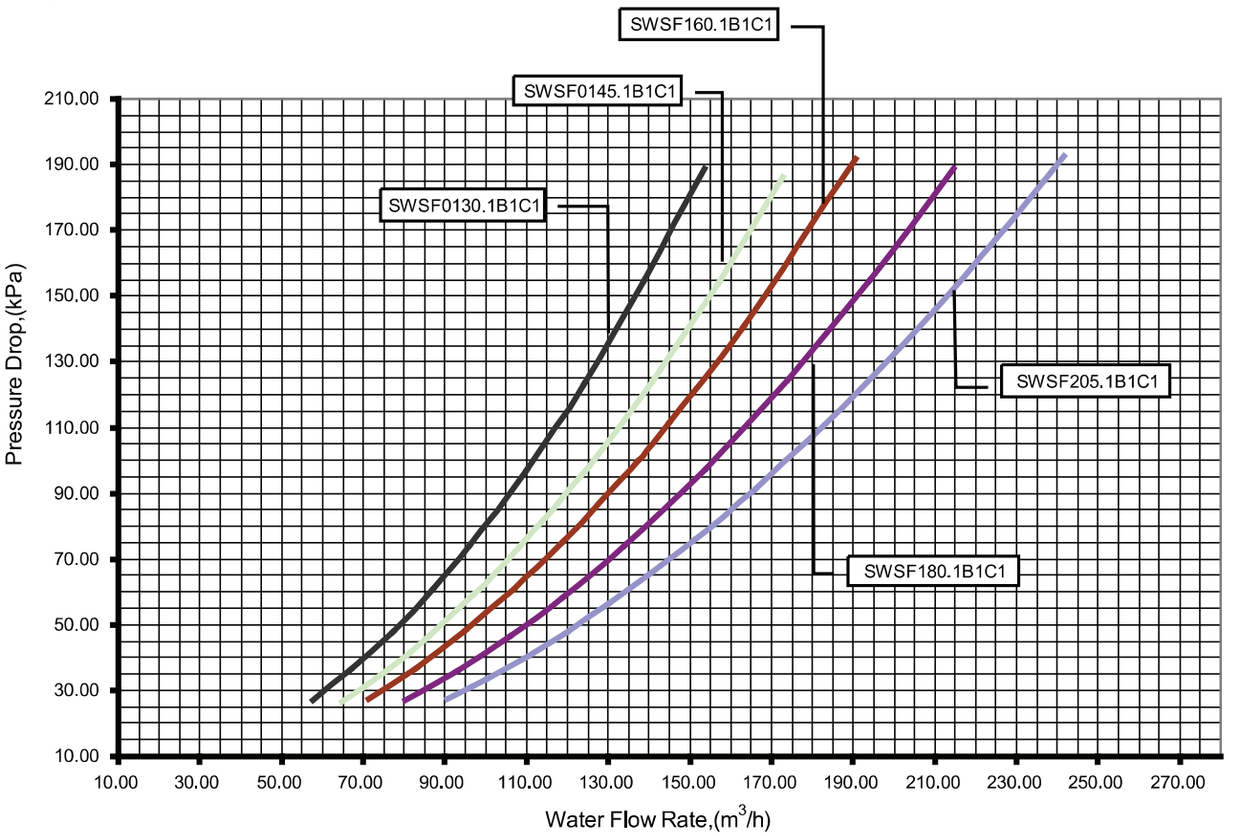
Twin Compressors System (R22)



