Flooded Type
Water cooled screw chiller

Technical service manual

LSBLG365~LSBLG1500/MCFN

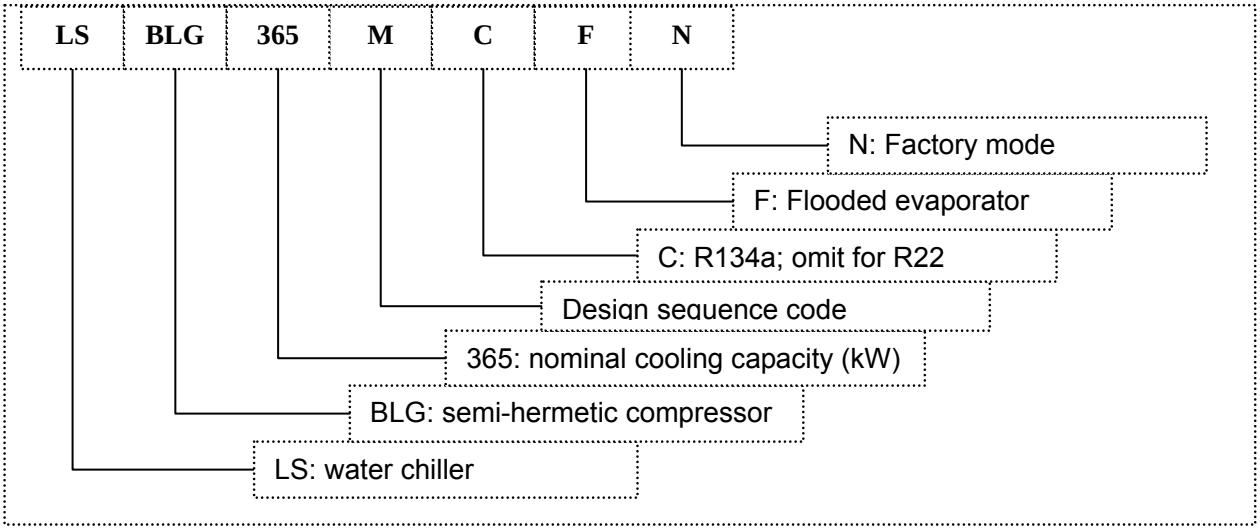
Contents

I. Product

1. Product Line Up

Series	Model	Cooling Capacity (kW)	Picture
Single head	LSBLG365/MCFN	364	
	LSBLG465/MCFN	465	
	LSBLG560/MCFN	560	
	LSBLG750/MCFN	750	
Dual head	LSBLG825/MCFN	825	
	LSBLG925/MCFN	924	
	LSBLG1120/MCFN	1120	
	LSBLG1230/MCFN	1230	
	LSBLG1500/MCFN	1500	

2. Nomenclature

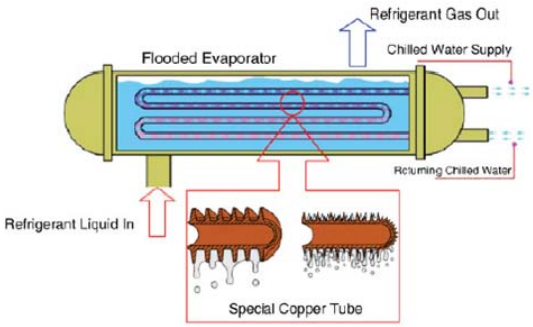


3. Features

Leading technology of twin screw compressor

- Midea screw chiller is equipped with the 3rd generation industrial compressor that has the latest advanced 5-6 asymmetry dentiform Semi-hermetic Screw Rotors.
- The rotors are processed by high-precision CNC and each part is well-proportioned and none-gap matched, which minimizes the friction resistance and clearance lost and also guarantees quiet running and good duration.

High Efficiency（with Flooded Evaporator）



- New kind of high efficiency finned copper pipe enhances the heat-exchange process, improves heat exchange efficiency and makes the evaporator much more compact for saving installation space.
- Significantly improve the evaporating temperature and reduce heat transferring temperature difference which directly improves heat-exchange efficiency, provide most cost effective & reliable solutions to all valuable customers.

Green chiller

R134a environmental-friendly refrigerant

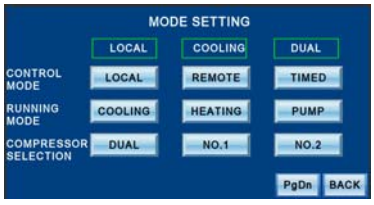
- Refrigerant of the Chlorine-free HFC with zero ozone depletion potential.
- Very low GWP (Global Warming Potential).

High reliability and excellent serviceability

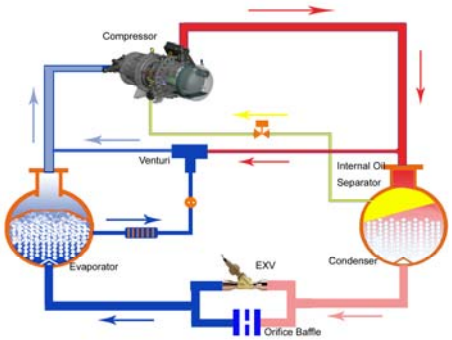
- Flooded evaporator makes cleaning inside of pipes possible, and guarantees high reliability.
- Discharge cut-off valve and liquid line angle valve for simplified maintenance.
- Simplified field wiring for easy installation.

Intelligent control & User-friendly Operating Interface

- Complete and safe control system: All electrically control elements are designed and selected with stable quality and reliable function; The unit designed with multiple security measures ensure the safe and reliable running
- The sensors related to control and other assemblies are equipped by factory and strictly tested
- Graphical display of the operating state, operation scheduling, malfunction inquiry, help menu for easy trouble shooting and other user-oriented functions.



- **Efficient Lubrication cycle**



✸ There are two oil separators which are separately integrated inside the compressor and condenser. The refrigerant and oil mixture gets separated in the first oil separator inside the compressor and then to the second oil separator of which the separating efficiency can reach 99%. Oil will return to compressor through the oil return pipe by pressure difference. Some oil remains in the evaporator will be sucked up by the Venturi tube and goes back to compressor. These two oil return circuits can guarantee reliable oil return efficiency.

- **Reliable throttling device**

✸ Orifice baffle with no moving parts can guarantee high reliability and it cooperates with EXV（Danfoss）to throttle the high-pressure liquid refrigerant from condenser to evaporator. EXV which is controlled by EVD module provides high-precision adjustment and perfectly matches the compressor load，both full load and partial load.

- **Easy and fast installation**

✸ The unit has passed full factory test before being delivered to ensure the reliable working on the site. The unit can be placed in service only after being connected with power and water supply during field installation.

✸ The installation and adjustment are simple .Standard flange connection and wire mesh to the electrical panel. Refrigerant and lubrication oil are provided to the unit in the factory. Only piping connection and power supply connection are required on the site.

- **Wide application range**

✸ Water cooled screw chiller are widely applied in school, hospital, shopping mall, office as well as the factory and manufacturing processing area.

School Factory Hotel Hospital Office

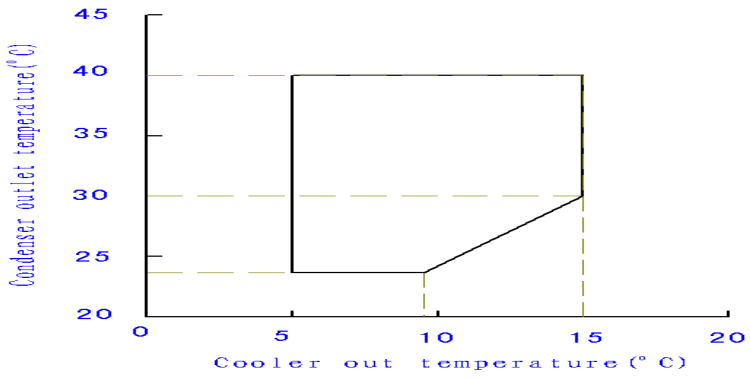
4. Operating Range

Content	Running range
Chilled Leaving Water Temperature	5℃～15℃
Cooling Entering water Temperature	20℃~35℃
Water flow volume	Rating flow volume±20%
Max inlet/outlet water Temp. difference	8℃
Fouling factor (m^{2}·℃/kW)	0.086
Voltage tolerance	Rating Voltage±10%
Phase tolerance	±2%
Power supply frequency	Rating frequency±2%
Evaporator max working pressure on water side	1.0MPa
Compressor max. start count	4 times/h
Environment quality	High corrosive environment and high humidity should be avoided.
Drainage system	The height of water drainage should not be higher than the base of the unit on the spot
Normal operation ambient temperature	-10℃~45℃
Storage and transport temperature	-15℃～50℃
Applicable altitude range：	No more than 1000m

LSBLG/MCFN cooler	Minimum	Maximum
Entering temperature at start-up	9°C	22°C
Leaving temperature during operation	5°C	15°C
Entering/leaving temperature difference at full load	3.8°C	7.1°C

LSBLG/MCFN condenser	Minimum	Maximum
Entering temperature at start-up	19°C	33°C
Leaving temperature during operation	23°C	40°C
Entering/leaving temperature difference at full load	3.8°C	7.1°C

Changes water temperature curve in the operation:



5. Specification

Single head:

Item \ Model			LSBLG365 /MCFN	LSBLG465 /MCFN	LSBLG560 /MCFN	LSBLG750 /MCFN
Cooling Capacity		kW	364	465	560	750
		RT	103．5	132.3	159.3	213.3
Refrigerant model		-	R134a			
Refrigerant charged		kg	210	240	240	250
COP(Kw/kw)			5.87	5.96	5.89	6.15
Oil charge		Liter	HBR-B04/ 35	HBR-B04/ 39	HBR-B04/ 39	HBR-B04/ 41
Power supply			380V, 3Ph, 50Hz			
Compressor	Type		Semi-hermetic screw compressor			
	Quantity		1	1	1	1
	Capacity adjusting		25%,50%,75%,100%			
	Power input	kW	62	78	95	122
	Rated current	A	106	133	162	208
Evaporator	Type		Shell-and-tube evaporator			
	Water flow volume	m^3/h	63	80	96	129
	Pipe diameter	mm	DN125	DN125	DN150	DN150
	Water pressure drop	kPa	39	39	38	40
	Water side working	MPa	1.0	1.0	1.0	1.0
Condenser	Type		Shell-and-tube condenser			
	Water flow	m^3/h	73	94	113	150
	Pipe diameter	mm	DN125	DN125	DN150	DN150
	Water pressure drop	kPa	51	52	51	55
	Water side working	MPa	1.0	1.0	1.0	1.0
Dimension	Length	mm	3500	3500	3640	3640
	Width	mm	1400	1400	1420	1420
	Height	mm	1680	1750	1970	1970
Shipping weight		kg	3000	3120	3420	3930
Running weight		kg	3300	3520	3840	4380

Notes:

Nominal cooling capacities are based on following conditions: Chilled water inlet/outlet temperature 12/7℃ (53.6F/44.6F); Cooling water inlet/outlet temperature 30/35℃ (86F/96F).

The design fouling factor for both evaporator and condenser are 0.086m2/kW (0.0005ft2 F.hr/Btu), otherwise can be customized.

Dual head:

Model / Item			LSBLG825 /MCFN	LSBLG925 /MCFN	LSBLG1120 /MCFN	LSBLG1230 /MCFN	LSBLG1500 /MCFN
Cooling Capacity		kW	825	924	1120	1230	1500
		RT	234.6	262.7	318.5	349.7	426.5
Refrigerant model		-	R134a				
Refrigerant charged		kg	360	380	400	420	440
COP(Kw/kw)			5.57	5.92	5.89	5.86	5.95
Oil charge		Liter	HBR-B04/ 39*2	HBR-B04/ 39*2	HBR-B04/ 39*2	HBR-B04/ 39*2	HBR-B04/ 41*2
Power supply			380V, 3Ph, 50Hz				
Compressor	Type		Semi-hermetic screw compressor				
	Quantity		2	2	2	2	2
	Capacity adjusting		25%,50%,75%,100%				
	Power input	kW	148	156	190	210	244
	Rated current	A	253	266	324	359	417
Evaporator	Type		Shell-and-tube evaporator				
	Water flow volume	m^3/h	142	159	193	212	258
	Pipe diameter	mm	DN150	DN150	DN200	DN200	DN200
	Water pressure drop	kPa	73	77	71	71	73
	Water side working pressure	MPa	1.0	1.0	1.0	1.0	1.0
Condenser	Type		Shell-and-tube condenser				
	Water flow	m^3/h	168	186	226	248	300
	Pipe diameter	mm	DN150	DN150	DN200	DN200	DN200
	Water pressure drop	kPa	88	90	85	85	87
	Water side working pressure	MPa	1.0	1.0	1.0	1.0	1.0
Dimension	Length	mm	4650	4650	4700	4700	4700
	Width	mm	1500	1500	1600	1600	1620
	Height	mm	1900	1900	2100	2100	2200
Shipping weight		kg	5500	5700	6200	7000	7200
Running weight		kg	6000	6210	6710	7680	7900

Notes:

Nominal cooling capacities are based on following conditions: Chilled water inlet/outlet temperature 12/7℃ (53.6F/44.6F); Cooling water inlet/outlet temperature 30/35℃ (86F/96F).

The design fouling factor for both evaporator and condenser are 0.086m2/kW (0.0005ft2 F.hr/Btu), otherwise can be customized.

6. Performance Data

Model	Chilled water leaving temp.℃	Cooling water entering temp. ℃					
		30		32		35	
		Cooling capacity (kW)	Input(kW)	Cooling capacity (kW)	Input(kW)	Cooling capacity (kW)	Input(kW)
365	5	341.1	60.0	333.1	61.6	326.1	64.3
	6	352.4	61.1	347.3	62.9	337.1	65.2
	7	364.0	62.0	359.6	63.6	345.8	66.0
	8	377.5	63.1	368.0	64.4	356.7	67.1
	9	388.8	63.7	383.3	65.5	372.7	67.8
	10	402.9	65.0	394.9	66.5	384.0	68.9
	11	424.8	66.3	414.2	67.5	398.2	70.0
	12	441.5	67.6	430.6	68.5	413.9	71.0
	13	458.6	68.9	447.4	69.5	429.9	72.1
	14	476.5	70.1	464.5	70.5	446.6	73.2
	15	494.7	71.4	482.7	71.4	464.1	74.2
465	5	435.7	75.4	425.5	77.5	416.6	80.9
	6	450.1	76.8	443.6	79.2	430.6	82.1
	7	465.0	78.0	459.4	80.0	441.8	83.1
	8	482.2	79.3	470.1	81.0	455.7	84.5
	9	496.6	80.2	489.6	82.4	476.2	85.3
	10	514.8	81.8	504.5	83.6	490.6	86.7
	11	542.7	83.4	529.2	84.9	508.7	88.1
	12	564.0	85.0	550.1	86.2	528.7	89.3
	13	585.9	86.7	571.5	87.4	549.2	90.7
	14	608.7	88.2	593.3	88.7	570.6	92.1
	15	631.9	89.9	616.6	89.9	592.9	93.3
560	5	524.7	91.9	512.4	94.4	501.8	98.5
	6	542.1	93.6	534.2	96.4	518.6	99.9
	7	560.0	95.0	553.3	97.4	532.0	101.2
	8	580.7	96.6	566.2	98.6	548.8	102.9
	9	598.1	97.7	589.7	100.3	573.4	103.9
	10	619.9	99.7	607.6	101.8	590.8	105.6
	11	653.5	101.6	637.3	103.4	612.6	107.3
	12	679.3	103.6	662.5	105.0	636.7	108.8
	13	705.6	105.5	688.2	106.5	661.4	110.5
	14	733.0	107.4	714.6	108.0	687.1	112.2
	15	761.0	109.4	742.6	109.4	714.0	113.6

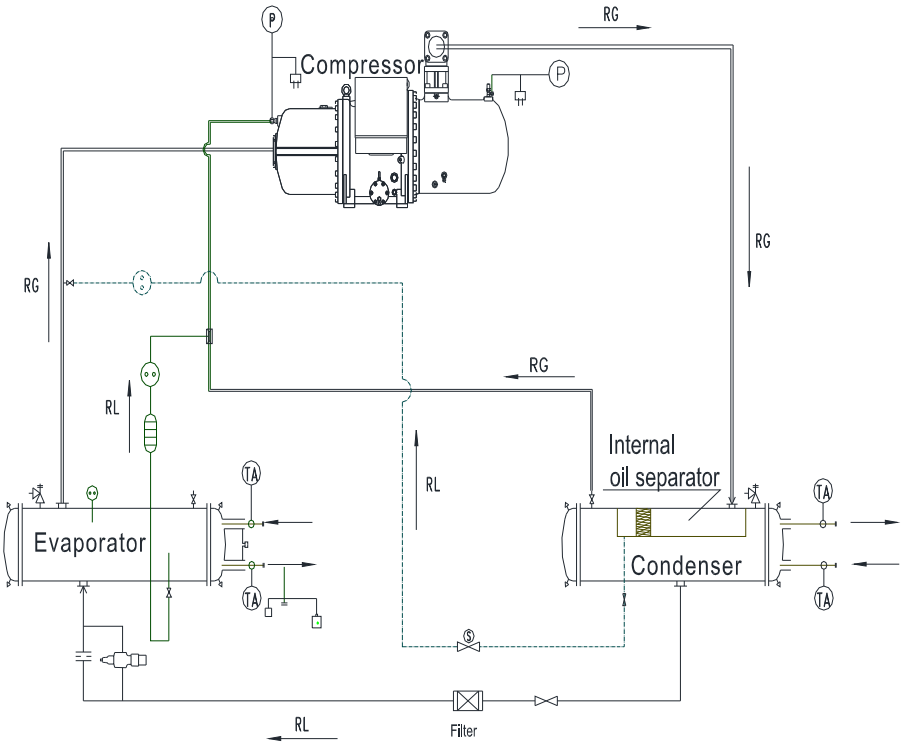
Model	Chilled water leaving temp.℃	Cooling water entering temp. ℃					
		30		32		35	
		Cooling capacity (kW)	Input(kW)	Cooling capacity (kW)	Input(kW)	Cooling capacity (kW)	Input(kW)
750	5	702.8	118.0	686.3	121.3	672.0	126.5
	6	726.0	120.2	715.5	123.8	694.5	128.3
	7	750.0	122.0	741.0	125.1	712.5	129.9
	8	777.8	124.1	758.3	126.6	735.0	132.1
	9	801.0	125.4	789.8	128.8	768.0	133.5
	10	830.3	128.0	813.8	130.8	791.3	135.7
	11	875.3	130.4	853.5	132.7	820.5	137.7
	12	909.8	133.0	887.3	134.8	852.8	139.7
	13	945.0	135.5	921.8	136.8	885.8	141.9
	14	981.8	138.0	957.0	138.7	920.3	144.1
	15	1019.3	140.5	994.5	140.5	956.3	145.9
825	5	773.0	143.1	754.9	147.1	739.2	153.5
	6	798.6	145.8	787.1	150.2	764.0	155.7
	7	825.0	148.0	815.1	151.7	783.8	157.6
	8	855.5	150.5	834.1	153.6	808.5	160.3
	9	881.1	152.1	868.7	156.3	844.8	161.9
	10	913.3	155.3	895.1	158.7	870.4	164.6
	11	962.8	158.2	938.9	161.0	902.6	167.1
	12	1000.7	161.3	976.0	163.5	938.0	169.5
	13	1039.5	164.4	1013.9	165.9	974.3	172.1
	14	1079.9	167.4	1052.7	168.3	1012.3	174.8
	15	1019.3	170.5	994.5	170.5	956.3	177.0
925	5	866.7	150.9	846.4	155.1	828.8	161.8
	6	895.4	153.7	882.5	158.3	856.6	164.1
	7	925.0	156.0	913.9	159.9	878.8	166.1
	8	959.2	158.7	935.2	161.9	906.5	168.9
	9	987.9	160.4	974.0	164.7	947.2	170.7
	10	1024.0	163.6	1003.6	167.2	975.9	173.5
	11	1079.5	166.8	1052.7	169.7	1012.0	176.1
	12	1122.0	170.0	1094.3	172.4	1051.7	178.6
	13	1165.5	173.3	1136.8	174.9	1092.4	181.4
	14	1210.8	176.4	1180.3	177.4	1135.0	184.2
	15	1257.1	179.7	1226.6	179.7	1179.4	186.6

Model	Chilled water leaving temp.℃	Cooling water entering temp. ℃					
		30		32		35	
		Cooling capacity (kW)	Input(kW)	Cooling capacity (kW)	Input(kW)	Cooling capacity (kW)	Input(kW)
1120	5	1049.4	183.7	1024.8	188.9	1003.5	197.0
	6	1084.2	187.2	1068.5	192.9	1037.1	199.9
	7	1120.0	190.0	1106.6	194.8	1064.0	202.4
	8	1161.4	193.2	1132.3	197.2	1097.6	205.8
	9	1196.2	195.3	1179.4	200.6	1146.9	207.9
	10	1239.8	199.3	1215.2	203.7	1181.6	211.3
	11	1307.0	203.1	1274.6	206.7	1225.3	214.5
	12	1358.6	207.1	1325.0	210.0	1273.4	217.6
	13	1411.2	211.1	1376.5	213.0	1322.7	221.0
	14	1466.1	214.9	1429.1	216.0	1374.2	224.4
	15	1522.1	218.9	1485.1	218.9	1428.0	227.2
1230	5	1152.5	203.1	1125.5	208.7	1102.1	217.8
	6	1190.6	206.9	1173.4	213.2	1139.0	220.9
	7	1230.0	210.0	1215.2	215.3	1168.5	223.7
	8	1275.5	213.6	1243.5	218.0	1205.4	227.4
	9	1313.6	215.9	1295.2	221.8	1259.5	229.7
	10	1361.6	220.3	1334.6	225.1	1297.7	233.5
	11	1435.4	224.5	1399.7	228.5	1345.6	237.1
	12	1492.0	228.9	1455.1	232.1	1398.5	240.5
	13	1549.8	233.3	1511.7	235.4	1452.6	244.2
	14	1610.1	237.5	1569.5	238.8	1509.2	248.0
	15	1671.6	241.9	1631.0	241.9	1568.3	251.2
1500	5	1405.5	235.9	1372.5	242.5	1344.0	253.0
	6	1452.0	240.3	1431.0	247.7	1389.0	256.7
	7	1500.0	244.0	1482.0	250.1	1425.0	259.9
	8	1555.5	248.1	1516.5	253.3	1470.0	264.3
	9	1602.0	250.8	1579.5	257.7	1536.0	266.9
	10	1660.5	256.0	1627.5	261.6	1582.5	271.3
	11	1750.5	260.8	1707.0	265.5	1641.0	275.5
	12	1819.5	266.0	1774.5	269.6	1705.5	279.4
	13	1890.0	271.1	1843.5	273.5	1771.5	283.8
	14	1963.5	276.0	1914.0	277.4	1840.5	288.2
	15	2038.5	281.1	1989.0	281.1	1912.5	291.8

7. System Schematic Diagram

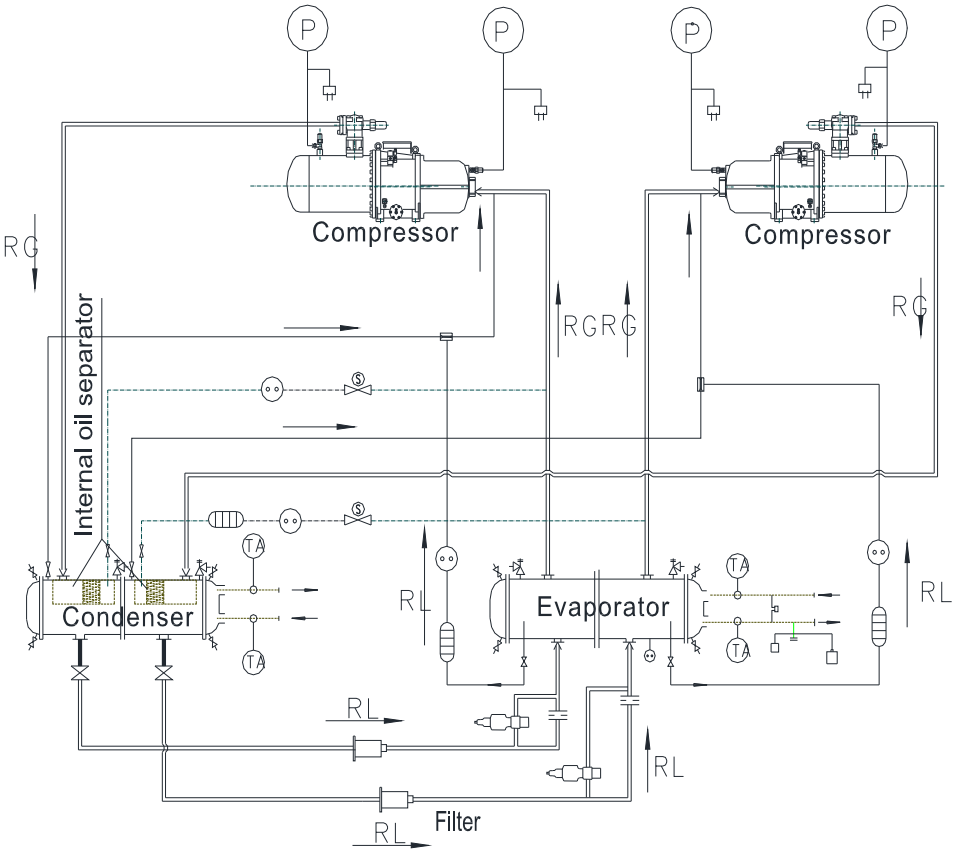
For single head unit (LSBLG365~750/MCFN)

Code	Name
P	Pressure Gauge
TA	Temperature Sensor
	Sight glass
	Filter
S	Solenoid Valve
	Safety Valve
	Check Valve
	Shut-off Valve
RG RG	Refrigerant Gas Line
RL RL	Refrigerant Liquid Line
O	Oil way
W	Water way
	Throttle plate
	High/Low Pressure Switch
	Electric expansion valve
	Venturi Tube
	Pressure Difference Switch



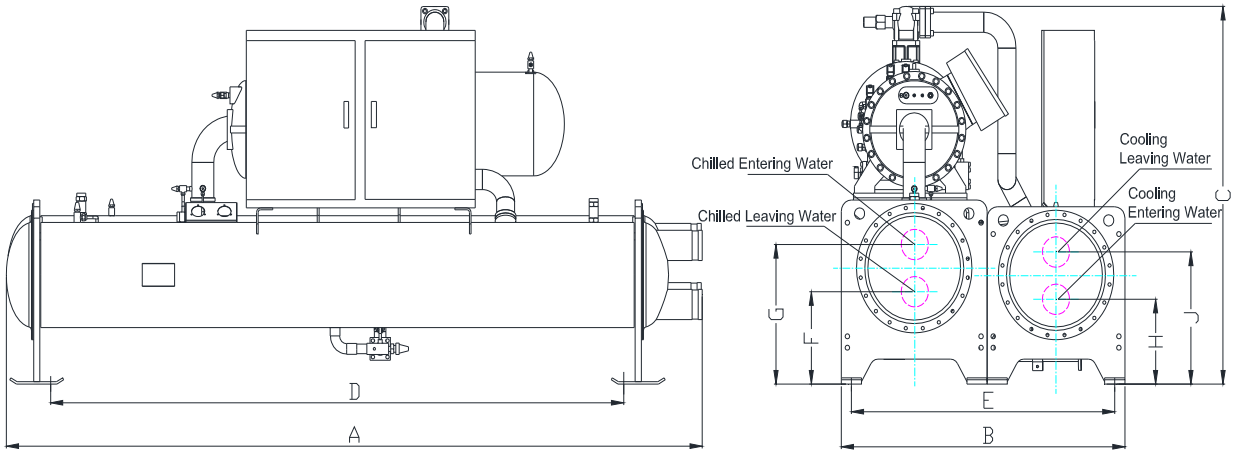
For dual head unit (LSBLG820~1500/MCFN)

Code	Name
P	Pressure Gauge
TA	Temperature Sensor
	Sight glass
	Filter
S	Solenoid Valve
	Safety Valve
	Check Valve
	Shut-off Valve
RG RG	Refrigerant Gas Line
RL RL	Refrigerant Liquid Line
O	Oil way
W	Water way
	Throttle plate
	High/Low Pressure Switch
	Electric expansion valve
	Venturi Tube
	Pressure Difference Switch



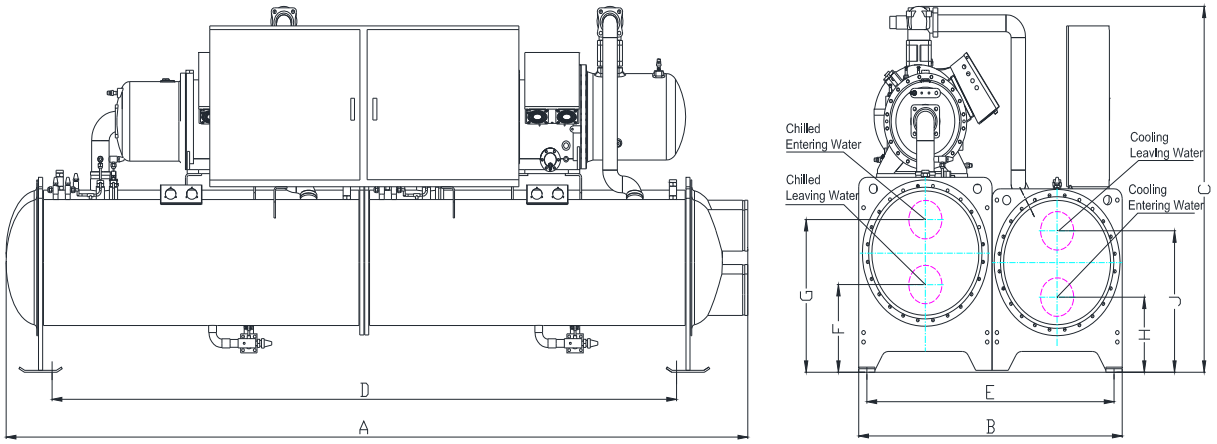
8. Outline Dimension

Single head:



Model	A	B	C	D	E	F	G	H	J	Cooling water Inlet/outlet	Chilled water Inlet/outlet
365/MCFN	3500	1400	1750	2850	1300	380	640	350	610	DN125	DN125
465/MCFN	3500	1400	1800	2850	1300	380	640	350	610	DN125	DN125
560/MCFN	3600	1500	2000	2855	1320	500	780	380	640	DN150	DN150
750/MCFN	3600	1500	2000	2855	1320	500	780	380	640	DN150	DN150

Dual heads:



Model	A	B	C	D	E	F	G	H	J	Cooling water Inlet/outlet	Chilled water Inlet/outlet
825/MCFN	4500	1600	1900	3855	1400	470	730	430	730	DN150	DN150
925/MCFN	4500	1600	1900	3855	1400	470	730	430	730	DN150	DN150
1120/MCFN	4600	1700	2100	3855	1500	440	740	390	690	DN200	DN200
1230/MCFN	4600	1700	2100	3855	1500	440	740	390	690	DN200	DN200
1500/MCFN	4600	1700	2100	3860	1520	460	800	410	750	DN200	DN200

9. Water Flow

Balance the chilled water flow through the evaporator and the condenser water flow through the condenser. The flow rates must fall between the minimum and maximum values shown in the below table. Flow rates below the minimum values shown will result in laminar flow which will reduce efficiency, cause erratic operation of the electronic expansion valve and could cause low temperature cutouts. On the other hand, flow rates exceeding the maximum values shown can cause erosion on the heat exchanges water connections and tubes, even piping breaking.

Variable chilled water flow through the heat exchanges while the compressor(s) are operating is not recommended. The chiller control set points are based upon a constant flow and variable temperature.

