OWNER'S & INSTALLATION MANUAL

FULL DC Inverter Chiller

KEM-30 DNS3 KEM-60 DNS3 KEM-90 DNS3

Original instructions.
Thank you very much for purchasing our air conditioner. Before using your air conditioner, please read this manual carefully and keep it for future reference.

CONTENTS PAGE

ACCESSORIES

Unit	Installation & Operation manual	Total water outlet temperature sensor casing	Transformer	Installation manual of wired controller
Quantity	**1**	**1**	**1**	1
Shape				
Purpose	———	Use for installation (only need for setting the main module)		

1. INTRODUCTION

Use conditions of the unit

a. The standard voltage of power supply is 380-415V 3N~50Hz, the minimum allowable voltage is 342V, and the maximum voltage is 456V.

b. The unit must be operated as the following outdoor temperature:

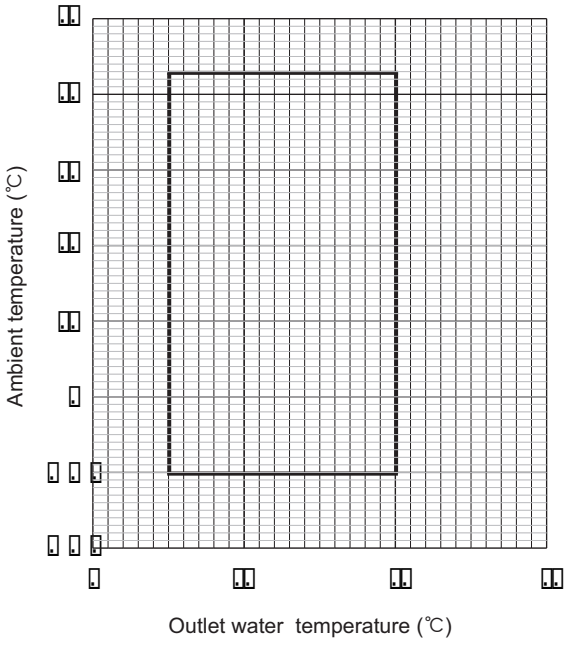


Fig. 1-1 Cooling operating range of KEM-30 DNS3 and KEM-60 DNS3

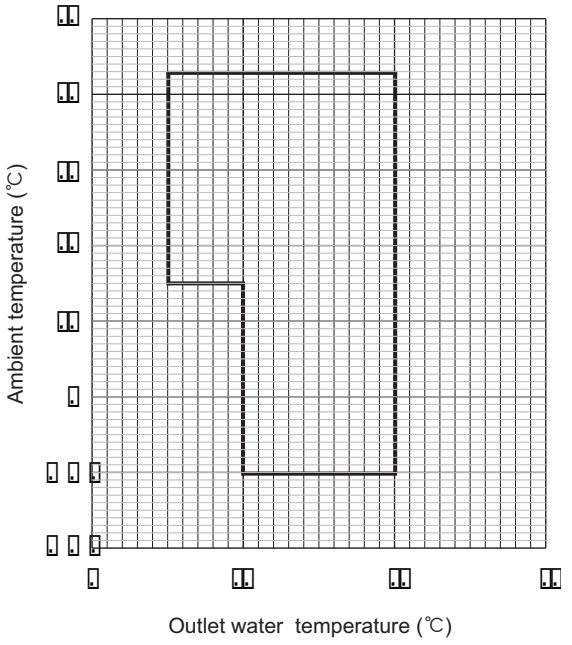


Fig. 1-2 Cooling operating range of KEM-90 DNS3

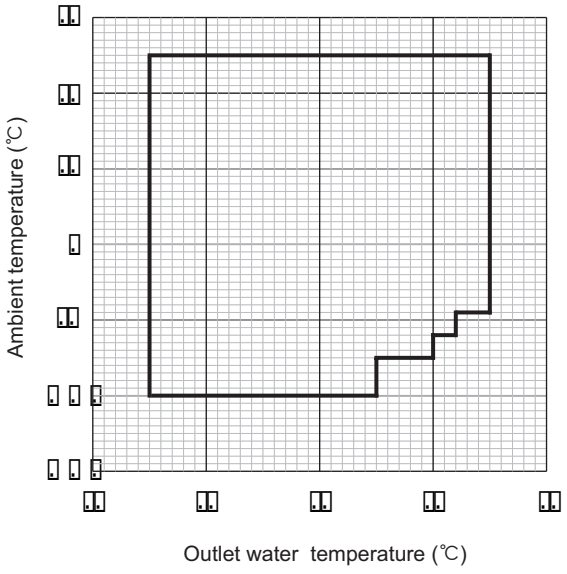


Fig. 1-3 Heating operating range of KEM-30 DNS3 and KEM-60 DNS3

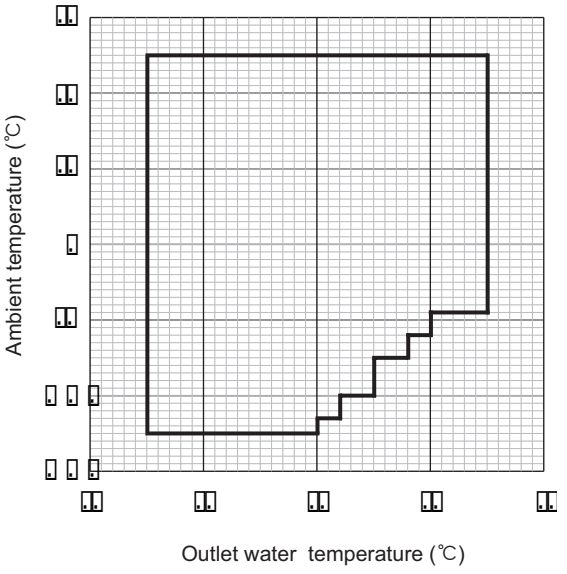


Fig. 1-4 Heating operating range of KEM-90 DNS3

2. SAFETY CONSIDERATION

To prevent injuries or property losses, make sure to observe the following instructions. Failure to do so may cause injuries or losses.

There are two types of safety instructions: warning and caution. Whichever type it is, you must read the information listed under it carefully.

WARNING

Failure to observe a warning may result injury.

CAUTION

Failure to observe a caution may result injury or damage to the equipment.

WARNING

- Get your distributor or a professional to install the product.
  The installation personnel must be equipped with the professional knowledge. When you install on your own, any mistake you made during the operations may lead to a fire, electric shock, injury or water leakage.
- When purchasing items locally, purchase those designated by our company.
- Failure to do so may result in a fire, electric shock, or water leakage. Note to entrust a professional to install those items.
- When powering the unit, follow the regulations of the local electric company.
- Make sure the unit is grounded reliably in accordance with the laws. Otherwise, it may cause electric shock. When moving or reinstalling the modular unit, get your distributor or a professional to do so.
- If installed improperly, a fire, electric shock, injury or water leakage may occur. Never modify or repair the unit on your own.
- Otherwise, a fire, electric shock, injury or water leakage may occur. Get your distributor or a professional to do so.

CAUTION

- Ensure that the residual current device (RCD) is installed.
  The RCD must be installed. Failure to install it may result in electric shock.
- Connect the cable properly. Otherwise, it may cause damage to electrical parts.
- Do not operate the unit near flammables (paint, coating, gasoline and chemical reagents) lest fire or explosion may occur. In the unlikely event of a fire, please turn off the main power immediately and put out the fire using an extinguisher.
- Do not touch refrigerant discharge parts to prevent being burnt.
- Service the unit regularly according to the manual, to ensure that the unit is in good condition.
  When the unit stops due to a fault, refer to the Fault Analysis and Troubleshooting in this manual, or contact the local customer service centre. Do not start the unit until the fault is eliminated.
- When finding refrigerant or chilled water (cooling water) leaks, turn off all the switches immediately. If you cannot do so through operating the controller, do not restart the unit unless the fault is located and eliminated.
- Use fuses with designated capacity. Do not use iron wires or copper wires, as doing so may result in serious damages to the unit or a fire.

3. BEFORE INSTALLATION

Handling of the unit

The angle of inclination should be between 45º and 70º when carrying the unit in case the machine turns over.

a. Rolling handling: several rolling rods of the same size are placed under the base of the unit, and the length of each rod must be more than the outer frame of the base and suitable for balancing of the unit.

b. Lifting: each lifting rope (belt) should be able to bear 4 times the weight of the unit. Check the lifting hook and ensure that it is firmly attached to the unit. To avoid damages to the unit, a protective block made of wood, cloth or hard paper should be placed between the unit and rope when lifting, and its thickness should be 50mm or more. It is strictly forbidden to stand under the machine when it is hoisted.

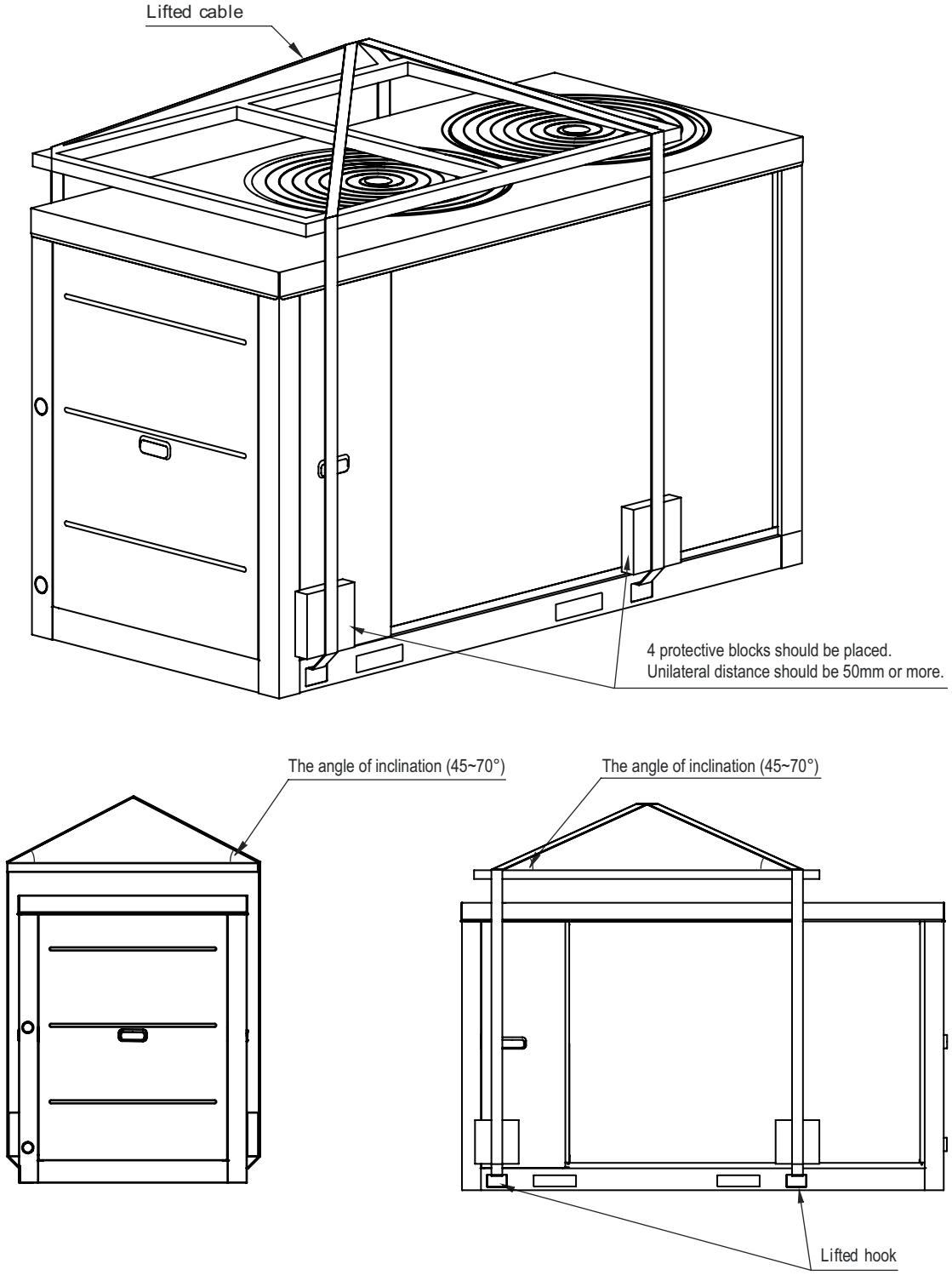


Fig. 3-1 Lifting of the unit

4. IMPORTANT INFORMATION ON REFRIGERANT

This product contains fluorinated greenhouse gases covered by the Kyoto Protocol. Do not vent gases into the atmosphere.

Refrigerant type: R-410A

GWP value: 2088

GWP = global warming potential

Table 4-1

Model	Factory charge	
	Refrigerant(kg)	Tonnes CO_2 equivalent
KEM-30 DNS3	10.50	21.94
KEM-60 DNS3	17.00	35.50
KEM-90 DNS3	27.00	56.36

5. PRECAUTIONS OF INSTALLATION

a. Units can be installed on the ground or proper place on a roof, provided that sufficient ventilation can be guaranteed.

b. Do not install the unit in a scenario with requirements on noise and vibration.

c. When installing the unit, take measures to avoid exposure to direct sunlight, and keep the unit away from boiler pipeline and surroundings which might corrode the condenser coil and copper pipes.

d. If the unit is within the reach of unauthorized personnel, take protective measures for safety considerations, such as installing a fence. These measures can prevent man-caused or accidental injuries, and can also prevent the electrical parts in operation from being exposed when the main control box is opened.

e. Install the unit on a foundation at least 300 mm high above the ground, where the floor drain is provided, to ensure that water does not accumulate.

f. If installing the unit on the ground, put the steel base of the unit on the concrete foundation, which must be as deep as into the frozen soil layer. Ensure the installation foundation is separated from buildings, as the noises and vibration of the unit may adversely affect the latter. By means of the installation holes on the unit base, the unit can be fastened on the foundation reliably.

g. If the unit is installed on a roof, the roof must be strong enough to bear the weight of the unit and the weight of maintenance personnel. The unit can be placed on the concrete and groove-shaped steel frame, similar to the case when the unit is installed on the ground. The weight-bearing groove-shaped steel must match the installation holes of the shock absorber and is wide enough to accommodate the shock absorber.

h. For other special requirements for installation, please consult the building contractor, architectural designer or other professionals.

NOTE

The selected installation site of the unit should facilitate connection of water pipes and wires, and be free from water inlet of oil fume, steam or other heat sources. Besides, the noise of the unit and cold and hot air should not influence the surrounding environment.