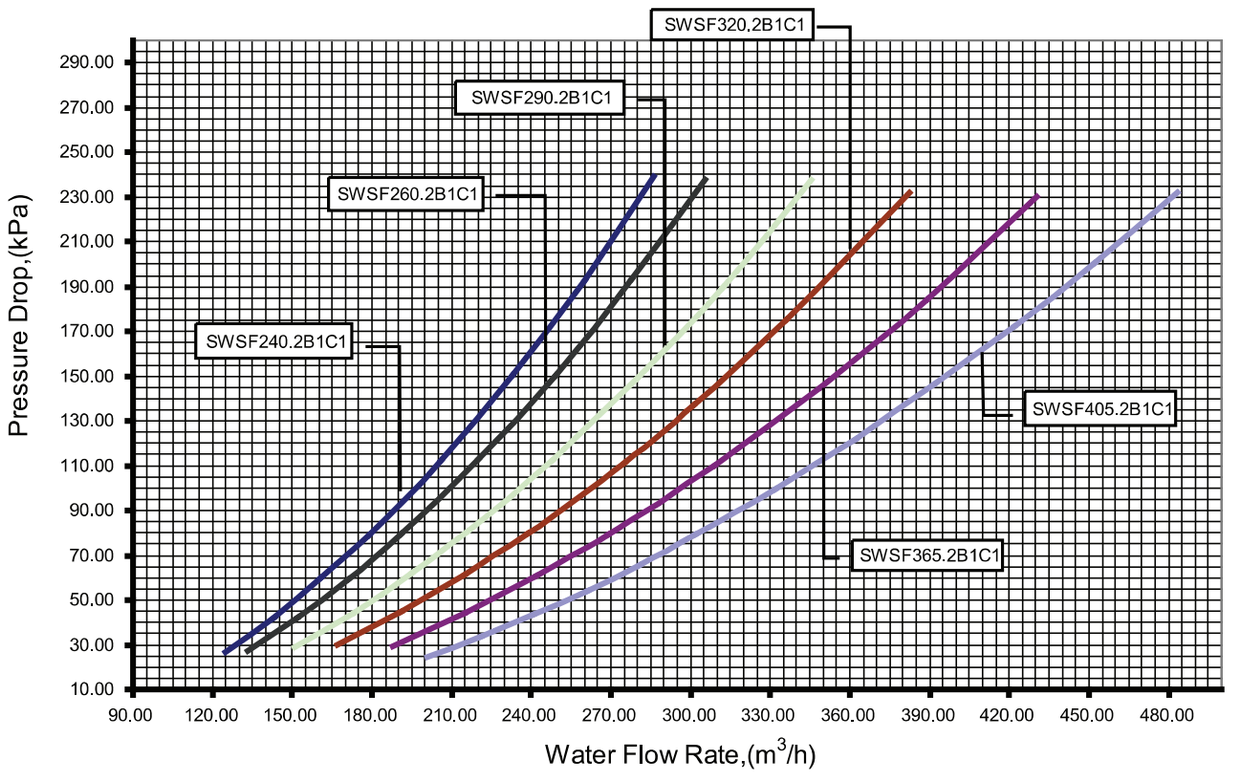
Three Compressors System (R22)



Single Compressor System (R134a)

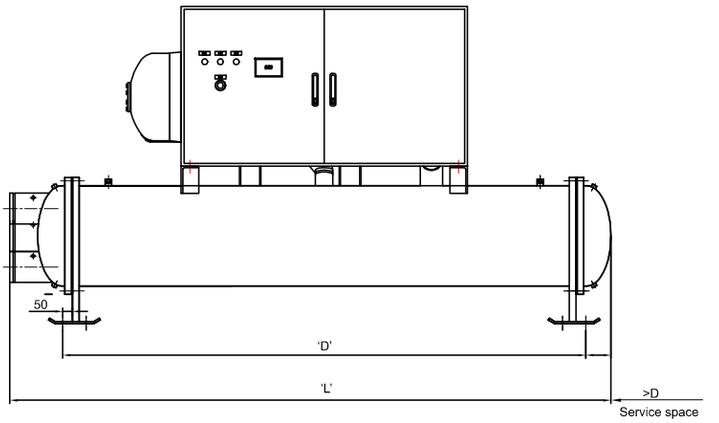


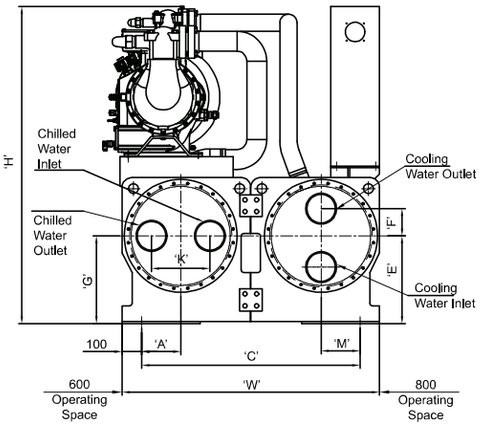
Twin Compressors System (R134a)