Unit Model	CHILLED WATER				CONDENSER WATER			
	MIN. FLOW RATE		MAX. FLOW RATE		MIN. FLOW RATE		MAX. FLOW RATE	
SIZE	m^3/h	GPM	m^3/h	GPM	m^3/h	GPM	m^3/h	GPM
LSBLG365/MCFN	44	194	82	360	51	225	95	418
LSBLG465/MCFN	56	246	104	458	66	290	122	538
LSBLG560/MCFN	67	296	125	549	79	348	147	646
LSBLG750/MCFN	90	397	168	738	105	462	195	858
LSBLG825/MCFN	99	437	185	812	118	517	218	961
LSBLG925/MCFN	111	490	207	909	130	573	242	1064
LSBLG1120/MCFN	135	594	251	1104	158	696	294	1293
LSBLG1230/MCFN	148	653	276	1213	174	764	322	1419
LSBLG1500/MCFN	181	795	335	1476	210	924	390	1716

II. Installation

Safety considerations

Access to the unit must be reserved to authorized personnel, qualified and trained in monitoring and maintenance. The access limitation device must be installed by the customer.

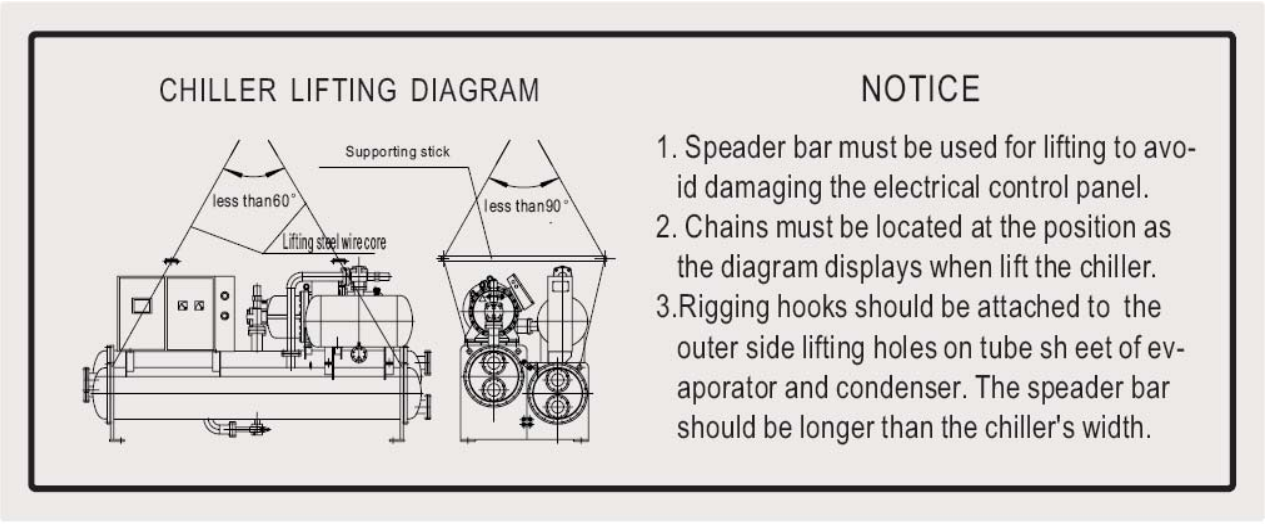
After the unit has been received, when it is ready to be installed or reinstalled, and before it is started up, it must be inspected for damage. Check that the refrigerant circuit(s) is (are) intact, especially that no components or pipes have shifted. If in doubt, carry out a leak tightness check and verify with the manufacturer that the circuit integrity has not been impaired. If damage is detected upon receipt, immediately file a claim with the shipping company.

Strongly recommend employing a specialized company to unload the machine.

Safety is only guaranteed, if these instructions are carefully followed. If this is not the case, there is a risk of material deterioration and injuries to personnel.

1. Unit Lifting

1) When transporting the unit, please make sure there is no any collision happens between the unit and other objects.
2) Move the unit by placing a roller in the bottom of the unit to avoid damage.
3) Choose a suitable crane according to the unit's weight（Buy an insurance for it if it is convenient）; Hoist the unit according to the following chart strictly. The steel rope shall wind the lifting hook one circle to prevent steel rope slipping and causing danger when the weight is unbalanced. Security guard circle should be set up when hoist the unit, and also abide by the local Safety Regulations when hoist the unit. Prohibit non-staff entering the job site or staying under the unit or the hoisting crane.

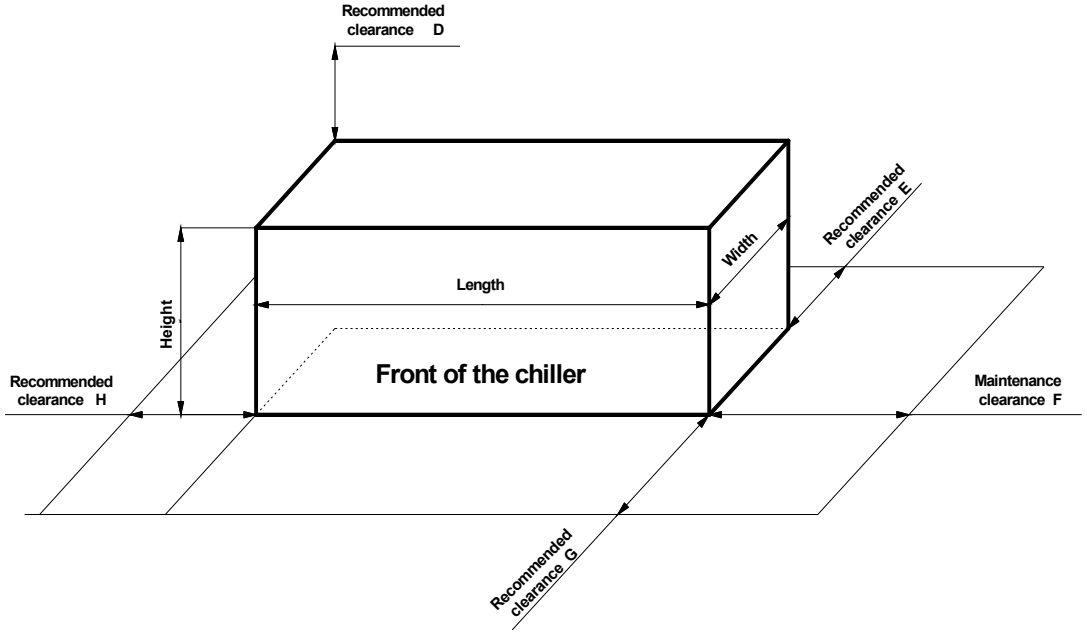


2. Installation Location Select

1) Leave enough space above and around unit for operation and maintenance. For cleaning the

copper pipes or exchanging pipes, there should be enough space reserved(for single compressor unit, it should be at least 3.5m, for dual compressor unit, it should be 5m), and the other end of the unit should have at least 2.0m space, use the hole on door or other holes with appropriate position; there should have the space of 0.7m in front of the unit (the side faces to the electric cabinet) for operation; the space in front and back of the unit should not less than 0.6m .

2) Do not install the unit at the place exposed to sunlight or other heat sources.
3) Near the power supply where it is convenient for wiring.
4) The floor is solid enough and the location should not easily bring about resonance or noise.
5) Put the unit indoors which should be well-ventilated with low humidity and little dust.



Model / Dimensions	LSBLG/MCFN R134a, FLOODED TYPE								
	Single head				Dual heads				
	365	465	560	750	825	925	1120	1230	1500
D(mm)	600	600	600	600	600	600	600	600	600
E(mm)	600	600	600	600	600	600	600	600	600
F(mm)	2000	2000	2000	2000	5000	5000	5000	5000	5000
G(mm)	700	700	700	700	700	700	700	700	700
H(mm)	3500	3500	3500	3500	2000	2000	2000	2000	2000

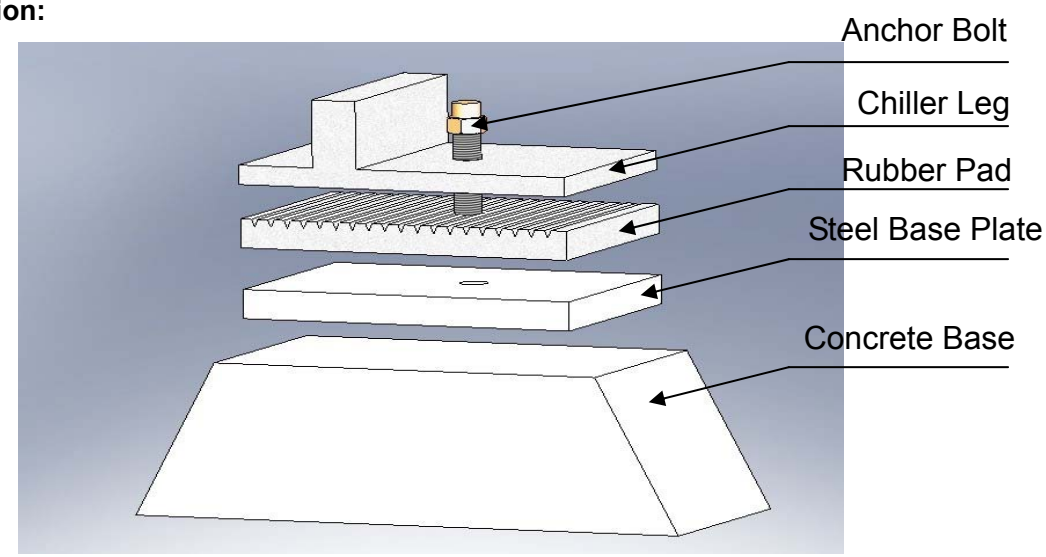
3. Installation Foundation

1) Please take into account the construction of installation foundation. Attention should be especially paid to the intensity of the floor and noise elimination when installing the unit in interlayer or on the top floor. It is suggested to consult the building designer before installation.
2) For convenient drainage, gutter way should be made around the basement to ensure the drainage unblocked.
3) To eliminate the vibration and noise, put an absorber between the unit and basement and keep

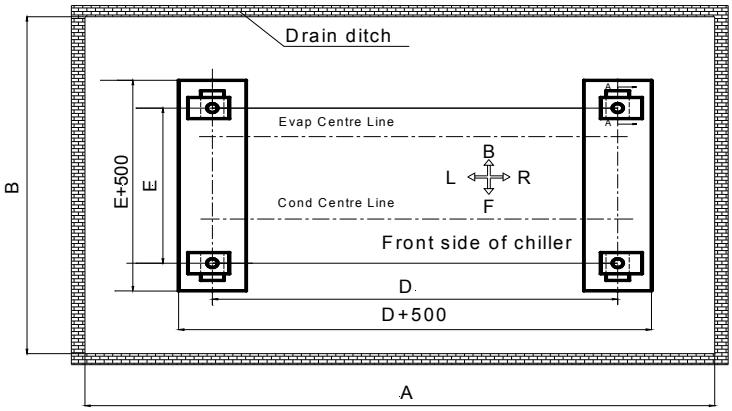
the unit in balance. Install a shockproof foundation when necessary.

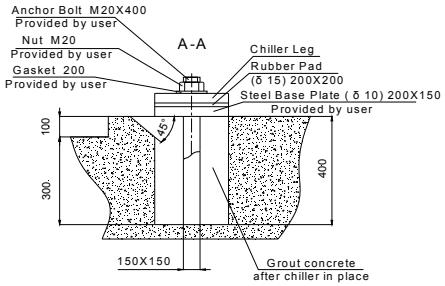
4) Vibration isolators are recommended for all roof mounted installations or wherever vibration transmission is a consideration. Neoprene Isolation is optional, it is recommended for normal installations and provides good performance in most applications for the least cost. Spring isolator is level adjustable, spring and cage type isolators for mounting under the unit base rails. 1" nominal deflection may vary slightly by application.

Typical Isolation:



Foundation Dimensions



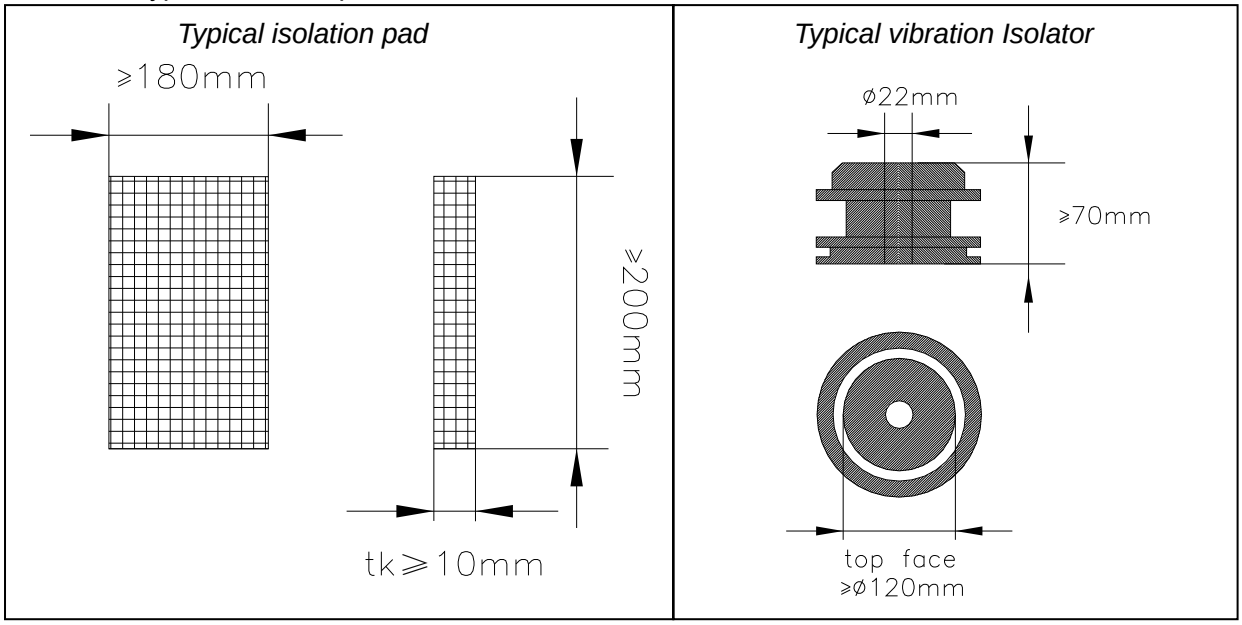


Foundation Bolt Installation Dimension Table

Model / Dimension	LSBLG**/MCF Flooded Screw Water Cooled Chiller								
	365	465	560	750	825	925	1120	1230	1500
A(mm)	3490	3490	3490	3490	4490	4490	4490	4490	4490
B(mm)	1950	1950	2050	2050	1950	1950	2100	2100	2100
D(mm)	2790	2790	2790	2790	3790	3790	3790	3790	3790
E(mm)	1250	1250	1350	1350	1250	1250	1400	1400	1400

4. Vibration Isolators

Put the absorbers under unit saddles before final positioned the unit. The quantity of absorber used for each unit is always decided by the elasticity or durometer value of the absorber. Below please refer to the typical isolation pad and vibration isolator for selection.



Expected load bearing value listed below:

Model	Isolation pad		Vibration Isolator		Running Weight (kg)
	Minimum load bearing (kg/EA)	Minimum Quantity	Minimum load bearing (kg/EA)	Quantity	
LSBLG 365/MCFN	900	4	900	4	3300
LSBLG 465/MCFN	1000	4	1000	4	3600
LSBLG 560/MCFN	1200	4	1200	4	4200
LSBLG 750/MCFN	1400	4	1400	4	4500
LSBLG 825/MCFN	1800	4	1800	4	6000
LSBLG 925/MCFN	1800	4	1800	4	6500
LSBLG 1120/MCFN	2000	4	2000	4	7300
LSBLG1230/MCFN	2200	4	2200	4	7600
LSBLG 1500/MCFN	2200	4	2200	4	8000

Note:

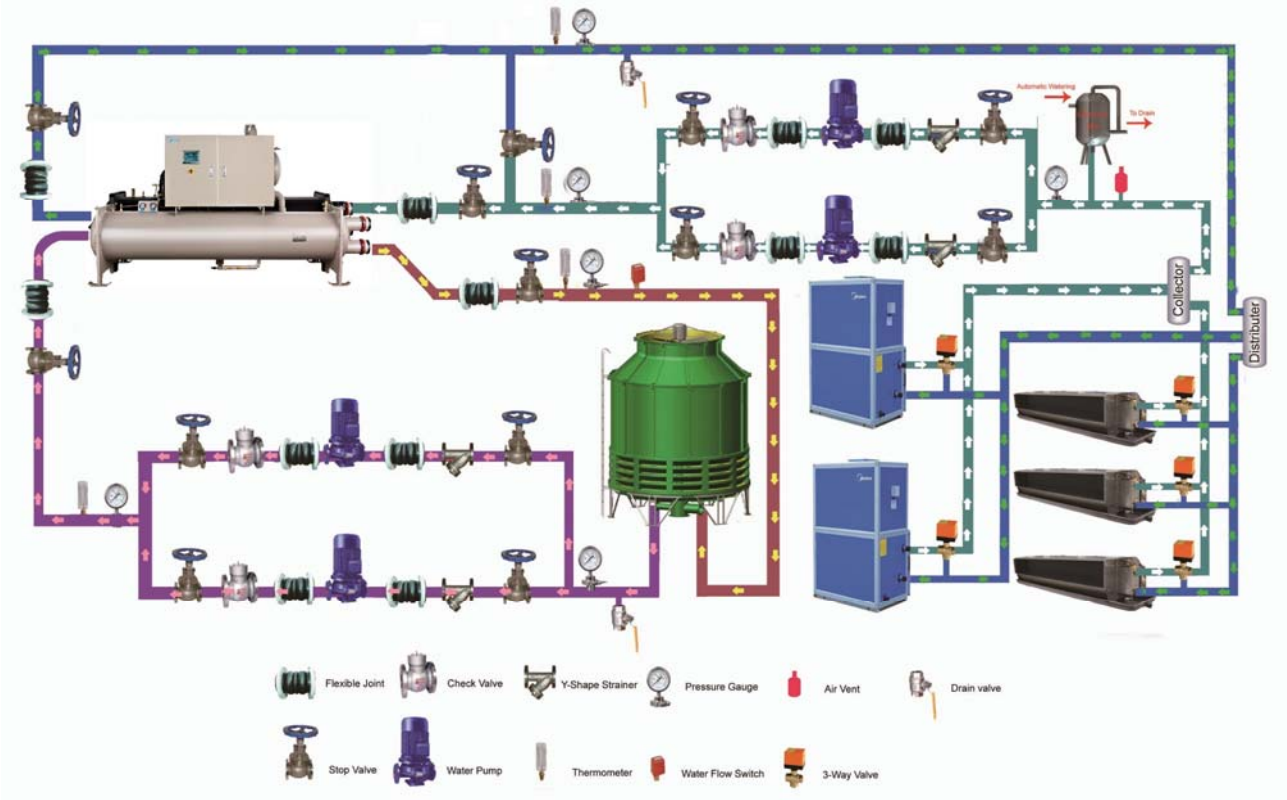
(1) Pads have to extend the full length of the saddle when isolation pad be used.

(2) Level the unit to within 5mm over through it's length and width after absorbers installed.

5. Installation of Water Pipeline System

Due to the variety of piping practices, it is advisable to follow the recommendations of local authorities. The installation and insulation of the water pipelines of the air conditioning system shall be designed and guided by design professionals, and confirm to the corresponding provisions of the HVAC installation specifications.

Basically, the piping should be designed with a minimum number of bends and changes in elevation to keep system cost down and performance up.



1) The water inlet pipeline and drain pipeline shall be connected according to the requirements of markings on the unit. Generally, the refrigerant pipe side of the evaporator is the chilled water outlet side.
2) The chilled water pipeline system must be provided with the soft connection, thermometer, pressure gauge, water filter, electronic scale remover, check valve, target flow controller, discharge valve, drain valve, stop valve, expansion tank, etc.
3) The water system must be fitted with the water pump with appropriate displacement and head, so as to ensure normal water supply to the unit. The soft connection shall be used between the water pump, unit and water system pipelines, and the bracket shall be provided to avoid stress on the unit. Welding work for installation shall avoid damage to the unit.

   (1) Determination of water pump flow:

   Flow (m3/h) = (1.1 ~ 1.2) * Unit Cooling Capacity (kW)/5.8

   (2) Determination of water pump head:

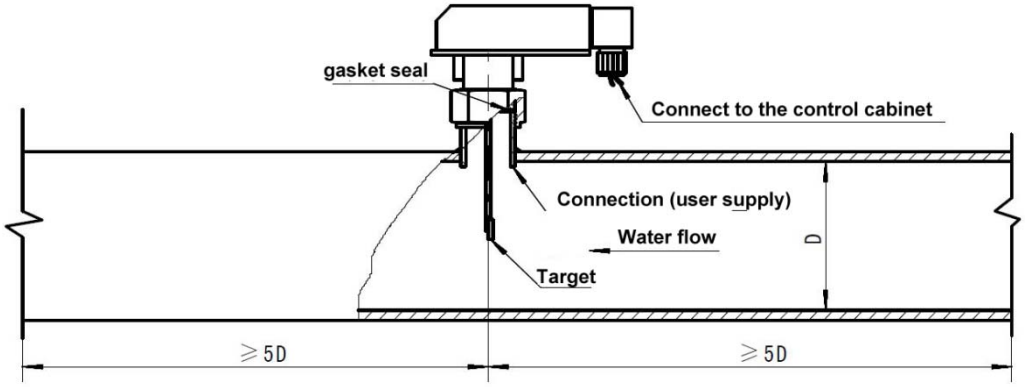
   Head (m) = (Unit Resistance (see product parameters) + Resistance at Maximum End of

Pressure Drop (see product parameters) + Pipeline Resistance (length of the least favorable loop pipe * 0.05) + Local Resistance (length of the least favorable loop pipe * 0.05 * 0.5)) * (1.1 ~ 1.2)

4) The flow switch must be arranged on the drain pipe of the evaporator. The flow switch shall be interlocked with the input contact in the control cabinet. Its installation requirements are as follows:

(1) The flow switch shall be installed on the pipe vertically.

(2) The straight pipe section at each side of the flow switch shall have a length that is at least 5 times the pipe diameter; do not install it near the elbow, orifice plate or valve.



(3) The direction of the arrow on the flow switch must be consistent with the direction of water flow.

(4) In order to prevent vibration of the flow switch, remove all air in the water system.

(5) Adjust the flow switch to keep it in open state when the flow is lower than the minimum flow (the minimum flow is 70% of the design flow). When the water flow is satisfied, the flow switch shall keep in closed state.

5) The water filter must be installed before the water inlet pipeline of the unit, which shall be provided with a 25-mesh screen. This will aid in preventing foreign material from entering and decreasing the performance of the evaporator.

6) A strainer should be placed for enough upstream to prevent cavitation at the pump inlet (consult pump manufacturer for recommendations). The use of a strainer will prolong pump life and help maintain high system performance levels

7) The flushing and insulation of the water pipelines shall be carried out before it is connected with the unit, so as to prevent dirt from damaging the unit.

8) The design water pressure of the water chamber is 1.0Mpa. Use of the water chamber shall be not exceeding this pressure in order to avoid damaging the evaporator.

9) Do not load the weight of water pipe onto the unit. When water inlet/outlet are connected with corresponding water pipe, soft connection such as rubber joint should be used to avoid the transmission and inter-disturbance of vibration and noise to avoid the vibration which may be transmitted to indoor side.

10) In close loop water system, to diminish the impact on water pipe because of the expansion or contraction of water volume and to avoid the influence caused by supplementing water pressure, water return side should be fitted with an expansion water tank. The expansion tank shall be installed 1~1.5m higher than the system, and its capacity accounts about 1/10 of the water amount in the whole system.
11) The drain connection is arranged on the evaporator cylinder. The drain outlet has been equipped with a 1/2" plug.
12) In order to expel the air from water system, install an automatic discharge valve on the highest place of local water pipe and the horizontal pipe should be up tilted for about 1/250 degree.
13) The thermometer and pressure gauge are arranged on the straight pipe sections of the water inlet pipeline and drain pipeline, and their installation places shall be far away from the elbows.

The pressure gauge installed shall be vertical to the water pipe, and the installation of the thermometer shall ensure that its temperature probe can be inserted into the water pipe directly.

14) Each low point shall be fitted with a drain connection so as to drain the remaining water in the system. Before operating the unit, connect the stop valves to the drain pipeline, respectively near the water inlet connection and drain connection. The by-pass pipeline shall be provided between the water inlet pipe and drain pipe of the evaporator, convenient for cleaning and maintenance. Use of flexible connections can reduce vibration transfer.
15) The chilled water pipeline and expansion tank shall be subjected to insulation treatment, and the maintenance and operation part shall be reserved on the valve connections.
16) After the air-tightness test is carried out, and the insulation layer is applied on the pipeline, so as to avoid heat transfer and surface condensation; the insulation layer shall be covered by

moisture-proof seal.

17) Any water piping to the unit must be protected to prevent freezing. There are reserved terminals for the auxiliary electrical heater. Logic in PCB will transmit ON/OFF signal by checking the leaving evaporator water temperature.

Note: The unit only supplies the ON/OFF signal, but not the 220V power. If a separate disconnect is used for the 220V supply to the cooler heating cable, it should be clearly marked so that it is not accidentally shut off during cold seasons

18) If the unit is used as a replacement chiller on a previously existing piping system, the system should be thoroughly flushed prior to unit installation and then regular chilled water analysis and chemical water treatment is recommended immediately at equipment start-up.

19) Power on the chilled water pump, and inspect its rotation direction. The correct rotation direction shall be clockwise; if not, re-inspect the wiring of the pump.

20) Start the chilled water pump to circulate water flow. Inspect the water pipelines for water leakage and dripping.

21) Commission the chilled water pump. Observe whether the water pressure is stable. Observe the pressure gauges at the pump inlet and outlet, and the readings of the pressure gauges and the pressure difference between the inlet and outlet change slightly when the water pressure is stable. Observe whether the operating current of the pump is within the range of rated operating current; inspect whether the resistance of the system is too large if the difference between the operating current and rated value is too big; eliminate the system failures until the actual operating current is satisfied.

22) Inspect whether the water replenishing device for the expansion tank is smooth, and the auto discharge air valve in the water system enables auto discharge. If the discharge air valve is a manual type, open the discharge valve of the chilled water pipeline to discharge all air in the pipeline.

23) Adjust the flow and inspect whether the water pressure drop of the evaporator meets the requirement of the unit's normal operation. The pressure at the chilled water inlet and outlet of the unit shall be kept at least 0.2MPa.

24) The total water quantity in the system should be sufficient to prevent frequent "on-off" cycling. A reasonable minimum quantity would allow for a complete water system turnover in not less than 15 minutes.

III. Electrical Data

1. Field Wiring

WARNING: In order to prevent any accident of injury and death during the site wiring , the power supply shall be cut off before the line is connected to the unit.

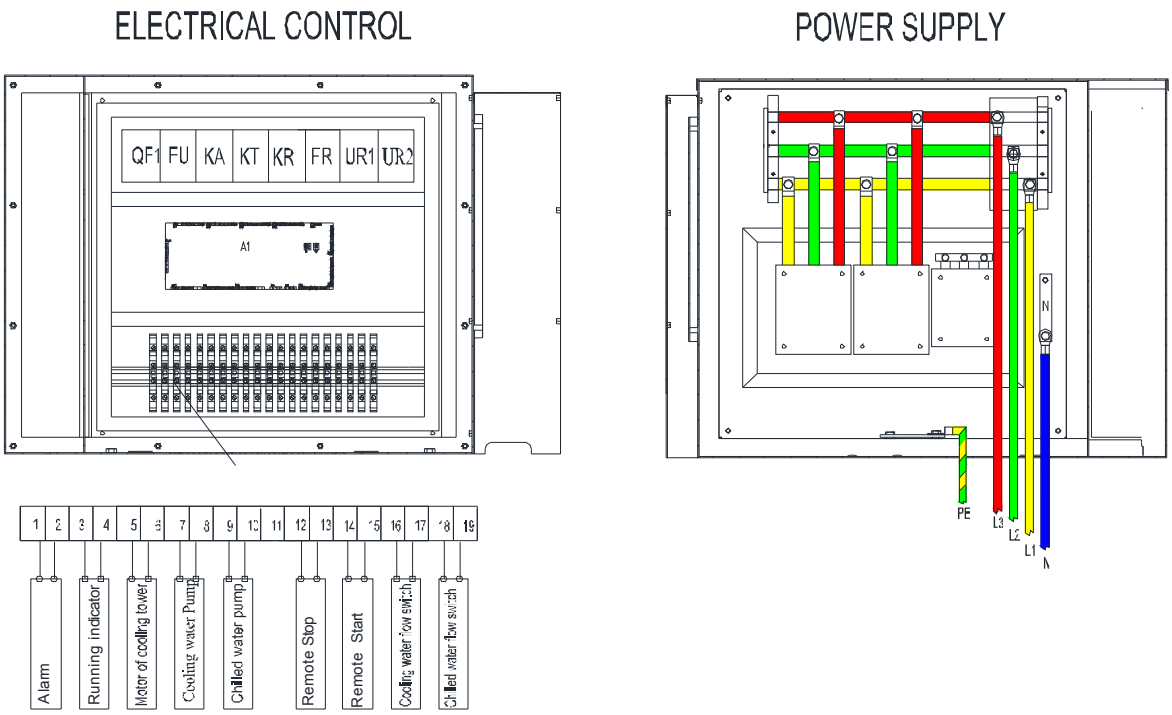
Wiring must comply with all applicable codes and ordinances. Warranty is voided if wiring is not in accordance with specifications. An open fuse indicates a short, ground, or overload. Before replacing a fuse or restarting a compressor or fan motor, the trouble must be found and corrected.

(1) Copper wire is required for all supply lines in field connection to avoid corrosion and overheat at the connection of terminals. The lines and control cables shall be separately paved and equipped with protective pipes to avoid intervention of supply line in control cable.

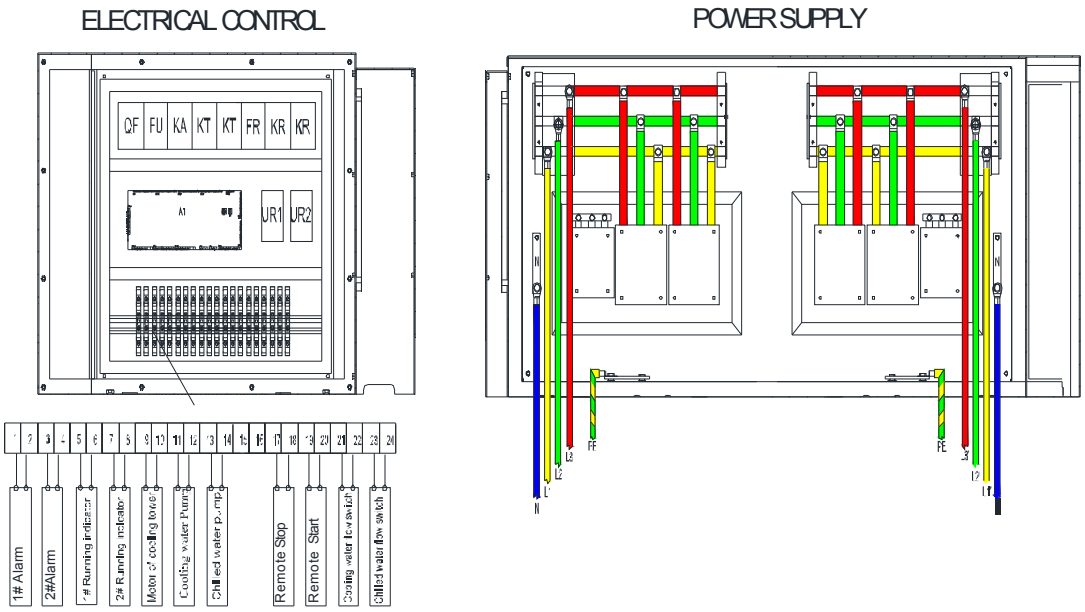
(2) Power section: It is required to connect the power supply cable to the control cabinet of the unit, when it arrives at the jobsite. The power supply cable is connected to the terminals of L1, L2, L3, N and PE and the terminals need to be fixed again after 24h running (the minimum allowed time). Please seal the entering wiring hole after users installed the main power wires, in order to avoid the dust entering into electric control cabinet.