6. INSTALLATION OF THE UNIT

6.1 Outline dimensional drawing

6.1.1 KEM-30 DNS3

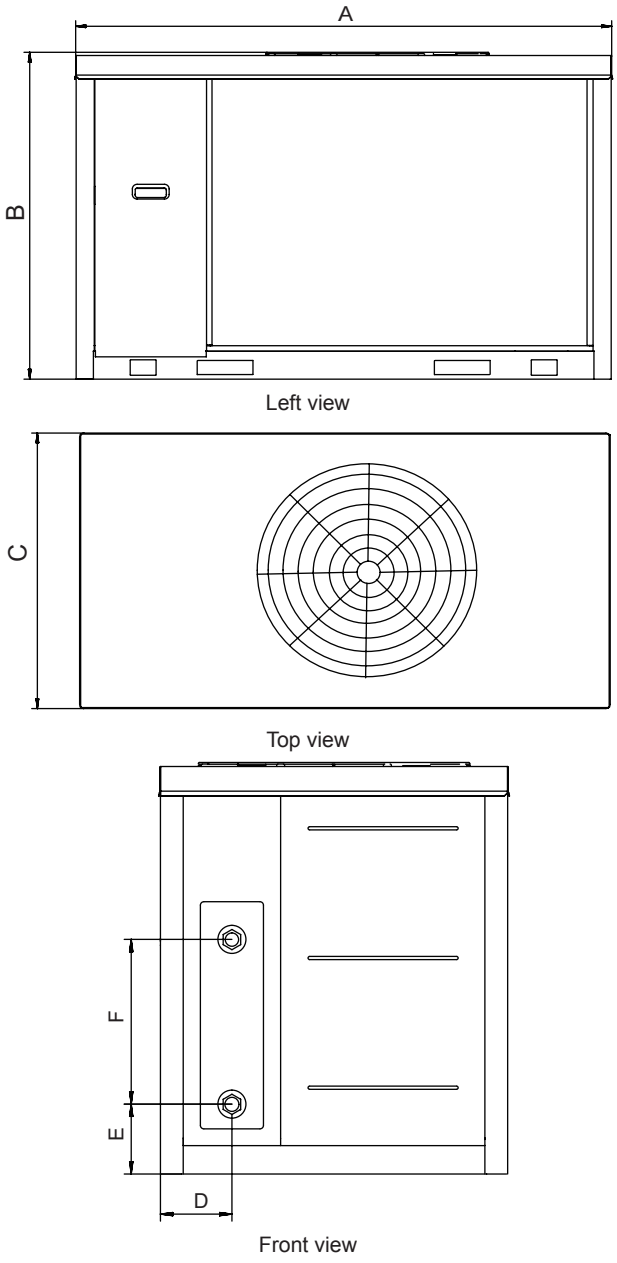
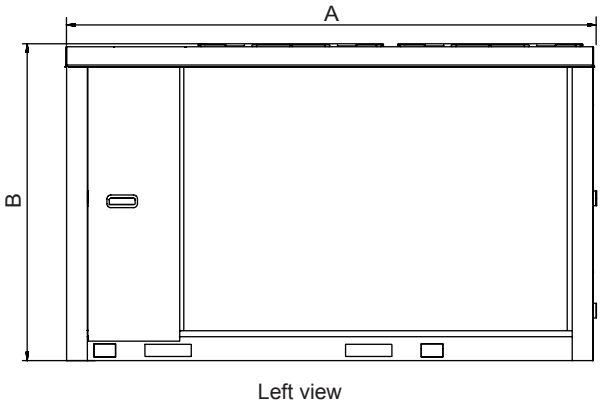
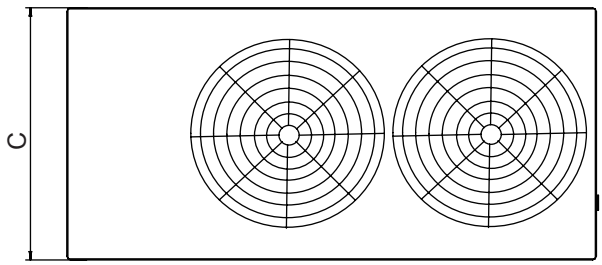


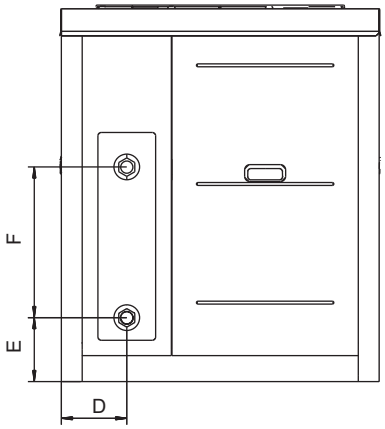
Fig. 6-1 Outline dimensional of KEM-30 DNS3

6.1.2 KEM-60 DNS3





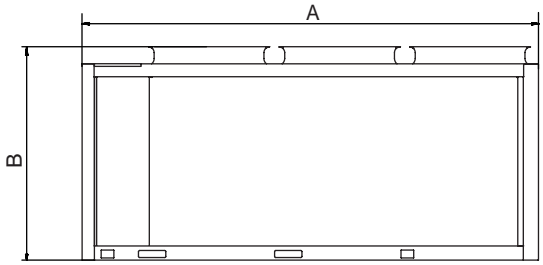
Top view



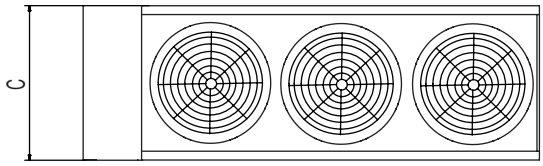
Front view

Fig. 6-2 Outline dimensional of KEM-60 DNS3

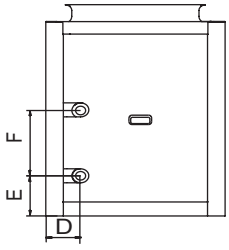
6.1.3 KEM-90 DNS3



Left view



Top view



Front view

Fig. 6-3 Outline dimensional of KEM-90 DNS3

Table 6-1 (unit: mm)

Model	KEM-30 DNS3	KEM-60 DNS3	KEM-90 DNS3
A	1870	2220	3220
B	1000	1325	1513
C	1175	1055	1095
D	204	234	286
E	200	210	210
F	470	470	470

NOTE

After installing the spring damper, the total height of the unit will increase by 135mm or so.

6.2 Requirements of installation space of the unit

a. To ensure adequate air flow entering the condenser, the influence of descending air flow caused by the high-rise buildings around upon the unit should be taken into account when installing the unit.

b. If the unit is installed where the flowing speed of air is high, such as on the exposed roof, the measures including sunk fence and Persian blinds can be taken, to prevent the turbulent flow from disturbing the air entering the unit. If the unit needs to be provided with sunk fence, the height of the latter should not be more than that of the former; if Persian blinds are required, the total loss of static pressure should be less than the static pressure outside the fan. The space between the unit and sunk fence or Persian blinds should also meet the requirement of the minimum installation space of the unit.

c. If the unit needs to operate in winter, and the installation site may be covered by snow, the unit should be located higher than the snow surface, to ensure that air flows through the coils smoothly.

d. To avoid back flow of the air in the codenser and operational faults of the unit, the parallel installation of multiple Modular units can follow the direction and distance as shown in Fig. 6-4, Fig. 6-5 and Table 6-2.

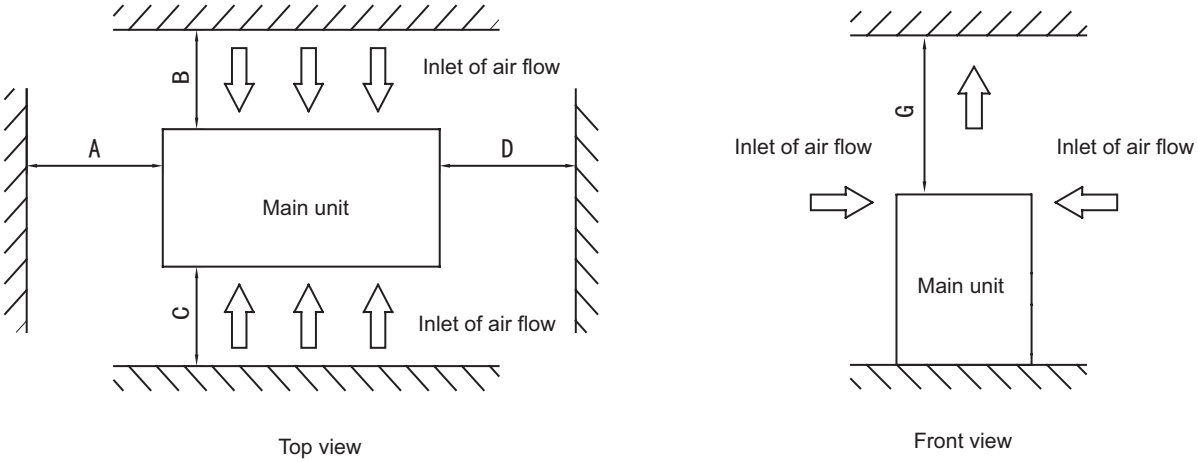


Fig. 6-4 Single unit installation

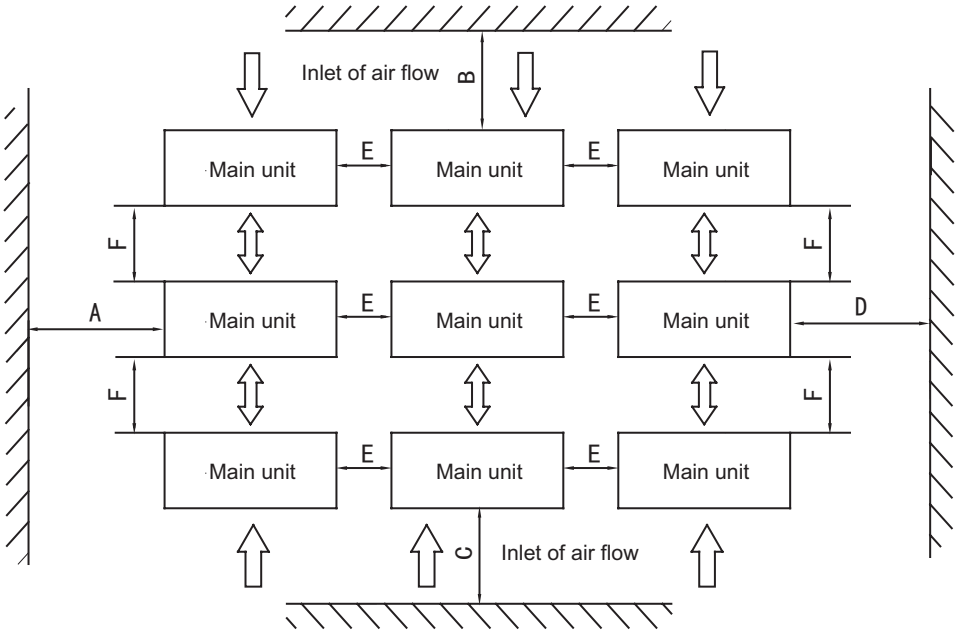


Fig. 6-5 Multiple units installation

Table 6-2 (unit: mm)

Installation space	
A	≥800
B	≥2000
C	≥2000
D	≥800
E	≥800
F	≥1100
G	≥6000

6.3 Installation foundation

6.3.1 Base structure

Outdoor unit base structure design should take account of the following considerations:

a. A solid base prevents excess vibration and noise. Outdoor unit bases should be constructed on solid ground or on structures of sufficient strength to support the units' weight.

b. Bases should be at least 200mm high to provide sufficient access for installation of piping. Snow protection should also be considered for the base height.

c. Either steel or concrete bases may be suitable.

d. A typical concrete base design is shown in Fig. 6-6. A typical concrete specification is 1 part cement, 2 parts sand and 4 parts crushed stone with steel reinforcing bar. The edges of the base should be chamfered.

e. To ensure that all contact points are equally secure, bases should be completely level. Base design should ensure that the points on the units' bases designed for weight-bearing support are fully supported.

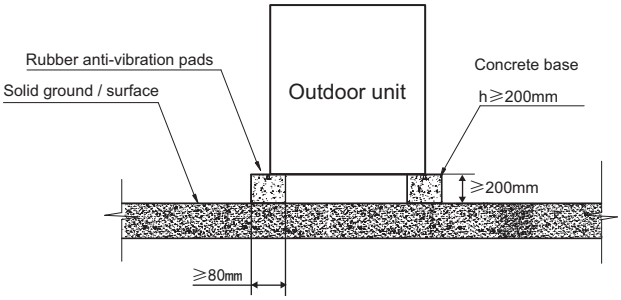


Fig.6-6 Front view of base structure

(unit: mm)

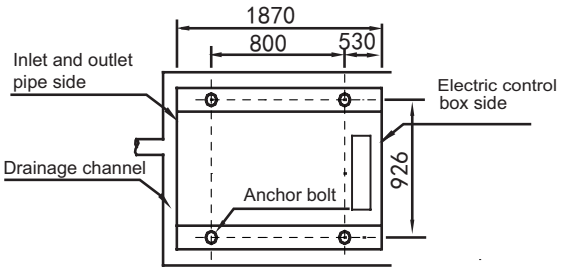


Fig. 6-7 Top view of schematic diagram of installation dimension of KEM-30 DNS3

(unit: mm)

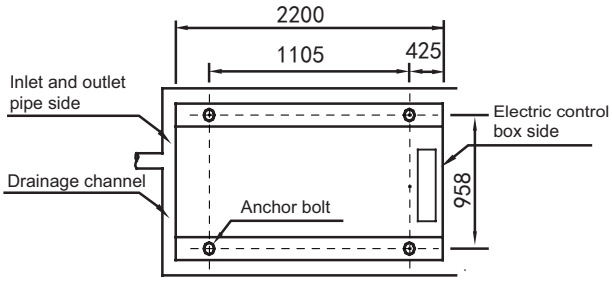


Fig. 6-8 Top view of schematic diagram of installation dimension of KEM-60 DNS3

(unit: mm)

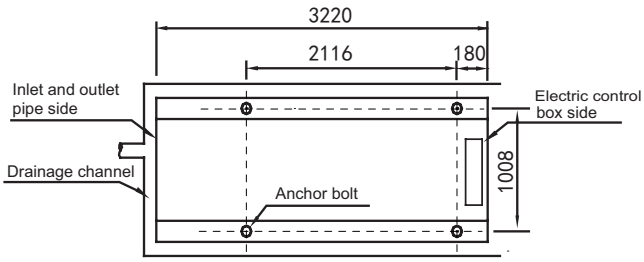


Fig. 6-9 Top view of schematic diagram of installation dimension of KEM-90 DNS3

6.3.2 Location drawing of installation foundation of the unit

a. The unit should be located on the level foundation, the ground floor or the roof which can bear operating weight of the unit and the weight of maintenance personnel. Refer to Table 12-1 (Table of applicable models and parameters) for operating weight.

b. If the unit is located so high that it is inconvenient for maintenance personnel to conduct maintenance, the suitable scaffold can be provided around the unit.

c. The scaffold must be able to bear the weight of maintenance personnel and maintenance facilities.

d. The bottom frame of the unit is not allowed to be embedded into the concrete of installation foundation.

e. A drainage ditch should be provided to allow drainage of condensate that may form on the heat exchangers when the units are running in heating mode. The drainage should ensure that condensate is directed away from roadways and footpaths, especially in locations where the climate is such that condensate may freeze.

6.4 Installation of damping devices

6.4.1 Damping devices

By means of t installation holes on the steel frame of the unit base, the unit can be fastened on the foundation through the spring damper. See Fig.6-7,6-8,6-9 (Schematic diagram of installation dimension of the unit) for details about center distance of the installation holes. The damper does not go with the unit, and the user can select the damper according to the relevant requirements. When the unit is installed on the high roof or the area sensitive to vibration, please consult the relevant persons before selecting the damper.

6.4.2 Installation steps of the damper

Step 1. Make sure that the flatness of the concrete foundation is within ±3mm, and then place the unit on the cushion block.
Step 2. Raise the unit to the height suitable for installation of the damping device.
Step 3. Remove the clamp nuts of the damper. Place the unit on the damper, and align the fixing bolt holes of the damper with the fixing holes on the unit base.
Step 4. Return the clamp nuts of the damper to the fixing holes on the unit base, and tighten them into the damper.
Step 5. Adjust the operational height of the damper base, and screw down the leveling bolts. Tighten the bolts by one circle to ensure equal height adjustment variance of the damper.
Step 6. The lock bolts can be tightened after the correct operational height is reached.

NOTE

It is recommended that the damper should be fastened on the foundation with the provided holes. After the unit is placed on the foundation, the damper connected with the unit should not be moved, and the central clamp nut is not allowed to be tightened before the damper sustains load.

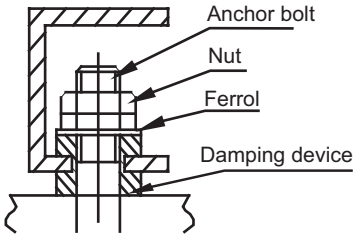


Fig. 6-10 Installation of the damper

6.5 Installation of device to prevent snow build-up and strong breeze

When installing an air-cooled heat pump chiller in a place with heavy snow, it is necessary to take snow protection measures to ensure trouble-free operation of the equipment.
Otherwise, accumulated snow will block the air flow and may cause equipment problems.