Dimensions

Single Compressor System





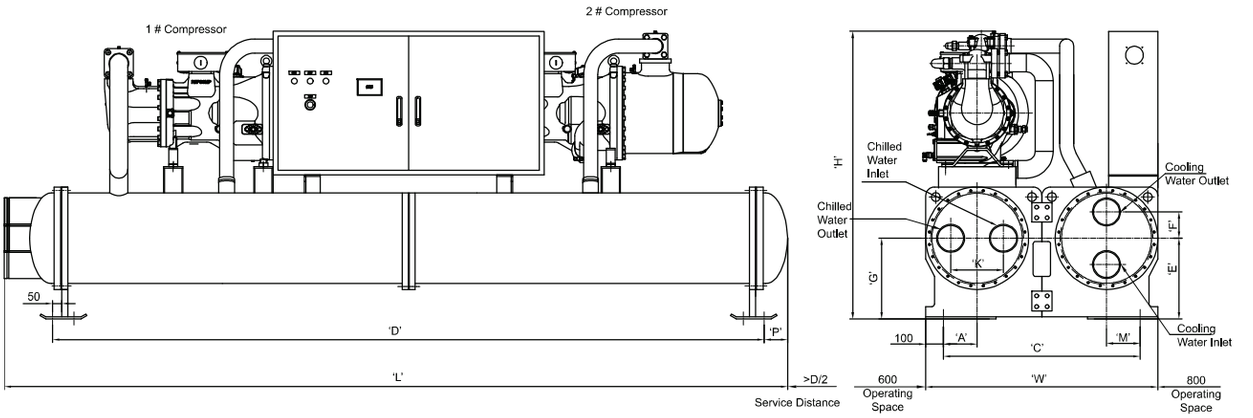
Note :

1. Evaporator and condensor inlet/outlet piping must be supported to prevent additional force asserted on the unit.
2. Unit dimension size ensure the evaporator and condenser have a better maintenance and protection.
3. Standard model is left-sided piping. It can change to right-sided upon requiry.
4. Dimension for dual mode chiller is similar with standard mode chiller.

Model	Evaporator Water Inlet / Outlet	Condenser Water Inlet / Outlet	A	C	D	E	F	G	H	K	L	M	W	P
SWSF0095.1B1C2	DN100	DN100	150	960	2970	410	120	410	1670	240	3345	150	1180	84
SWSF0110.1B1C2	DN125	DN125	150	960	2970	410	120	410	1670	240	3345	150	1180	84
SWSF0140.1B1C2	DN125	DN125	175	1040	3170	425	130	425	1670	260	3580	175	1260	97
SWSF0180.1B1C2	DN150	DN150	200	1120	3170	450	150	450	1760	300	3585	200	1340	111
SWSF0190.1B1C2	DN150	DN150	200	1120	3170	450	150	450	1760	300	3585	200	1340	111
SWSF0250.1B1C2	DN150	DN150	230	1240	3170	480	160	480	1820	320	3600	260	1460	124
SWSF0130.1B1C1	DN150	DN150	180	1040	2870	425	140	425	1710	280	3285	180	1260	97
SWSF0145.1B1C1	DN150	DN150	200	1120	2870	450	150	450	1710	300	3285	200	1340	111
SWSF0160.1B1C1	DN150	DN150	200	1120	3170	450	150	450	1730	300	3585	200	1340	111
SWSF0180.1B1C1	DN150	DN150	200	1120	3170	450	150	450	1730	300	3585	200	1340	111
SWSF0205.1B1C1	DN150	DN150	200	1120	3170	450	150	450	1730	300	3600	200	1400	111