Caution: it is suggested that to use appropriate tools to make sure that a enough height to install the main power wires if the basement is higher than 200 mm.

(3) Field Wiring:

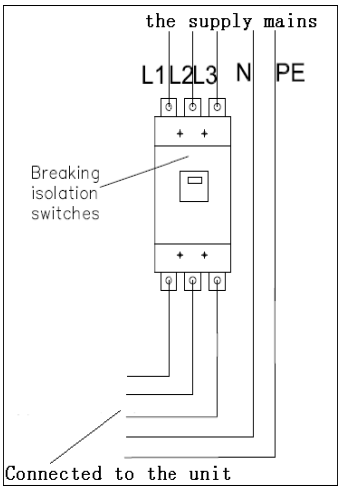


[Diagram for External Wiring of LSBLG365~750/MCFN Unit]



[Diagram for External Wiring of LSBLG825~1500/MCFN Unit]

(4) Breaking isolation switches should be added between the power cord of users and the unit. The capacities of the breaking isolation switches recommended are as follows.



BVR：Copper core PVC insulated soft wire					
Domestic model	Conductor material	Insulator material	Nominal section area (MM ²)	UL model	Note
BVR70	Cu	PVC	70	2/0	The electric cable must be copper core.
BVR95	Cu	PVC	95	4/0	
BVR120	Cu	PVC	120	250	
BVR150	Cu	PVC	150	300	
BVR185	Cu	PVC	185	400	

Unit Model	Rated Current /A	Max running current(A)	Breaker size (A)	Recommended Wire Size
365/MCFN	106	113	136	BVR50
465/MCFN	133	143	145	BVR70
560/MCFN	162	174	209	BVR95
750/MCFN	208	224	268	BVR120
825/MCFN	253	271	163×2	2*BVR70
925/MCFN	266	286	145×2	2*BVR70
1120/MCFN	324	348	209×2	2*BVR95
1230/MCFN	359	385	231×2	2*BVR95
1500/MCFN	417	462	277×2	2*BVR120

(5) Attention: refrigerant selection: the previous software settings are replaced by the current hardware settings to avoid the possibility of improper operation of the software leading to wrongly selected refrigerant and damage to the unit.

(6) In order to avoid wrong control in field connection, the liquid control circuit (24 V) shall not be in the same conduit with the lead wire with voltage higher than 24 V.

(7) The control circuits of various units are all 220 V, and for the wiring ways of the control circuits, please refer to the wiring diagrams supplied along with the units.

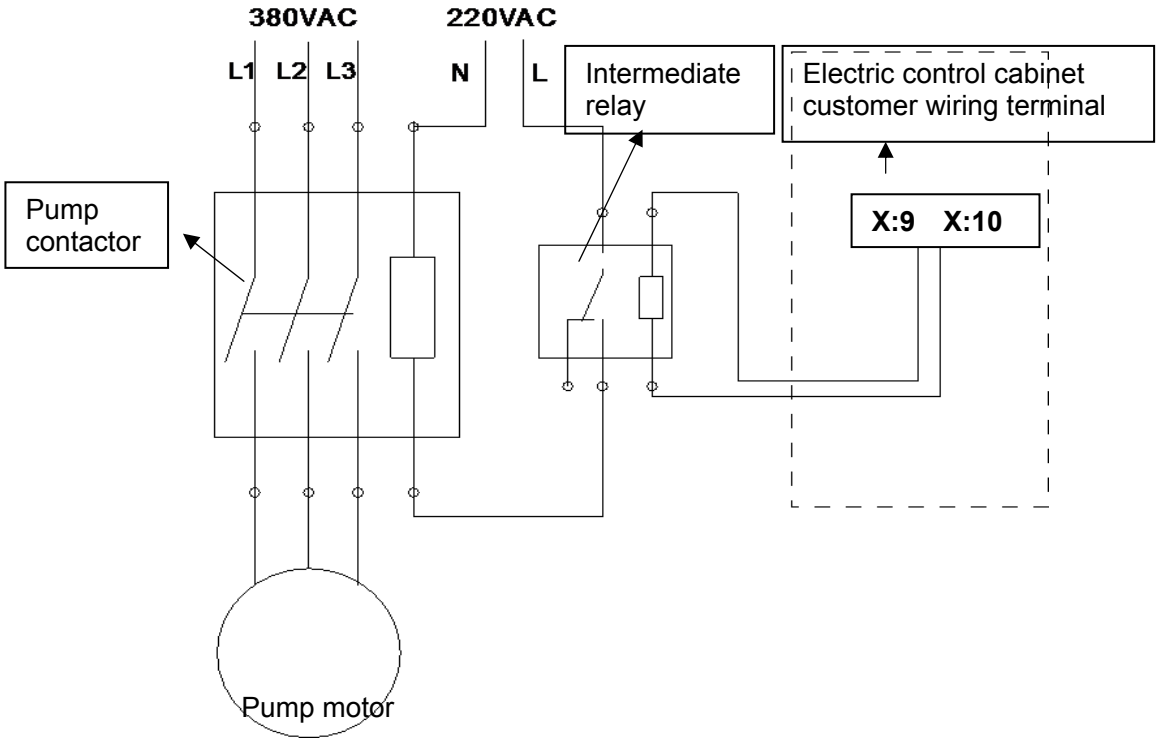
(8) A unit consists of master compressor and slave compressor communicating via shield wire protected by sleeve and paved separate from supply line.

(9) The control output cable to be connected on site shall be AC250V-1mm2, and 0.75mm2 shield wire (24 V) shall be used for control signal line.

(10) Attentions: Read the electrical wiring principle diagram and connect the wires strictly according to the wiring terminal diagram. Three-core shield cable (RVVP3×0.75mm2) shall be used for the connection of the temperature sensor. Common two-core cable (RVV2×0.75mm2) shall be used for the connection of flow switch to connect to the NO contact of the switch, i.e. the opening point when waterless. Two buttons can be connected to the external of remote start and stop.

(11) If the customer desires the linked control of the water pump, connect the water pump as shown in the diagram, where an intermediate relay is required. If the function of linked control of water pump is not needed, ensure that the water pump is started before starting the machine.

CAUTION: An independent power supply box needs to be equipped with the power supply of the water pump.



[Diagram for Wiring of Water Pump Linked Control]

(12) The wiring ports for remote start/stop, flow switch, cool/warm switch, water pump linked control, alarm indication, etc. are reserved in the electrical cabinet of the unit.

(13) Passive inching button is used for remote start and stop, and the flow switch must be connected to the NO contact, or the machine cannot be started.

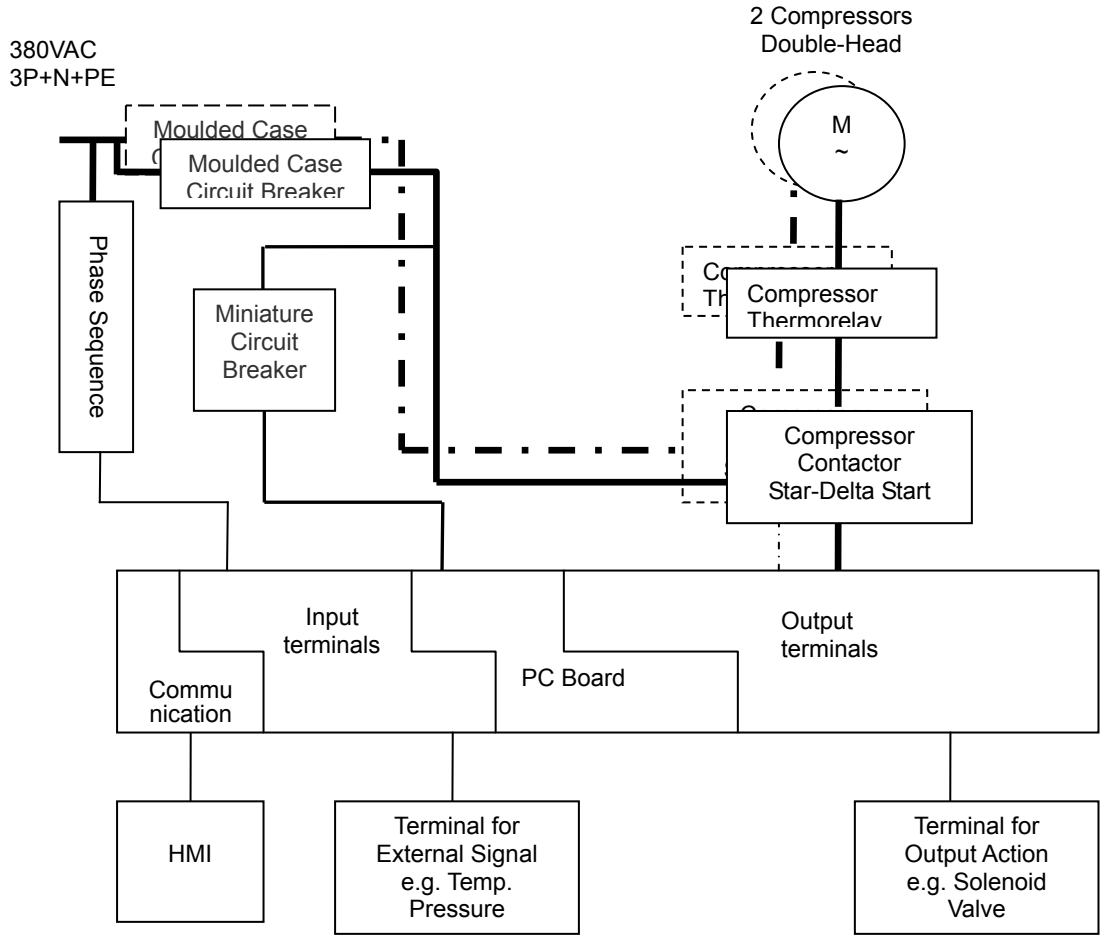
Passive holding switch is used for cool/warm switch, e.g. common selection switch. Controls of large power electrical appliances such as water pump and user electric heating must be interfaced with a relay, or the PCB might be burned. Other outputs can be directly connected to indicator lamps or alarms.

2. Electric parameter table

Power Table

Model	Main power		Power Range		Quantity of comp.	Rated current /A	Starting current /A	Max. running current/A
	V	Hz	Highest/ +%	Lowest/ -%				
LSBLG365/MCFN	380	50	+10	-10	1	106	810	113
LSBLG465/MCFN	380	50	+10	-10	1	133	875	143
LSBLG560/MCFN	380	50	+10	-10	1	162	1340	174
LSBLG750/MCFN	380	50	+10	-10	1	208	1990	224
LSBLG825/MCFN	380	50	+10	-10	2	253	810*2	271
LSBLG925/MCFN	380	50	+10	-10	2	266	875*2	286
LSBLG1120/MCFN	380	50	+10	-10	2	324	1340*2	348
LSBLG1230/MCFN	380	50	+10	-10	2	359	1430*2	385
LSBLG1500/MCFN	380	50	+10	-10	2	417	1990*2	462

3. Control Flow Chart



✧ Guidance of common electric problems treatment:

1) Phase sequence protector:

a) Protective condition: anti-phase, phase lack, overvoltage, under voltage or imbalance of three-phase voltage of power input terminal of phase sequence protector;

b) Results of action execution: power module failure lamp is ON, touch screen displays power failure and fails to be started;

c) Processing mode: see the power module, exchange any two unit incoming lines if it is anti-phase;

Please do not start until power gets right with failure removed in case of other failures.

Notes: this module has the important action of compressor protection. The imbalance rate of voltage of current is usually specified by compressor manufacturers, and burn-down due to overheating will be resulted from long-time operation under abnormal working voltage. The value and replacement of a scroll compressor cannot beat those of a screw compressor. There are more complaints, most of which concerned with normal protection, with respect to this problem when integrated with the current market feedback.

2) Miniature Circuit Breaker:
   a) Protective condition: current passing the miniature circuit breaker exceeds its numerical protection value;
   b) Results of action execution: power-fail of corresponding circuit, failure of start, circuit breaker switch positioned in the OFF terminal
   c) Processing mode: inspect its rear end for burn-down of component(s) or short-circuit between circuits. If any, please replace the component(s) or modify wiring;

   You may attempt to set the circuit breaker to ON terminal, if it immediately trips once again, it indicates that there is always a condition of short circuit, in this case, inspect the line and components having not executed any action for short circuit until normal pull-in is available.

   Notes: please switch on once without electricity prior to inspection. Damage to the miniature circuit breaker itself is resulted from existence of heavy current shock. At this moment, switch-on is impossible without electricity. When switch-on is successful, please test with a multimeter whether breakover is completed, excluding the case that mechanical mechanism is normal but electric mechanism is damaged. In such case, please replace the miniature circuit breaker, and inspect the above steps.

3) Moulded Case Circuit Breaker
   a) Protective condition: too heavy current of units or existence of short circuit failure of units
   b) Results of action execution: complete power-fail
   c) Processing mode: inspect whether the electric control part of units and insulation of loads are normal, if yes, power on and start the units again, and measure whether the working current of compressors and system pressure are normal

4) Compressor thermal relay
   a) Protective condition: too heavy compressor current or existence of short circuit failure
   b) Results of action execution: units stop, display of compressor overload on touch screen, thermal overload relay trip, failure of start.
   c) Processing mode: inspect whether the compressor part and insulation of loads are normal, inspect the pressure value when an alarm is given, and balance the pressure if it exceeds the running range. Please monitor the current of compressors in real time to ensure whether it is within normal running after the compressor thermal relay is reset.

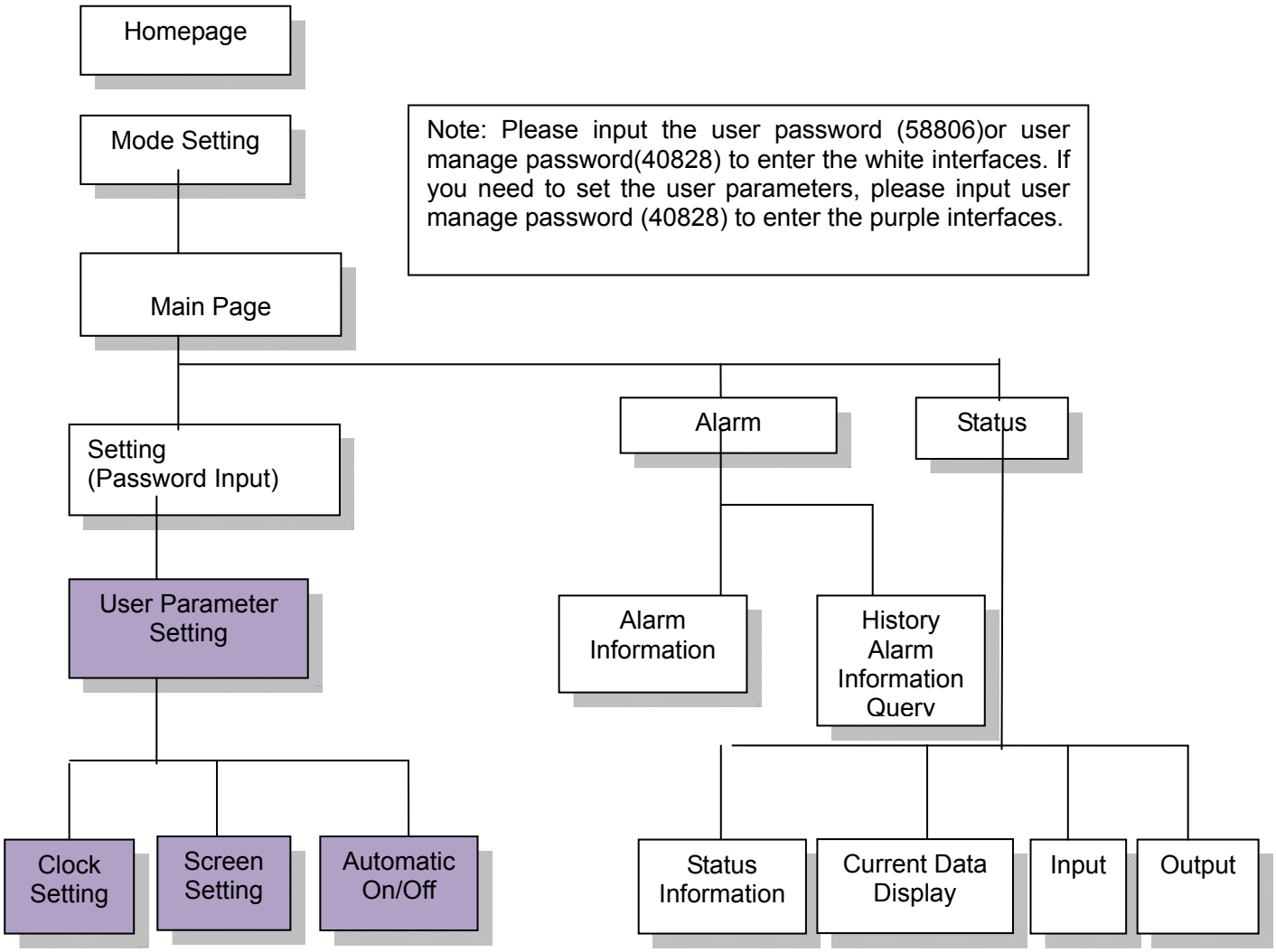
5) Sensor Failures

   Sensor failures include short circuit and open circuit of the temperature sensor and the pressure sensor (transformer). The current transformer is also included in the case of a stepless type
   a) Protective condition: any sensor failure
   b) Results of action execution: stop of units, display of corresponding sensor failure on touch

screen, failure of start.

c) Processing mode: inspect whether the wiring of faulty sensor is proper and firm, and whether the sensor itself is normal.

4. Control Screen Structures



5. Control Screen Operation

Initial Startup

- Before power up for the first time，make sure that the wiring is firm between the control box and the main switch ， the insulation resistances reach the requirements ,and the earth wire has been properly installed.
- The wiring might be loose due to the factors such as long-distance transport. Carry out complete inspection for the bolts of all wiring terminals for looseness 。
- Be sure that the distribution capacity is compliant with the power of the unit and the diameter of the selected cable can bear the maximum working current of the unit.
- Inspect whether the red emergency stop button on the control box is in natural state.

5.1 Introduction of Control Screen:

【Home Page】

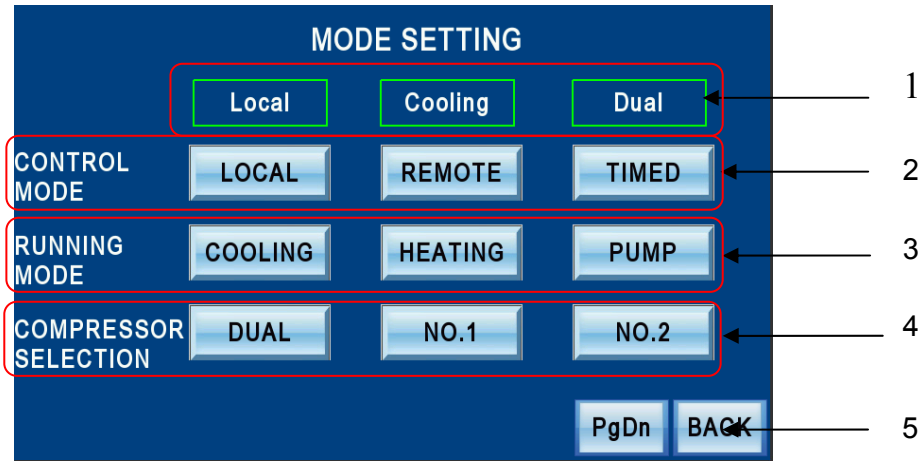
1) Power indicator (yellow), which is on when display is powered on; it is off when powered off.
2) Status indicator (green), which flashes at low frequency when display is normally operative, otherwise it is off.
3) Communication indicator (red), which flashes at high frequency when display and PCB communicate normally, otherwise it is off.
4) PCB and touch screen procedure version: showing the number of PCB and touch screen procedure version used by the current unit.

5.2 Basic Interface and Operations:

Please clink on ENTER button, and the “Password Input” dialog will be popped up, please input the User Password(58806) or User Manage Password (40828),and click “ENTER” into the next interface (Mode Setting Page)

Password Input Page

✧ **Mode Setting Page**



【Mode Setting Page】

Control mode and working mode are to be set in this page:

1. Control mode and running mode which have been selected currently for units are displayed here, and this position will correspondingly vary according to the choices of customers when selection of modes is changed.
2. Selection of unit control modes, including three modes: “LOCAL”, “REMOTE”, “TIMED”, i.e. local control, remote control, timing control.
3. Selection of unit operation modes, including three modes: “PUMP”, “COOLING”, “HEATING”, i.e. pump mode, cooling mode, heating mode.
4. Selection of compressor, including three modes: “DUAL”, “NO.1”, “NO.2”,
5. Click on “PgDn” to enter the next page (Main Page).
6. Click on “BACK”, return to the homepage of units.

Note:

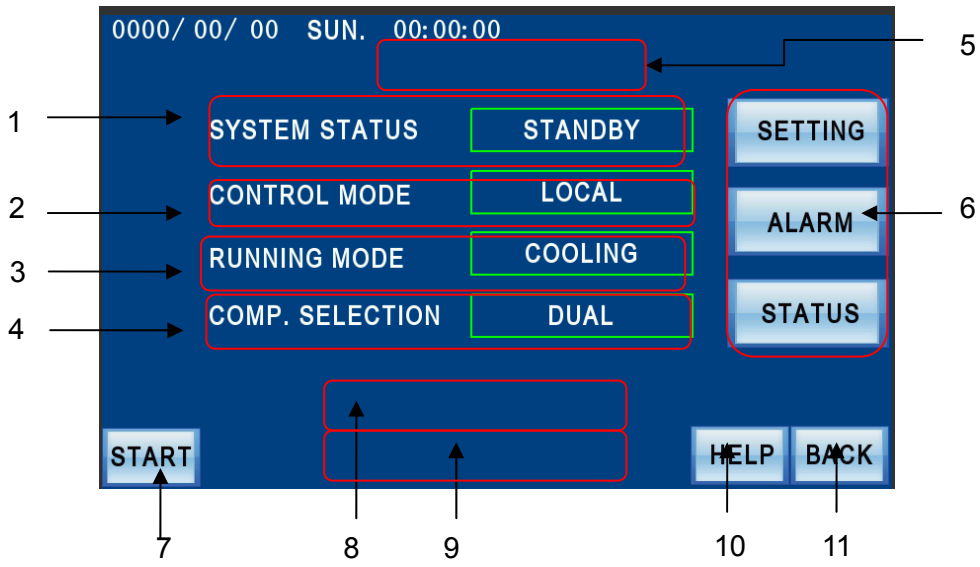
① The control mode and running mode can be selected optionally in standby status, while only the control mode can be switched in running status.

② Control Mode: The selection of the ways of Unit starting/stopping. “LOCAL” indicates you can only start or stop the unit through “Start/Stop” button in touch screen. “REMOTE” indicates you can only

achieve the unit starting or stopping though the “Remote Start” and “Remote Stop” hardware interfaces; “TIMED” indicates the unit can achieve timing start/stop according to the time set by the user.

③ “HEATING” mode is valid only for the heat pump unit.

✧ **Main Page**



【Main Page】

1. System Status: Current system status of units is displayed here. The status of system possibly displayed is as follows:

1) Standby status: in normal condition, displaying “Standby status” after the unit is powered on.

2) Running status: indicating that starting of unit compressors has been finished (entering the running status after double-head Start of one compressor), and it has entered the process of automatic energy adjustment from this point.

3) Pause status：The unit enters “Pause” status when the current detection water temperature (chilled outlet water temperature in single-unit or chilled inlet water temperature in Multi-units) is lower than the setting temperature of unit pause. The compressor start to run until the current detection temperature is higher than the setting temperature of compressor start, then the unit enter “Running” status.

4) Shutting down status: the status display “shutting down” after the unit has been confirmed to execute shutdown action. After finished, the unit enters “Standby” Status.

5) Protection status: indicating that the unit is in a failure status currently, click on "alarm information" to see alarm details.

2. Control mode: the current mode will be displayed here. For example, the current page displays that the unit is in a “LOCAL MODE”.

3. Running mode: the current mode will be displayed here. For example, the current page displays that the unit is in cooling mode.

4. Comp. Selection: For dual head unit, ”DUAL” means two compressors are working meanwhile;

"NO.1" means only No.1 compressor is working. "NO.2" means only No.2 compressor is working.

5. This position is the unit alarm display area, and alarm information of failure content will be displayed here in a mobile mode in case of any failure in units.
6. Functional key area of units. It has the functional keys of "SETTING", "ALARM", "STATUS" through which different operating interfaces are accessible. Introduction of their functions will be detailed hereafter.
7. Start is required upon completion of unit set-up, directly click on "START" button on the lower left, and the following dialog box will be popped up at this moment: click on "CANCEL" if you don't expect to execute the start.

【Ensure unit start-up】

8. The sign "Failure to start, please check the status" will appear when the conditions of compressor stating can't be required.
9. There is a rotate button with a key beside the touch screen. When the units need to be maintained by the user or after sale service personnel while expecting to see parameters from the touch screen, the user may rotate the button to the service point, and "System under maintenance, please don't start up!" will be displayed below main page at that moment. Start operation is not allowed at this moment. Any action of maintenance or power operation shall not be taken in the absence of personnel who have been specially trained and certified!
10. Help information, abbreviation of words in units will be explained in detail in help interface.
11. Click on "BACK", return to previous page of units------mode selection interface.

Starting Operation

Note: Clicking on 

button is invalid when the unit is in failure. The unit can start normally only when all of the alarm have been eliminated and reset manually on the touch screen interface.

Shutting down Operation

Click on 

button , and the "Confirm Shutdown" dialog will be popped up. Click on "Confirm" if you ensure execution of Shutdown action, the system status indicates "Shutting down". (Note: The

system status indicates “shutting down” even the requirements of shutting down the compressor are not meet. The unit will execute shutdown action automatically after all of the requirements have been satisfied.)

The action of 4 functional keys in main page will be detailed in subsequent sections:

✧ **Setting**

Click on 

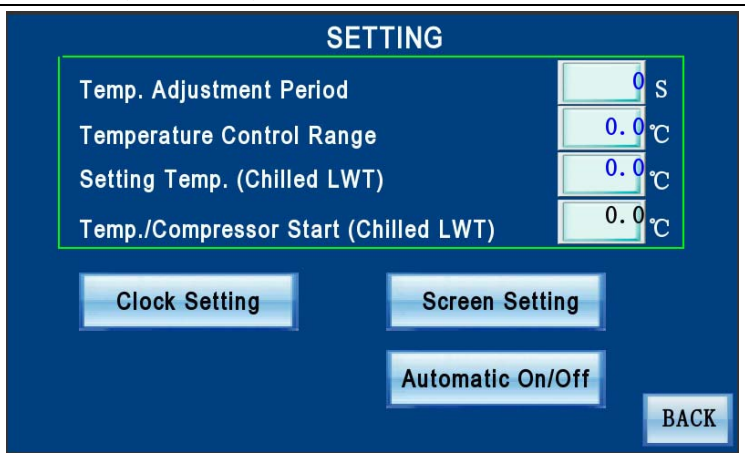
in main page to enter the password page. Click on the dialog box of password input, an input keyboard will be popped up in the interface, input user manage password “40828”, then click on “Enter” in numeric keyboard, the dialog box disappears, click on “ENTER” to enter “User Parameter Setting Page”.

【User Parameter Setting Page 】

Password Error Page

“Password Error Page” will be popped up when the password is wrong, click on 

button to return “Password Input Interface”, input the password again to enter the next page.



Note:

① "Max" in the upper left indicates the upper limit of the setting parameter; "Min" in the upper right indicates the lower limit.

② "Automatic On/Off": Only displaying under Timed mode.

Explanation:

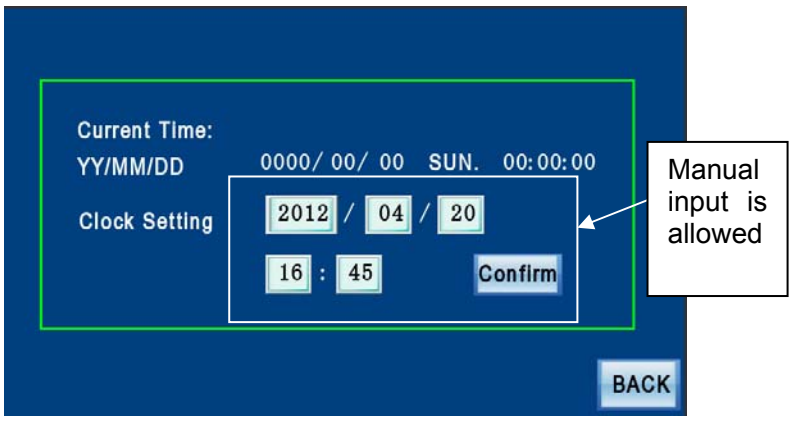
① Setting Temp. (Chilled Leaving Water): The target temperature of the chiller leaving water

② Temp. / Compressor start (Chilled Leaving Water): One of the compressor starting conditions required to be achieved for the chilled leaving water temperature. The compressor can start only at the current chilled leaving water temperature ＞ the setting value in cooling mode, or the current chilled leaving water temperature ＜ the setting value in heating mode.

③ Temp. Adjustment Period: The time interval between two temperature detections.

④ Temperature Control Range: Indicating the precision of the temperature control. For example, the factory default setting is 2 ℃，it means when the temperature is in the range of the setting temperature ± 0.5℃，the unit will not execute the loading or unloading action.

✧ **Clock Setting**



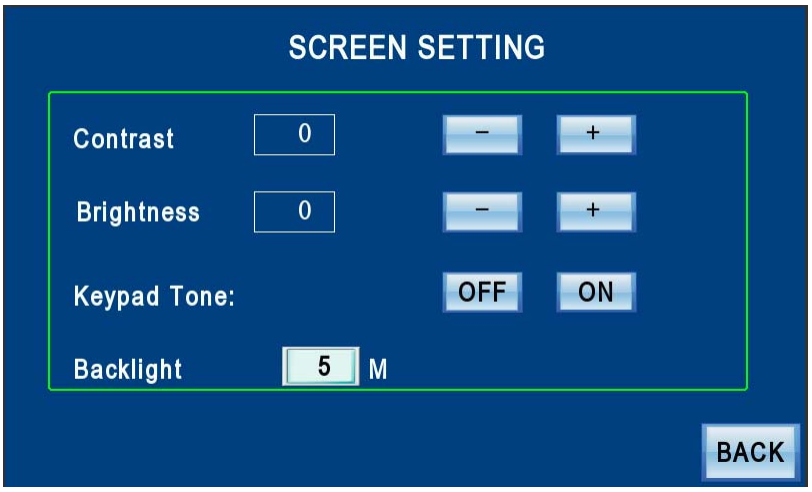
Clock Setting

Click on the numerical box, the numeric keyboard will appear, input the time, click "ENT" to save and take effect. Click "ESC" to cancel the input value.

Note: Please pay special attention in setting of time and date to the fact that setting of

non-existent date or time is not allowed, and we assume no liability or responsibility for setting of non-existent date or time and consequence resulting from this setting.

✧ Screen Setting



User can increase and reduce the brightness and contrast of screen by clicking on "+"and "-" in this page.

User can also open and close the keypad tone of screen by clicking on "ON" and "OFF".