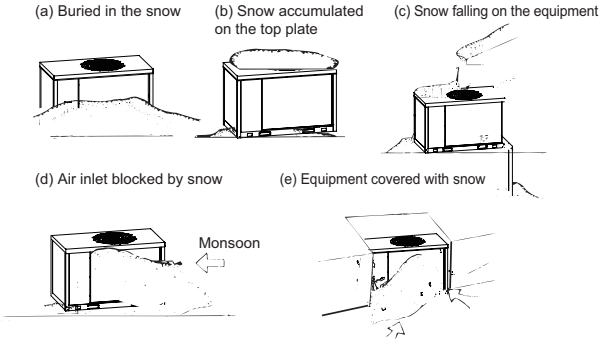


Fig. 6-11 Types of problems caused by snow

6.5.1 Measures used to prevent problems caused by snow

a. Measures to prevent build-up of snow

The base height should be as least the same as the predicted snow depth in the local area.

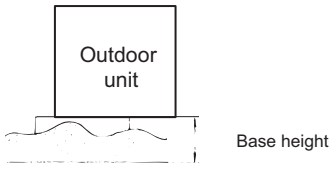


Fig. 6-12 Snow prevention base height

b. Lightning protection and snow protection measures

Check the installation site thoroughly; do not install the equipment under awnings or trees or a place where snow is piled up.

6.5.2 Precautions for designing a snow cover

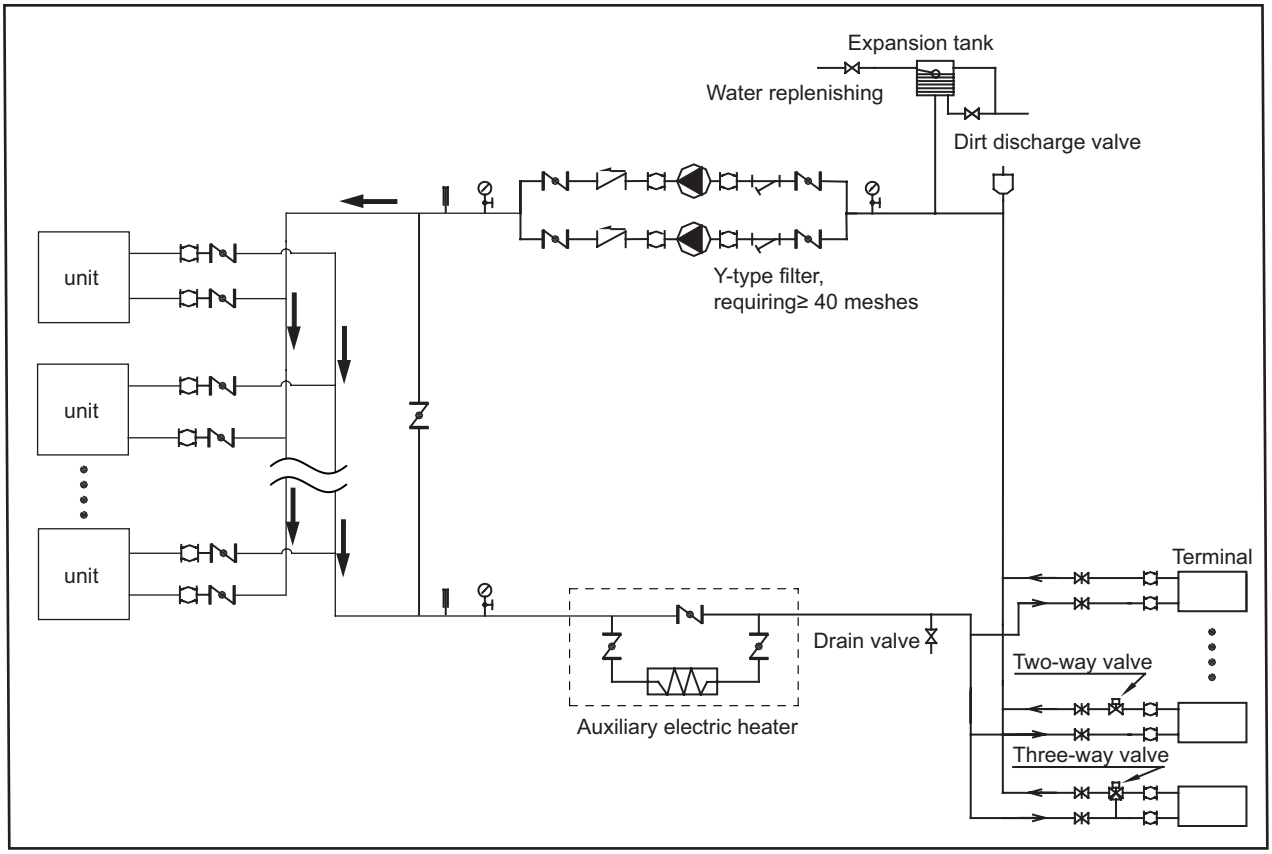
a. To ensure a sufficient air flow required by the air-cooled heat pump chiller, design a protective cover to make the dust resistance 1 mm H_2O or less lower than the allowable external static pressure of air-cooled heat pump chiller.

b. The protective cover must be strong enough to withstand the snow weight and the pressure caused by strong wind and typhoon.

c. The protective cover must not cause short circuit of air discharge and suction.

7. CONNECTION DRAWING OF PIPELINE SYSTEM

This is the water system of standard module.



Symbol explanation				
Stop valve	Pressure gauge	Flexible joint	Gate valve	Automatic discharge valve
Y-shaped filter	Thermometer	Circulating pump	one-way valve	

Fig.7-1 Connection drawing of pipeline system

NOTE

The ratio of the two - way valves on the terminal shall not exceed 50 percent.

8. OVERVIEW OF THE UNIT

8.1 Main parts of the units

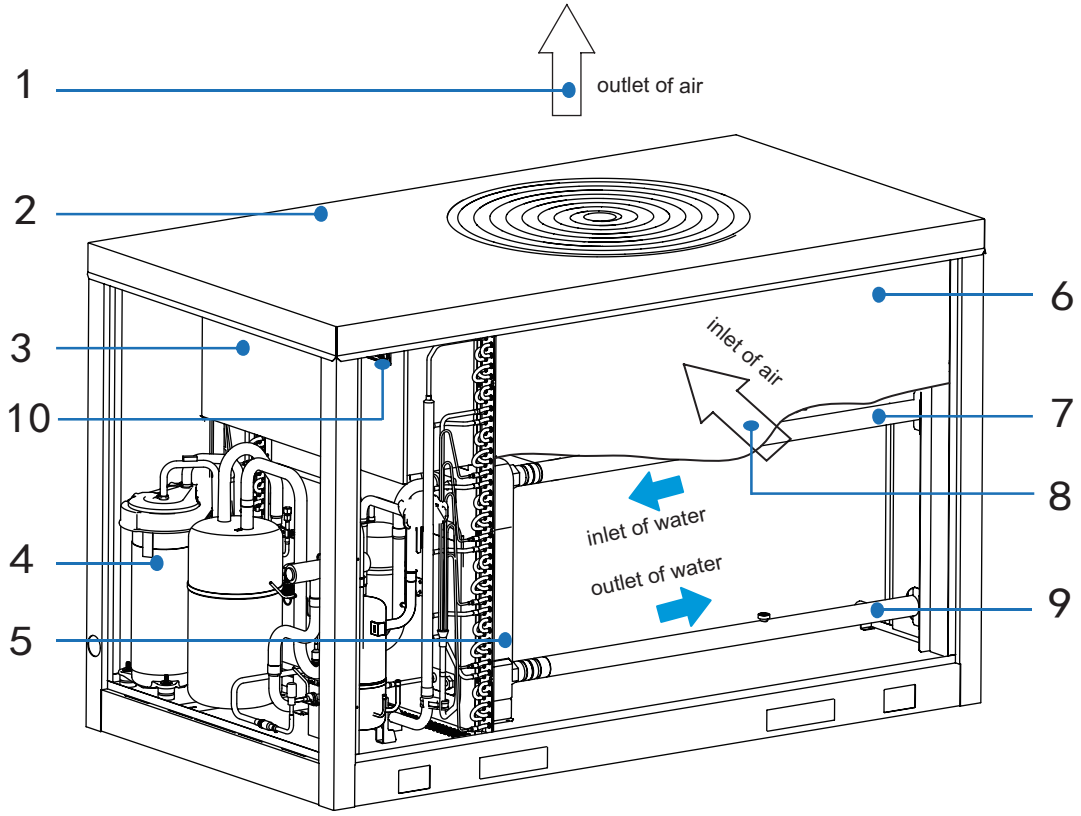


Fig. 8-1 Main parts of KEM-30 DNS3

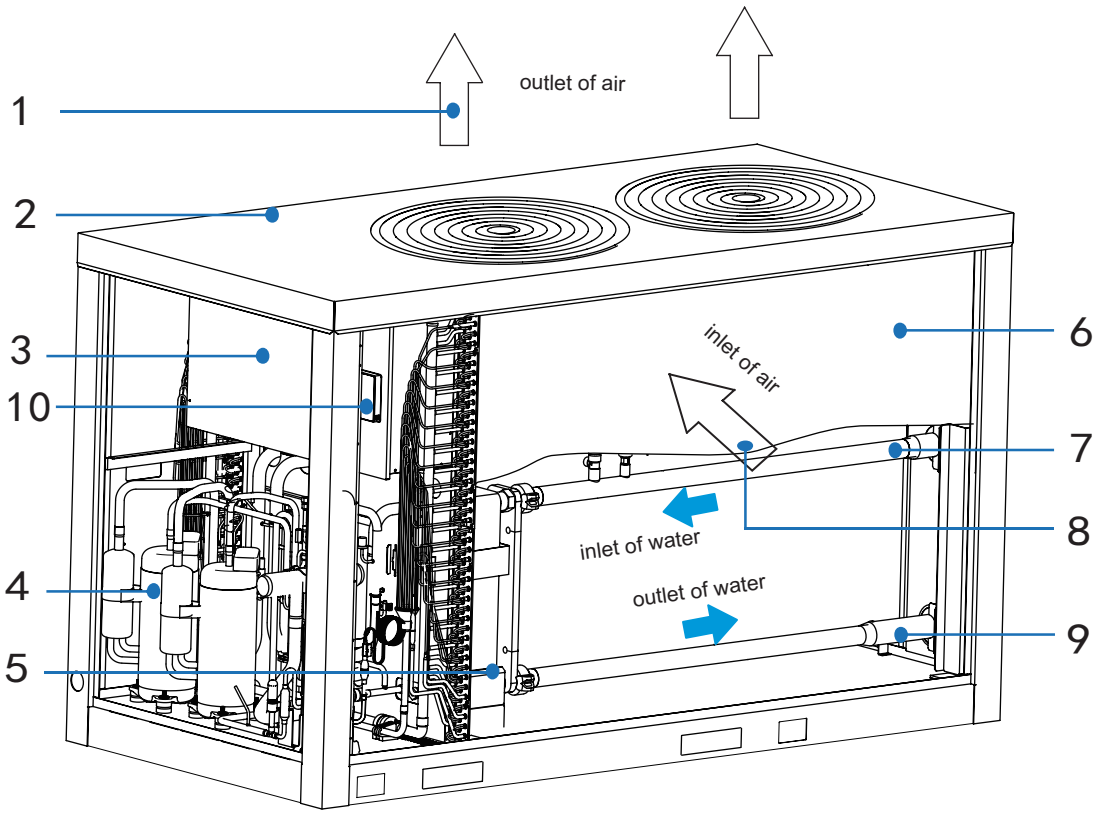


Fig. 8-2 Main parts of KEM-60 DNS3

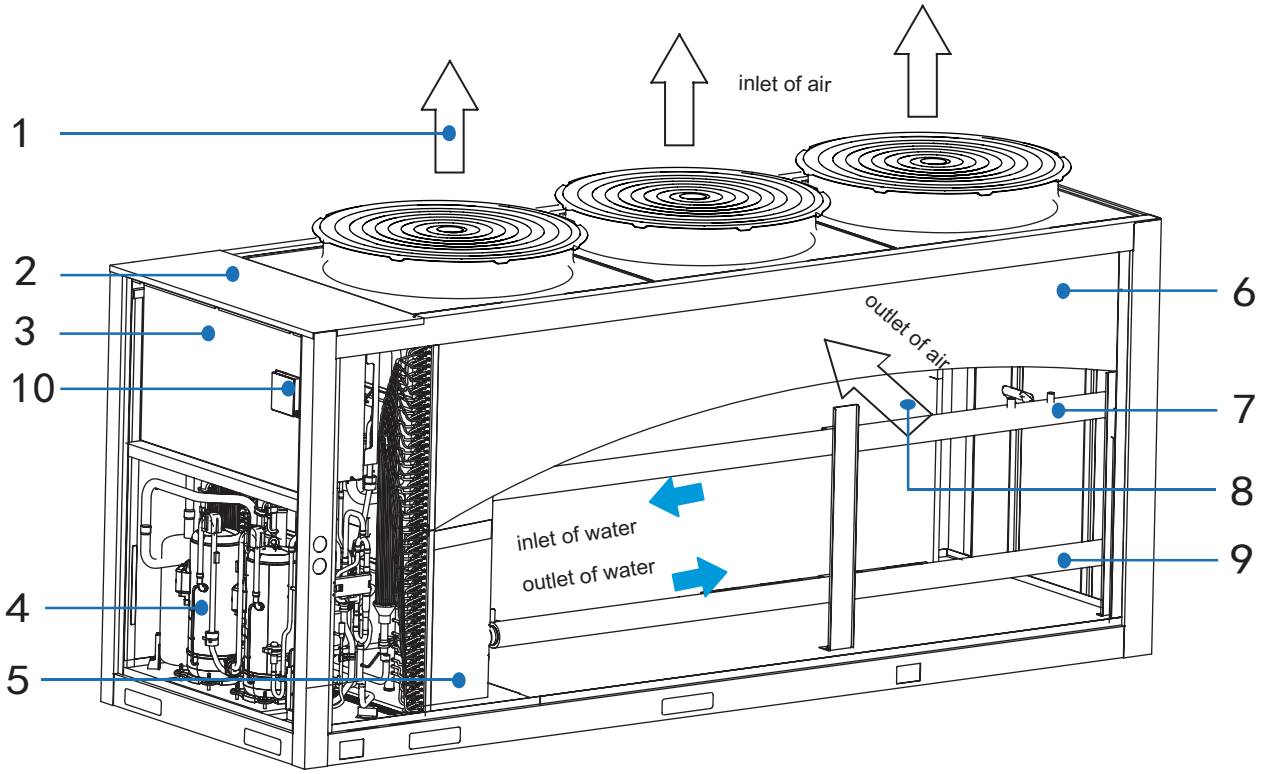


Fig. 8-3 Main parts of KEM-90 DNS3

NO.	1	2	3	4	5	6	7
NAME	Air outlet	Top cover	Electric control box	Compressor	Evaporator	Condenser	Water inlet
NO.	8	9	10				
NAME	Air inlet	Water outlet	wire controller				

8.2 Opening the unit

By means of a detachable service panel, the maintenance personnel can easily access the interior components of the unit.