All dimensions are in mm

Twin Compressors System



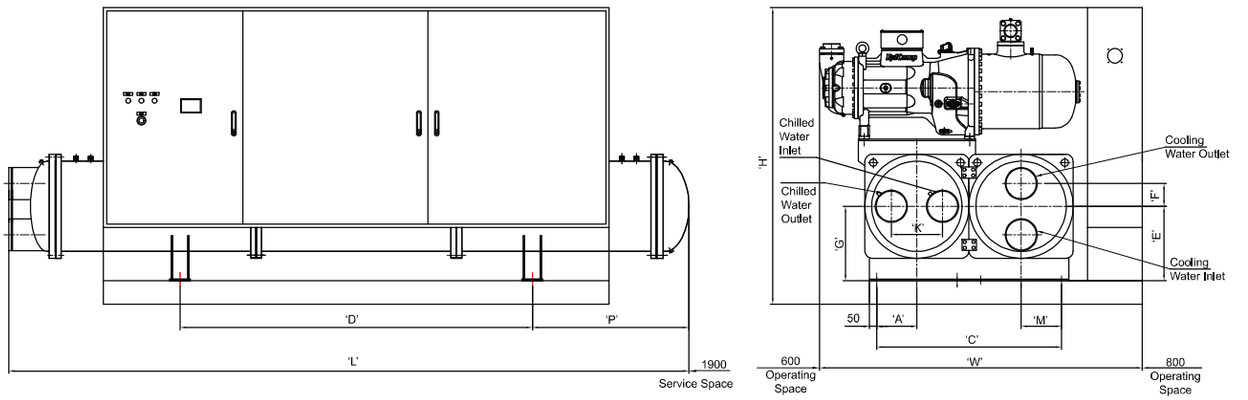
Note :

1. Evaporator and condensor inlet/outlet piping must be supported to prevent additional force asserted on the unit.
2. Unit dimension size ensure the evaporator and condenser have a better maintenance and protection.
3. Standard model is left-sided piping. It can change to right-sided upon requiry.
4. Dimension for dual mode chiller is similar with standard mode chiller.

Model	Evaporator Water Inlet / Outlet	Condenser Water Inlet / Outlet	A	C	D	E	F	G	H	K	L	M	W	P
SWSF0280.2B1C2	DN150	DN150	230	1240	4045	480	160	480	1820	320	4500	220	1460	124
SWSF0315.2B1C2	DN150	DN150	230	1240	4045	480	160	480	1820	320	4500	220	1460	124
SWSF0360.2B1C2	DN200	DN200	252	1340	4045	508	175	508	2070	350	4500	252	1560	136
SWSF0405.2B1C2	DN200	DN200	252	1340	4045	508	175	508	2070	350	4500	252	1560	136
SWSF0470.2B1C2	DN200	DN200	277	1440	4045	533	190	533	1920	380	4515	277	1660	149
SWSF0500.2B1C2	DN200	DN200	277	1440	4045	533	190	533	1920	380	4515	277	1660	149
SWSF0240.2B1C1	DN150	DN150	200	1120	4045	450	150	450	1730	300	4470	200	1340	111
SWSF0260.2B1C1	DN150	DN150	200	1120	4045	450	150	450	1990	300	4470	200	1340	111
SWSF0290.2B1C1	DN200	DN200	230	1240	4045	483	160	483	2020	320	4500	220	1460	124
SWSF0320.2B1C1	DN200	DN200	252	1340	4045	508	175	508	2070	350	4500	252	1560	136
SWSF0365.2B1C1	DN200	DN200	252	1340	4045	508	175	508	2070	350	4500	252	1560	136
SWSF0405.2B1C1	DN200	DN200	277	1440	4045	533	190	533	2290	380	4500	277	1660	149

All dimensions are in mm

Three Compressors System



Note :

1. Evaporator and condensor inlet/outlet piping must be supported to prevent additional force asserted on the unit.
2. Unit dimension size ensure the evaporator and condenser have a better maintenance and protection.
3. Standard model is left-sided piping. It can change to right-sided upon requiry.
4. Dimension for dual mode chiller is similar with standard mode chiller.

Model	Evaporator Water Inlet / Outlet	Condenser Water Inlet / Outlet	A	C	D	E	F	G	H	K	L	M	W	P
SWSF0500.3B1C2	DN200	DN200	300	1540	3200	533	190	533	2270	380	4665	300	2200	614
SWSF0520.3B1C2	DN200	DN200	350	1750	3200	563	200	563	2370	380	4780	350	2200	614
SWSF0555.3B1C2	DN250	DN250	350	1750	3200	563	200	563	2370	380	4780	350	2200	628
SWSF0585.3B1C2	DN250	DN250	350	1750	3200	563	200	563	2370	380	4780	350	2200	628
SWSF0700.3B1C2	DN250	DN250	375	1790	3200	585	200	585	2200	400	4800	375	2600	664
SWSF0755.3B1C2	DN250	DN250	375	1800	3200	610	200	610	2250	450	4850	375	2600	676

All dimensions are in mm

SAKURA®

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