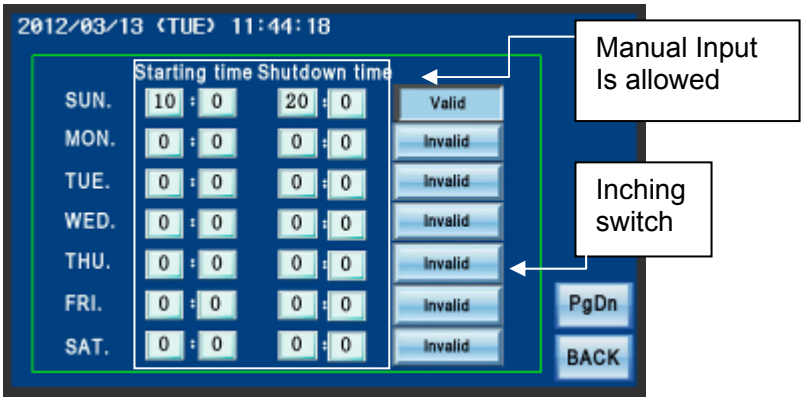
User can modify the time of backlight by clicking on the numeric box following the time of backlight.

Electric control capacity displays the battery capacity of PCB whose battery is used for supplying power for PCB interior time in the case of failure to engage PCB. Reset of PCB interior event will be resulted from too long power-fail time of PCB module without battery.

✧ Automatic On/Off

If the automatic on/off function is needed, please switch to "TIMED" mode in control mode (as shown in Picture 2) firstly, then enter user parameters setting page, click on 

button to enter the following page ,and set the starting times and shutdown times.



Automatic On/Off Setting

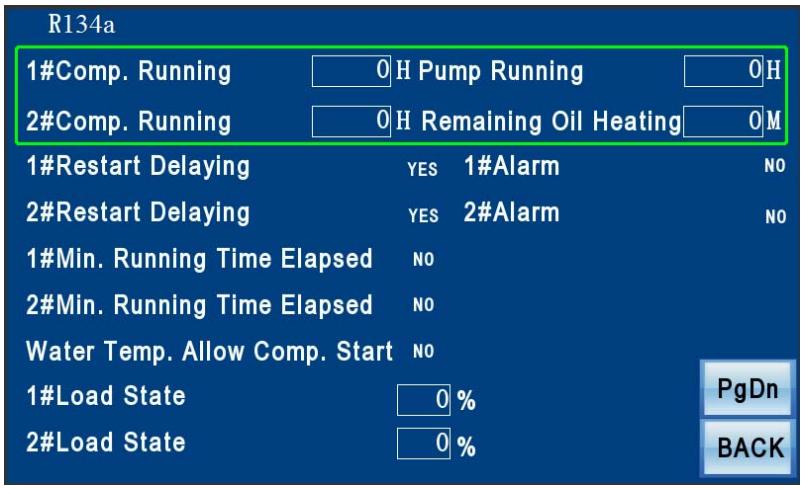
Any time every day in a week can be selected, and the units will be started or stopped at the time points. When a period of continuous running time (for example from 10:00 Tuesday to 16:00 Thursday) is necessary, you can set the time 10:00 in starting time and 0:00 in shutdown time on Tuesday and click

on “Invalid” to switch to Valid, set the time 0:00 in starting time and 16:00 in shutdown time on Thursday and click on “Invalid” to switch to Valid,all of the others time buttons are Invalid. Pay attention to that the starting time must be before the shutdown time.

Since system interior time is used for timing start / stop, please draw attention to check whether the time of the system is correct when you are using this function.

Status

Click on STATUS in main page to check the current unit status information.



Status Information

The upper left in the page display the refrigerant type; the upper right display the station number address, the station number of master is set to 1.

Note:

To start up, following conditions are required:

① “Restart Delaying” need to display “NO”, if “YES”, it indicates the delaying period has not achieved.

② ”Water Temp. Allow Compressor Start” need to display “YES”, if “NO”, it indicates the current temperature is not able to meet the compressor starting condition.

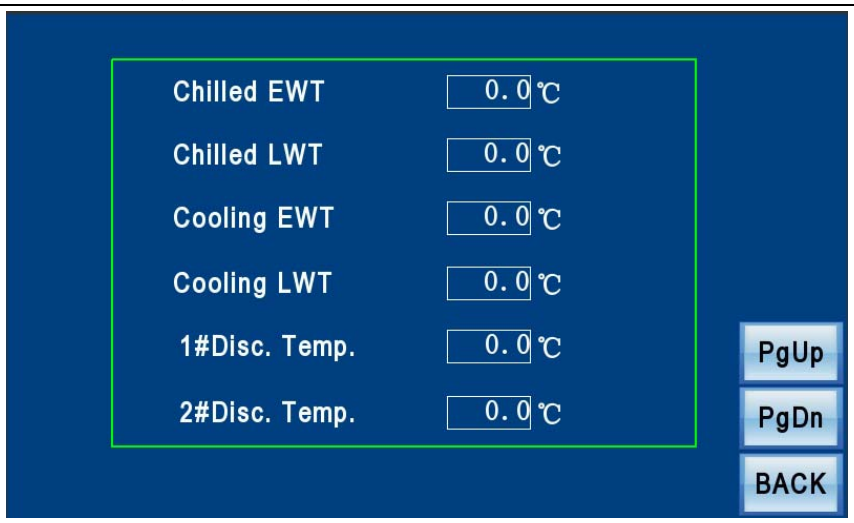
③ “Remaining Oil Heating Time” need to display “0”, if more than 0, it indicates the oil heating is in process.

To shut down, the following condition is required:

① ”Min. Running Time Elapsed” need to display “YES”, if ‘NO’, it indicates the shortest running period has not achieved.

Current Data Display

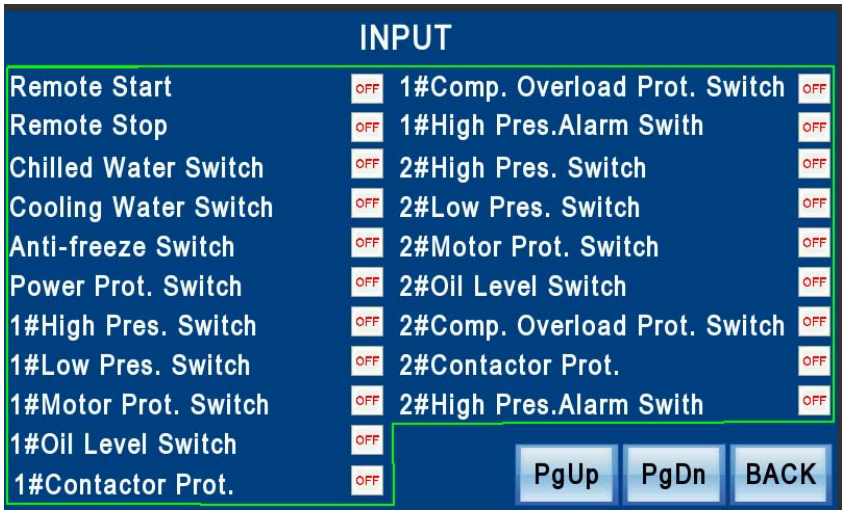
Please click on PgDn button to enter the current data interface, the interface indicates current detection data. User can enter this interface to query the temperature information when there are alarms such as temperature too high or too low.



Current Data Display

Input

Click on "PgDn" to enter "Input Page"



Input Status

"ON" as displayed indicates the input point is closed; "OFF" as displayed indicates the input point is open.

Note:

① "Remote Start/Stop" is available only under REMOTE mode. According to inching output from use's remote order, "Remote Start" or "Remote Stop" switch to ON and then revert to OFF rapidly.

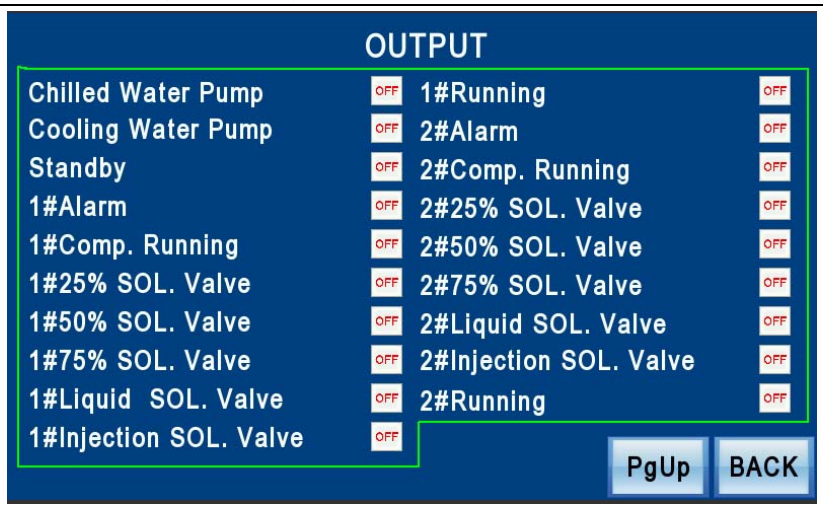
② "Chilled/Cooling Water Switch": indicating that current water flow status of chilled water system. "OFF" displayed in no water flow state, otherwise "ON".

③ "Contactor Protection": indicating that when the compressor start to run, the contactor act normally, "OFF" switch to "ON".

④ All of protection switches are "ON" in normal except "Comp. Overload Prot. Switch". "Comp. Overload Prot. Switch" is "ON" in failure status and "OFF" in normal.

Output Status

Click on "PgDn" to enter "Output Page",

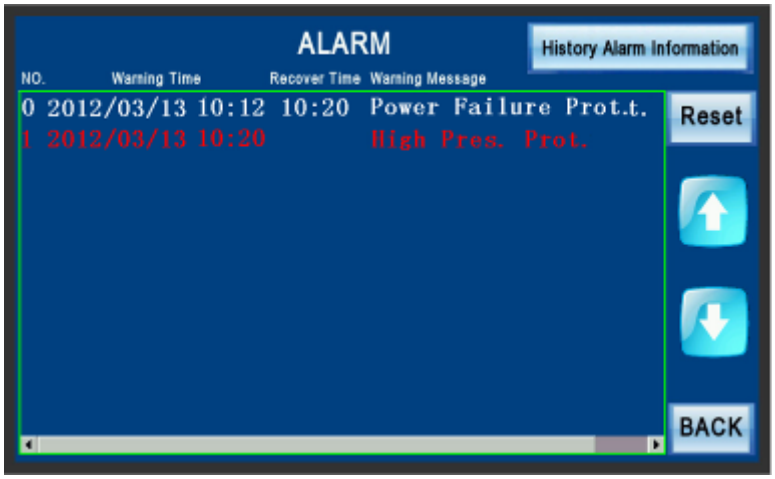


Output

"ON" as displayed indicates the output point is energized; "OFF" as displayed indicates the output point is de-energized.

All of output points display "OFF" when the unit is in pause status. According to Start/Stop order, corresponding switch points start to execute action.

✧ **Alarm**



Alarm Information Page

Click on 

button in Main Page to enter the alarm information page.

If there is any alarm, the unit will execute alarm procedure action. The unit alarm status can't be removed until all of the alarms have been eliminated and alarm shutdown process has been finished.

Click on 

button and "Fault" in main page disappear, the unit returns to normal. If the warning message is more, please click on  to check. These in red color indicate the alarms which have not been eliminated; these in white color indicate the alarms which have been eliminated.

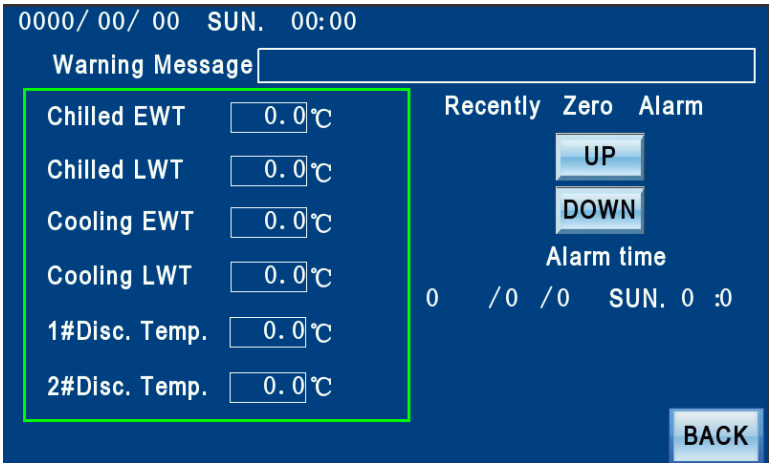
Note:

1. High-Pressure Protection is unable to reset in alarm information page, manual reset in the high pressure switch (installed in the discharge pipe) is needed.
2. Compressor and fan overload protection are unable to reset automatically, please check the

relevant thermal relay in the control box to reset manually.

History Alarm Information

Click on History Alarm Information button in Alarm Page to enter history alarm information query information, as shown in Picture 8.2. Max.5 warning messages can be recorded meanwhile. The messages will be updated automatically if there are more messages.



History Alarm Information Query

Note:

1. The history alarm information record the unit operating parameters when there happen unit alarms during the compressor running.

Content of Failure	Interface in English
冷冻水流故障	Chilled water flow fault
冷却水流故障	Cooling water flow fault
防冻保护	Anti-freeze Protection
1#高压保护	1# High-pressure protection
2#高压保护	2# High-pressure protection
1#低压保护	1# Low-pressure protection
1#低压保护	2# Low-pressure protection
1#机内保护	1# Compressor Motor Protection
2#机内保护	2# Compressor Motor Protection
1#油位过低保护	1# Low Oil Level Protection
2#油位过低保护	2# Low Oil Level Protection
1#接触器保护	1# Contactor protection
2#接触器保护	2# Contactor protection
1#压缩机过载	1# Compressor overload
2#压缩机过载	2# Compressor overload
电源保护	Power Failure Protection
冷冻水进水温度传感器故障	Chilled entering water temp. sensor failure
冷冻水出水温度传感器故障	Cooling leaving water temp. sensor failure
冷却水进水温度传感器故障	Cooling entering water temp. sensor failure
冷却水出水温度传感器故障	Chilled leaving water temp. sensor failure

1#排气温度传感器故障	1# Discharge temp. sensor failure
2#排气温度传感器故障	2# Discharge temp. sensor failure
冷冻水出水温度过低保护	Low chilled leaving water temperature
冷却水进水温度过低保护	Low cooling entering water temperature protection
冷却水出水温度过高保护	High cooling entering water temperature protection
1#排气温度过高保护	1# High discharge temperature protection
2#排气温度过高保护	2# High discharge temperature protection
1#排气压力变送器故障	1# Discharge pressure failure
2#排气压力变送器故障	2# Discharge pressure failure
1#排气压力过高保护	1# High discharge pressure protection
2#排气压力过高保护	2# High discharge pressure protection
1#膨胀阀模块故障	1# EXV module failure
2#膨胀阀模块故障	2# EXV module failure

6. Introduction of Major Electric Components

PC Board		Collect all digital quantities and analog quantities on units as well as inputs of quantities and touch screen commands, and realize different outputs by judgment of procedures to meet the requirement or normal and safe running of units.
Touch Screen Human-Machine Interface (HMI)		Communicate with PCB to display the running status of units, set the running mode of units and control the running parameters of units.
Switch Power Supply		Achieve AC220V/DC24V to provide power supply for touch screen, And Achieve AC220V/DC12V to provide power supply for touch screen,
Time Relay		An element necessary for achieving compressor contactor star-delta switchover. The time set above is defined as the star running time (3 to 6S)
EXV Control Module		Work out the suction superheat in the running process of compressors through the temperature sensor (PT1000) and the pressure sensor connected to the module, and regulate the opening of EXV through the suction superheat to enable units to run in a stable status of energy-saving
Thermal Overload Relay		Heat will be generated when current passes through a conductor. Heat effects are different due to different types of current passing through thermal sheet metal inside the thermal relay. When the heat effects are accumulated to certain degree, the thermal sheet metal will be deformed so as to switch off front and rear parts of the thermal relay forcibly to achieve the purpose of protection.

Power Protection Module		Detect the quality of power supplied to units by the user, detect the voltage range of the power, the imbalance rate of three-phase voltage, phase sequence and phase lack, and protect the units by inspecting the quality of power.
Isolating Transformer		Transform the electrical system applied by the user into AC220V for supplying power to the control circuit. It can isolate harmonic disturbance between circuits and increase control accuracy.
Intermediate Relay		The intermediate relay has the major action of separating control circuit from power circuit to avoid heavy current of the latter from returning to control circuit in case of any failure and burning down PCB and other important components.
Miniature Circuit Breaker		Control on/off of circuit, and also has the action of short circuit protection on control circuit.
Current Transformer		Transform main incoming current into low current to be accessed to the thermal overload relay to enable the thermal overload relay to judge whether the current is too heavy so as to play a role of current protection.

IV. Maintenance and Commissioning

Engineers working on the electric or refrigeration components must be authorized, trained and fully qualified to do so. All refrigerant circuit repairs must be carried out by a trained person, fully qualified to work on these units. He must have been trained and be familiar with the equipment and the installation. All welding operations must be carried out by qualified specialists.

Any manipulation (opening or closing) of a shut-off valve must be carried out by a qualified and authorized engineer. These procedures must be carried out with the unit shut-down.

NOTE:

The unit must never be left shut down with the liquid line valve closed, as liquid refrigerant can be trapped between this valve and the expansion device. (This valve is situated on the liquid line before the filter drier box.)

ATTENTION:

Even if the unit has been switched off, the power circuit remains energized, unless the unit or circuit disconnect switch is open. Refer to the wiring diagram for further details. Attach appropriate safety labels.

At least once a year thoroughly inspect the protection devices (valves). If the machine operates in a corrosive environment, inspect the protection devices more frequently.

1. Commissioning

1.1 Electrical System Connection Inspection

1) Inspect whether power distribution capacity is compliant with the power of the unit before the first start-up, and whether the diameter of the selected cable can bear the maximum working current of the master compressor.

The max economical conveying distance:

The max loading time in a year（h）	Copper core length(m)
<3000h	264
3000～5000h	294
>5000h	331

2) Inspect whether the electric mode is compliant with that of the unit, three-phase five-line (three phase lines, one zero line and one earth wire, 380V±10%).

3) Inspect whether the maximum phase voltage unbalance is compliant with the requirement, 2% for the maximum permissible phase voltage unbalance and 5% for the phase current balance. The machine must not be started up when the phase voltage unbalance exceeds 2%. If the measured unbalance% is excess, the power supply sector shall be informed of immediately. The formula for calculation of phase voltage unbalance% based on the maximum deviation from the average voltage is: voltage unbalance% = maximum deviation from average voltage/average voltage.

e.g. at nominal voltage 3N~, AC380V, 50Hz, the measured UAB=376V, UAC=379V, UBC=385V.

Average voltage = (376+379+385) 3= 380V

Determined deviation from average voltage:

△UAB=380-376=4V, △UAC=380-379=1V, △UBC=385-380=5V,

Maximum deviation: 5V

5/380=1.3%, the maximum phase voltage unbalance is 1.3%.

4) Inspect whether the supply circuit is the compressor is firmly and properly connected, and tighten it if there is any looseness. The screws might be loose due to the factors such as long-distance transport and hoisting of the master compressor. Or, the electrical elements (e.g. air switch, AC contactor, etc.) in the control cabinet of the master compressor and the compressor might be damaged.

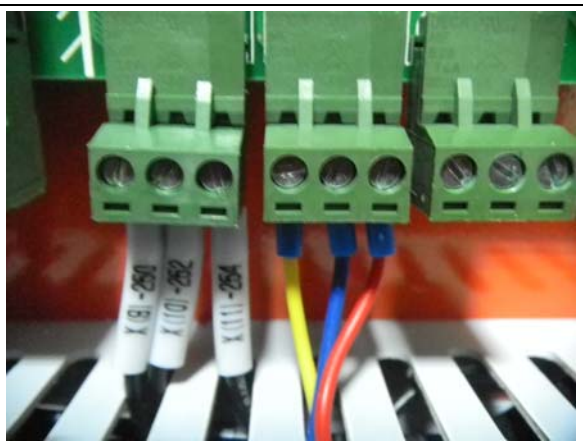
5) Carefully inspect all the electrical lines with a multimeter, and whether the connections are properly installed. Carry out measurement in mega ohm and ensure that there is no short circuit at the shell. Inspect whether the earth wire is properly installed, and whether the insulation resistance to ground exceeds 2MΩ. And inspect whether the supply line meets the requirement of capacity.

6) Inspect whether disconnection switch is installed to the supply line of the supply unit.

7) Carry out complete inspect for all connections of the main circuit in the control cabinet and all external connections of the control circuit before power connection (e.g. oil heater, compressor electronic protection, circulatory water temperature sensor, target-type flow switch connection, water pump linked control, communication line connection, etc.); inspect the bolts of the wiring terminal for looseness. Inspect whether various electric meters and appliances are properly installed, complete and available. Inspect the interior and exterior of the electrical cabinet, especially various wiring ports, for cleanness. If the communication lines of the PCB and control screen are damaged, refer to the diagram below.

8) After the inspection for all the above items is complete, connect the control cabinet and the supply indication lamp will light up, indicating that the oil heater is working. Observe whether the phase loss protection is in normal condition, if it is (green light on), close the single-pole switch in the control cabinet, then the control circuit begins working, and the touch screen and PCB control are put into operation.

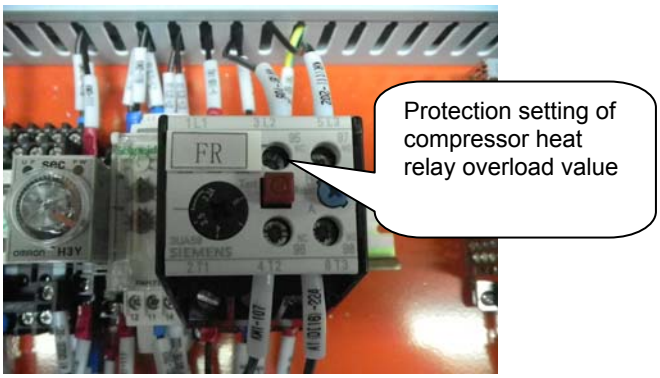
9) Before start up the machine, inspect whether the external system of the unit meets the conditions for start-up (e.g. whether the water cooling pump of the system is externally controlled or interlocked with the master compressor, and that the water pump must be started before starting up the master compressor via external control).



[Communication Lines of PCB and Touch Screen]

1.2 Electrical Elements Parameters Settings Inspection

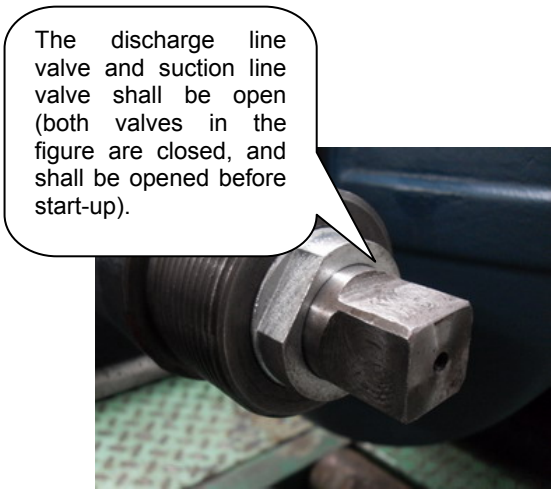
1) Inspect whether the compressor overload protection value, which shall not exceed the maximum compressor permissible current value indicated in the nameplate on the compressor, is set correctly. The compressor overload protection value generally equals to the set value of heat relay multiplied by variable ratio of current inductor, which is (250/5)50 in the following case.

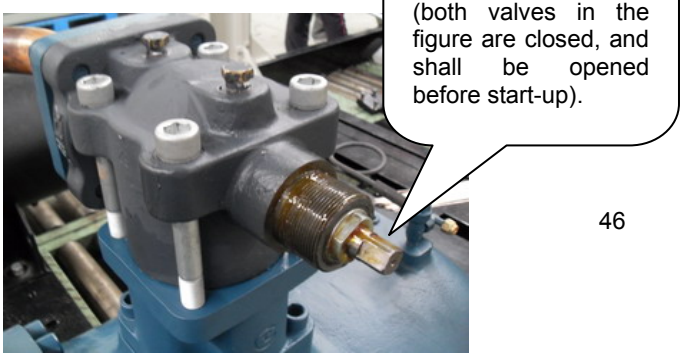


2) Inspect whether the value of phase loss and reversal protection is set correctly. The over-/under-voltage protection value shall be ±10% of the rated voltage.

1.3 Unit Parts and Inspection of Leak Points

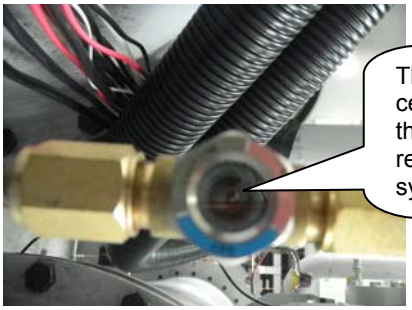
1) The discharge line valve and suction line valve of the compressor must be fully open (turn anticlockwise to open) and the cores shall be tightly locked to prevent leakage of refrigerant.





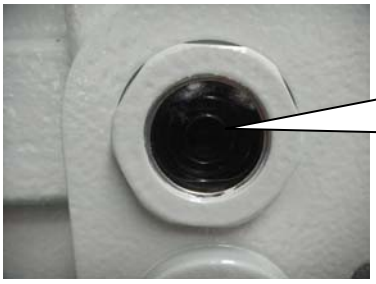
2) Inspect whether moisture content of the system exceeds the limit

Excessive moisture content in the refrigerant system of the unit might cause ice block, copper plating, etc. that would seriously affect the safety of the unit. Therefore, the dryness of the refrigerant system of the unit shall be inspected from the sight glass before and during operation of the unit, purple indicating dry, and pink moist, as shown in the right figure. When the color turns red, the filter core in the unit shall be replaced with a dry one.



3) Sufficient lubricating oil in the oil tank (not lower than 1/2 of the oil level in the high oil immersion lens), and no deterioration (blackness).

Inspect the oil level and quality before start-up for the two factors have direct impact on the performance and reliability of the unit. There must be sufficient lubricating oil in the unit. And during the shutdown of the unit, the high oil immersion lens must be full of oil.



When the unit is in stable operation, the oil level in the high oil immersion lens should be at least above the 1/2 position. And there shall be no deterioration (blackness) of the lubricating oil, or else, qualified lubricating oil shall be changed before operating the unit.

6) Inspect whether the pressure sensor stop valve, dry filter front/rear angle valve and liquid/air sampling stop valve etc. are all opened.

When the unit stops, the high and low voltages shall be almost the same. After the start-up, the low voltage decreases, and the high voltage increases. If there is no voltage change certain time after the start-up, inspect whether the liquid/air sampling stop valve is open.

7) After the unit is installed and before connected, it is principle required to tighten the connections in the electrical cabinet of the unit one by one.

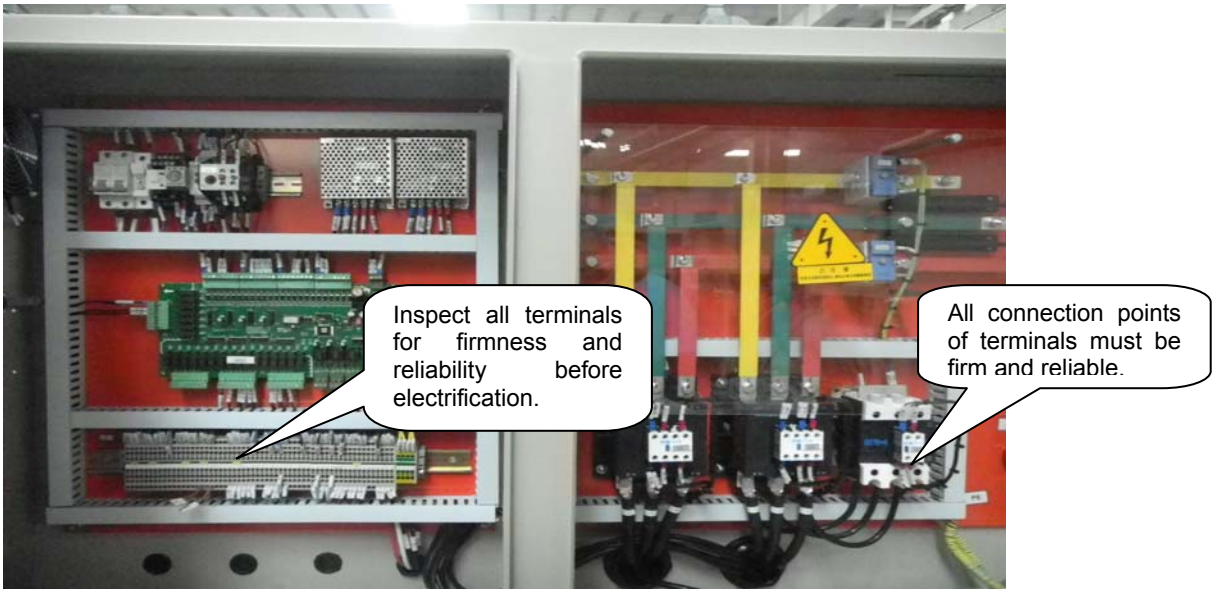
8) Inspect the bolts of the unit for looseness.

After the unit is transported and installed, it is required to inspect whether the fixing bolts of the unit (e.g. fixing bolts at compressor base angle, at post and beam of the unit, and at pipe clamp, etc.) and of the electrical elements (e.g. fixing bolts of PCB and of insulating transformer, and

connection bolts of upper/lower terminals of AC contactor, etc.) are firmly fixed.

9) Inspect the connections in the electrical cabinet for looseness, especially the electric part in the cabinet. The parts connected by bolts might be loose due to transportation. If there is any looseness, tighten it to avoid burnout of circuit or element caused by poor contact.

Inspect the terminals for looseness and poor contact caused by vibration and collision during transportation and installation (especially the electric part; ensure the connection points of all terminals are firm and reliable before electrification).



Inspect whether there is poor contact and short circuit caused by dust, moisture, etc. in the electrical cabinet, and whether the values of all temperature sensors are normal. During the shutdown of the machine, the indicated temperatures of discharge, fin, and the environment shall be almost the same, and the entering and leaving chilled water temperatures shall be almost the same.

10) Before the unit leaves the factory, the control cabinet is well connected with main motor, electrical actuator, and sensor elements of pressure temperature, etc. Therefore, the wiring on site for the user is very simple. Only the chilled water flow switch line and chilled water pump linked control line (control contact is active) need to be connected. For the detailed connection way, please refer to the circuit wiring diagram in the operation manual for the unit. (The attached circuit diagram represents the case of air-cooled heat pump unit for user's reference, as for the details, the operation manual supplied with the unit shall be final.)

11) Target-type flow control is set on the chilled water pipeline which shall be installed at the chilled water outlet of the unit. The NO contact of the target-type flow control in the chilled water system shall be connected to the control circuit as per the wiring diagram.

Note: Disordered water flow may lead to wrong action of the flow switch; therefore, the control cabinet will command the unit to stop after receiving continuous disconnection signals during 10 s.

12) The tube where the temperature sensing probe is installed shall be filled with lubricating oil or other grease that will not freeze at the temperature of the leaving chilled water for the

convenience of heat transfer. Thermostatic insulation and enclosing measures shall be taken for the temperature sensing device.

Inspect whether there is temperature deviation for the entering and leaving water temperature sensor caused by insufficient heat transfer oil in the thermostatic pipe.

For later armored dip-type temperature sensor, no lubricating oil is required for heat transfer.

1.4 Complete Machine Performance Parameters Inspection

1) Parameters Inspection before Start-up

Before start-up of the unit, the following performance parameters need to be inspected:

(1) High/low voltage value of the system. For the unit shutdown and waterless in a long term, the liquid and gas of the system shall be equivalent and close to the saturation pressure corresponding to the current ambient temperature. The correlation of saturation temperatures and pressures (the pressures in the list are gage pressures, among which, the atmospheric pressure is 0.1MPa) of R22 and R134a refrigerant is shown in table 1:

In the pressure gauge scale, taking the right figure for example: the values outside of the black circle are pressure values (unit: bar), and the values of the red, blue and green circles indicate saturation temperatures of refrigerants R404A, R22 and R134a respectively under the relative pressure. The types of refrigerants indicated in different pressure gauges might differ.