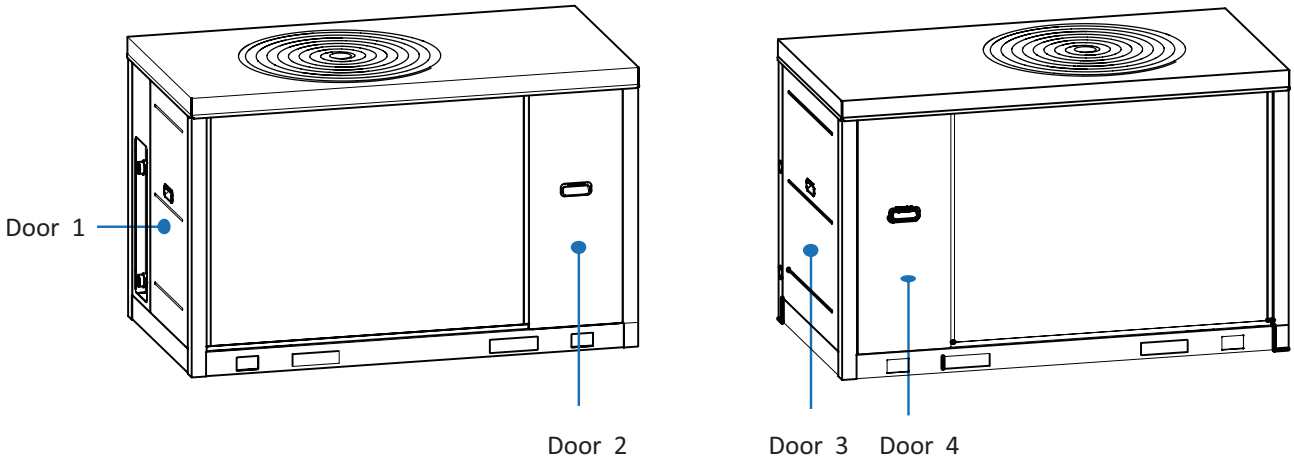


Fig. 8-4 Doors of KEM-30 DNS3

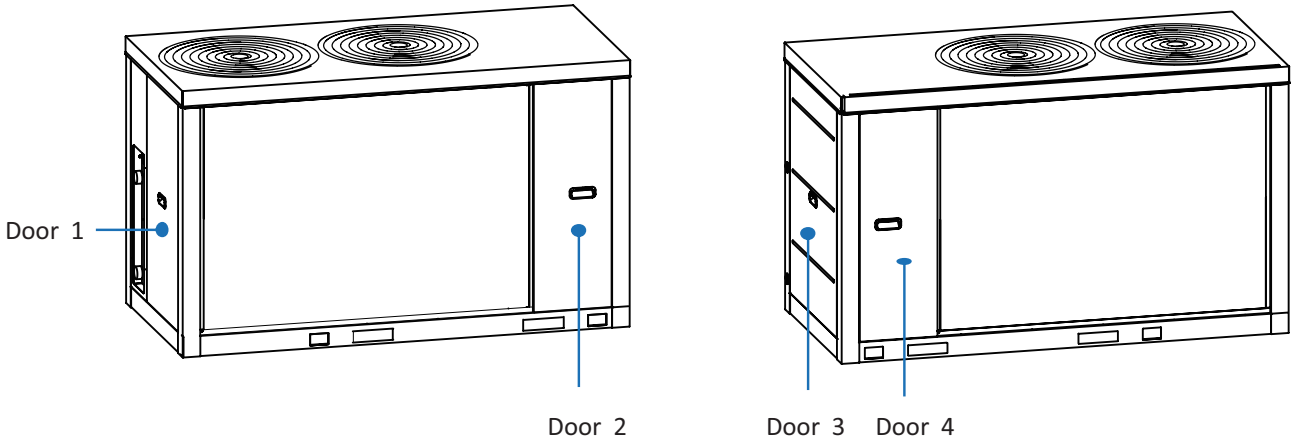


Fig. 8-5 Doors of KEM-60 DNS3

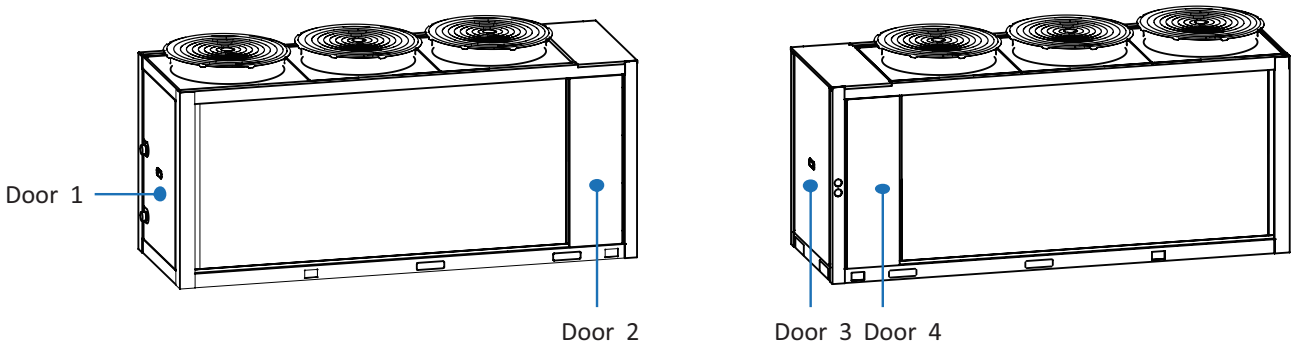


Fig. 8-6 Doors of KEM-90 DNS3

Door 1 give access to the compartment of water pipes and water side heat exchanger.
Door 2/3/4 give access to the refrigerating system components and electrical parts.

8.3 System diagram

8.3.1 Diagram of KEM-30 DNS3

Fig.8-7 is the function diagram of the KEM-30 DNS3.

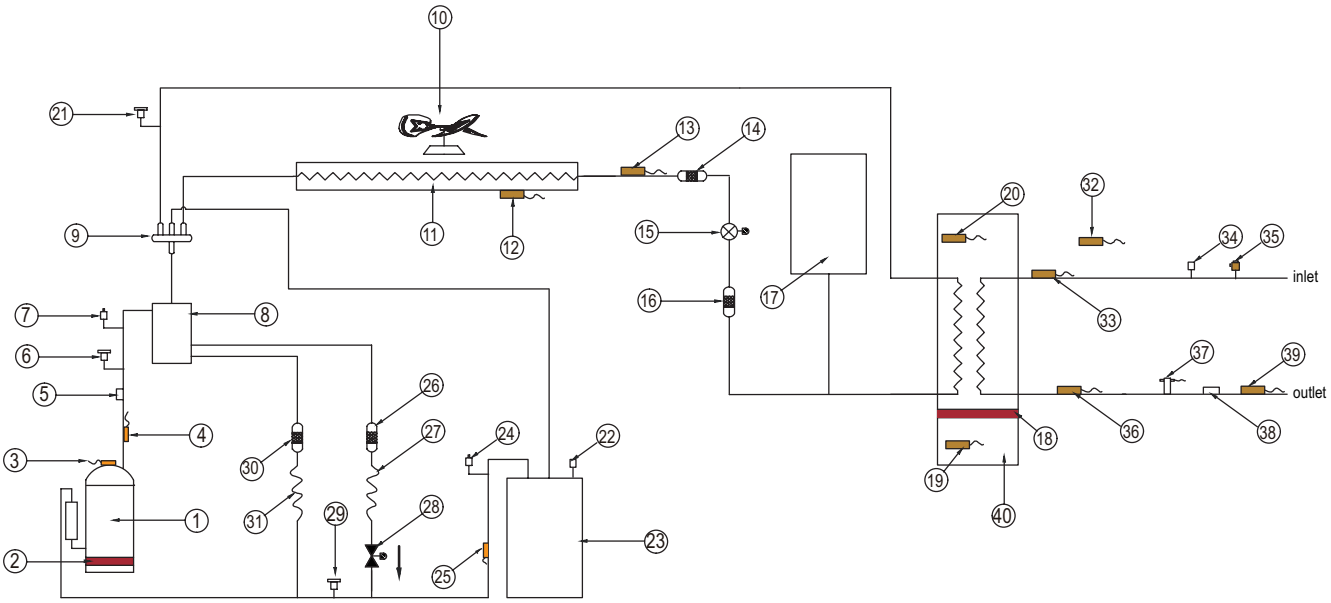


Fig.8-7 KEM-30 DNS3 function diagram

Table 8-1

Legend			
1	DC inverter compressor	21	System pressure sensor
2	Crankcase heater	22	Safety valve
3	DC inverter compressor discharge temperature sensor 1	23	Vapor-liquid separator
4	DC inverter compressor discharge temperature sensor 2	24	Pressure gauge joint (low pressure side)
5	Discharge temperature control switch	25	Suction temperature sensor
6	High pressure switch	26	Filter
7	Pressure gauge joint(high pressure side)	27	Capillary
8	Oil separator	28	Fast oil return solenoid valve
9	4-way-valve	29	Low pressure switch
10	DC fan	30	Filter
11	Condenser	31	Capillary
12	Coil outlet temperature sensor	32	Outdoor ambient temperature sensor
13	Coil final outlet temperature sensor	33	Unit water inlet temperature sensor
14	Filter	34	Safety valve
15	Electronic expansion valve	35	Air purge valve
16	Filter	36	Unit water outlet temperature sensor
17	High pressure tank	37	Water flow switch
18	Antifreeze heater of plate heat exchanger	38	Manual water drain valve
19	Water side antifreeze temperature sensor 2	39	Total outlet water temperature sensor
20	Water side antifreeze temperature sensor 1	40	Plate heat exchanger

8.3.2 diagram of KEM-60 DNS3

Fig.8-8 is the function diagram of the KEM-60 DNS3.

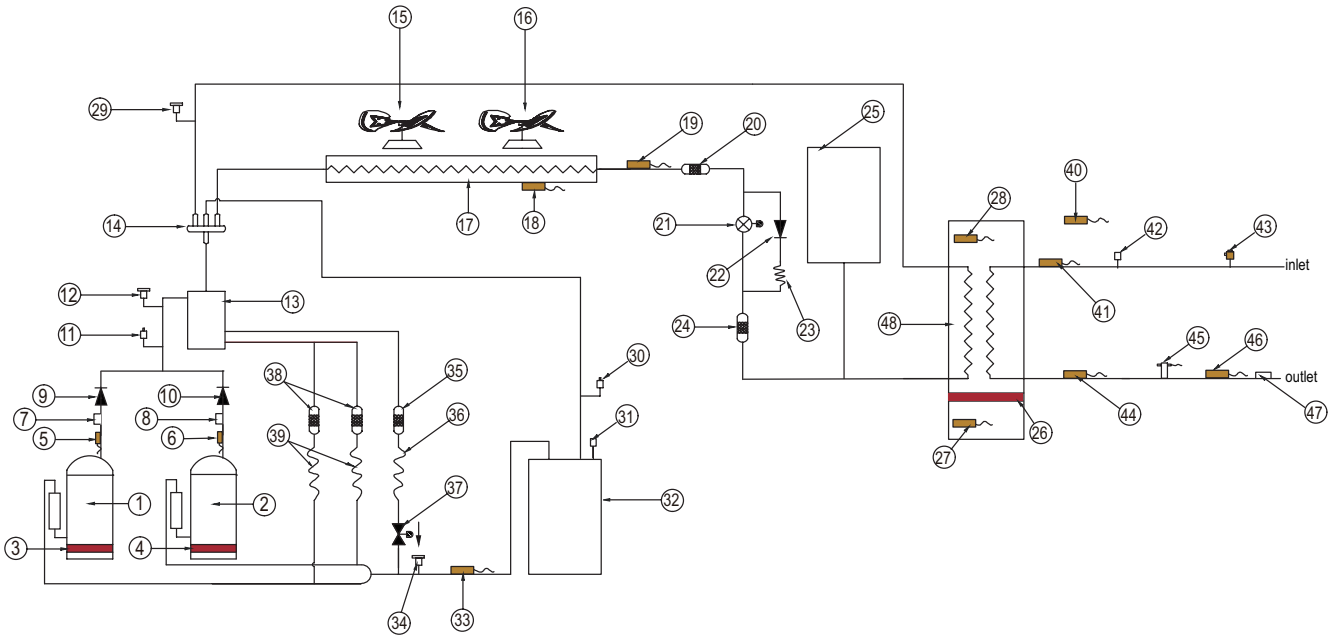


Fig.8-8 KEM-60 DNS3 function diagram

Table 8-2

Legend			
1	Dc inverter compressor 1	25	High pressure tank
2	Dc inverter compressor 2	26	Antifreeze heater of plate heat exchanger
3	Crankcase heater 1	27	Water side antifreeze temperature sensor 2
4	Crankcase heater 2	28	Water side antifreeze temperature sensor 1
5	Dc inverter compressor discharge temperature sensor 1	29	System pressure sensor
6	Dc inverter compressor discharge temperature sensor 2	30	Pressure gauge joint (low pressure side)
7	Discharge temperature control switch 1	31	Safety valve
8	Discharge temperature control switch 2	32	Vapor-liquid separator
9	One-way valve 1	33	Suction temperature sensor
10	One-way valve 2	34	Low pressure switch
11	Pressure gauge joint (high pressure side)	35	Filter
12	High pressure switch	36	Capillary
13	Oil separator	37	Fast oil return solenoid valve
14	4-way valve	38	Filter
15	Dc fan 1	39	Capillary
16	Dc fan 2	40	Outdoor ambient temperature sensor
17	Condenser	41	Unit water inlet temperature sensor
18	Coil outlet temperature sensor	42	Safety valve
19	Coil final outlet temperature sensor	43	Air purge valve
20	Filter	44	Unit water outlet temperature sensor
21	Electronic expansion valve	45	Water flow switch
22	One-way valve 3	46	Total outlet water temperature sensor
23	Capillary	47	Manual water drain valve
24	Filter	48	Plate heat exchanger

8.3.3 diagram of KEM-90 DNS3

Fig.8-9 is the function diagram of the KEM-90 DNS3.

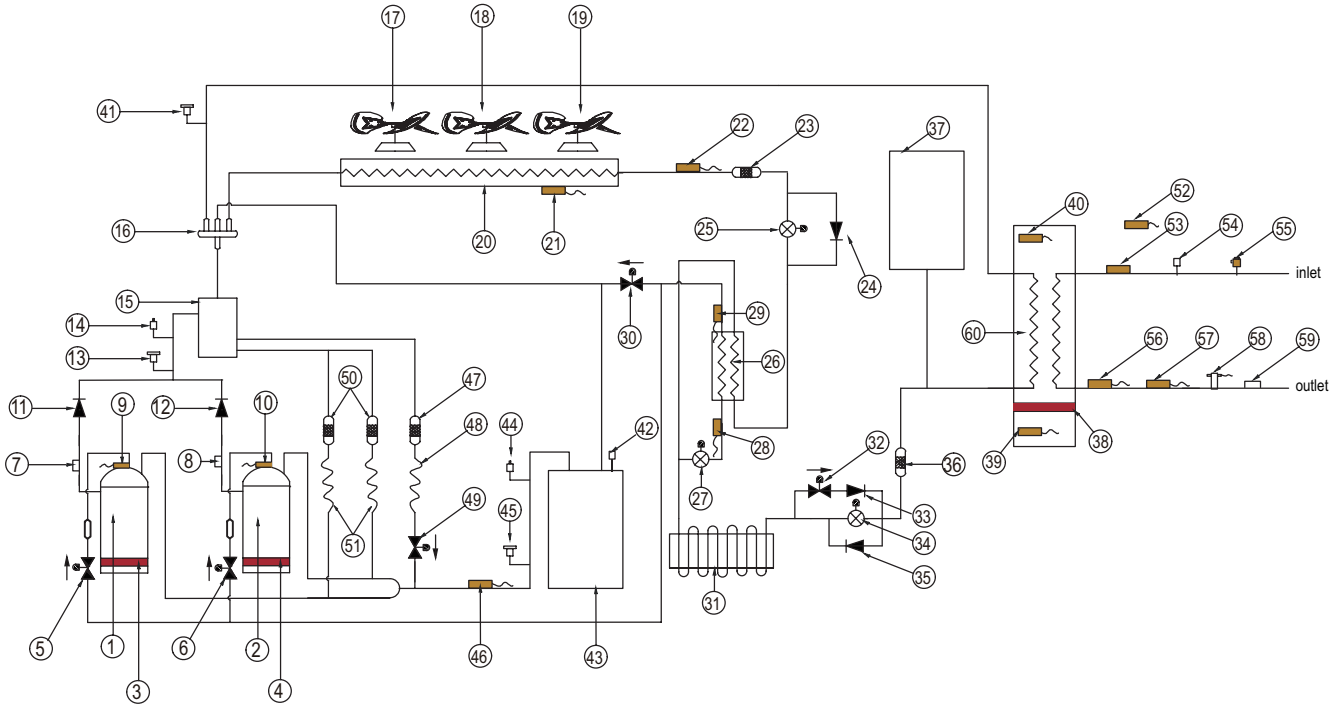


Fig.8-9 KEM-90 DNS3 function diagram

Table 8-3

Legend			
1	DC inverter compressor 1	31	Unit for cooling electronic control board
2	DC inverter compressor 2	32	Liquid side bypass solenoid valve
3	Crankcase heater 1	33	One-way valve 4
4	Crankcase heater 2	34	Electronic expansion valve 2
5	Enhanced vapor injection solenoid valve 1	35	One-way valve 5
6	Enhanced vapor injection solenoid valve 2	36	Filter
7	Discharge temperature control switch 1	37	High pressure tank
8	Discharge temperature control switch 2	38	Antifreeze heater of plate heat exchanger
9	DC inverter compressor discharge temperature sensor 1	39	Water side antifreeze temperature sensor 2
10	DC inverter compressor discharge temperature sensor 2	40	Water side antifreeze temperature sensor 1
11	One-way valve 1	41	System pressure sensor
12	One-way valve 2	42	Safety valve
13	High pressure switch	43	Vapor-liquid separator
14	Pressure gauge joint (high pressure side)	44	Pressure gauge joint (low pressure side)
15	Oil separator	45	Low pressure switch
16	4-way valve	46	Suction temperature sensor
17	DC fan 1	47	Filter
18	DC fan 2	48	Capillary
19	DC fan 3	49	Fast oil return solenoid valve
20	Condenser	50	Filter
21	Coil outlet temperature sensor	51	Capillary
22	Coil final outlet temperature sensor	52	Outdoor ambient temperature sensor
23	Filter	53	Unit water inlet temperature sensor
24	One-way valve 3	54	Safety valve
25	Electronic expansion valve 1	55	Air purge valve
26	Economizer	56	Unit water outlet temperature sensor
27	EVI Electronic expansion valve 3	57	Total outlet water temperature sensor
28	Refrigerant inlet temperature of evi plate heat exchanger	58	Water flow switch
29	Refrigerant outlet temperature of evi plate heat exchanger	59	Manual water drain valve
30	Multifunctional solenoid valve	60	Plate heat exchanger

8.4 Outdoor unit PCB

MAIN PCB

Label descriptions are given in Table 8-4

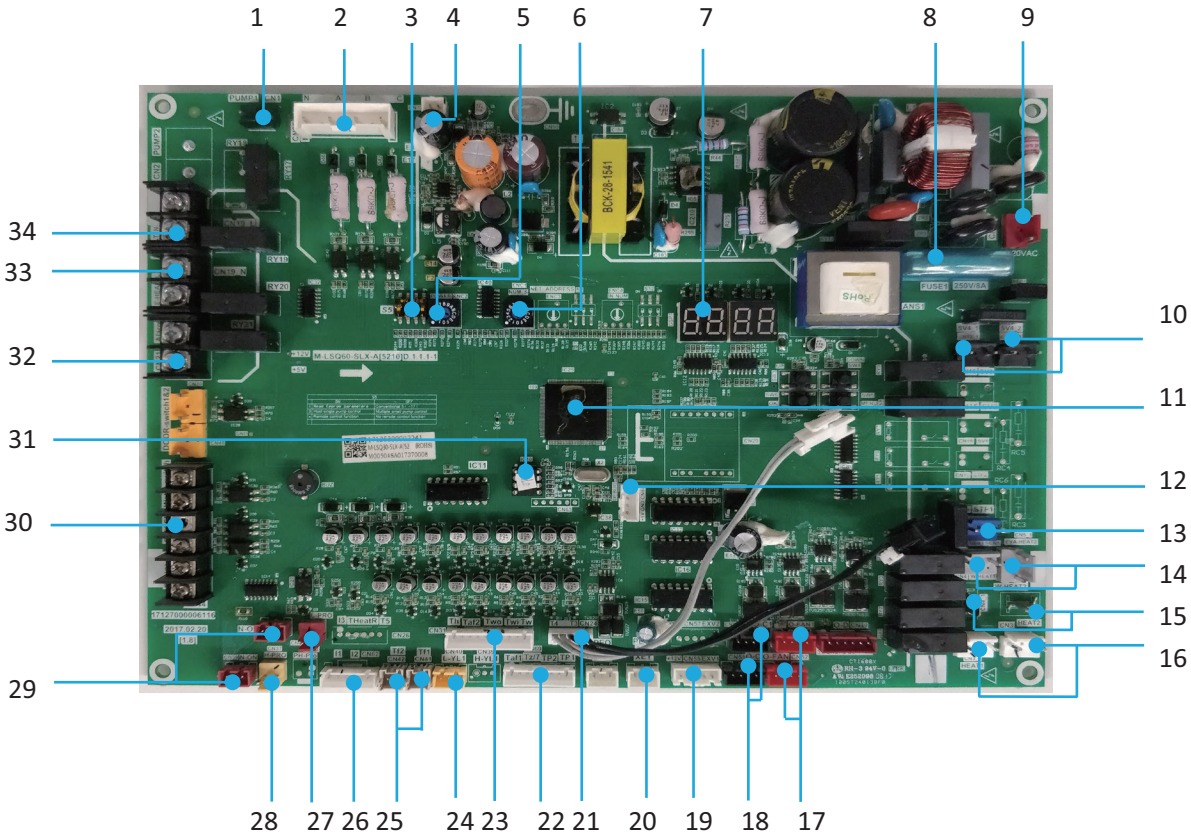


Fig. 8-11 Main PCB of KEM-90 DNS3

Table 8-4

No.	Content
1	CN1: Pump 1 connection
2	CN30: Power sequence detection connection
3	S5: DIP switches
4	CN72: Power supply to user interface
5	ENC2: DIP switch for capacity selection
6	ENC1: DIP switch for address of outdoor units
7	DSP1: Digital display
8	FUS1:Fuse
9	CN43: Power input
10	CN12_1, CN12_2: Solenoid valve (SV4) drive ports
11	IC25: Main control chip
12	CN64: Debug port
13	CN6: Four-way valve drive port
14	CN5, CN5_1: Water side heat exchanger heaters connection
15	CN4, CN4_1: Water flow switch heaters connection
16	CN3, CN3_1: Compressor crankcase heater connections
17	CN52, CN53: Fan inverter module communication ports

18	CN50, CN51: Compressor inverter module communication ports
19	CN55: EXV drive port
20	CN60, CN71: Wired controller communication ports
21	CN24: Outdoor ambient temperature sensor and air side refrigerant outlet temperature sensor connections
22	CN69: Water side heat exchanger ant-freezing temperature sensor 1, coil final outlet temperature, discharge temperature sensor 2 and discharge temperature sensor 1 connections.
23	CN31: Air suction temperature sensor, water side heat exchanger anti-freezing temperature sensor 2, water side heat exchanger water outlet temperature sensor, water side heat exchanger water inlet temperature sensor and combined water outlet temperature sensor connections.
24	CN40: System pressure sensor connection
25	CN41, CN42: Inverter module temperature 1 and Inverter module temperature sensor 2 connections temperature sensor 2 connections
26	CN62: AC indicator A and AC indicator B connections
27	CN65: Low pressure switch connection
28	CN47: High pressure switch and discharge temperature switch(es) connections
29	CN58, CN59: AC filter board communication ports
30	CN44: Water flow switch, remote function of on/off and cool/heat connections
31	IC10: EEPROM
32	CN21: Remote alarm connection
33	CN19_N: Electric auxiliary heater N line connection
34	CN19_L: Electric auxiliary heater N line connection

Label descriptions are given in Table 8-5

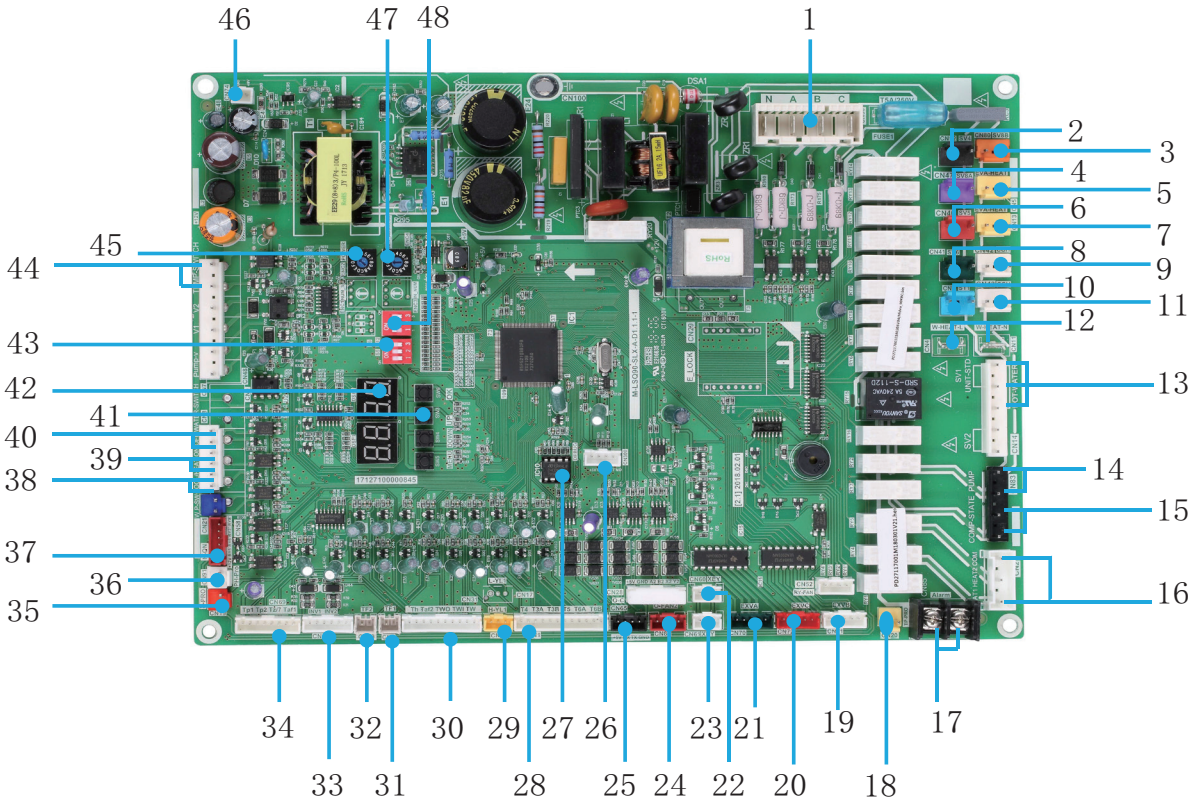


Fig. 8-11 Main PCB of KEM-90 DNS3

Table 8-5

No.	Detail information
1	CN30: Input of three-phase four-wire power supply (fault code E1) Input of transformer, 220-240V AC current. (only valid for the main unit) Three phases L1, L2 and L3 of power supply should exist simultaneously, and the difference of phase angle should be 120º among them. If the conditions are not met, fault of phase sequence or phase lack may occur, and fault code will be displayed. When the power supply returns to normal condition, fault is removed. Attention: phase lace and phase dislocation of power supply are detected only in the early period after the power supply is connected, and they are not detected while the unit is in operation.
2	CN12: Quick return oil solenoid valve
3	CN80: Injection solenoid valve of compressor system B
4	CN47: Injection solenoid valve of compressor system A
5	CN5: Water side heat exchanger heaters connection
6	CN40: Multi-function solenoid valve
7	CN13: Electric of water side heat exchanger heaters connection
8	CN41: Liquid bypass solenoid valve
9	CN42: Crankcase heater
10	CN6: Four-way valve
11	CN43: Crankcase heater
12	CN4/CN11: Electric heater of water flow switch
13	CN14: Three-way valve(hot-water valve)
14	CN83: Pump 1) After receiving start-up instruction, the pump will be started up instantly, and will maintain start-up state always in the process of operation. 2) In case of refrigerating or heating shutdown, the pump will be shut down 2 minutes after all modules stop operating. 3) In case of shutdown under the pump mode, the pump can be directly shut down.
15	CN83: COMP-STATE, connect with an ac light to indicate the state of the compressor Attention: the control port value of the pump actually detected is ON/OFF but not 220-230V control power supply, so special attention should be paid when installing the light.

No.	Detail information
16	CN2: HEAT1. Pipeline Auxiliary Heater Attention: the control port value of the pump actually detected is ON/OFF but not 220-230V control power supply, so special attention should be paid when installing the pipeline auxiliary heater.
17	CN85: The alarm signal output of the unit(ON/OFF signal) Attention: the control port value of the pump actually detected is ON/OFF but not 220-230V control power supply, so special attention should be paid when installing the alarm signal output.
18	Discharge temperature switch protection (protection code P0, provent the compressor from over temperature 115°C)
19	CN71: System electronic expansion valve2. Used for cooling.
20	CN72: EVI electronic expansion valve. Used for EVI.
21	CN70: System electronic expansion valve1. Used for heating.
22	CN60: Outdoor units communication or HMI communication port
23	CN61: Outdoor units communication or HMI communication port
24	CN64: Fan inverter module communication ports
25	CN65: Compressor inverter module communication ports
26	CN300: Program burn in port (WizPro200RS programming device).
27	IC10: EEPROM chip
28	CN1: temperature sensors input port. T4: outdoor ambient temperature sensor T3A/T3B: pipe temperature sensor of the condenser T5: water tank temperature sensor T6A: Refrigerant inlet temperature of EVI plate heat exchanger T6B: Refrigerant inlet temperature of EVI plate heat exchanger
29	CN16: System pressure sensor
30	CN31: Temperature sensors input port Th: System suction temperature sensor Taf2: Water side antifreeze temperature sensor Two: Unit water outlet temperature sensor Twi: Unit water inlet temperature sensor Tw: Total water outlet temperature sensor when several units are connected in parallel
31	CN3: Module 1 temperature sensor
32	CN10: Module 2 temperature sensor
33	CN15: Detection of current of the compressor system input port INV1: Detection of current of the compressor A INV2: Detection of current of the compressor B

No.	Detail information
34	CN69: Temperature sensors input port Tp1: DC inverter compressor 1 discharge temperature sensor Tp2: DC inverter compressor 2 discharge temperature sensor Tz/7: coil final outlet temperature sensor Taf1: Water side antifreeze temperature
35	CN19: Low voltage protection switch. (Protection code P1)
36	CN91: Three-phase protector output switch. (Protection code E8)
37	CN58: Fan relay driver port.
38	CN8: Remote function of cool/heat signal
39	CN8: Remote function of on/off signal
40	CN8: Water flow switch signal
41	SW3: Up button a) Select different menus when enter menu selection. b) For spot inspection in conditions. SW4: Down button a) Select different menus when enter menu selection. b) For spot inspection in conditions. SW5:Menu button Press to enter menu selection, short press to return to the previous menu. SW6: OK button Enter the submenu or confirm the function selected by short pressing.
42	Digital tube 1) In case of stand-by, the address of the module is displayed; 2) In case of normal operation, 10. is displayed (10 is followed by dot). 3) In case of fault or protection, fault code or protection code is displayed.
43	S5: Dip switch S5-3: Normal control, valid for S5-3 OFF (factory default). Remote control, valid for S5-3 ON.
44	CN7: Target water temperature switching port.
45	ENC2: POWER DIP switch for capacity selection, 2 by default
46	CN74: The power supply port of the HMI. (DC9V)
47	ENC4: NET_ADDRESS DIP switch 0-F of outdoor unit network address is enabled, which represent address 0-15
48	S12: Dip switch S12-1: Valid for S12-1 ON (factory default). S12-2: Single water pump controll, valid for S12-2 OFF (factory default) Multiple water pumps controll, valid for S12-2 ON. S12-3: Normal cooling mode, valid for S12-3 OFF (factory default). Low temperature cooling, valid for S12-3 ON.