[Table 1]

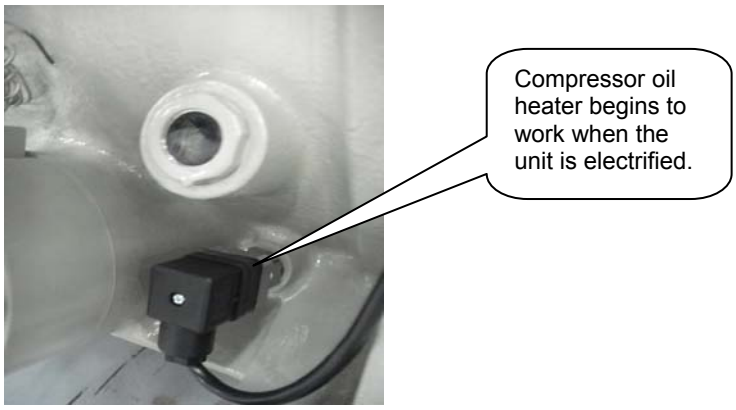
Refrigerant Temperature ℃	R134a Refrigerant Pressure (Gage Pressure) MPa
0	0.19
5	0.25
10	0.32

15	0.39
20	0.47
25	0.57
30	0.67
35	0.79
40	0.92

If the high/low voltage deviates much from the saturation pressure corresponding to the current temperature (more than 2bar), leakage or insufficient refrigerant is likely in the system.

(2) Inspect the unit for normal heating

Before start-up, it is necessary to inspect whether the oil heating in the unit is available, and whether the oil heater does not work when there is oil for heating but no power supply. It is particularly important in winter when the temperature is low and the failure of oil heating might lead to poor lubrication of the unit. The optimum working temperature for current types of lubricating oil is generally around 40℃.

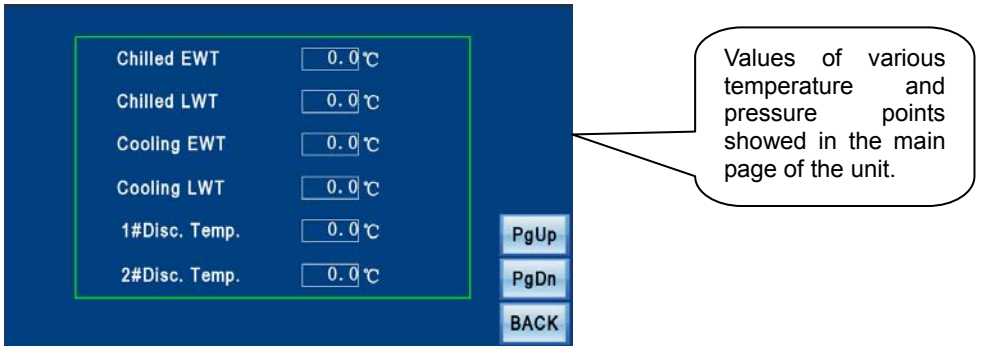


(3) Inspect whether there is alarm for trouble of the display screen. if there is, the trouble must be corrected.

(4) Inspect the electronic expansion valve control module for alarm trouble.

(5) Inspect whether various temperature points displayed on the display screen are within the normal range.

Before the operation of the unit, the showed temperatures of discharge and fin and the ambient temperature are close to the current actual ambient temperature, and whether the entering and leaving water temperatures are close to the water temperature at the user side. If there is any obvious deviation of the above temperatures, inspect whether the temperature sensor is in normal condition and whether the connection is firm and reliable.



(6) Inspect whether the flow in the water pump meets the requirements of the unit.

(7) Inspect whether the power supply of the unit is stable.

2) Parameters Inspections during Start-up and Operation

(1) The maximum range of parameters for normal operation of R134a refrigerant unit

See table 2 for the maximum range of performance parameters of R134a refrigerant:

[Table 2]

Working Condition	Refrigeration
Discharge temp. ℃	40~50℃
Suction temp. ℃	5~9℃
Suction super-heating degree ℃	1~3℃
Discharge super-heating degree ℃	10~15℃
Discharge pressure MPa	0.8~0.9MPa
Suction pressure MPa	0.2~0.25MPa

(1) Keep good record of unit data during commissioning.

2. Maintenance and Service

ATTENTION:

1) All installation parts must be maintained by the personnel in charge, in order to avoid material deterioration and injuries to people. Faults and leaks must be repaired immediately. The authorized technician must have the responsibility to repair the fault immediately. Each time repairs have been carried out to the unit, the operation of the safety devices must be re-checked.
2) Do not use oxygen to purge lines or to pressurize a machine for any purpose. Oxygen gas reacts violently with oil, grease, and other common substances.
3) The necessary protection equipment must be available, and appropriate fire extinguishers for the system and the refrigerant type used must be within easy reach.
4) Do not siphon refrigerant. Avoid spilling liquid refrigerant on skin or splashing it into the eyes. Use safety goggles. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, immediately and abundantly flush the eyes with water and consult a doctor.
5) Never let an open flame or live steam close to a refrigerant container. Dangerous overpressure can result. If it is necessary to heat refrigerant, only use warm water.
6) Do not re-use disposable (non-returnable) cylinders or attempt to refill them. It is dangerous and illegal. When cylinders are empty, evacuate the remaining gas pressure, and move the cylinders to a place designated for their recovery. Do not incinerate.
7) Ensure that you are using the correct refrigerant type before recharging the unit.Charging any refrigerant other than the original charge type (R-134a) will impair machine operation and can even lead to a destruction of the compressors. The compressors operating with this refrigerant type are lubricated with a synthetic

8) Do not climb on a machine. Use a platform, or staging to work at higher levels.Use mechanical lifting equipment (crane, hoist, winch, etc.) to lift or move heavy components. For lighter components, use lifting equipment when there is a risk of slipping or losing your balance.Use only original replacement parts for any repair or component replacement. Consult the list of replacement parts that corresponds to the specification of the original equipment.

2.1 Common Items and Tools for Unit Commissioning and Service

In order to realize immediate and effective commissioning, maintenance and service, the following tools and items shall be available depending on units.

I. Common tools and applications:

1) External hex wrench, incl. adjustable and non-adjustable wrenches.
2) Internal hex wrench, comp. better
3) Pressure gauge, incl. gas/liquid gauge and connective gauge pipe, mainly for measuring pressures of various locations in the system, monitoring the pressure during adding of refrigerant, and functioning as a switch.
4) Refrigerant recycling machine, recycling refrigerant in the system.
5) Welding torch and relative equipment, welding torch, electrode (both common electrode and high silver electrode), and scaling powder. For copper pipe with diameter above 9.52mm, larger welding torch is required to facilitate even heating of the copper pipe.
6) As for vacuum pump and connection gauge pipe, if the vacuum pump connection is not common for the general gauge pipe, the connection transition pipe must be prepared.
7) As for the refrigerant tank and connection, the refrigerant tank connection must be sound and not damaged. In addition, it is important that the connection is common for related connection gauge pipe.
8) Scissors, generally used for connecting gasket of relative connective parts of cutting unit.
9) Brush, used for cleaning dry filter and oil filter, etc.
10) Cutter, used for cutting copper pipe. Cutters with appropriate sizes shall be prepared for cutting copper pipes of different sizes.
11) Pliers, auxiliary tool.
12) Mouth expander, consisting of bell mouth and mouth expansion.
13) Screwdriver, incl. slotted screwdriver and Phillips screwdriver, with complete sizes.
14) Leak detector (Leak detection powder is alternative if leak detector is not convenient for carrying.)
15) Universal meter, for measuring current and voltage of the unit (incl. compressor, fan and other parts), as well as coil resistances of compressor, fan and electronic expansion valve, line connection and disconnection, etc.
16) Temperature detector, for measuring temperatures of various points in the system of the unit.
17) Pipe bender, for bending the copper pipe to certain degree, and frequently used for tubing of pipeline in the unit.

18) Measuring tape, for measuring distance and length, etc.

II. Common items and application:

1) Copper nut, incl. metric and British systems, for making connective pipe with copper pipe.
2) Gasket cardboard, for making gasket seal as sealing is frequently required during maintenance and service.
3) PTFE tape, for tightening nut, connection, etc.
4) Insulating tape
5) Tighten strip, for tightening wire or sensor, etc.

The above are only common tools and materials. Exceptional cases require particular considerations.

2.2 Protection items and Troubleshooting

Midea screw chiller has many protection measures and devices. There're many features to aid in troubleshooting. By using the alarm information, DI/O, AI/O and operating conditions of the chiller during chiller operation, it's convenient to find the possible problem. Verify that the chiller is properly configured, including options and/or accessories.

Protection items:

Protection	Purpose
High pressure / low pressure protection of compressor	Ensures the compressor runs in normal range and ensures its work life.
Converse phase, lack of phase protection	Protects the compressor from damage because of converse phase or lack of phase of power.
Anti-freezing protection during refrigeration	Protects the key components such as evaporator, condenser and water pipe etc. from damage because of the expanse caused by the water becomes into ice
Overload protection	Protects the compressor from burn due to overload running.
Over current protection of compressor	Protects the compressor from burn due to over current running under bad conditions.
Internal protection	Makes the compressor run safely under permitted conditions.
Anti-overheating protection of system	Protects the compressor from burn because of running lack of refrigerant orlubricating oil.
Water flow switch protection	Protects the compressor and the water pump motor from burn because there is lack of cooling water or chilled water.
Protection of sensor fault	Ensures the data from sensor is correct to prevent the system from wrong action.
Oil level and oil pressure difference protection	Ensures the compressor to run normally.
High discharge temperature protection	Makes the compressor run safely under permitted conditions.

- Phase reversal/phase loss (phase protection)

Power supply A/B/C should exist simultaneously and differ from each other by 120° phase angle. If not, Phase reversal or phase loss fault will occur and be displayed on screen. Before unit start when Phase reversal or phase loss fault occurs, the chiller won't start; when Phase reversal or phase loss

fault occurs during chiller operating, the chiller will stop according to protective stop program. Both compressors are shut down and water pumps and cooling tower fan stops in accordance with normal shutdown procedure. When fault record gets cleared and both temperature and time condition gets satisfied, the chiller can restart.

- Cooling Water flow failure

  PCB controller begins to detect cooling water flow switch after water pumps get energized 180s. The switch will disconnect if water flow less than set point and water flow loss signal will generate if it lasts for 5s. During chiller operation (including dual heads unit), any flow switch disconnects for 5s continuously, Unit stops according to protective stop program.

  If cooling water flow fails, cooling water pump and cooling tower stops after 60s delay; chilled water pump stops after 600s delay.

  Note: fault can be cleared after power re-energized and it needs to be confirmed manually, then when both temperature and time condition gets satisfied, the chiller can restart.

- Temperature sensor failure

  Entering chilled water temperature sensor short circuit/open circuit, display entering chilled water temperature fault and chiller stops according to abnormal shutdown program. After the sensor reset, fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

  Leaving chilled water temperature sensor short circuit/open circuit, display leaving chilled water temperature fault and chiller stops according to abnormal shutdown program. After the sensor reset, fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

  Entering cooling water temperature sensor short circuit/open circuit, display entering cooling water temperature fault and chiller stops according to abnormal shutdown program. After the sensor reset, fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

  Leaving cooling water temperature sensor short circuit/open circuit, display leaving cooling water temperature fault and chiller stops according to abnormal shutdown program. After the sensor reset, fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

  Discharge temperature sensor short circuit/open circuit, display discharge temperature fault and chiller stops according to abnormal shutdown program. After the sensor reset, fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

- Over/under voltage

  When power supply voltage is less than 90% or more than 110%, corresponding alarm over voltage or under voltage occurs. The chiller will stop immediately according to abnormal shutdown program. Fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

- High/low pressure protection

  Alarm as soon as high pressure switch trips and stop the chiller immediately according to abnormal shutdown program. It is one kind of NC switch and needs manual reset of the red reset button when fault happens. Fault on screen must be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

  When suction pressure is lower than the protective low pressure set point (effective for time delay), stop according to abnormal shutdown program. After the switch reset, fault on screen must be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

- Anti-freeze protection

  Over low leaving chilled water temperature

  When leaving chilled water temperature gets lower than 4°C, perform low water temperature protection and stop according to abnormal protective shutdown program. Cooling water pump/chilled water pump/cooling tower fan keeps on running. When leaving chilled water temperature gets higher than 10°C, unit resets. When both temperature and time condition gets satisfied, the chiller can restart.

- Mechanical antifreeze switch

  The switch trips when leaving chilled water temperature <= 3°C and chiller stops according to abnormal protective shutdown program. Reset at 10°C and fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

- Compressor protection module

  Alarm when compressor protection module trips. Perform abnormal protective shutdown program immediately. Fault on screen must be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

- Compressor overload protection

  Thermal overload relay trips when heat storage reaches trip point. Faulted compressor will stop immediately to abnormal protective shutdown program and other normal system will keep on running. After the switch reset, fault on screen must be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

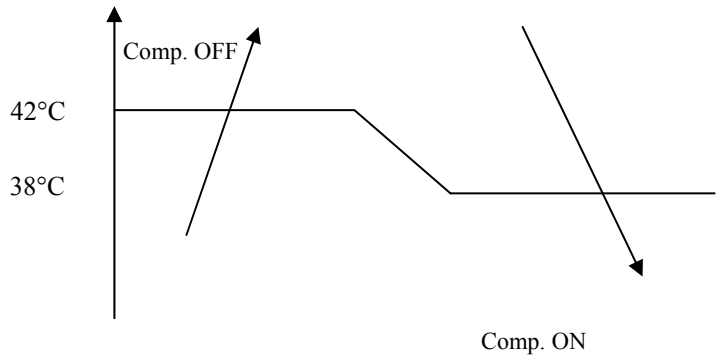
- Oil level protection

  During unit running, if oil level keeps on lower than set point for 5s, the unit will stop immediately according to abnormal protective shutdown program. After the switch reset, fault on screen must be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart

- High cooling leaving water temperature protection

  Cooling leaving water temperature >=42°C, perform high cooling leaving water temperature protection. Faulted compressor stops immediately to abnormal protective shutdown program and other normal system will keep on running. The protection resets when temperature gets lower than 38°C and should be confirmed and cleared manually; when both temperature and time condition

gets satisfied, the chiller can restart.



- Over current protection of compressor

  The protection trips when compressor current > set point. Faulted compressor will stop immediately to abnormal protective shutdown program and other normal system will keep on running. After the switch reset, fault on screen must be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

Troubleshooting:

No.	Alarm	Trouble Description	Action	Reset Type	Possible Cause
1	Power Failure Protection	Phase sequence relay switches OFF	Compressor can not work; The compressor stop running immediately	Reset manually on the touch screen	The power quality is poor, there may exist phase inversion, lacking phase or phase imbalance.
2	Compressor Motor Protection	Compressor motor module switches OFF	Compressor can not work; The compressor stop running immediately	Power off the unit and re-up electricity,reset manually on the touch screen	1.The power of motor is poor, there may exist phase inversion, lacking phase,over-voltage,under-voltage 2. The motor overheat
3	Compressor Overload Protection	Excess current and cumulate energy make the thermal relay trip	The compressor stop running immediately	Reset manually on the touch screen	1,The compressor continue running in bad condition, over-current 2,The setting value of thermal relay too low
4	Contactor Protection	The coil of contactor does not suction normally	The compressor stop running immediately	Reset manually on the touch screen	1.The suction of the contactor is abnormal when Y type switch to △ type 2.The vibration during operation cause the contact to loosen
5	Anti-freeze Protection	Anti-freeze switch OFF	The compressor stop running immediately	Reset manually on the touch screen	1,The chilled water flow fall sharply, the water temperature too low 2,Anti-freeze switch is damaged or wiring connection is abnormal
6	Water Flow Fault	The water flow switch continue disconnecting more than 5s	1.Compressor can not work; The compressor stop running immediately ； 2.Chilled water flow failure:The chilled water pump stop working after 30s delay; Cooling water pump and cooling tower shut down after 120s delay 3.Cooling water flow failure: The cooling water pump and cooling tower shut down after 30s delay; chilled water pump stop working after 180s delay.	Power off the unit and re-up electricity,reset manually on the touch screen	1,The water pump failure, the water flow too small 2,Water flow switch failure or wrong wiring connection

7	High-pressure Protection	High pressure switch OFF	The compressor which exists protection stop running immediately; Other compressors continue running	Press red reset button,reset manually on the touch screen	1,The cooling water quality is too bad and the heat exchange of condenser is abnormal 2,There is too much non-condensable gas in the system 3,The cooling water flow too small or the temperature too high 4,Too much refrigerant 5,Wrong refrigerant type 6,The discharge shutoff valve does not open fully
8	Low-pressure Protection	The low pressure switch continue disconnecting more than 3s (setting is allowed)	1.The compressor which exists protection stop running immediately; Other compressors continue running 2.If the protection occurs before the unit starts to work, all of the compressors in the unit can not run.	Reset manually on the touch screen	1,The refrigerant not enough 2,EXV failure, can not work abnormally 3,The delay time of low pressure switch alarm too short 4,There is plugging in the filter 5,Some water enter the refrigerant system in evaporator 6,Poor system matching(the evaporator too small or the compressor too large) 7,There is too much oil in the system 8,Chilled water flow too small or the temperature too low
9	Low Oil Level Protection	The oil level switch continue disconnecting more than 60s (setting is allowed)	The compressor which exists protection stop running immediately; Other compressors continue running	Reset manually on the touch screen	1,Too low oil temperature when starting lead to too low pressure difference and return oil is abnormal 2,Return oil solenoid valve failure or plugging in the filter 3,Mix different oil types and return oil system is abnormal 4,Oil level switch failure or wrong wiring connection 5. The oil volume not enough

10	High Discharge Temperature Protection	The compressor discharge temperature is greater than the setting value	The compressor which exists protection stop running immediately; Other compressors continue running	The protection is relieved once the discharge temperature is lower than the setting value and reset manually on the touch screen	1,The superheat too high(the refrigerant not enough, EXV failure) 2,The discharge pressure too high 3,The oil level too low and the oil volume in the system too small 4,Running in bad condition, too high compression ratio , no auxiliary cooling 5,Bearting or screws are damage 6,Poor system matching
11	Low Chilled Leaving Water Temperature Protection	The chilled water temperature is lower than the setting value	The compressor stop running immediately	No display. Reset automatically when the water temperature is greater than the setting value	1,The chilled water flow not enough 2,The unit continue running in underload contidion
12	High Cooling Entering Water Temperature Protection	The cooling water temperature is greater than the setting value	The compressor stop running immediately	No display. Reset automatically when the water temperature is greater than the setting value	1,The cooling tower can not work normally 2,The cooling water flow not enough
13	Chilled Entering Water Temperature Sensor Failure	Chilled entering water temperature sensor is abnormal (open circuit or short circuit)	The compressor stop running immediately	Reset manually on the touch screen	1.The temperature sensor failure 2.The wiring connection is not correct 3.The wiring line is abnormal,has been damaged
14	Cooling Leaving Water Temperature Sensor Failure	Cooling leaving water temperature sensor is abnormal (open circuit or short circuit)	The compressor stop running immediately	Reset manually on the touch screen	1.The temperature sensor failure 2.The wiring connection is not correct 3.The wiring line is abnormal,has been damaged
15	Cooling Entering Water Temperature Sensor Failure	Cooling entering water temperature sensor is abnormal (open circuit or short circuit)	The compressor stop running immediately	Reset manually on the touch screen	1.The temperature sensor failure 2.The wiring connection is not correct 3.The wiring line is abnormal,has been damaged
16	Chilled Leaving Water Temperature Sensor Failure	Chilled leaving water temperature sensor is abnormal (open circuit or short circuit)	The compressor stop running immediately	Reset manually on the touch screen	1.The temperature sensor failure 2.The wiring connection is not correct 3.The wiring line is abnormal,has been damaged

EXV Troubleshooting:

Problem	Reason	Solution
Measured superheat value is incorrect	Measured superheat value is incorrect	Check that the measured pressure and temperature sensors correctly and the correct position.
	Set the wrong type of refrigerant	Check on the drive set minimum and maximum pressure pressure sensor parameter with the range of pressure sensors installed in line. Check sensor electrical wiring is correct.
liquid back to the compressor during the control	Valve type setting error	Check and correct valve type parameters
	Valve connection error (rotation in the opposite direction) and is open	And manual control valve is completely closed or open, to check the valve rotation. A fully open valve Superheat can be decreased, and vice versa so that the superheat values have increased. If the valve is rotating in the opposite direction, check electrical wiring.
	Superheat setting is too low	Check superheat setting. Beginning to set 12 ° C, check to make sure there is no return of liquid. Then gradually reduce the set value, but always returning to ensure that no liquid.
	Low superheat protection is invalid	If low superheat value of long duration and the valve closes slowly, then increase the degree of protection of low superheat threshold and / or protection to lower superheat integration time. The beginning of the threshold value is set lower than the superheat setting 3 ° C, points time is set to 3-4 seconds. Low heat and then gradually reduce the threshold and increase the integration time, check to make sure the under any operating conditions there was no return of liquid.
	Valves damaged or connected incorrectly the stator	The stator and the valve and disconnect the cable connection, with ordinary measuring coil resistance tester. Two coil resistance should be around 36 Euro. Otherwise, replace the stator. Finally, check the connection of electric drive cable wiring.
	Valve can not close	Always check the superheat value is too low (<2 ° C) and the valve position is always 0 step. If the above situation, the valve is set to manual control and completely shut down. If the superheat value is always low, check the electrical wiring and / or replacement the valve.
	Often to control the settings in the refrigerated cabinet set "Start at the valve opening degree control" parameter too High (only for composite refrigerated cabinet)	In all uses are reduced" began to control the valve opening degree" parameter values, make sure to control the temperature will not be affected
Liquid only during the defrosting returned to the compressor (only applicable to composite refrigerating cabinet)	Defrosting control after the pause time is too short	Increasing the " defrosting valve control delay" parameter values
	Defrosting and reaches operating conditions before drive the measured degree of superheat temperature is very low, and continued for a few minutes	Check and confirm the LowSH threshold is higher than the measured value of the superheat, and activate the corresponding protection function (integration time > 0 seconds). When necessary, reduced integration time
	Drive the measured	Setting a more sensitive parameter, so that the valve

	degree of superheat temperature is not low, but there is still liquid flows back to the compressor unit	can be closed: the proportion coefficient increases to 30, integral time increased to 250 seconds, differential time increased to 10 seconds
	A plurality of refrigerator and defrosting	Stagger the defrosting start time. If unable to stagger, in the absence of the first two issues in the case, will involve the refrigerated cabinet superheat setpoint and at least 2 °C LowSH threshold increase
	The valve is too large	The replacement for the smaller valves
Liquid only at start controller (closed) when returning to the compressor	Parameter "start control valve opening degree" set too high	Reference to the evaporator cooling capacity and rated capacity of the valve than check this parameter value; necessary to reduce this value
Superheat value is about swing around the set value, and larger than 4 ° C	Condensing pressure instability	Check the controller condenser settings, set the parameter to the more "moderate" values (such as increasing the proportion with or increasing the integration time). Note: the need for stability, including + / -0.5 bar changes. If this does not work or can not change the settings,In the "oscillation" system used in electronic expansion valve control parameters
	Even if the valve is set to manual control (mean value in the corresponding position with the work), the value remains stable superheat	Check the cause of instability (such as the refrigerant charge is less) and try to solve. If not feasible, in the "oscillation" system used in the electronic expansion valve control parameters
	Will set the manual control valve (in the position corresponding to the average work), the superheat value is no longer swing	First try to reduce the scale factor (30% to 50%) and then increasing the integration time by the same proportion. In any case, the recommended use of stable system parameters
	Superheat setting is too low	Increase the superheat setting, check to make sure superheat swing has been reduced or disappeared. Set the start of 13 ° C,and then gradually reduce the set value, to ensure that the system does not swing again and the device temperature can be set to control value
In the evaporating temperature higher start-up phase, the evaporation pressure is too high	MOP protection disabled or invalid	The MOP threshold is set to require saturated evaporation temperature (high evaporation temperature limit compressor) and MOP integration time set between the National Cheng Kung University in 0 (recommended for 4 seconds) to activate the MOP protection. To make the protection more sensitive, down MOP integration time low
	Start system or transient conditions, excess refrigerant charge (for refrigerator)	A "soft start", a time to start a facility or a group. If this method is not feasible to reduce all the facilities of the MOP threshold
Low start-up phase protection function activated (only comes with the	Parameter "start control valve opening degree" set too low	Reference to the evaporator cooling capacity and rated capacity of the valve than check this parameter value; increase this value if necessary
	tLAN or pLAN drive configured not begin to control the valve remains	Check tLAN / pLAN wiring. Check that the drive to connect with the pCO application (if equipped) properly manage the drive start signal. Check that

compressor equipment)	closed	the drive is not in standalone mode
	Configured as a stand-alone mode, the drive does not begin to control the valve remains closed	Check the digital input terminal. Check that when the control signal input correctly when closed. Check that the drive is in stand-alone mode
	LOP protection disabled	The LOP integration time is set to greater than 0 seconds
	LOP protection invalid	Ensure that the needs of the LOP protection threshold in the saturation temperature of evaporation (evaporation temperature and the rated voltage corresponding to the temperature scale switch between) and reduce the LOP integration time
	Solenoid valve block	Check the solenoid valve opens correctly, check the electrical wiring and relay operation
	Lack of refrigerant	Check expansion valve upstream of the observation hole no bubbles. To ensure proper cooling temperature (greater than 5 ° C); or refrigerant filling
	Valve connection error (rotation in the opposite direction) and is open	And manual control valve is completely closed or open, to check the valve rotation. Once the valve is fully open to allow heat decreased, and vice versa so that the superheat values have increased. If the valve is rotating in the opposite direction, check the electrical wiring
	Valves damaged or connected incorrectly the stator	The stator and the valve and disconnect the cable connection, with ordinary measuring coil resistance tester. Two coil resistance should be around 36 Euro. Otherwise, replace the stator. Finally, check the cable connection to connect the drive
	Valve can not open	Started using the manual control valve fully open. If the superheat value is still high, check the electrical wiring and / or replace the valve
Control process equipment due to low and off (only comes with the compressor equipment)	LOP protection disabled	The LOP integration time is set to greater than 0 seconds
	LOP protection invalid	Ensure that the needs of the LOP protection threshold in the saturation temperature of evaporation (evaporation temperature and the rated voltage corresponding to the temperature scale switch between) and reduce the LOP integration time
	Solenoid valve block	Check the solenoid valve opens correctly, check the electrical wiring and relay operation
	Lack of refrigerant	Check expansion valve upstream of the observation hole no bubbles. To ensure proper cooling temperature (greater than 5 ° C); or refrigerant filling
	Valve is too small	Replaced with a larger valve
	Valves damaged or connected incorrectly the stator	The stator and the valve and disconnect the cable connection, with ordinary measuring coil resistance tester. Two coil resistance should be around 36 Euro. Otherwise, replace the stator. Finally, check the cable connection to connect the drive
	Valve can not open	Started using the manual control valve fully open. If the superheat value is still high, check the electrical wiring and / or replace the valve
Even if the valve is fully opened,	Solenoid valve block	Check the solenoid valve opens correctly, check the electrical wiring and relay operation
	Lack of refrigerant	Check expansion valve upstream of the observation

refrigerated cabinets also reach the set temperature (only for composite refrigerated cabinet)		hole no bubbles. To ensure proper cooling temperature (greater than 5 ° C); or refrigerant filling
	Valve is too small	Replaced with a larger valve
	Valves damaged or connected incorrectly the stator	The stator and the valve and disconnect the cable connection, with ordinary measuring coil resistance tester. Two coil resistance should be around 36 Euro. Otherwise, replace the stator. Finally, check the cable connection to connect the drive
	Valve can not open	Started using the manual control valve fully open. If the superheat value is still high, check the electrical wiring and / or replace the valve
Freezers reach the set temperature, and the valve position is always 0 step (only for composite refrigerated cabinet)	tLAN or pLAN drive configured not begin to control the valve remains closed	Check tLAN / pLAN wiring. Check that the drive to connect with the pCO application (if equipped) properly manage the drive start signal. Check that the drive is not in standalone mode
	Configured as a stand-alone mode, the drive does not begin to control the valve remains closed	Check the digital input terminal. Check that when the control signal input correctly when closed. Check that the drive is in stand-alone mode

2.3 Removal and Service of Key Parts

In order to do maintenance when convenient, a leaky tube can be plugged until retubing can be done if damaged tubes are not too many. The number of tubes plugged determines how soon the evaporator must be retubed. Plugging tubes will result in loss of capacity and efficiency as well as increased pump power. Failed tubes should be replaced as soon as possible. Up to 10% of the total number of tubes can be plugged before retubing is necessary. If the problem is much more serious, contact your local Midea or your local representative for assistance.

Caution

Use extreme care when installing plugs to prevent damage to the tube sheet section between the holes.

- **Retubing**

Retubing must be done by qualified personnel experienced in boiler maintenance and repair. Most standard procedures can be followed when retubing the evaporators.

Place one drop of Loctite or equivalent on top of tube prior to rolling. This material is intended to “wick” into the area of the tube that is not rolled into the tube sheet, and prevent fluid from accumulating between the tube and the tube sheet. New tubes must also be rolled into the center tube sheet to prevent circuit to circuit leaks.

- **Tightening cooler/condenser head bolts**

When reassembling the evaporator head, always check the condition of the O-rings first. The O-ring should be replaced if there are visible signs of deterioration, cuts or damage. Apply a thin film of grease to the O-ring before installation. This will aid in holding the O-ring in the groove while the head is installed. Torque all bolts in sequence as shown in Fig.:6.2.1

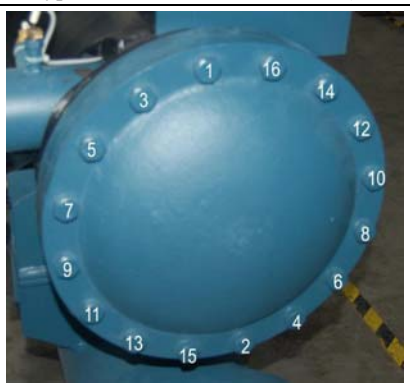


Fig.:6.2.1

Bolt specifications	Torque rang (N.m)	
	Max.	Min.
M10	16	24
M12	45	68
M16	95	122
M20	142	210

Fig. 6.2.2

1. Install all bolts finger tight.

2. Bolt tightening sequence is outlined in Fig. 6.2.2. Follow the numbering or lettering sequence so that pressure is evenly applied to O-ring.

3. Apply torque in one-third steps until required torque is reached. Load all bolts to each one-third step before proceeding to next one-third step.

4. No less than one hour later, retighten all bolts to required torque values.

5. After refrigerant is charged to system, check for refrigerant leaks using halogen detector or other recommended industry practices.

6. Replace evaporator insulation.

Cleaning Heat Exchangers

Check the chiller tightness and whether there's leak of heat exchange tubes. It is necessary to do nondestructive inspection for the principal weld (longitudinal and circumferential weld of evaporator/condenser barrel) of pressure vessel. Inspect and clean cooler tubes at the end of the first operating season. Tube condition in the exchanger will determine the scheduled frequency for cleaning, and will indicate whether water treatment is adequate in the water circuit. Too much scale will cause big loss of capacity and efficiency.

Refer to the following pressure-temperature curve for condition in heat exchangers:

High pressure-cooling water temperature (high pressure beyond 0.6~1.2MPa is abnormal)

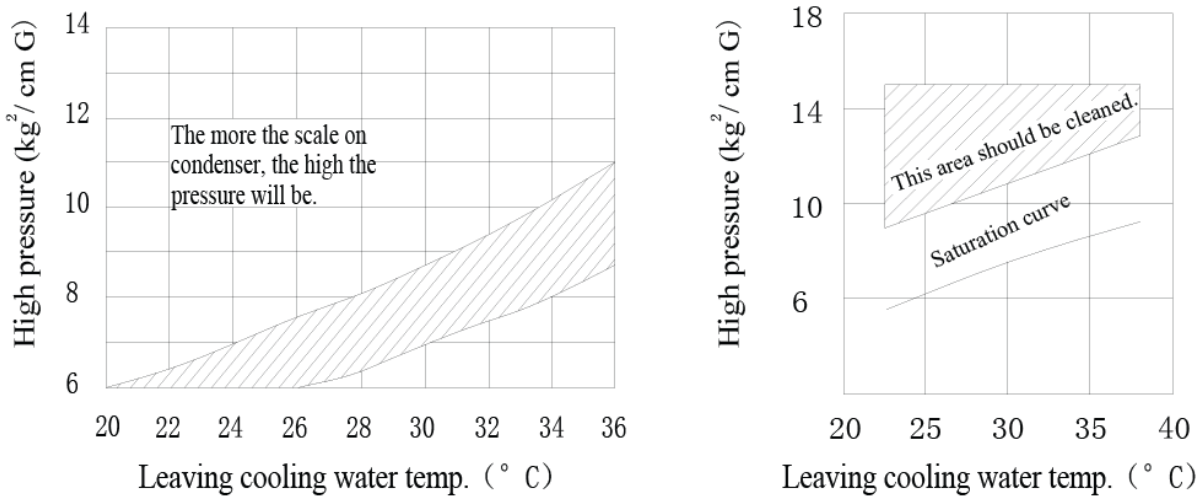


Fig.26 High pressure at full load (standard unit)

Low pressure-chilled water temperature (low pressure beyond 0.14~0.37MPa is abnormal)

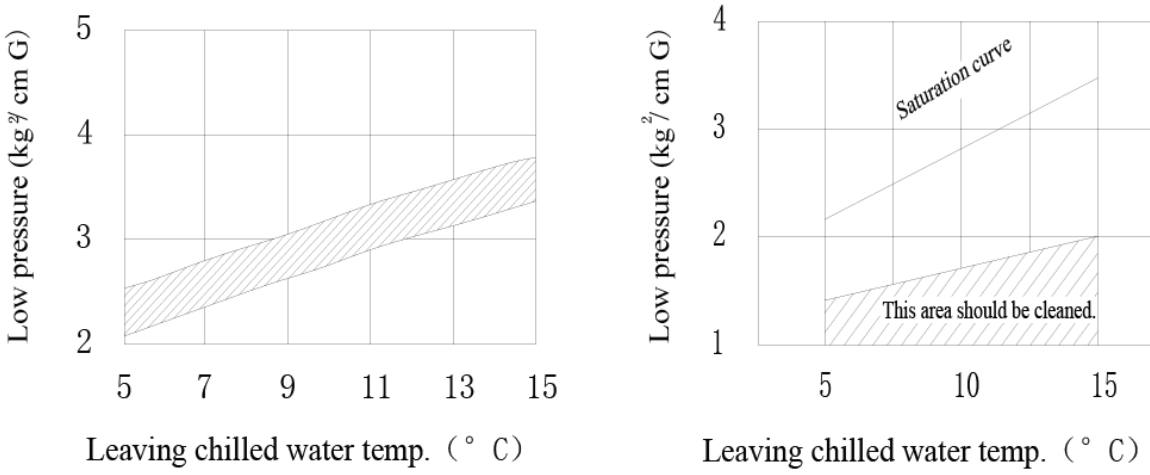


Fig.27 Low pressure at full load (standard unit)

Cleaning work must be done when too much scale found. Physical and chemical cleaning can be chosen according to the device you have. Generally, chemical cleaning is much easier to carry out. Methods are as below and the services of a qualified water treatment specialist should be obtained to develop and monitor a treatment program.

a) Cycle under normal temp. (A):

(Volume of condenser+ volume of pipes+ volume of container)×1/3

Note: concentration of detergent ——33%

b) Cycle under normal temp. (B):

(Volume of cooling tower flume + volume of condenser+ volume of pipes)×1/10

Note: concentration of detergent ——10%

Warning: When doing cleaning with unit stops, volume of cooling tower flume can be 1/2 or 1/3 of rated value; but if doing cleaning with unit is runs, the volume of cooling tower flume should keep rated value. Midea assumes no responsibility for pressure vessel damage resulting from untreated or improperly treated water.

c) Precautions of chemical cleaning

- ✓ When doing cleaning please wear rubber gloves and do not expose your skin or your clothes to the detergent. In case of touching the detergent, please wash with clean water immediately.
- ✓ The container for detergent should be made of plastic or glass rather than lead.
- ✓ The used detergent should be neutralized with lime or soda before draining.
- ✓ Detergent is harmful to human body; please keep it away from children.
- ✓ Turn on the unit to check the effect after cleaning work done. If necessary, please do cleaning again.

Water Treatment

Before every start-up, clean and flush the cooling water circuit. Make sure tower blow-down or bleed-off

is operating. It should be recognized that atmospheric air contains many contaminants that increase the need for proper water treatment. The use of untreated water can result in corrosion, erosion, sliming, scaling or algae formation. Midea assumes no responsibility for the results of untreated or improperly treated water.

See appendix for water quality requirements.

Refrigerant Circuit

Leak testing

Units are factory-charged with refrigerant R-134a (Refer to the Physical Data tables supplied in the IOM manual book). Leak test must be done under sufficient pressure. This can be done by charging enough refrigerant into the system to build the pressure up to approximately 70 kPa and adding sufficient dry nitrogen to bring the pressure up to a maximum of 850 kPa. Leak test with an electronic leak detector. Water flow through the vessels must be maintained anytime refrigerant is added or removed from the system. If any leaks are found in welded or brazed joints, or it is necessary to replace a gasket, relieve the test pressure in the system before proceeding. Brazing is required for copper joints. After leaks are repaired, system must be evacuated and dehydrated.

Evacuation

After it has been determined that there are no refrigerant leaks, the system must be evacuated using a vacuum pump with a capacity that will reduce the vacuum to at least 130Pa (=1mmHg). A mercury manometer, or an electronic or other type of micron gauge, must be connected at the farthest point from the vacuum pump. For readings below 130Pa, an electronic or other micron gauge must be used. The triple evacuation method is recommended and is particularly helpful if the vacuum pump is unable to obtain the desired 130Pa of vacuum. The system is first evacuated to approximately 660Pa (=5mmHg). Dry nitrogen is then added to the system to bring the pressure up to zero.

Then the system is once again evacuated to approximately 230Pa(=2mmHg). This is repeated three times. The first pulldown will remove about 90% of the noncondensables, the second about 90% of that remaining from the first pulldown and, after the third, only 0.2% noncondensables will remain.

Checks on refrigerant charge

To verify if the unit is operating with the correct refrigerant charge, perform the following checks.

1. Run the unit at maximum operating load.
2. Check the leaving chilled water temperature to be between 6~8°C.
3. Check the entering cooling water temperature to be between 25 and 32°C.
4. Under the above mentioned conditions verify the following items.

a) The discharge superheating to be between 8 and 15°C

b) The sub-cooling to be between 4 and 6°C

c) The difference between leaving water temperature and evaporating temperature to be in 0.5~4°C range.

d) The difference between condensing temperature and condenser leaving water temperature to be in 0.2~3°C range.

e) The evaporator refrigerant level slightly laps last tubes row by checking the sight glass installed on each evaporator for a visual inspection.

f) The condenser refrigerant level to be included between the condensing and the sub-cooling sections by checking the sight glass installed on each condenser for a visual inspection.

5. Verify the sight glass on the liquid piping to be fully charged. If one of the above parameters exceeds the limits, unit may require an additional refrigerant charge.

Note: Refrigerant removing and drain operation must be performed by qualified personnel using correct material. Inappropriate maintenance could lead to refrigerant or pressure loss. Do not discharge the refrigerant or the lubricant oil into the environment. Always use a proper recovery system.

Refer to Physical Data tables supplied in the IOM manual book). Immediately ahead of orifice baffle (see Fig.) is a factory-installed liquid line service angle valve. Each angle valve has a1 5/8-in. threaded connection for charging liquid refrigerant. Connect the refrigerant drum to the gauge port on the liquid line shutoff valve and purge the charging line between the refrigerant cylinder and the valve. Then open the valve to the mid-position.

Turn on both the cooling tower water pump and chilled water pump and allow water to circulate through the condenser and the chiller.

IMPORTANT: When adding refrigerant to the unit, circulate water through evaporator continuously to prevent freezing and possible damage to the evaporator. Do not overcharge, and never charge liquid into the low-pressure side of system.

If the system is under a vacuum, stand the refrigerant drum with the connection up, and open the drum and break the vacuum with refrigerant gas to a saturated pressure above freezing.

With a system gas pressure higher than the equivalent of a freezing temperature, invert the charging cylinder and elevate the drum above the condenser. With the drum in this position, valves open, water pumps operating, liquid refrigerant will flow into the condenser. Approximately 75% of the total requirement estimated for the unit can be charged in this manner.

After 75% of the required charge has entered the condenser, reconnect the refrigerant drum and charging line to the service valve on the bottom of the evaporator. Again purge the connecting line, stand the drum with the connection up, and place the service valve in the open position.

Before replacing electronic expansion valve of the system, pressure sensor sampling stop valve, low pressure pipeline, etc. force the refrigerant in the liquid part of the system.

The particular steps are: (take careful consideration before continuing with the following steps)`

a Close the dry filter angle valve of the system.

b Start up the unit, and emergently stop the unit when the gas in the system is below 0.5bar.

c Close the liquid/air valve of the compressor.

d Discharge the residual refrigerant in the gas system.

e Carry on replacement of the parts of the system.

f After the replacement, extract vacuum in the gas part.

g After the vacuum extraction, keep the negative voltage until the resumed vacuum in the unit meets the requirements.

h Open the angle valve of liquid system and compressor liquid/air stop valve to ensure the loop of the entire system is unobstructed.

i Add proper amount of refrigerant, generally 5~10k.

Compressor Oil System

Each compressor/circuit has its own oil system which includes an oil filter, oil solenoid valve, Venturi tube, oil separator heater, and an oil shut-off valve. A typical oil system is shown in Fig. 34. See Table 33 for oil charge Quantities.

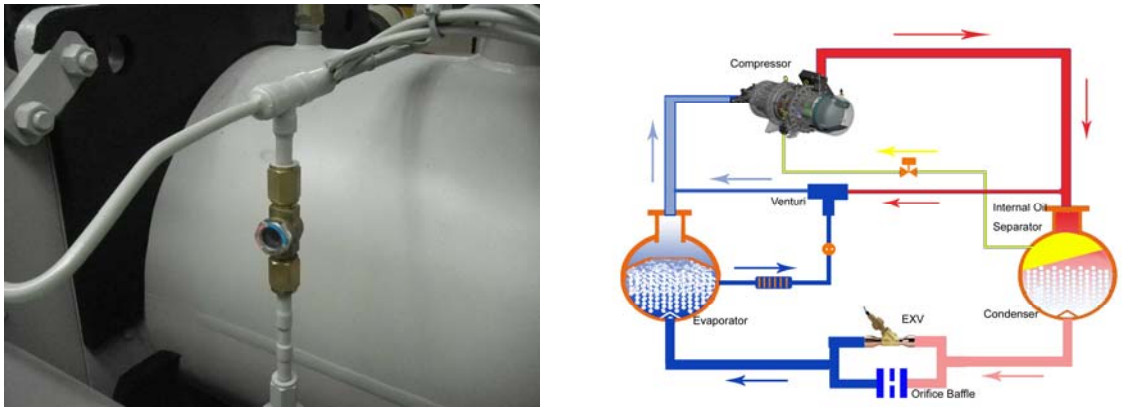


Fig. 34.

Each screw compressor is connected to a tank (oil separator) separating and collecting the oil from discharge gas. The discharge gas pressure pushes the oil back into the compressor for compressor seal and lubrication of all moving parts. During the compression, the oil joints the discharge gas before being conveyed again into the oil separator and re-start the cycle. The oil flow is granted by the pressure difference created between the condenser and the evaporator. This difference depends on the cooling water and evaporator water temperatures. During the start-up it is vital to establish rapidly the appropriate temperature difference, by checking the right cooling water temperature. The head of cooling water pump at zero flow rate should not exceed the maximum working pressure of condenser and plant water side.

Oil recovery system

Each compressor includes a system to recover the oil accumulated inside the evaporator during the normal operation. This system consists of a jet pump able to collect continuously all the oil from the evaporator preventing from the accumulation due to the low speed refrigerant gas. The high-pressure discharge gas feeds the jet pump that creates a depression, which allows the suction of the oil refrigerant mixture from the evaporator into the compressor to re-establish the oil level inside the lubrication system. On the oil recovery piping a sight glass allows to check the oil-gas mixture flow to the compressor. If flow is insufficient or the unit continuously stops for “Low Oil Level” alarm, verify the

correct operation of the corresponding circuit.

Oil Charging/Low Oil Recharging

Pre-cautions in changing of oil

1. Use only qualified oil and do not mix different brand of oil together. Different kinds of refrigerant should match different kinds of oil, note that some synthetic oil is incompatible with mineral oil.

2. When using the synthetic oil for the chiller system, be sure not to expose the oil to atmosphere for a long time, it is also necessary to vacuum the system completely when installing the compressor.

3. In order to ensure no moisture inside the system, it is suggested to clean the system by charging it with dry Nitrogen and then vacuum the system repeatedly as long as possible.

4. It is essential to change for new oil especially after the motor burns out; the acidity debris still remain inside the system so clean work must be done to overhaul the system. Check the oil acidity after 72 hours of operation and then change it again until the oil acidity is in the standard value.

5. Contact local distributor/agent for concerning unqualified oil to be used.

Oil change

1. Change oil periodically: Check the lubrication oil for every 10,000 hours of continuous running. For the first operation of the compressor, it is recommended to change oil and clean oil filter after running at 2,000 hours. Check the system whether clean or not and then change the oil every 20,000 hours or after 3 years of continuous running while the system is operated under good condition.

2. Avoid the debris or swarf clogging oil filter, this may caused bearings failure. The oil pressure differential switch will trip when the oil pressure differential reaches the critical point (default: 150kPa). The compressor will automatically shut down to prevent the bearings from getting damaged due to the lack of lubricating oil.

Caution

Compressor oil is pressurized. Use proper safety precautions when relieving pressure.

Additional oil charge to lubrication systems

1. If the unit shuts off repeatedly on Low Oil Level, this may be an indication of inadequate oil charge. It could also mean simply that there may be problems in the process of being reclaimed from the low-side of the system. Adjust the valves of high pressure side and evaporator side; make sure oil reclaiming process effective. If problem still persists, additional oil charge is needed.

2. Make sure that the unit is not running when adding oil, as this will make the oil charging process easier. Because the system is under pressure even when the unit is not running, it will be necessary to use a suitable pump (hand pump or electric pump) to add oil to the system.

3. Use a suitable pump to add appropriate Synthetic ester compressor oil (absolutely no substitutes are approved) to the system. Make sure that the oil level safety switch is NOT tripped, and allow the unit to restart and run normally. Do not exceed maximum oil change.

According to the oil model and charge, please refer to physical data.

Oil Filter Maintenance

Each compressor has its own internal oil filter and each circuit also has an in-line external filter located under the external oil separator. The internal oil filter pressure drop should be checked and filter

changed (if necessary) after the initial 2000 hours of compressor operation. Oil line pressure loss is monitored by the control and reported for each compressor as the oil filter pressure drop.

Normally the pressure differential (discharge pressure minus oil pressure) is typically less than 150kPa for a system with clean internal and external filters. To determine the oil pressure drop due to the oil lines and external filter only, connect a gage to the oil pressure bleed port. Compare this value to the discharge pressure read at the touch screen. If this value exceeds 150 kPa, replace the external filter.

Compressor Change out Sequence

Compressor service requires metric tools and hardware. Change compressors according to the following procedure:

- **Compressor removal procedure**

1) Cut off all main and control circuit power supply of the machine.

2) Close the discharge valve, suction valve, and evaporator inlet line service angle valve, oil line shutoff valve for circuit to be changed. Disconnect the oil inlet line from the compressor.

3) Remove any remaining refrigerant in the compressor and refrigerant lines by proper reclaiming devices. All of the refrigerant that is in the evaporator must be removed if there is no suction service valve installed on the evaporator.

IMPORTANT: Cooling and chilled water pumps must be energized. There must be water flowing through heat exchangers whenever adding or removing charge.

4) Remove junction box cover of compressor to be changed. Check main power leads for marked numbers. If no numbers are visible on leads, mark leads with appropriate numbers to match those printed on the ends of the terminal lugs. This is extremely important as power leads MUST be installed on the exact terminals from which they were removed.

5) Disconnect main power leads from compressor terminal lugs. Mark remaining control circuit wires (connected together with wire nuts) for ease of reconnecting later.

6) Remove the capacity adjustment SV and oil solenoid valve and high-pressure switch from compressor.

Caution: The next steps involve compressor unbolting and removal. Compressor seals are made using O-rings. Use care when removing bolts and disconnecting flanges. The O-rings must NOT be re-used. New O-rings are provided with the replacement compressor. Be sure that an appropriate lifting cart or hoist is used to avoid injury.

7) See Fig. 31 for lifting methods of screw compressor. Make sure compressor is properly rigged before unbolting. Move lifting apparatus into place and attach to the 2 lifting rings on the compressor. When lifting the compressor, it is recommended to use a steel chain or steel cable as shown in the figure below, and also a safety rope can also be used provided it has loading capacity of 2000kgf. Make sure that the chains, cables, ropes or other lifting equipment are properly positioned so as to avoid damage to compressor or its accessories. Keep the compressor in horizontal position when lifting, and avoid the compressor to crash or fall on the ground; hit the wall or any other event that may damage it or its

accessories.

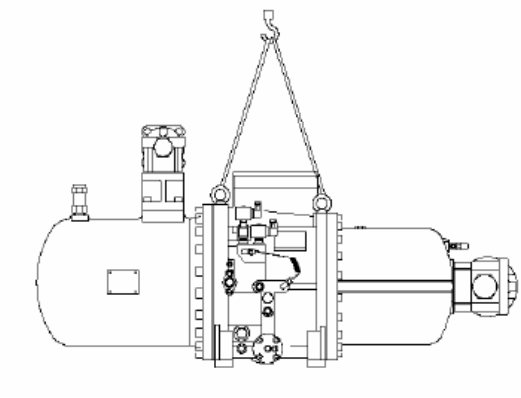


Fig. 21 Lifting the compressor with steel chain or steel cable

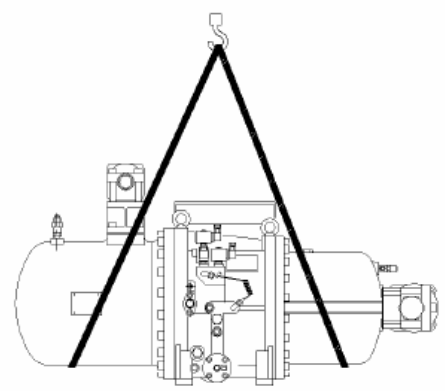


Fig. 22 Lifting the compressor with safety ropes

8) Remove the M14 bolts securing the discharge line flange located between compressor and oil separator.

In the same way, remove the bolts securing the suction line flange between evaporator and compressor if there is no suction service valve. If there is suction service valve, remove the bolts securing the suction valve to compressor.

9) Save all the hardware as it will be needed to install the replacement compressor. When there's no interfere with compressor, remove compressor from evaporator.

- **Compressor reinstallation**

Install the new compressor to the mounting bracket; connect all the accessories removed before back to the new compressor, including gas pipes, oil pipes, pressure switches, power cables and control cables, etc. All these must be reinstalled to the same place as per uninstallation procedure.

IMPORTANT: the power cable must be connected to compressor correctly as per marks on the cables. Wrong connection may cause reversal rotation and serious damages.

1) Leak check the compressor and refrigerant lines with nitrogen. Repair any leaks found. Remove nitrogen from system. Evacuate compressor and refrigerant lines. Refer to the Refrigerant Charging/Adding Charge and Oil Charging/Low Oil Recharging sections on pages for recharging procedures.
2) Open all shutoff valves and check the circuit and all fittings and joints. Repair any leaks found.
3) Restore main and control power to the machine. Confirm all the possible alarms and reset on the screen alarm page.

- **Moisture-Liquid Indicator**

Clear flow of liquid refrigerant indicates sufficient charge in the system. Note, however, that bubbles in the sight glass do not necessarily indicate insufficient charge. Moisture in the system is measured in parts per million (ppm), changes of color of indicator are:

Green—moisture is below 80 ppm;

Yellow-green (chartreuse)—80 to 225 ppm (caution);

Yellow (wet)—above 225 ppm.

Change filter drier at the first sign of moisture in the system.

IMPORTANT: Unit must in operation for at least 12 hours before moisture indicator can give an accurate reading. With the unit running, the indicating element must be in contact with liquid refrigerant to give true reading.

Liquid Line Service Valve

This valve is located ahead of the filter drier and provides a 1/4-in. Schrader connection (30GXN,R only) for field charging. In combination with compressor discharge service valve, each circuit can be pumped down into the high side for servicing.

Thermistors

For PTC thermistors, resistances vary with various temperatures.

Location

Motor thermistor locates in the motor winding and is connected to the compressor protection module which will cut off the main power when motor winding temperature exceeds 110 °C. Water temperature thermistors are installed in wells on chilled water inlet/outlet and cooling water inlet/outlet. Refer to the electric control wiring diagram for detail connection information.

Thermistor replacement

To Replace Thermistors RT1, RT2, RT3, RT4, RT5, or RT6 (Entering/Leaving chilled Water; Entering/Leaving cooling Water; Discharge Gas Temperature) — Disconnect appropriate connector from the PCB controller. New thermistors should be spliced to existing wiring close to the connector unless new connectors are required. Remove thermistor cable from harness. Remove and discard original thermistor from well. Insert new thermistor in well body to its full depth. Add a small amount of thermal conductive grease to thermistor probe and well. Tighten the screw to prevent thermistors from slipping out of the well.

To Service Compressor Motor Thermistors

A thermistor is factory installed in each compressor. Connections for the thermistors are located in the compressor wiring box. 2 terminals are reserved for the thermistor: S1 and S2. Motor temperature is measured by leads connected to S1 and S2 terminal. The thermistors are not serviceable in the field. If the compressor motor thermistor fails, compressor replacement is required.

Safety Devices

Compressor protection module (INT69 HBY/ JTX-A)

The units are equipped with compressor protection modules built in the wiring cabinet of compressor. INT69 HBY and JTX-A module is designed to detect the motor winding temperature, phase sequence and phase loss. The detecting signal of JTX-A is voltage type. When motor winding temperature reaches set point, the module will cut off control circuit immediately. The module with phase sequence control can prevent motor reversal due to the adverse consequences. When any one phase loses, the module will cut off main power after a short delay to protect the motor from burning. When phase unbalance happens, it cuts the power immediately. In order to avoid interference and discriminate between false voltage drop and malfunction as phase loss or phase unbalance during motor operating, JTX-A will cut off main power after 3-5s delay.

- **Thermal overload relay**

Each compressor is equipped with one thermal overload relay to protect the compressor against overcurrent. Bypass the current transducers or make any changes to the factory default set points is forbidden. The configuration of the module defines the Must Trip Amps (MTA) at which the thermal overload relay will turn the compressor off.

- **High/low pressure switch**

All compressors have factory-installed high/low-pressure switches. See Table.6.10

Table – High/low-pressure switch settings

UNIT	High-pressure switch setting		Low pressure switch setting	
	Protection Value	Reset Value	Protection Value	Reset Value
LSBLG***/MCFN	14bar	9bar	1bar	2bar

Table.6.10

If the high pressure switch continuously opens for 3s during operation, the compressor will be shut down. A manual reset of the control is required to restart the compressor. If the low pressure switch continuously opens for 1s during operation, the compressor will be shut down. It will reset automatically when malfunction gets solved and cleared on the malfunction record page of touch screen. Sometimes if the malfunction cannot be solved by reset, consider replace the pressure switches.

- **Evaporator protection-Low Water Temperature**

PCB is programmed to shut the chiller down if the leaving water temperature drops below 4 °C. When

water temperature rises up to 13℃, the safety resets and the chiller restarts. Besides, the chillers are equipped with antifreeze switch which located on the outlet of chilled water. If leaving water temperature continuously keeps lower than 3 °C for 3s during operation, the chiller will be shut down. When water temperature rises up to 10 °C, the chiller resets, but it needs manually reset on the touch screen.

IMPORTANT: If unit is installed in an area where ambient temperature may fall below 32 F (0° C), a suitable corrosion-inhibited antifreeze solution or auxiliary electric heater must be used in the chilled water circuit.

Relief Devices

➢ **Pressure relief valves**

Relief valves are installed on evaporator, condenser and oil separator. These valves are designed to relieve if an abnormal pressure condition arises. Relief valves on condenser relieve at 1.55MPa. These valves should not be capped. If a valve relieves, it should be replaced. If not replaced, it may relieve at a lower pressure compared to the set point, or leak due to trapped dirt from the system which may prevent resealing.

Control Modules

• Main base board (mbb), screwcompressor Board (scb), expansion valve board (exv), Energy management module (emm), Comfortlink™compressor protection Board (ccp), and the navigator

• Red led

• Green led

• Yellow led

Replacing Defective PCB Controller

For Midea screw chiller, it adopts special refrigeration PCB controller. The program and data is written into the memory by Midea in the replacement module. When ordering any replacement module, specify the model of unit and information of user (Name/Country/Installation time of unit). Return the faulted module to Midea.

Caution：

Electrical shock can cause personal injury. Disconnect all electrical power before servicing.

1） Check that all power to unit is off. Carefully disconnect all wires from the defective module by unplugging its connectors. Remove the defective module by removing its mounting screws with a Phillips screwdriver, and removing the module from the electric control box. Save the screws in an appropriate place for later use.

2） Package the defective module in the carton of the new module for return to Midea.

3） Install the new module in the unit’s control box using a Phillips screwdriver and the screws saved before.

4） Reinstall all module connectors and communication wire. Carefully check all wiring connections before restoring power. Make sure the connectors are installed at the right place.

5） Restore control power. Verify all configuration information, settings, set points and schedules.

2.4 Removal and Service of Key Parts

Annual Startup

This is a good time to check all the motor winding resistance to ground. Semi-annual checking and recording of this resistance will provide a record of any deterioration of the winding insulation. All new units have well over 100 MΩ resistances between any motor terminal and ground.

1. The control circuit must be energized at all times, except during service. If the control circuit has been off and oil is cool, energize oil heaters and allow 8 hours for heater to remove refrigerant from the oil before starting.
2. Check and tighten all electrical connections.
3. Replace the drain plug in the cooling tower pump if it was removed at shutdown time the previous season.
4. Install fuses in main disconnect switch (if removed).
5. Reconnect water lines and turn on supply water. Flush condenser and check for leaks.

Annual Shutdown

Where the chiller can be subject to freezing temperatures, the condenser and chiller must be drained of all water. Dry air blown through the condenser will aid in forcing all water out and decreasing the corrosion. Water permitted to remain in the piping and vessels can rupture these parts if subjected to freezing temperature.

If the chiller is used in areas where the ambient temperature will fall below 0℃, forced circulation of antifreeze through the water circuits is one method of avoiding freeze up.

1. Take measures to prevent the shutoff valve in the water supply line from being accidentally turned on.
2. If a cooling tower is used, and if the water pump will be exposed to freezing temperature, be sure to remove the pump drain plug and leave it out so any water that can accumulate will drain away.
3. Open the compressor disconnect switch, and remove the fuses.
4. Check for corrosion and clean and paint rusted surfaces.
5. Clean and flush water tower for all units operating on a water tower. It should be recognized that atmospheric air contains many contaminants that increase the need for proper water treatment. The use of untreated water can result in corrosion, erosion, sliming, scaling or algae formation. It is recommended that the service of a reliable water treatment company be used.
6. Remove condenser heads at least once a year to inspect the condenser tubes and clean if required.

Recommended maintenance schedule

This chapter shows the preventive maintenance of Midea screw chiller. Correct maintenance and timely service will make the chiller in the best condition and with best performance, beside, it can prolong the lifespan of chiller.

The customer has responsibility to appoint qualified equipment management engineer and specially-assigned operator to do the daily and scheduled maintenance. The repair work should be done by big maintenance agency that is qualified to do the job. It's better to make maintenance agreement

with local customer service centre of Midea after chiller out of warranty, to keep the chiller always under effective service and guarantee reliable operation.

Note: Repair work caused by incorrect maintenance within warranty will lead to extra charges.

Daily maintenance

The basic work of unit maintenance is to truly record the operation parameters of unit at certain intervals (e.g. 2hours) everyday. Fill the operation parameter table which contains such key parameters as high/low pressure, suction/discharge temperature, degree of sub-cooling/overheat degree. True and complete records of operation parameters are useful for analyzing and forecasting the trend of unit operation. It's good for finding and forecasting the problem that may occur and taking measures in time.

For example, by analyzing the record of a whole month, you may find that the temperature difference of condensing temperature and leaving cooling water temperature may become bigger. It means that the cooling water is dirty or water hardness is big, and it is scaling constantly. So it's compulsory to perform softening process or clean the tubes.

Note: Keeping the normal operation parameters of initial unit commissioning is very useful. It can be used for comparative analysis to find out the trend of problem.

Scheduled maintenance

General

Take notice of the noise at any time by standing 1m from the unit. Watch the vibration amplitude at all times to see whether it's within permitted. Check the voltage of power supply whether it's within ±10% of rated voltage at any time.

- **Visual inspection**

Keep the unit clean, if there's rust, do scaling with iron brush and cover it with antirust paint. Pay attention to the oil traces (sign of a refrigerant leak) and water traces on pipeline. Check the threaded connection joints carefully, fasten any loose screw in time. Any time seeing the insulating material flakes off, stick them with adhesive.

- **Compressor**

For insulation resistance, check it yearly and it should be over 5MΩ when measuring with ohmmeter of DC 500V. When touching the shockproof rubber, it should be elastic, or it means the rubber gets ageing. Every 3000 hours, make middle inspection of vibration and oil level; every 6000 hours, check the safety device and protective device to guarantee the normal operation.

Important: The normal oil level is at the middle of sight glass. Adding lubricating oil if the oil level decline obviously. Inspect the oil quality monthly to see if there's dirt or deterioration, otherwise, replace the oil and filter core if necessary by specialized technicians. Make chemical analysis of the lubricating oil, if emulsification phenomenon occurs, change the oil of same brand.

- **Heat exchangers**

Adjust the water flow to keep the high/low pressure within normal range (high pressure 0.6~1.2MPa/low pressure 0.1~0.4,If the temperature difference between leaving cooling water temperature and refrigerant temperature in condenser is larger than 6 °C, it means the condenser is scaling and

cleanness work is in urgent need. When the chiller stops for a long time, water in heat exchangers and pipe system should be drained thoroughly. For newly installed chiller, the filters in water system should be cleaned after running for 24 hours and then clean the filters quarterly.

- **Valves and pressure controllers**

▲ Safety valves

Inspect the integrity and performance of valves every year. The maintenance of safety valves should be done by specialized technicians. Take apart the connecting pipe of safety valve, and check it to see whether there is corrosion, rust, scaling, leakage phenomenon internal (if necessary, replace the safety valve). And also check other operating valves to see whether it's smooth when opening or closing them.

▲ High/low pressure switch

Check their performance whether they are in good condition according to "performance of protection device" monthly, and change the broken one in time. Or the chiller may get damaged when over high pressure or too low pressure happens.

- **Chilled water cycling**

Seek the possible leakage on the unit and the pipe joint with leak detector. Expel the water from condenser and evaporator to see whether there's leakage on water inlet and outlet. Leak can be found with electronic detector, torch detector or soap water. The work looking for refrigerant leakage should be carried out at least once/month.

- **Electrical control system**

For insulation resistance, check it monthly and it should be over 1MΩ when measuring with ohmmeter of 500VDC. Check the running current and compare with the rated value (refer to Table.9). Check the conductibility of wire and verify whether it's intact and well connected. Fasten the loose bolts. Check other components such as electromagnetic contactor, rotary switch, auxiliary relay, time relay and thermostat whether they are all normal monthly.