CAUTION

a. Faults
When the main unit suffers faults, the main unit stops operating, and all other units also stop running;
When the subordinate unit suffers faults, only the unit stops operating, and other units are not affected.
b. Protection
When the main unit is under protection, only the unit stops operating, and other units keep running;
When the subordinate unit is under protection, only the unit stops operating, and other units are not affected.

8.5 Electric wiring

8.5.1 Electric wiring

CAUTION

1. The air-conditioner should apply special power supply, whose voltage should conform to rated voltage.
2. Wiring construction must be conducted by the professional technicians according to the labeling on the circuit diagram.
3. The power wire and the grounding wire must be connected the suitable terminals.
4. The power wire and the grounding wire must be fasten up by suitable tools.
5. The terminals connected the power wire and the grounding wire must be fully fastened and regularly checked, in case to become flexible.
6. Only use the electric components specified by our company, and require installation and technical services from the manufacturer or authorized dealer. If wiring connection fails to conform to electric installation norm, failure of the controller, electronic shock, and so on may be caused.
7. The connected fixed wires must be equipped with full switching-off devices with at least 3mm contact separation.
8. Set leakage protective devices according to the requirements of national technical standard about electric equipment.
9. After completing all wiring construction, conduct careful check before connecting the power supply.
10. Please carefully read the labels on the electric cabinet.
11. The user's attempt to repair the controller is prohibited, since improper repair may cause electric shock, damages to the controller, and so on. If the user has any requirement of repair, please contact the maintenance center.
12. The power cord type designation is H07RN-F.

8.5.2 KEM-30 DNS3 and KEM-60 DNS3

DIP switch, buttons and digital display positions of units.

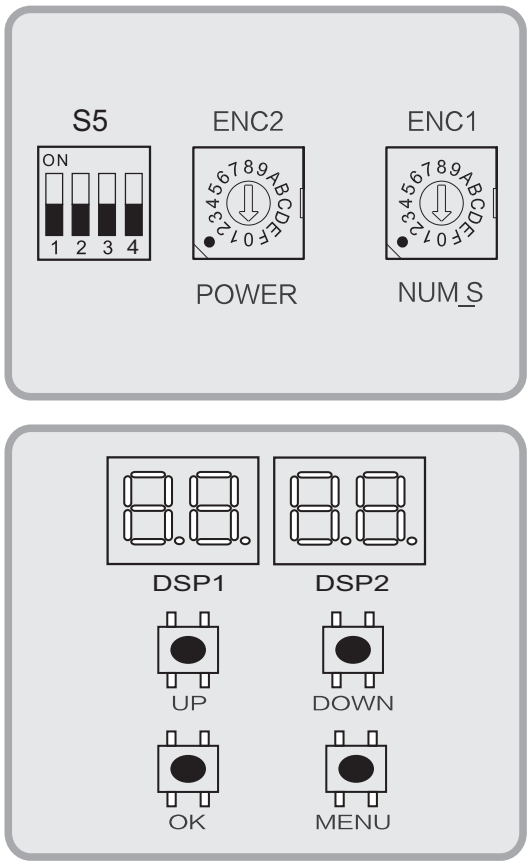


Fig. 8-12 Display positions

8.5.3 KEM-90 DNS3

DIP switch, buttons and digital display positions of units.

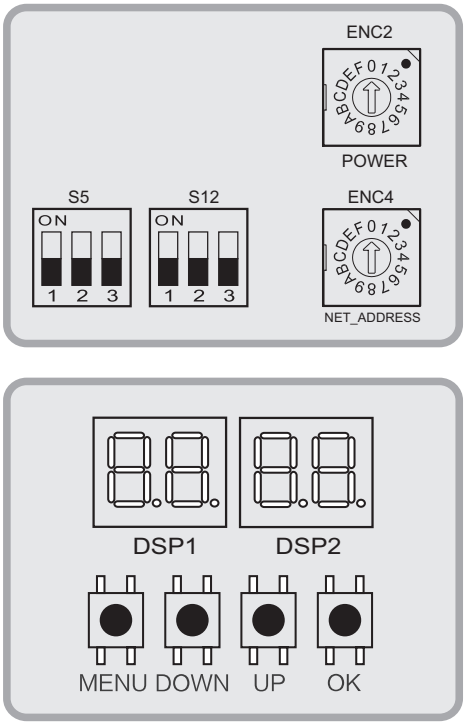


Fig. 8-13 Display positions

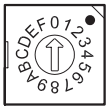
8.5.4 DIP switch instructions

The definitions for DIP switch of KEM-30 DNS3 and KEM-60 DNS3 are different from those of KEM-90 DNS3. See Table 8-6 for DIP switch instructions of KEM-30 DNS3 and KEM-60 DNS3, and Table 8-7 for KEM-90 DNS3.

Table 8-6 KEM-30 DNS3 and KEM-60 DNS3

ENC1		0-F	0-F valid for unit address setting on the DIP switches 0 indicates the master unit and 1-F the auxiliary units (parallel connection) (0 by default)
ENC2		0-5	DIP switch for capacity selection (KEM-30 DNS3 defaults 2) (KEM-60 DNS3 defaults 5)
S5-1		OFF	Normal cooling mode Valid for S5-1 OFF(factory default)
		ON	Low-temperature cooling mode Valid for S5-1 ON
S5-3		OFF	Single water pump control Valid for S5-3 OFF(factory default)
		ON	Multiple water pumps control Valid for S5-3 ON
S5-4		OFF	Normal control Valid for S5-4 OFF(factory default)
		ON	Remote control valid for S5-4 ON

Table 8-7 KEM-90 DNS3

ENC2		2	DIP switch for capacity selection (KEM-90 DNS3 defaults 2)
ENC4		0-F	0-F valid for unit address setting on the DIP switches 0 indicates the master unit and 1-F the auxiliary units (parallel connection) (0 by default)
S5-3		OFF	Normal control Valid for S5-3 OFF(factory default)
		ON	Remote control valid for S5-3 ON
S12-1		ON	valid for S2-1 ON (factory default)
S12-2		OFF	Single water pump control Valid for S12-2 OFF(factory default)
		ON	Multiple water pumps control Valid for S12-2 ON
S12-3		OFF	Normal cooling mode Valid for S12-3 OFF(factory default)
		ON	Low-temperature cooling mode Valid for S12-3 ON

8.5.5 Button instructions

The instructions for buttons of KEM-30 DNS3, KEM-60 DNS3 and KEM-90 DNS3 are the same. See the instructions below:

MENU button:
Press the button for 5s to enter menu selection.
Short press it to return the previous menu.

OK button:
Short press the button to enter the submenu or confirm the function selected.

UP button/ DOWN button:
a) Select different menus when enter menu selection
b) Used for spot checks in other circumstance

8.5.6 Menu selection instructions

The menu selection instructions for KEM-30 DNS3, KEM-60 DNS3 and KEM-90 DNS3 are the same. See the instructions below:

Press the menu button to enter menu selection and display n10 (it exits if no button is pressed in 10 seconds). Use the up button/down button to select different level-1 menus (n11~nd1).

Press the confirmation button to enter the level-2 menu and display nx1 (x indicates 1~d). After entering the level-2 menu, use the up button/down button to select different level-2 menus and display nxy (x indicates the level-1 menu No.; y indicates the level-2 menu No.) Use the confirmation button to confirm the specific menu command.

8.5.7 Menu types instructions

Menu type function is not available for KEM-90 DNS3. For menu types instructions of KEM-30 DNS3 and KEM-60 DNS3, see Table 8-8.

Table 8-8 KEM-30 DNS3 and KEM-60 DNS3

MENU	FUNCTION	NOTE
n40	Time 1 of silent mode	6/10h (factory default)
n41	Time 2 of silent mode	6/12h
n42	Time 3 of silent mode	8/10h
n43	Time 4 of silent mode	8/12h
n51	Silent mode 1	Silent mode
n52	Silent mode 2	Super silent mode
n53	Silent mode 3	No silent mode (factory default)

8.5.8 Query display

Spot check the parameters using UP/DOWN buttons in non-menu mode. The instructions for spot check sequence displaying of KEM-30 DNS3 and KEM-60 DNS3 are different from those of KEM-90 DNS3. See Table 8-9 for spot check sequence instructions of KEM-30 DNS3 and KEM-60 DNS3, and Table 8-10 for KEM-90 DNS3.

Table 8-9 KEM-30 DNS3 and KEM-60 DNS3

Digital tube display	Spot inspection item
	Standby: Outdoor units address (L88) + number of on-line units(R88) On: display frequency Defrosting: dF and operating frequency flash alternately at 1s intervals In case of Pb protection, Pb and operating frequency flash alternately at 1s intervals
0.xx	Outdoor units address
1.xx	30kW displays 12, 60kW displays 24
2.xx	Number of units (Main unit included)
3.xx	3 displayed
4.xx	Operation modes (8 OFF, 0 Standby, 1 Cooling, and 2 Heating)
5.xx	Fan Speed
6.xx	0 displayed
7.xx	T3
8.xx	T4
9.xx	T5(reserved)
10.xx	Taf1
11.xx	Taf2
12.xx	Tw
t.xxx	Twi
14.xx	Two
15.xx	Tz/7
16.xx	--
17.xx	Tp1
18.xx	Tp2
19.xx	Tf1
20.xx	Tf2
21.xx	Discharge superheat degree Tdsh
22.xx	Current of compressor A
23.xx	Current of Compressor B
24.xx	--
25.xx	Electronic expansion valve 1 opening (/4)
26.xx	Electronic expansion valve 2 opening (/4)
27.xx	High pressure
L.xxx	Low pressure
29.xx	Suction superheat
30.xx	Suction temperature
31.xx	Silent mode selection
32.xx	Static pressure selection
33.xx	--
34.xx	--
35.xx	Last fault
36.xx	Frequency limiting No. (0: No frequency limiting; 1: Frequency limiting of T4; 2: Frequency limiting of Tp1; 3: Frequency limiting of Tp2; 4: Frequency limiting of Tz/7; 5: Frequency limiting of TzB; 6: Frequency limiting of Tf1; 7: Frequency limiting of Tf2; 8: Frequency limiting of high pressure H-YL; 9: Frequency limiting of compressor current ; 10: Frequency limiting of voltage
37.xx	Defrosting process status (the first digit: T4 selection solution; the second digit: scheme's range; the third and fourth digits as a whole indicates the defrosting time)
38.xx	EEPROM error: 1 means error,and 0 means no error
39.xx	Defrosting solution
40.xx	Initial frequency
41.xx	Tc (+30°C) / Te(+25°C)
42.xx	Number of unit those on working
43.xx	Software version No.
44.xx	----

Table 8-10 KEM-90 DNS3

Digital tube display	Sport Check Item
	Standby: Outdoor units address (88 on the left) + number of online units (88 on the right) On: display frequency Defrosting: dFdF
0.xx	Outdoor units address
1.xx	90kw displays 90
2.xx	Number of online units (main unit included)
3.xx	1 displayed
4.xx	Operation mode (8 - Off, 1 - Cool, 2 -Heat)
5.xx	Fan speed (0 - 35)
6.xx	0 displayed
7.xx	T3
8.xx	T4
9.xx	T5 (reserved)
10.xx	Taf1
11.xx	Taf2
12.xx	Tw
13.xx	Twi
14.xx	Two
15.xx	Tz/7
16.xx	--
17.xx	Tp1
18.xx	Tp2
19.xx	Tf1
20.xx	Tf2
21.xx	Discharge superheat Tdsh
22.xx	Current of compressor A
23.xx	Current of compressor B
24.xx	--
25.xx	Electronic expansion valve A opening (/20)
26.xx	Electronic expansion valve B opening (/20)
27.xx	Electronic expansion valve C opening (/4)
28.xx	High pressure (Heating mode)
L.xxx	Low pressure
30.xx	Suction superheat
31.xx	Suction temperature
32.xx	The first digital tube from the right: Silence selection: 0 – Night silent; 1 - Silent; 2 - Super silent; 3 - No silence (by default) The second digital tube from the right: Silence time selection (0-3) values depend on the parameters of the wired controller

33.xx	Static pressure selection (0 static pressure by default)
34.xx	--
35.xx	--
36.xx	Frequency limiting No. (0: No frequency limiting; 1: T4 Frequency limiting; 2: Discharge frequency limiting; 3: Frequency limiting of Tz total cold outlet; 4: Frequency limiting of module temperature; 5: Pressure frequency limiting; 6: Current frequency limiting; 7: Voltage frequency limiting
37.xx	Defrosting process state (the first digit:T4 selection solution; the second digit: interval in the solution; the third digit and fourth digit determine the defrosting timer time)
38.xx	EEPROM error: 1 means error, and 0 means no error
39.xx	Defrosting solution
40.xx	Initial frequency
41.xx	Tc (Saturation temperature corresponding to the high pressure in heating mode)
42.xx	Te (Saturation temperature corresponding to the low pressure in cooling mode)
43.xx	T6A
44.xx	T6B
45.xx	Software version No.
46.xx	Last malfunction
47.xx	----

8.5.9 Electrical wiring precautions

a. On-site wiring, parts and materials must comply with the local and national regulations as well as relevant national electrical standards.

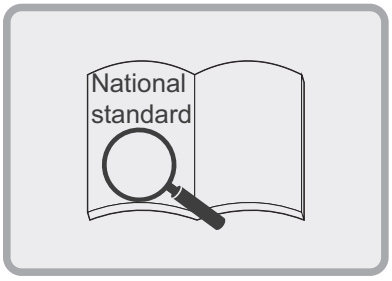


Fig. 8-14-1 Electrical wiring precaution (a)

b. Copper core wires must be used

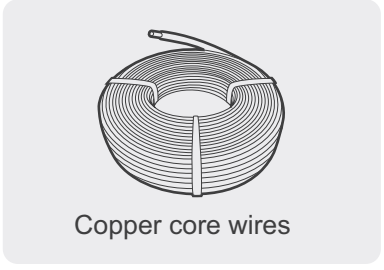


Fig. 8-14-2 Electrical wiring precaution (b)

c. It is advisable to use 3-core shielded cables for unit to minimize interference. Do not use the unshielded multicore conductor cables.

Fig. 8-14-3 Electrical wiring precaution (c)

d. Power wiring must be entrusted to professionals with electrician qualification.

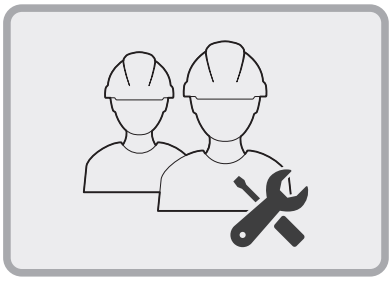


Fig. 8-14-4 Electrical wiring precaution (d)

8.5.10 Power supply specification

Table 8-11 Selection of power wire diameter and manual switch

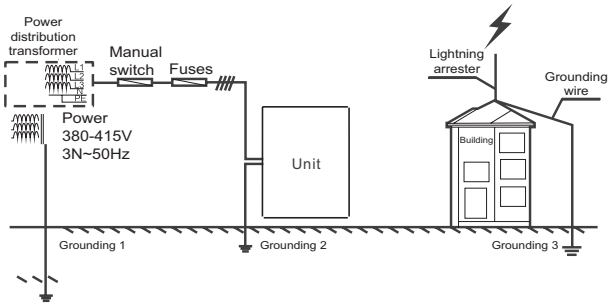
Item / Model	Outdoor power supply			
	Power supply	Manual switch	Fuses	Wiring (<20m)
KEM-30 DNS3	380-415V 3N~50Hz	50A	3X36A	10mm^{2}x5
KEM-60 DNS3	380-415V 3N~50Hz	100A	3X63A	16mm^{2}x5
KEM-90 DNS3	380-415V 3N~50Hz	125A	3X100A	25mm^{2}x5

NOTE

See the table above for power wire diameter and length when the voltage drop at the power wiring point is within 2%. If the wire length exceeds the value specified in the table or the voltage drop is beyond the limit, the power wire diameter should be larger in accordance with the relevant regulations.