2.5 Training User Operator

The commissioning process includes training user operators in the following aspects:

1) Stress the safety in shutdown and operation processes.
2) Require the users to carefully read the operation manual of the unit.

   Explain to the users that operation of the unit shall be carried out strictly as per the steps and methods specified in the operation manual. If anyone has any problems about descriptions in the manual, he shall enquire after-sale personnel or professionals in the factory and carry out the operation only when he understands it. Any deviation in the installation of the unit from the requirements in the manual shall be pointed out to the part responsible for installation, and the after-sale personnel or professionals in the factory will determine whether change is necessary.
3) Short-connection is forbidden when all protection functions of the unit are normal. Ensure all protection functions are available and reliable.

   Various protection switches in the unit are for safety of the unit or user, and are not permitted to be short connected in principle. If short-connection is required for commissioning, the operation shall be done by the after-sale personnel or professionals in the factory on site. After the commissioning,

connect the protection switches to the system before starting up the unit for long-time running.

4) Open the water pump and wait until the water flow is stable before starting up the master compressor. For shutdown, the water pump must be closed in a delayed time. It is not allowed to forcibly close the water pump when the master compressor is still running. If the water pump fails, and the flow switch does not jump, the unit must be emergently shut down.

5) The unit must be disconnected from the power supply during inspection or replacement of the lines of the unit.

   If it is required to tighten the line bank screw or replacing the wire and element in the electrical cabinet during commissioning and maintenance, it shall be down when the power supply is disconnected. Similar operations by the user in later maintenance and service shall also be done when the power supply is disconnected.

6) The non-user parameters in the touch screen of the unit and electronic expansion valve control module are forbidden to be changed.

   The non-user parameters in the touch screen of the unit and electronic expansion valve control module are directly related to the performance and reliability of the unit, and are not allowed to be changed in principle. Even if it is required to adjust some parameters due to special local climate, it shall be done by or under the instructions of after-sale personnel or professionals in the factory.

7) If any exceptional case occurs to the unit, it is forbidden to forcibly start up the unit unless under the instructions of professionals.

   Exceptional temperature, pressure, sound, or vibration, etc. of the unit during the running shall be clearly recorded in details, and reported to after-sale personnel or professionals in the factory. It is forbidden to forcibly start up the unit unless permitted.

V. Control

1. Description of Energy Adjustment

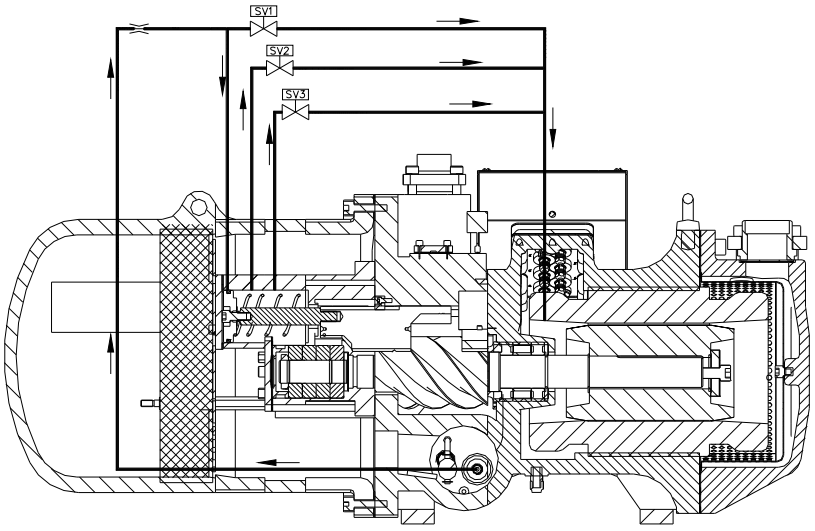
Energy adjustment may be controlled by either entering water temperature or leaving water temperature in case of operation of single-module unit, and it can only be controlled by entering water temperature in case of multi-module interconnection.

Compressor Capacity Adjustment

The capacity output of the unit is determined by the valid length of slide valve which is controlled by 3 solenoid valves. The control system cycles compressors, loaders, and minimum load control valves to maintain the user configured leaving (or entering) chilled water temperature set point. Temperature sensors transfer temperature signals to PCB which will calculate the optimum time to add or subtract capacity stages. Special algorithm programmed in PCB will try to maintain the Control Point at the desired set point.

- 4-stage control (50%~100%)

The 4-step capacity control system is made of one slider, three NC solenoid valves and one piston with adjustable range of 25%, 50%, 75% and 100%. The principle of capacity control is by moving the slider to allow partial refrigerant to bypass back to the intake and regulate the refrigerant flow.



Solenoid valve activating table of four-stage capacity control

SV / Status	SV1 (NC)	SV2 (NC)	SV3 (NC)
100%	OFF	OFF	OFF
75%	OFF	OFF	ON
50%	OFF	ON	OFF
25%(startup)	ON	OFF	OFF

ON: energize, OFF: de-energize

- ✓ Startup: 25% loading

For easier startup of compressor, the loading must be minimized. Therefore, SV1 is energized to bypass oil to the low-pressure side directly. The slider does not move and keep the maximum opening in suction end to bypass the refrigerant. After the completion of startup the compressor then can increase loading gradually by de-energizing the SV1 solenoid valve. It is recommended to run compressor at 25% loading for about 30 seconds before starting to increase loading.

✓ Partial load: 50% Operation

With the same principle as stated in 25% loading, SV2 is engergized and others are de-energized to achieve 50% loading.

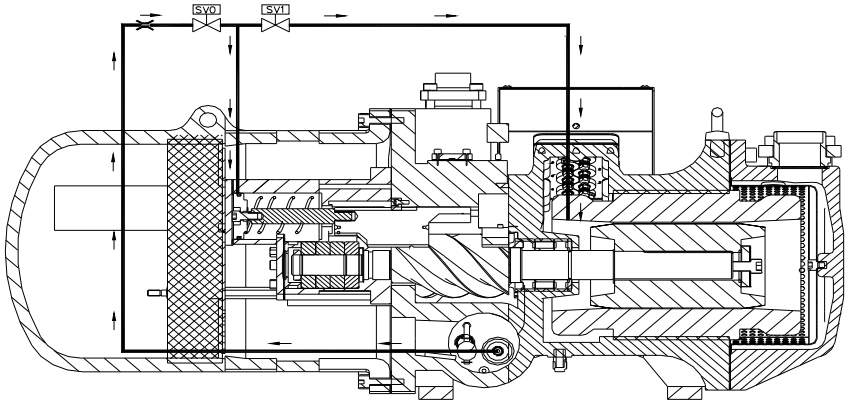
✓ Partial load：75% Operation

Receiving a feedback from system demanding for lower capacity, the SV3 is energized to allow oil to flow back to the low-pressure side through the valve channel. The piston returns to the outlet of SV3 oil passage and the slide block moves to let part refrigerant flow back to the low-pressure side through bypass opening. This action would reduce the discharge volume and make the compressor operating at 75% loading

✓ Full load: 100% operation

After the completion of startup, SV1, SV2 and SV3 are de-energized and oil flows straight to cylinder and pushes piston forward, driving the slider to gradually reduce bypass opening. When the opening is closed completely, the compressor is running at 100% loading.

➢ Stepless control (25%~50%)



Solenoid valve activating table of stepless control

SV / Status	SV0 (NC)	SV1 (NC)
Startup	OFF	ON
Loading	ON	OFF
Unloading	OFF	ON
Holding	OFF	OFF

ON: energize, OFF: de-energize

The principle of linear capacity control system is same as four-step one, except that the control logic of solenoid valve varies. The four-step capacity-control needs three NC (normal close) solenoid

valves, whereas the linear one uses two NC (normal close) solenoid valve to control the increase or decrease of loading.

When starting compressor, SV1 is energized to bypass the oil in hydraulic cylinder back to the low-pressure suction end while SV0 is de-energized. Slider remains in its initial position due to the spring force, and then the compressor can be sure to start at 25% loading. Once the startup process is completed, SV0 is energized while SV1 is de-energized to increase the loading up to 100%.

To keep compressor running in steady state, SV0/SV1 is de-energized continuously to maintain the stable refrigeration capacity output. Once loading has been changed, the system energizes de-energizes of SV0 and SV1 to adjust output of compressor in order to fit actual loading requirement.

When loading increases, SV0 energizes shortly to allow small amount of oil to flow into hydraulic cylinder and force slider to move in the direction of increasing refrigeration capability. If loading decreases, SV1 energizes shortly to allow small amount of oil to flow out of hydraulic cylinder and cause slider to move in the direction of decreasing the refrigeration capability.

2. Description of cooling tower fan control

For Midea screw chiller, it adopts professional PCB controller to maintain the saturated condensing temperature to a configurable set point. Cooling tower fan is controlled by cooling leaving water temperature. During compressor startup and operating progress, cooling tower fan is OFF when cooling leaving water temperature <23°C. When cooling leaving water temperature >25°C, cooling tower fan is ON. When cooling leaving water temperature is between 23~25°C, cooling tower fan keeps in initial state.

3. Description of Oil heater control

In unit shutdown period, oil heater is energized to keep normal oil temperature. When unit starts, it is turned off.

Oil heating time limits:

- When the PCB receive “Unit start” signal, the program begin to detect oil temperature.Only when oil temperature ≥ Oil setting temperature, the unit can start.

4. Pump control

- **Water pump mode**

When user has selected water pump mode, PCB receives operation signal and turn on chilled/cooling water pump without starting the compressor. Chilled/cooling water flow switch is valid and its detection method is the same with normal startup procedure.

In pump mode, if user chooses cooling mode when chilled water temperature is low and not enough to start the chiller, both chilled/cooling water pumps keep on running until leaving chilled water temperature condition gets satisfied.

Note: In pump mode, it can transfer to cooling mode directly; in cooling mode, it needs to stop the unit and pumps first, then transfer to pump mode.

When accumulative total running time reaches 3,600,000s, remind user servicing water system and performing scheduled cleaning work.

- **Cooler and Condenser Pump Control**

Midea chillers can be configured for cooler and condenser pump control. Inputs for a cooler pump interlock and condenser flow switch or interlock are provided. Refer to appendix for details.

Cooler pump control

Proper configuration of the cooler pump control is required to prevent possible cooler freeze-up. A cooler flow switch must be installed on the outlet of chilled water to prevent operation without flow through the cooler. The chiller is also interlocked with the chiller water pump starter to provide additional protection. See appendix of the Field Wiring section for proper connection of the cooler pump interlock.

All chiller cooler pump control is utilized unless the chilled water pump runs continuously or the chilled water system contains a suitable antifreeze solution. It is recommended that the cooler pump should be interlocked with the unit unless there're other antifreeze solutions.

When the cooler pump control is "ON," the cooler pump relay will be energized when the chiller enters an "ON" mode. The cooler pump relay will remain energized for 10 min after all compressors stop due to off command in order to prevent freeze-up. In the event a freeze protection alarm is generated, the cooler pump relay will be energized whether cooler pump control is configured "ON" or "OFF." The cooler pump relay is also energized anytime a compressor is started as well as when certain alarms are generated. The cooler pump relay should be used as an override to the external pump control if cooler pump control is not utilized.

IMPORTANT: If the cooler pump control relay output is not wired to control or override the operation of the chilled water pump. An OFF DELAY of 10 minutes must be provided after the chiller is disabled to maintain cooler water flow during the pump down period.

If the chilled water flow switch/interlock does not close within 5 minutes after the unit is enabled and in an "ON" mode when cooler pump control is turned "OFF" or "ON", water flow loss alarm will be generated.

No matter water pump is "OFF" or "ON", if water flow switch opens for 5s continuously, the unit will not start or stop immediately.

Condenser pump control

The condenser pump can be controlled in the way like the cooler pump. It is turned on whenever the machine is in an "ON" mode and turned off 60 seconds after all compressors stop. When configured for a condenser flow switch/interlock, an alarm of cooling water flow loss is generated if the input does not close after unit starts for 2 min and fault will be displayed on the operation interface.

- **Flow Sensor**

Water flow protection

All water pipe kits and water flow switches are provided. Water flow switch must be installed on the

outlet of both the Condenser and Evaporator and the length A of water flow switch should be 5 times the length of the pipe diameter. Adjust the target of water flow switch according to the water pipe specification (Refer to the manufacturing manual). Water flow switch is connected to the terminals in control cabinet; refer to the electrical wiring diagram for details.

When power is supplied to the device, PCB control begins to detect water flow after water pumps running for 3 minutes. If water flow switch keeps open for 5s, the chiller will stop. It needs manually reset. Perform the steps below to solve the problem.

1. Check to confirm that all strainers are clean, valves are open and pumps are running. For the case of VFD controlled pumps, ensure that the minimum frequency set point has not been changed.

2. Measure the pressure drop across the heat exchangers (Read the difference of pressure gauges installed on the inlet and outlet) and using Appendix water pressure drop curves, calculate the flow and compare this to the system requirements.

3. If the measured flow rate through the heat exchanger agrees with the system requirements. Possible reason of the malfunction may be wrong installation direction of the switch, inadequate depth of the target, broken switch or wiring looseness, etc. New switch must be replaced if problem is switch itself.

5. Demand Limit

- **Auto unload control function**

For step control unit: When compressor continuously operates at chilled water temperature > 12°C more than 30 mins, unload to 50%; regain 100% load after 10 mins later.

For stepless control unit: When compressor continuously operates at chilled water temperature > 12°C more than 30 mins, unload to 50%; regain 100% load after 10 mins later.

- **Operation current limit control**

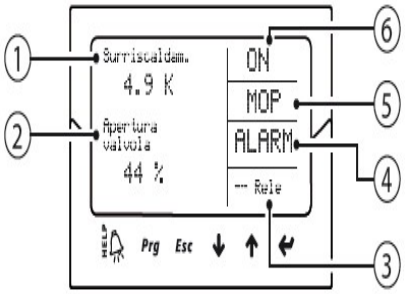
During unit running, it will unload immediately when the current reach 95% of set point and will not execute capacity increase action. Stop unloading until compressor unloads to 50%. After unloading operation for 10mins and the current value <=70% of set point and the unit meets loading condition, the unit will reload step by step.

6. EXV operation& wiring

User interface consists of five components of the LED display operating status, the table below:

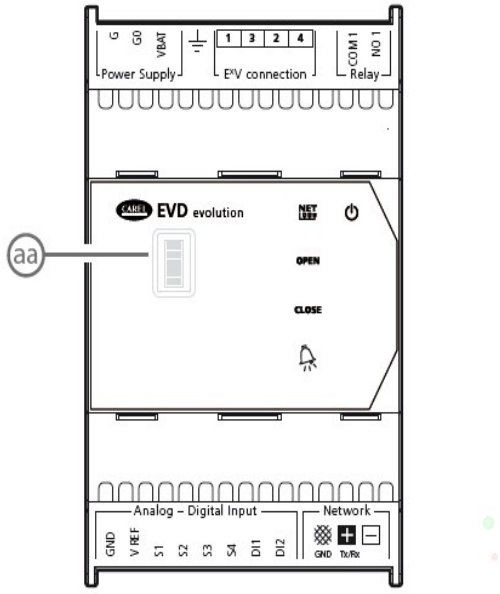
- **Display and keypad**

Graphical display with two kinds of system variables, the drive control of the state, protection function is activated, and the alarm and relay output status



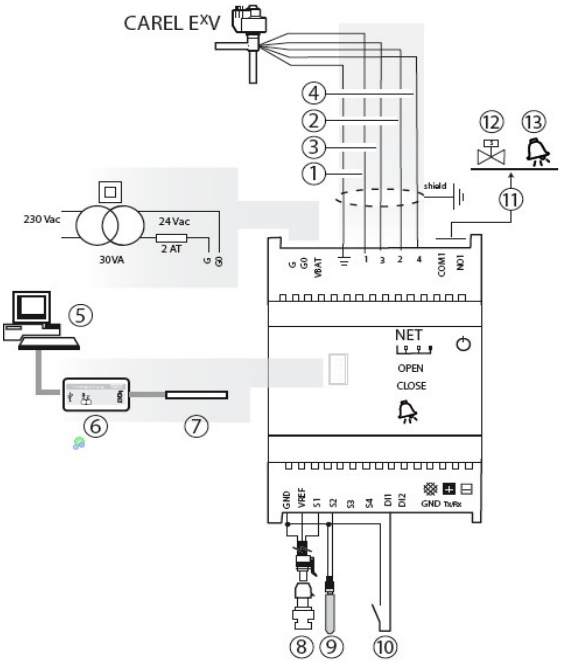
1	Display first kinds of variables	4	Alarm
2	Display second kinds of variables	5	Start of the protection
3	Relay output status	6	Control state

➢ General wiring diagram



Terminal	Explanation
G\G0	Power supply
VABT	Emergency Power Supply
⏚	Functional ground
1,2,3,4	Stepper motor power supply
COM1,NO1	Alarm Relay
GND	Signal Ground
VREF	Sensor power supply
S1	Sensor 1 (pressure) or an external signal 4 to 20mA
S2	Sensor 2 (temperature) or 0 to 10V external signal
S3	Sensor 3 (pressure)
S4	Sensor 4 (temperature)

Terminal	Explanation	Terminal	Explanation
DI1	Digital input 1	⊞	Connection tLAN, pLAN, RS485, Modbus ® terminal
DI2	Digital input 2	⊟	Connection pLAN, RS485, Modbus ® terminal
▩	Connection tLAN, pLAN, RS485, Modbus ® terminal	aa	Service port, after removal of the cover need to be connected LED



1	Green
2	yellow
3	Brown
4	white
5	sets of personal computers
6	USB / tLAN converter
7	Adapter
8	ratio of pressure sensor - evaporation pressure
9	NTC suction temperature
10	start-controlled digital input 1
11	free contacts (up to 230Vac)
12	solenoid valve
13	warning signs

Appendix 1: R134a saturation temperature - pressure corresponding tables

R134a saturation temperature - pressure corresponding tables							
℃	KPa	℃	KPa	℃	KPa	℃	KPa
-15	164	7	375	29	748	51	1351
-14	171	8	388	30	770	52	1385
-13	178	9	401	31	793	53	1420
-12	185	10	415	32	815	54	1455
-11	193	11	429	33	839	55	1492
-10	201	12	443	34	863	56	1528
-9	209	13	458	35	887	57	1566
-8	217	14	473	36	912	58	1604
-7	225	15	488	37	937	59	1642
-6	234	16	504	38	963	60	1682
-5	243	17	521	39	990	61	1722
-4	253	18	537	40	1017	62	1763
-3	262	19	554	41	1044	63	1804
-2	272	20	572	42	1072	64	1847
-1	282	21	590	43	1101	65	1890
0	293	22	608	44	1130	66	1934
1	304	23	627	45	1160	67	1978
2	315	24	646	46	1190	68	2024
3	326	25	665	47	1221	69	2070
4	338	26	685	48	1253	70	2117
5	350	27	706	49	1285	71	2165
6	362	28	727	50	1318	72	2213

Note: this table of pressure values for absolute pressure value, the pressure value (unit touch screen display value) for the vast pressure value and the local atmospheric pressure difference.

Appendix 2: the flow chart of the system

Appendix 2: Requirement for cleaning and maintenance

	Water quality	Scale	Corrosion	Remark
1	PH≤6 Acid water	Hard	Strong	Generates insoluble $CaSO_4$
2	PH≥8 Alkali water	Soft	——	Soft fluid deposit may be caused by ions iron or aluminum
3	Water with much Ca^{2+} and Mg^{2+}	Hard	——	Easily generates hard scale.
4	Water with much Cl^-	Dirt	Ultra-strong	Corrosive to copper and iron.
5	Water with much SO_4^{2-} and SiO_2^{2-}	Hard	Strong	Generates hard $CaSO_4$ and $CaSiO_2$
6	Water with much Fe^{3+}	Large quantity, hard	Strong	Generates deposits $Fe(OH)_3$ and Fe_2O_3
7	Odorous water	Large quantity	Ultra-strong	Generates sulfide, ammonia and marsh gas, especially H_2S which has great corrosion to copper.
8	Water with organic substance	Large quantity	——	Easily generates scale
9	Exhaust gas from auto, chemical factory, plating factory, sewage plant, ammonia refrigeration plant and fiber factory		Strong	Copper tubes of condenser may be eroded and perforated.
10	Dusty places such as plastic plant	Large quantity		
11	Sulfurous gas in the air		Ultra-strong	
12	Natural pollution such as damp air near the coast or insects in the field goes into cooling tower.	Large quantity	Strong	

Cycle under normal temp. (A):

(Capacity of condenser+ Capacity of pipe+ Capacity of container)×1/3(Thickness of detergent 33%)

Cycle under normal temp. (B):

(Capacity of flume of cooling tower+ Capacity of condenser+ Capacity of pipe)×1/10(Thickness of detergent 10%)

In case doing cleaning after the unit stops, the capacity of flume of cooling tower can be 1/2 or 1/3 of rated value; if doing cleaning as the unit is running, the capacity should achieve rated value.

Precautions on usage of detergent

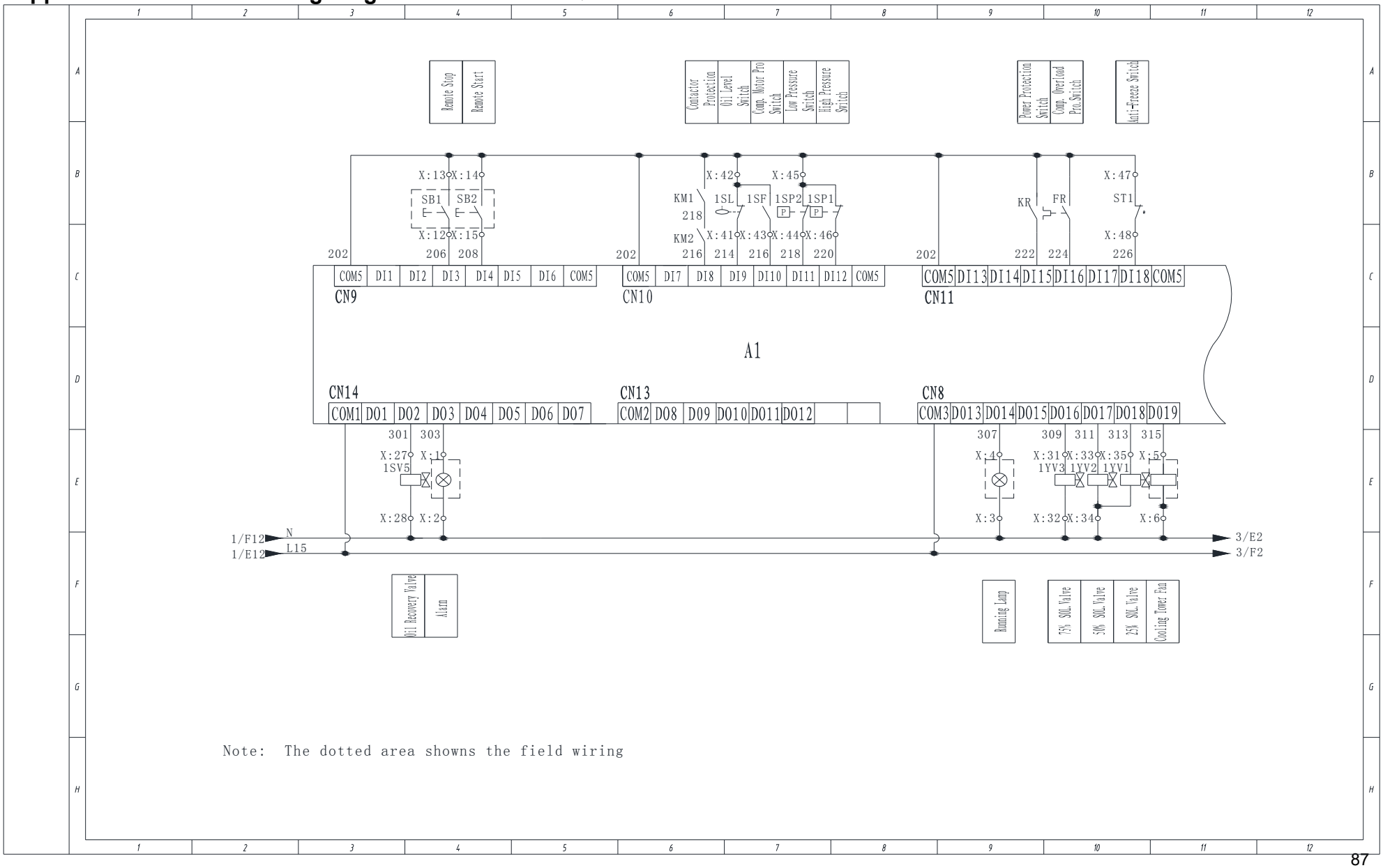
When doing cleaning, please wear rubber gloves and do not expose your skin or your clothes to the detergent. In case touching the detergent, please wash it with clean water.

The container for detergent should be made of plastic or glass rather than lead. The used detergent should be neutralized with lime or soda before draining

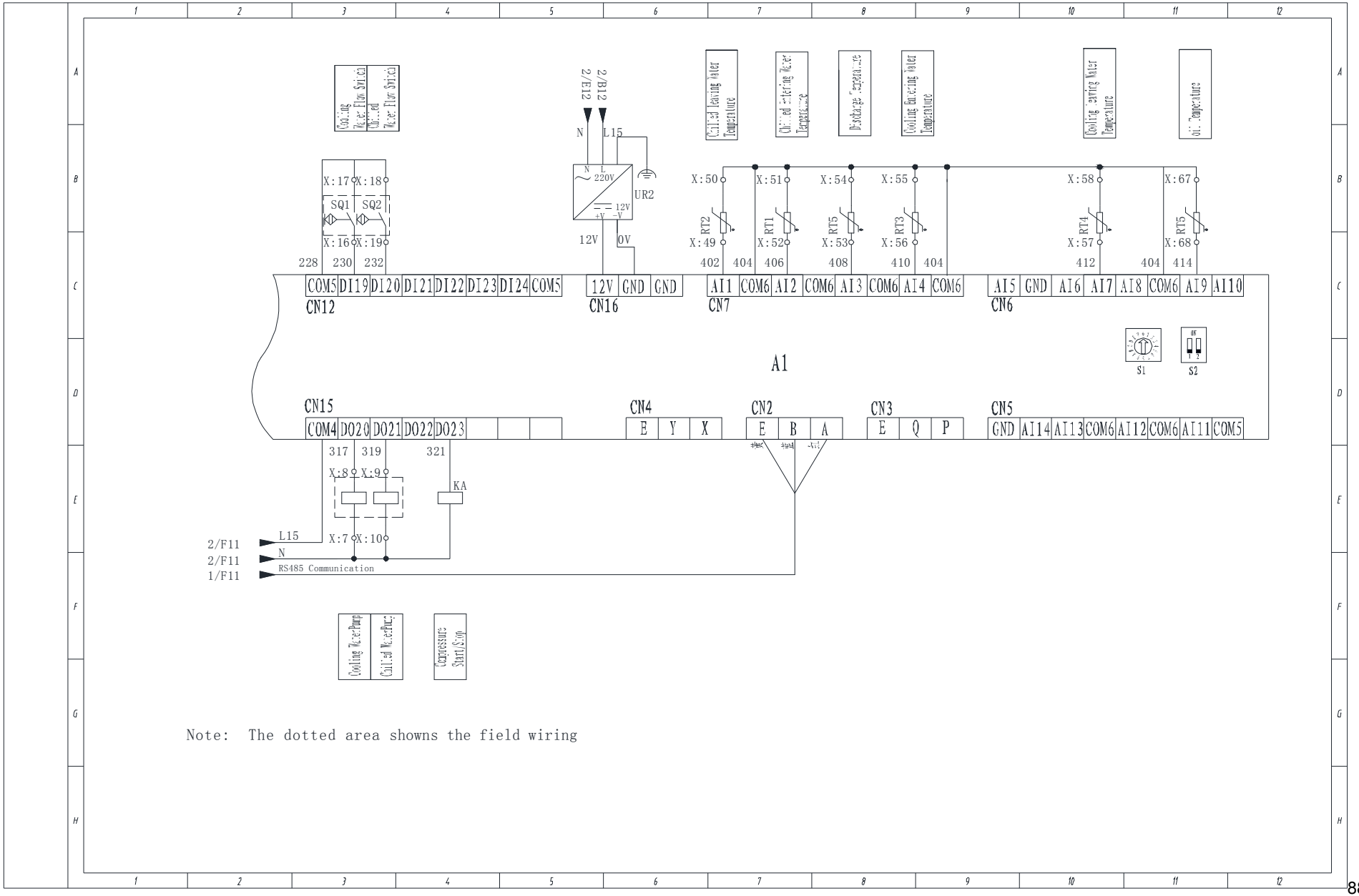
Detergent is harmful to human; please keep it away from children.

Turn on the unit after cleaning to ensure it is clean. If necessary, please do cleaning again.