8.5.11 Requirements for power supply wiring

Correct



Wrong

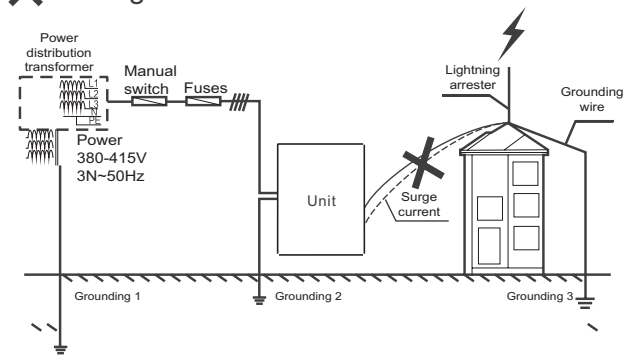


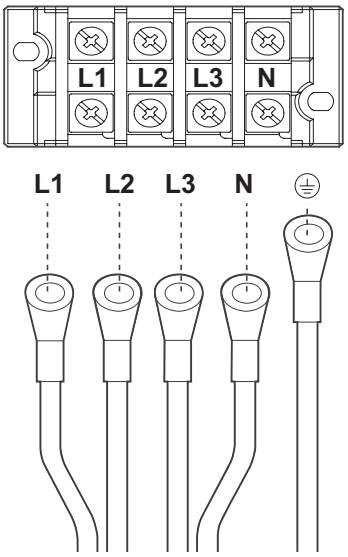
Fig. 8-15 Requirements of power supply wiring

NOTE

Do not connect the grounding wire of the lightning arrester to the unit shell. The grounding wire of the lightning arrester and the power supply grounding wire must be configured separately.

8.5.12 Requirements for power cord connection

Correct



Wrong

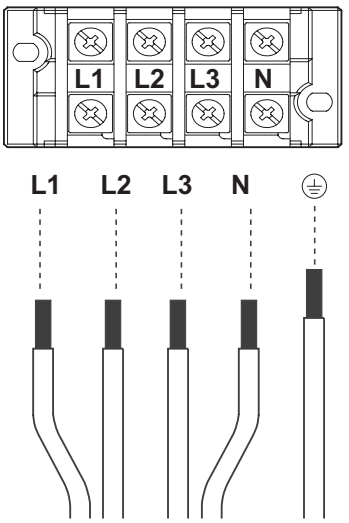


Fig. 8-16 Requirements for power cord connection

NOTE

Please use the round-type terminal with correct specifications to connect the power cord.

8.5.13 Function of terminals

As shown in the figure below, the wired controller signal wire and unit communication signal wire for KEM-30 DNS3 and KEM-60 DNS3 are both connected to the terminal block inside the electric control box. For specific wiring, see chapter 8.5.18 (I & II).

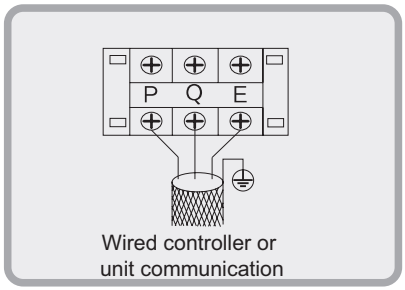


Fig. 8-17 Function of terminals of KEM-30 DNS3 and KEM-60 DNS3

As shown in the figure below, the unit communication signal wire for KEM-90 DNS3 is connected to the terminal block XT2 at 5(X), 6(Y) and 7(E), and the wired controller signal wire is connected at 8(X), 9(Y) and 10(E) inside the electric control box. For specific wiring, see chapter 8.5.18 (III).

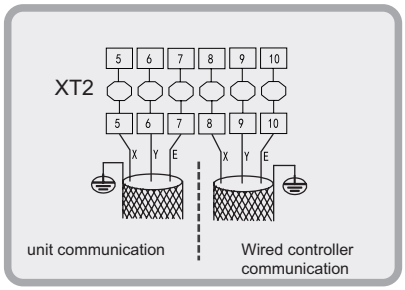


Fig. 8-18 Function of terminals of KEM-90 DNS3

When the water pump and auxiliary heater are added to KEM-30 DNS3 and KEM-60 DNS3 externally, a 3-phase contactor must be used for control. The model of contactor is subject to the power of water pump and auxiliary heater. The contactor coil is controlled by the main control board. See the figure below for coil wiring. For specific wiring, see chapter 8.5.18 (I & II).

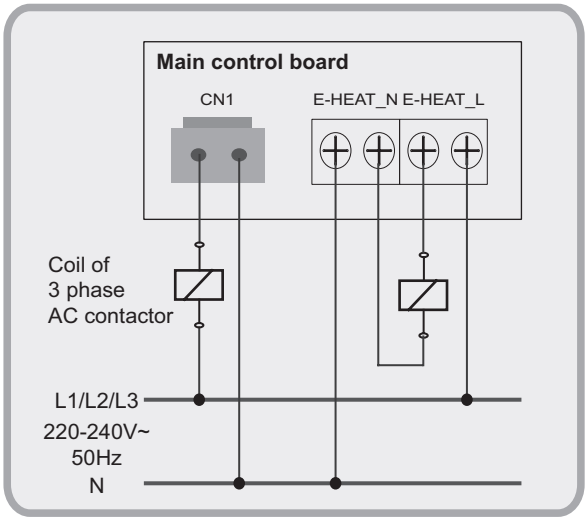


Fig. 8-19 Function of terminals of KEM-30 DNS3 and KEM-60 DNS3 with pump or heate

When the water pump and auxiliary heater are added to KEM-90 DNS3 externally, a 3-phase contactor must be used for control. The model of contactor is subject to the power of water pump and heater power. The contactor coil is controlled by the main control board. See the figure below for coil wiring. For specific wiring, see chapter 8.5.18 (III).

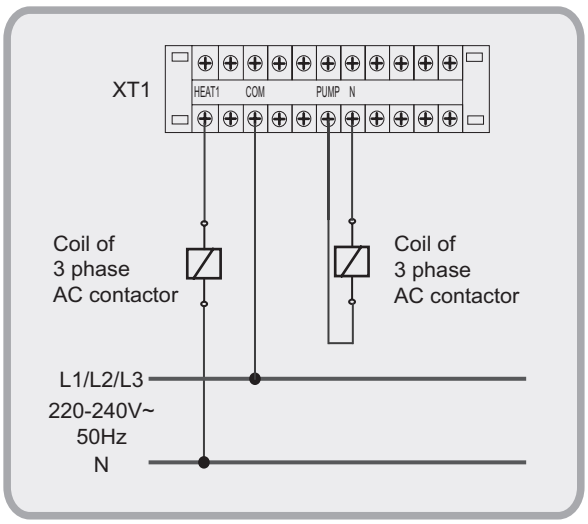


Fig. 8-20 Function of terminals of KEM-90 DNS3 with pump or heater

8.5.14 Wiring of “ON/OFF” weak electric port

The remote function of “ON/OFF” must be set by DIP switch. The remote function of “ON/OFF” is effective when S5-4 for KEM-30 DNS3 and KEM-60 DNS3 or S5-3 for KEM-90 DNS3 is chosen ON, at the same time, the wire controller is out of control.
Corresponding parallel connect the “ON/OFF” port of the main unit’s electric control box,then, connect the “ON/OFF” signal (provide by user) to the “ON/OFF” port of main unit as follows. The remote function of “ON/OFF” must be DIP switch set.
Wiring method: When KEM-30 DNS3 and KEM-60 DNS3 enable “ON/OFF” control, short the “ON/OFF” ports on the main control board. When KEM-90 DNS3 enables “ON/OFF” control, short the terminal block XT2 at 15 and 24 inside the electric control box.

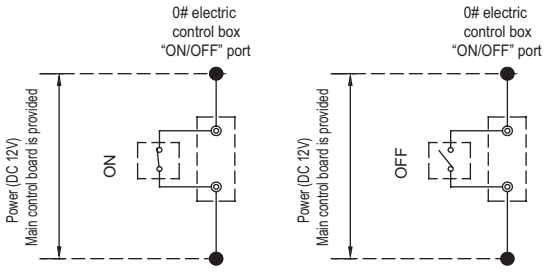


Fig. 8-21 Wiring of “ON/OFF ” weak electric port

If the “ON/OFF” port is effective, the “ ▭ ” icon of the wire controller will be flashing.

8.5.15 Wiring of “HEAT/COOL” weak electric port

The remote function of “ON/OFF” must be set by DIP switch. The remote function of “ON/OFF” and “HEAT/COOL” is effective when S5-4 for KEM-30 DNS3 and KEM-60 DNS3 or S5-3 for KEM-90 DNS3 is chosen ON, at the same time, the wire controller is out of control.
Corresponding parallel connect the “HEAT/COOL” port of the main unit’s electric control box,then, connect the “ON/OFF” signal (provide by user) to the “HEAT/COOL” port of main unit as follows.
Wiring method: When KEM-30 DNS3 and KEM-60 DNS3 enable “HEAT/COOL” control, short the “HEAT/COOL” ports on the main control board.
When KEM-90 DNS3 enables “HEAT/COOL” control, short the terminal block XT2 at 14 and 23 inside the electric control box.

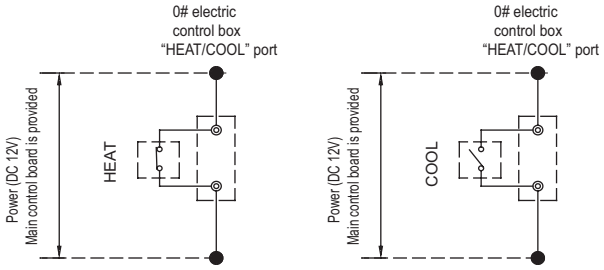


Fig. 8-22 Wiring of “HEAT/ COOL” weak electric port

8.5.16 Wiring of “ALARM” port

Connect the device provided by user to the “ALARM” ports of the module units as follows.

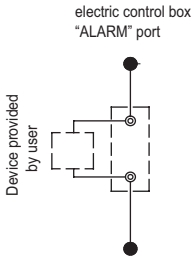


Fig. 8-23 Wiring of “ALARM” port

If the unit is operating unnormally, the ALARM port is closed, otherwise, the ALARM port is not closed.
The ALARM ports for KEM-30 DNS3, KEM-60 DNS3 and KEM-90 DNS3 are on the main control board. See the wiring nameplate for details.

8.5.17 Control system and installation precautions

a. Use only shielded wires as control wires. Any other type of wires may produce a signal interference that will cause the units to malfunction.

Fig. 8-24-1 Control system and installation precaution (a)

b. The shielding nets at both ends of the shielded wire must be grounded. Alternatively, the shielding nets of all shielded wires are interconnected and then connected to earth through or one metal plate.

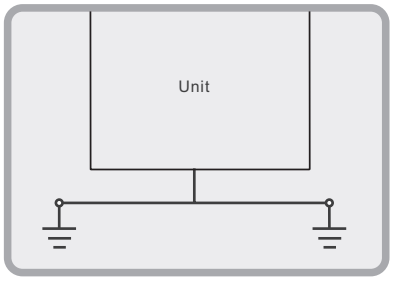


Fig. 8-24-2 Control system and installation precaution (b)

c. Do not bind the control wire, refrigerant piping and power cord together. When the power cord and control wire are laid parallel, they should be kept at a distance of more than 300 mm to prevent signal source interference.

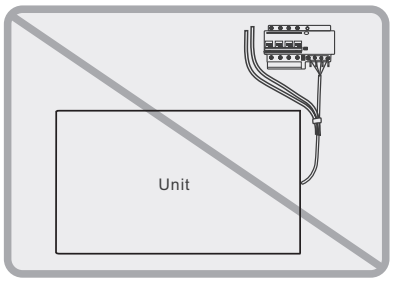


Fig. 8-24-3 Control system and installation precaution (c)

d. Pay attention to the polarity of the control wire when conducting wiring operations.

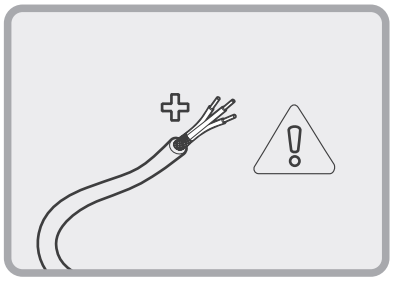


Fig. 8-24-4 Control system and installation precaution (d)

8.5.18 Wiring instances

If multiple units are connected in parallel, the user needs to set unit address on the DIP switches.
The DIP switch address for units of KEM-30 DNS3 and KEM-60 DNS3 is ENC1 and for unit of KEM-90 DNS3 is ENC4. With 0-F being valid, 0 indicates the main unit and 1-F the auxiliary units. The pump contactor wiring of KEM-90 DNS3 is diffrent with KEM-30 DNS3 and KEM-60 DNS3.The user must be sure to wire as shown in the following figures.

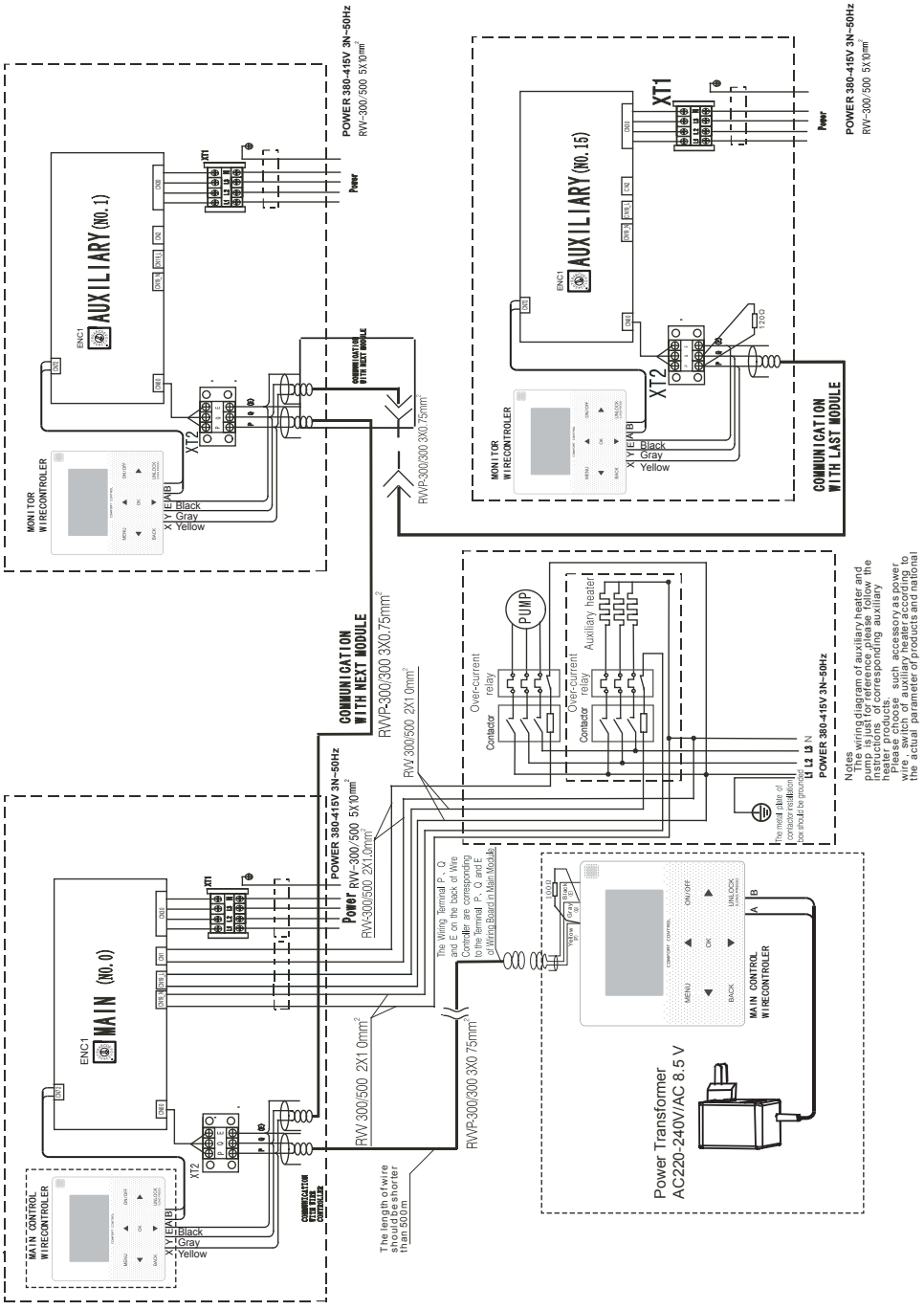


Fig. 8-25 Networking communication schematic of main unit and auxiliary unit of KEM-30 DNS3

NOTE

When the power cord is parallel to the signal wire, make sure that they are enclosed in respective conduits and are kept a reasonable wire spacing. (Distance between the power cord and signal wire: 300 mm if below 10 A, and 500 mm if below 50 A)

CAUTION

In the case of multiple units connection, the HMI of KEM-30 DNS3 and KEM-60 DNS3 can be parralled with in the same system, while KEM-90 DNS3 can`t be.