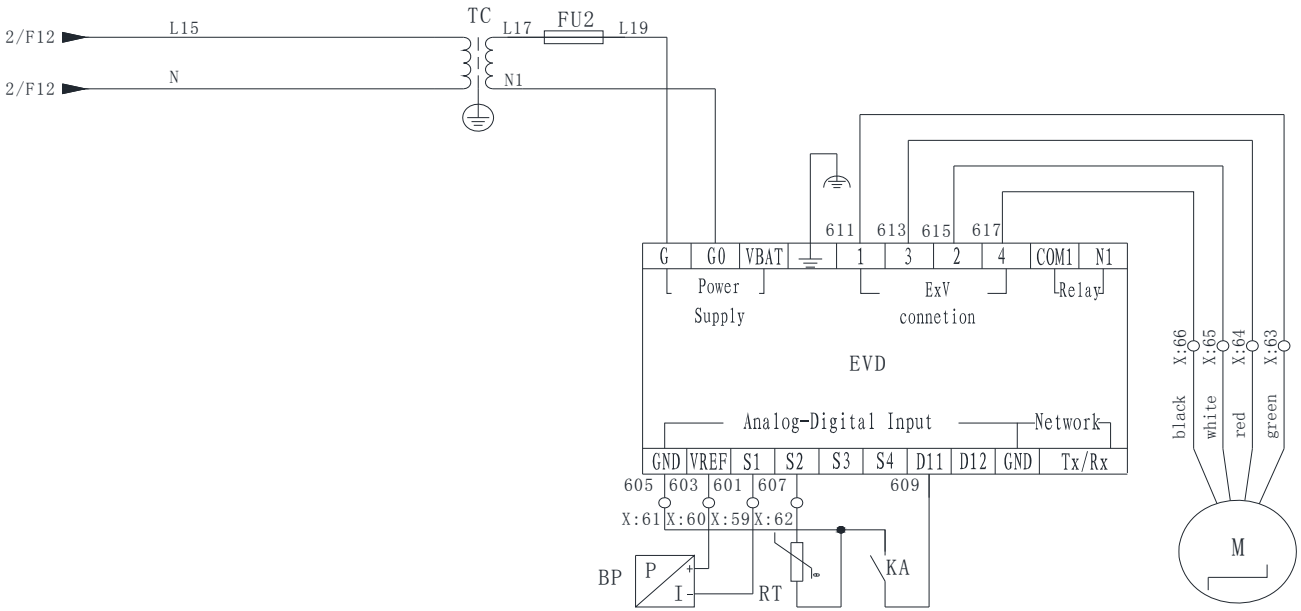
Appendix 3: Electrical Wiring Diagram LSBLG365-750/MCFN



Note: The dotted area showns the field wiring

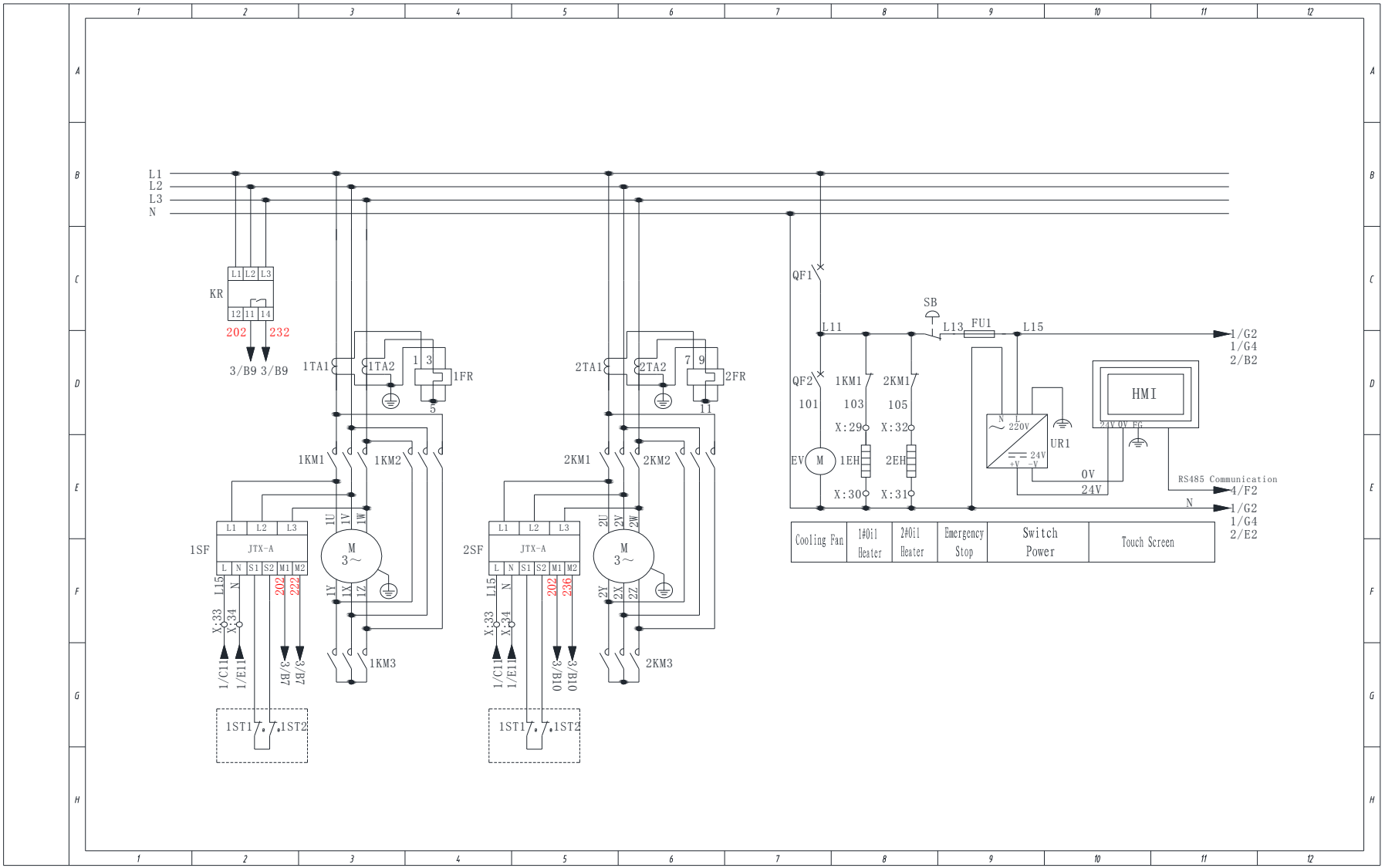


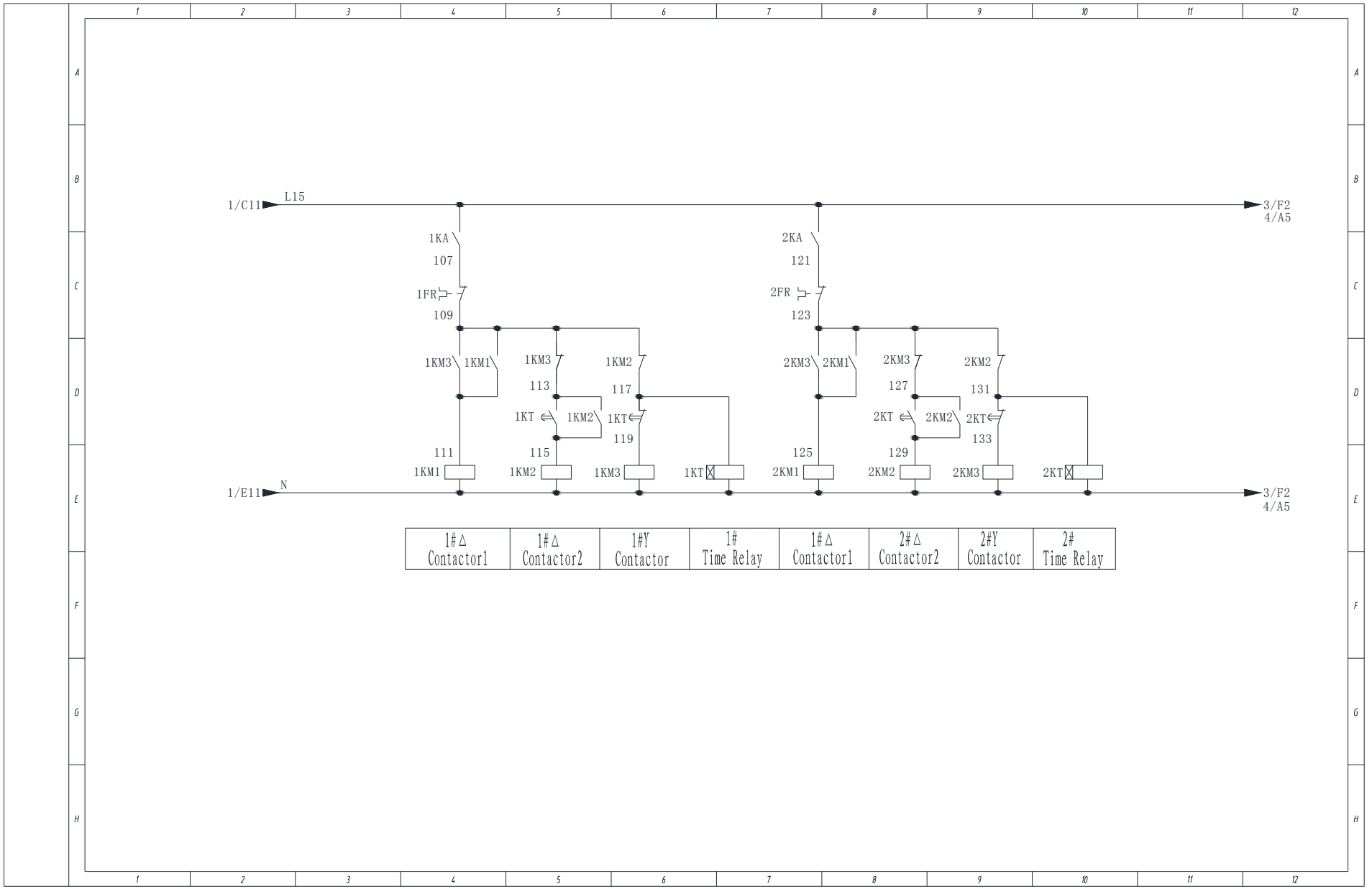
Note: The dotted area showns the field wiring

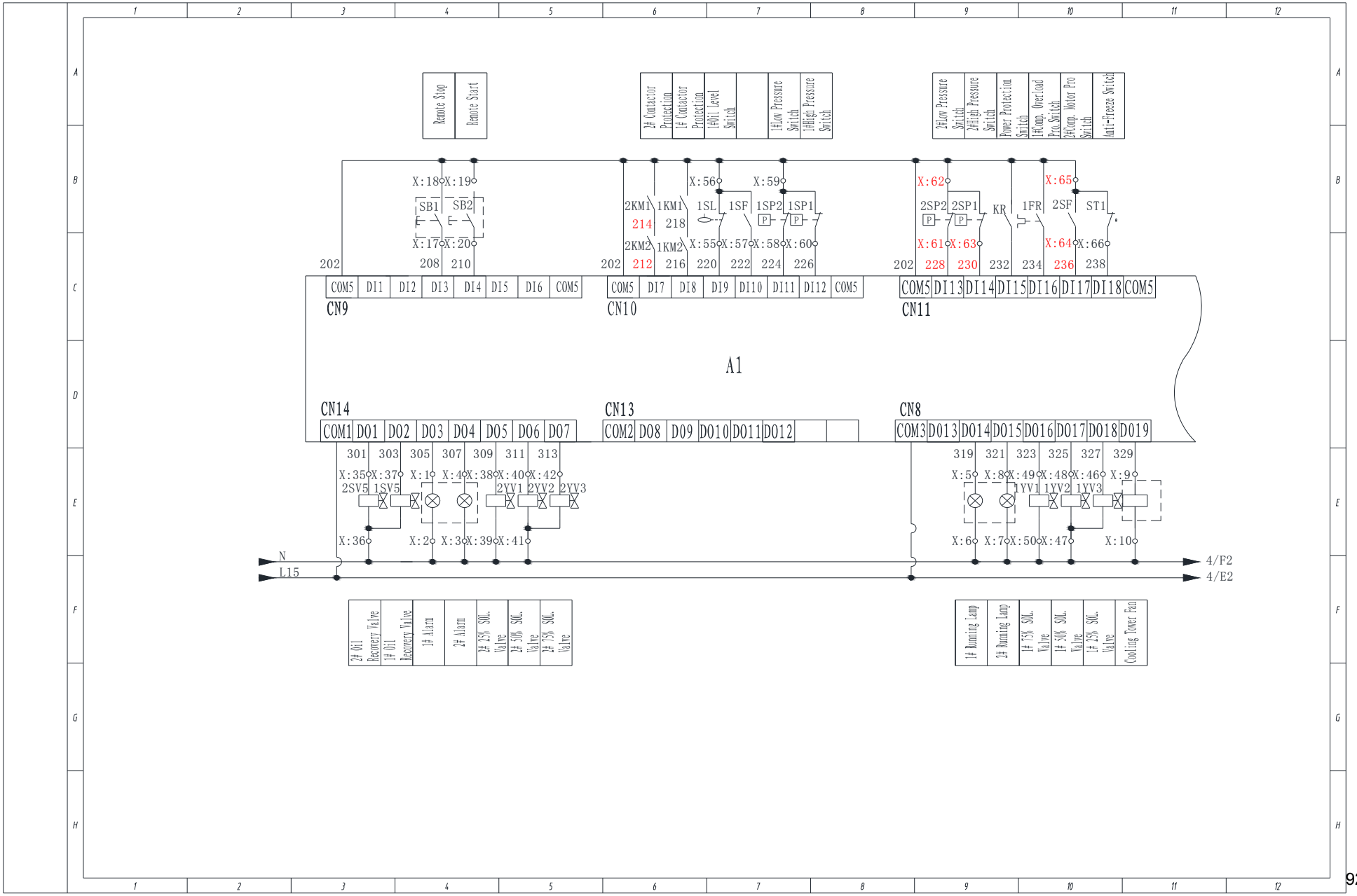


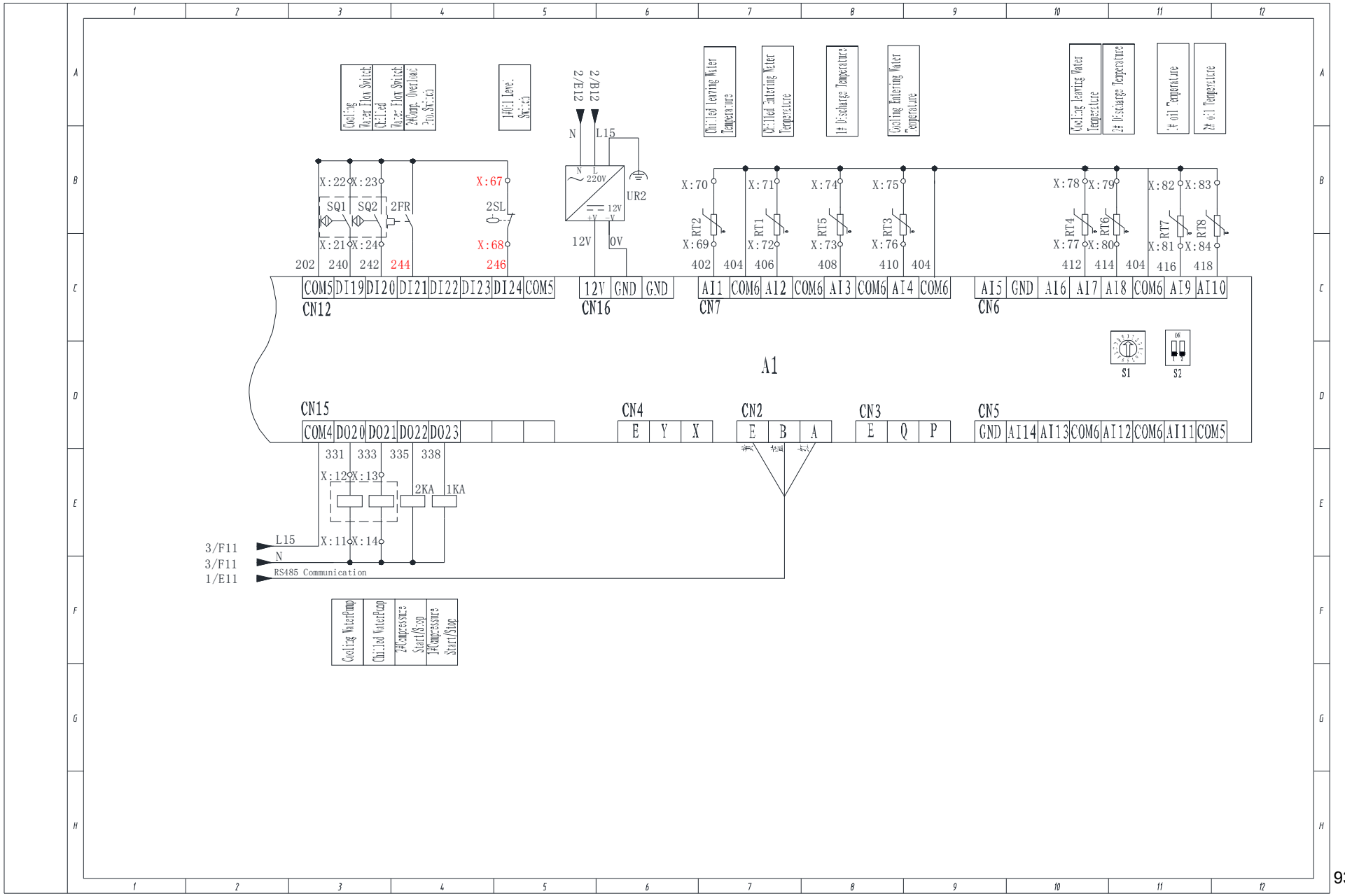
Control Transformer	EVD Pressure Sensor	EVD Temp. Sensor	EVD Power Supply	EXV Motor

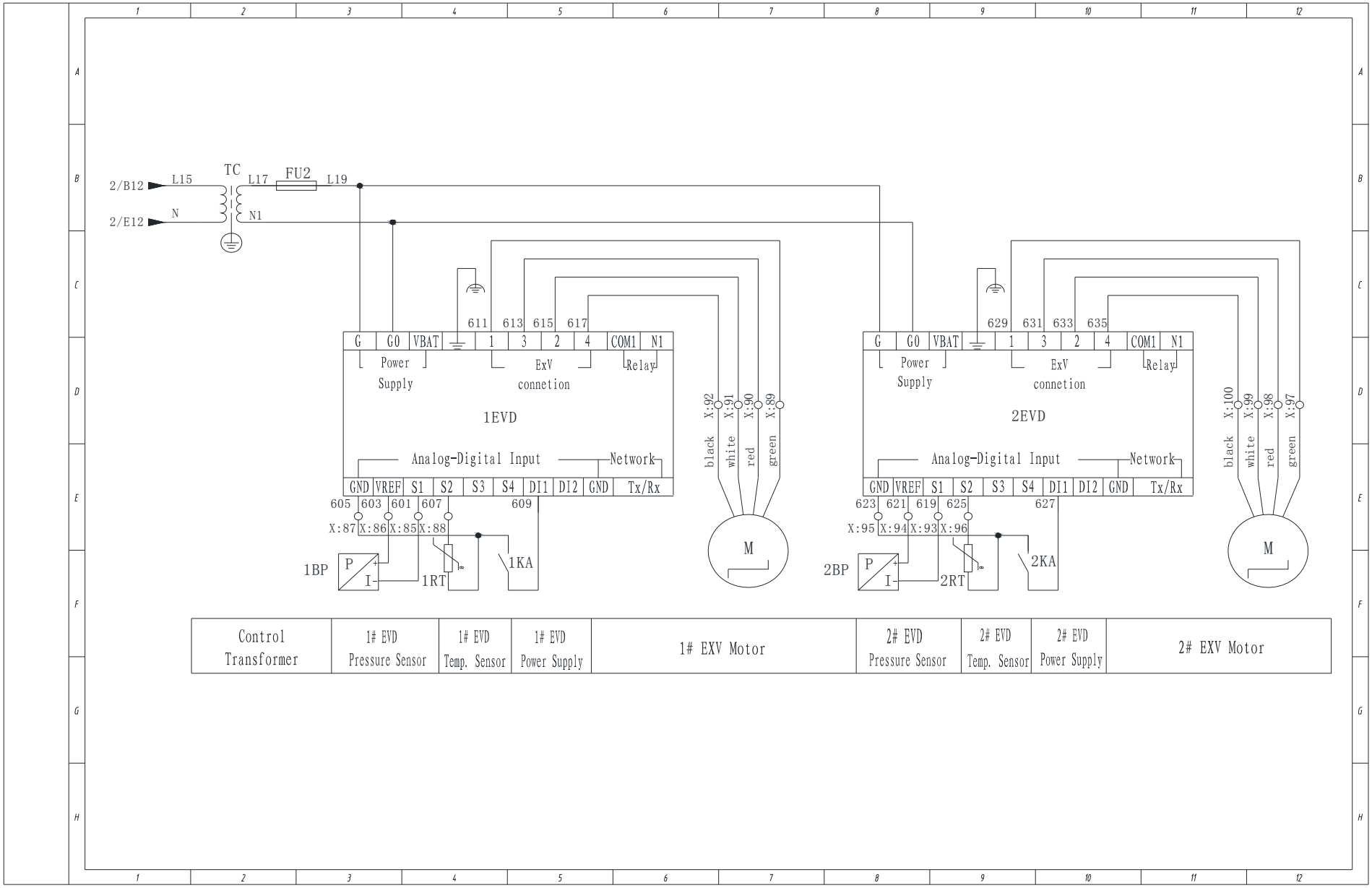
LSBLG825-1500/MCFN




1/C11
L15
3/F2
4/A5
1KA
107
1FR
109
2KA
121
2FR
123
1KM3
1KM1
1KM3
1KM2
2KM3
2KM1
2KM3
2KM2
113
117
127
131
1KT
1KM2
1KT
2KT
2KM2
2KT
119
133
111
115
125
129
1KM1
1KM2
1KM3
1KT
2KM1
2KM2
2KM3
2KT
1/E11
N
3/F2
4/A5
1#△ Contactor1
1#△ Contactor2
1#Y Contactor
1# Time Relay
1#△ Contactor1
2#△ Contactor2
2#Y Contactor
2# Time Relay


Remote Stop
Remote Start
2# Contactor Protection
1# Contactor Protection
1#Oil Level Switch
1#Low Pressure Switch
1#High Pressure Switch
2#Low Pressure Switch
2#High Pressure Switch
Power Protection Switch
1#Comp. Overload Pro.Switch
2#Comp. Motor Pro Switch
Anti-Freeze Switch
SB1
SB2
2KM1
1KM1
1SL
1SF
1SP2
1SP1
2KM2
1KM2
2SP2
2SP1
KR
1FR
2SF
ST1
CN9
CN10
CN11
A1
CN14
CN13
CN8
2SV5
1SV5
2YV1
2YV2
2YV3
1YV1
1YV2
1YV3
N
L15
4/F2
4/E2
2# Oil Recovery Valve
1# Oil Recovery Valve
1# Alarm
2# Alarm
2# 25% SOL. Valve
2# 50% SOL. Valve
2# 75% SOL. Valve
1# Running Lamp
2# Running Lamp
1# 75% SOL. Valve
1# 50% SOL. Valve
1# 25% SOL. Valve
Cooling Tower Fan

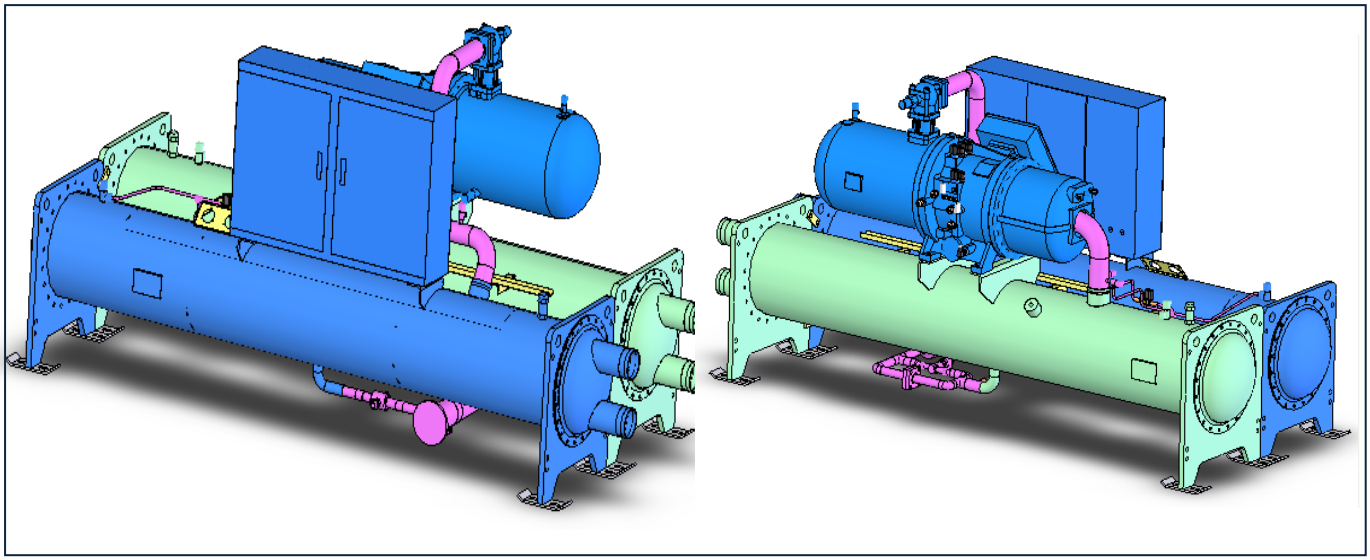

Cooling Water Flow Switch
Chilled Water Flow Switch
1#Comp. Overload
2#Comp. Overload
1#Oil Level Switch
2/E12
2/E12
N
L15
Chilled Leaving Water Temperature
Chilled Entering Water Temperature
1# Discharge Temperature
Cooling Entering Water Temperature
Cooling Leaving Water Temperature
2# Discharge Temperature
1# oil Temperature
2# oil Temperature
X:22 X:23 X:67
SQ1 SQ2 2FR 2SL
X:21 X:24 X:68
202 240 242 244 246
N L 220V
UR2
12V +V −V 12V
0V
X:70 X:71 X:74 X:75 X:78 X:79 X:82 X:83
RT2 RT1 RT5 RT3 RT4 RT6 RT7 RT8
X:69 X:72 X:73 X:76 X:77 X:80 X:81 X:84
402 404 406 408 410 404 412 414 404 416 418
COM5 DI19 DI20 DI21 DI22 DI23 DI24 COM5
CN12
12V GND GND
CN16
AI1 COM6 AI2 COM6 AI3 COM6 AI4 COM6
CN7
AI5 GND AI6 AI7 AI8 COM6 AI9 AI10
CN6
A1
S1
S2
CN15
COM4 DO20 DO21 DO22 DO23
CN4
E Y X
CN2
E B A
CN3
E Q P
CN5
GND AI14 AI13 COM6 AI12 COM6 AI11 COM5
331 333 335 338
X:12 X:13
2KA 1KA
X:11 X:14
L15
N
3/F11
3/F11
1/E11
RS485 Communication
Cooling WaterPump
Chilled WaterPump
2#Compressure Start/Stop
1#Compressure Start/Stop

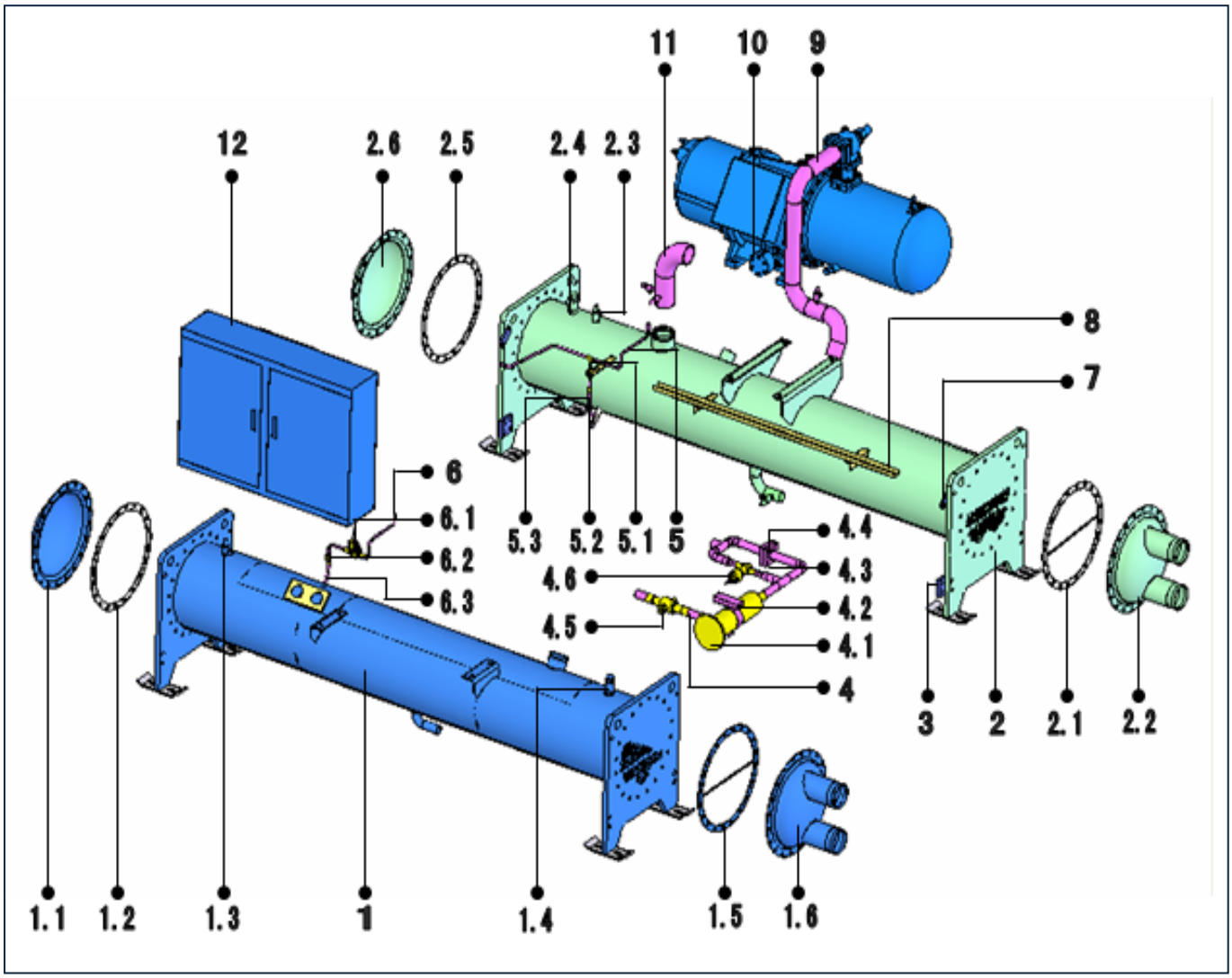

2/B12
L15
TC
L17
FU2
L19
2/E12
N
N1
611 613 615 617
G G0 VBAT 1 3 2 4 COM1 N1
Power Supply
ExV connetion
Relay
1EVD
Analog-Digital Input
Network
GND VREF S1 S2 S3 S4 DI1 DI2 GND Tx/Rx
605 603 601 607 609
X:87 X:86 X:85 X:88
1BP
P
I
1RT
1KA
X:92 X:91 X:90 X:89
black white red green
M
629 631 633 635
2EVD
623 621 619 625 627
X:95 X:94 X:93 X:96
2BP
2RT
2KA
X:100 X:99 X:98 X:97
Control Transformer
1# EVD Pressure Sensor
1# EVD Temp. Sensor
1# EVD Power Supply
1# EXV Motor
2# EVD Pressure Sensor
2# EVD Temp. Sensor
2# EVD Power Supply
2# EXV Motor

Appendix 4: Explosive View (Take LSBLG465/MCFN for example)

Unit Name：Flooded Type Water-cooled screw chiller

Unit Model：LSBLG465/MCFN





No.	中文	Part Name	Quantity	BOM code
1	冷凝器	Condenser	1	201790207873
1.1	左水室	Left shell cover	1	
1.2	左水室垫片	Left shell sealed shim	1	
1.3	直角截止阀(DN8)	Angle valve	1	201600801155
1.4	安全阀	Safty valve	1	201604100115
1.5	右水室垫片	Right shell sealed shim	1	
1.6	右水室	Right shell cover	1	
2	蒸发器	Evaporater	1	201790207876
2.1	右水室垫片	Right shell sealed shim	1	
2.2	右水室	Right shell cover	1	
2.3	直角截止阀(DN8)	Angle valve	1	201600801155
2.4	安全阀	Safty valve	1	201604100115
2.5	左水室垫片	Left shell sealed shim	1	
2.6	左水室	Left shell cover	1	
3	下连接板	The lower connection plate	2	201290206031
4	供液管路	Supply liquid pipe assambly	1	201690204150
4.1	干燥过滤器	Dry filter	1	201290200459
4.2	过滤器支撑	Filter support	1	
4.3	垫片φ70/φ50	Shim φ70/φ50	1	
4.4	节流孔板	Orifice plate	1	
4.5	直通球阀(DN40)	Ball valve (DN40)	1	201601601333
4.6	电子膨胀阀(ETS100)	Electronic Expansion valve body	1	201601300035
	电子膨胀阀电源线	Electronic Expansion valve power line	1	
5	引射回油管路	Oil Return Injecting pipe assembly	1	201690204144
5.1	文丘里管	Venturi tube	1	
5.2	视液镜(DN10)	Sight glass(DN10)	1	201800300003
5.3	过滤器(SR-070)	Filter (SR-070)	1	201601100151
6	油分回油管路	Oil Return pipe assmbly on oil seperator	1	201690204147
6.1	电磁阀(FDF10MJ-1/2(G))	Solenoid Vlave	1	201600600087
6.2	视液镜(DN10)	Sight glass(DN10)	1	201800300003
6.3	过滤器(SR-070)	Filter	1	201601100151
7	上连接板	The upper connection plate	2	202990201005
8	线槽组件	Wire casing	1	201203100021
9	排气管组	Discharge pipe assembly	1	201690204096
10	螺杆式压缩机(RC2-M610)	Semi-hermetic screw compressor	1	201402101520
11	吸气管组	Suction pipe assembly	1	201690204154
12	电控柜	Electrical Control Cabinet	1	203390290646
13	氟利昂 R134a	Refrigerant	170Kg	200500100004
14	冷冻油 (HBR-B04)	Refrigeration Oil	28L	200500500040

Midea®

ChongQing Midea-General Refrigeration Equipment Co., Ltd.

Add: NO. 15, ROSEBUSH Rd., Nan'an District, Chongqing, P. R. China Post: 401336

Tel: 0086-023-88069555 Fax: 0086-023-88066055