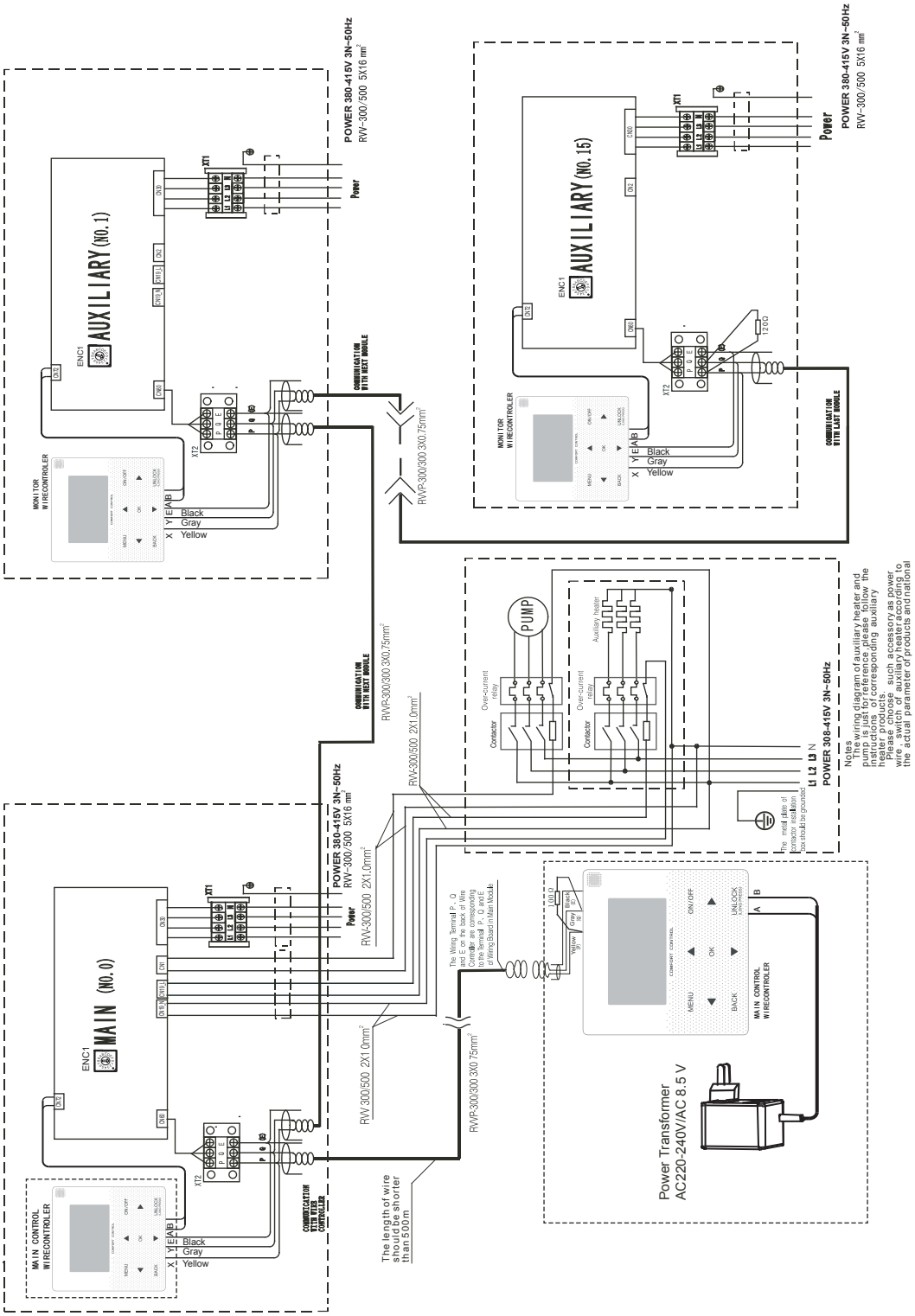


Fig. 8-26 Networking communication schematic of main unit and auxiliary unit of KEM-60 DNS3

NOTE

When the power cord is parallel to the signal wire, make sure that they are enclosed in respective conduits and are kept a reasonable wire spacing. (Distance between the power cord and signal wire: 300 mm if below 10 A, and 500 mm if below 50 A)

CAUTION

In the case of multiple units connection, the HMI of KEM-30 DNS3 and KEM-60 DNS3 can be parralled with in the same system, while KEM-90 DNS3 can`t be.

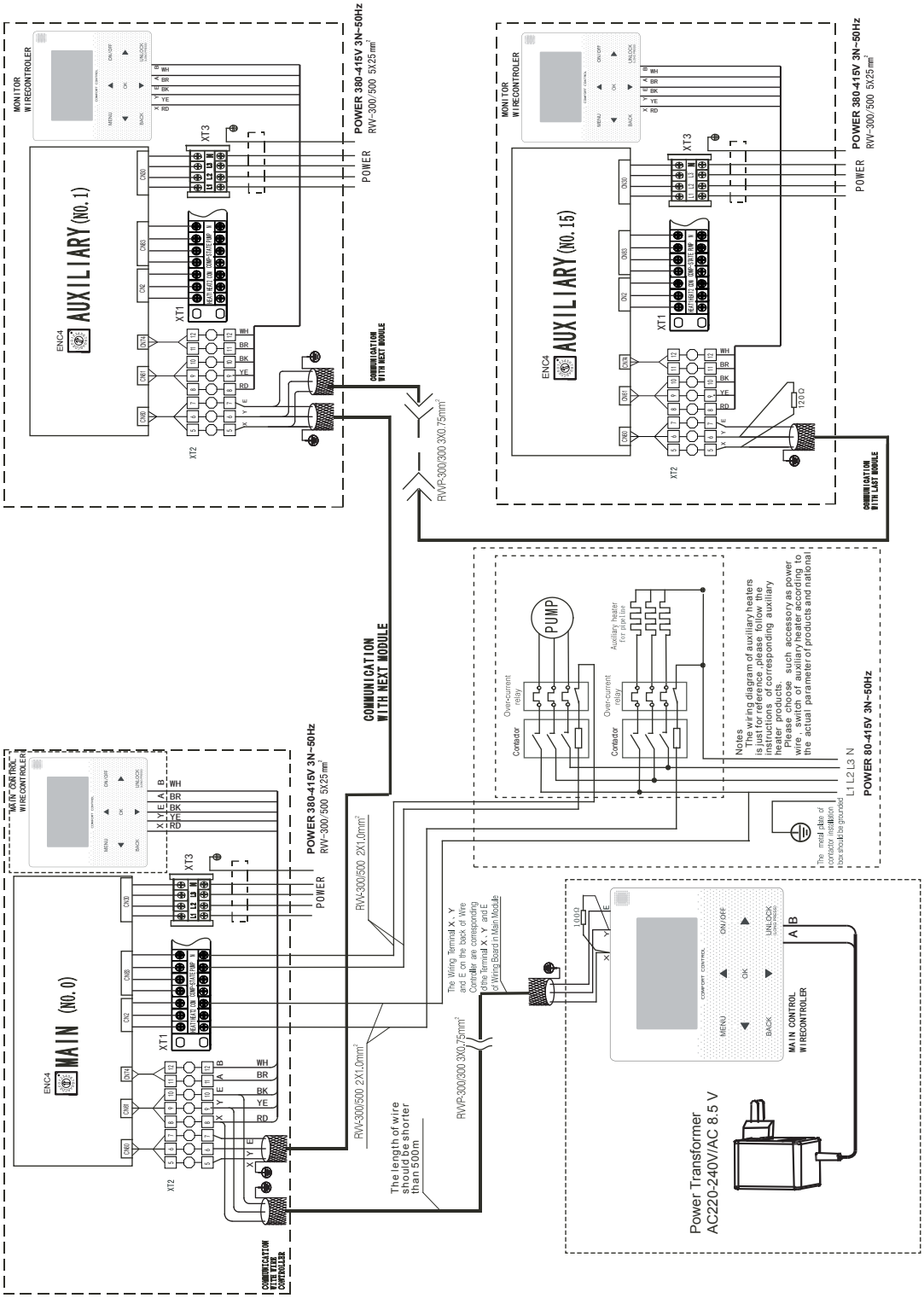


Fig. 8-27 Networking communication schematic of main unit and auxiliary unit of KEM-90 DNS3

NOTE

When the power cord is parallel to the signal wire, make sure that they are enclosed in respective conduits and are kept a reasonable wire spacing. (Distance between the power cord and signal wire: 300 mm if below 10 A, and 500 mm if below 50 A)

CAUTION

In the case of multiple units connection, the HMI of KEM-30 DNS3 and KEM-60 DNS3 can be parralled with in the same system, while KEM-90 DNS3 can`t be.

8.6 Water system installation

8.6.1 Basic requirements of connection of chilled water pipes

CAUTION

- After the unit is in place, chilled water pipes can be laid.
- The relevant installation regulations should be abided with when conducting connection of water pipes.
- The pipelines should be free of any impurity, and all chilled water pipes must conform to local rules and regulations of pipeline engineering.

a. All chilled water pipelines should be thoroughly flushed, to be free of any impurity, before the unit is operated. Any impurity should not be flushed to or into the heat exchanger.

b. Water must enter the heat exchanger through the inlet; otherwise the performance of the unit will decline.

c. The pump installed in the water pipeline system should be equipped with starter. The pump will directly press water into the heat exchanger of the water system.

d. The pipes and their ports must be independently supported but should not be supported on the unit.

e. The pipes and their ports of the heat exchanger should be easy to disassemble for operation and cleaning, as well as inspection of port pipes of the evaporator.

f. The evaporator should be provided with a filter with more than 40 meshes per inch at site. The filter should be installed near to the inlet port as much as possible, and be under heat preservation.

g. The by-pass pipes and by-pass valves as shown in Fig. 7-1 must be mounted for the heat exchanger, to facilitate cleaning of the outside system of water passage before the unit is adjusted. During maintenance, the water passage of the heat exchanger can be cut off without disturbing other heat exchangers.

h. The flexible ports should be adopted between the interface of the heat exchanger and on-site pipeline, to reduce transfer of vibration to the building.

i. To facilitate maintenance, the inlet and outlet pipes should be provided with thermometer or manometer. The unit is not equipped with pressure and temperature instruments, so they need to be purchased by the user.

j. All low positions of the water system should be provided with drainage ports, to drain water in the evaporator and the system completely; and all high positions should be supplied with discharge valves, to facilitate expelling air from the pipeline. The discharge valves and drainage ports should not be under heat preservation, to facilitate maintenance.

k All possible water pipes in the system to be chilled should be under heat preservation, including inlet pipes and flanges of the heat exchanger.

l. The outdoor chilled water pipelines should be wrapped with an auxiliary heating belt for heat preservation, and the material of the auxiliary heat belt should be PE, EDPM, etc., with thickness of 20mm, to prevent the pipelines from freezing and thus cracking under low temperature. The power supply of the heating belt should be equipped with an independent fuse.

m. When the ambient temperature is lower than 2°C, and the unit will be not used for a long time, water inside the unit should be drained. If the unit is not drained in winter, its power supply should not be cut off, and the fan coils in the water system must be provided with three-way valves, to ensure smooth circulation of the water system when the anti-freezing pump is started up in winter.

n. Total outlet water temperature sensor of main unit must be installed on total outlet water pipe in multi-module combination system.

WARNING

For the water pipeline network including filters and heat exchangers, dreg or dirt may seriously damages the heat exchangers and water pipes.

The installation persons or the users must ensure the quality of chilled water, and de-icing salt mixtures and air should be excluded from the water system, since they may oxidize and corrode steel parts inside the heat exchanger.

8.6.2 Connection mode of pipe

The water inlet and outlet pipes are installed and connected as shown in the following figures. KEM-30 DNS3 model uses screwed connection, while the KEM-60 DNS3 and KEM-90 DNS3 models use hoop connection. For the specifications of the water pipes and screw thread, see the Table 8-12 below.

Table 8-12

Model	Specifications of Pipe connection	Specifications of water pipe
KEM-30 DNS3	Rc 1 1/4	DN40
KEM-60 DNS3	2″	DN50
KEM-90 DNS3	2″	DN50

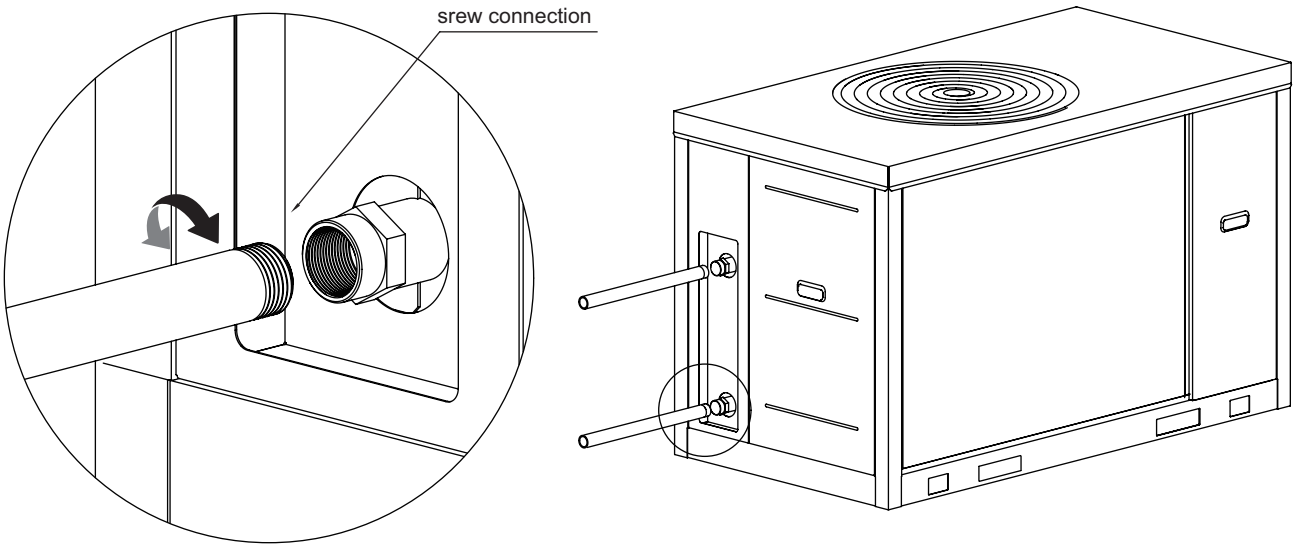


Fig. 8-28 Connection mode of KEM-30 DNS3 pipe

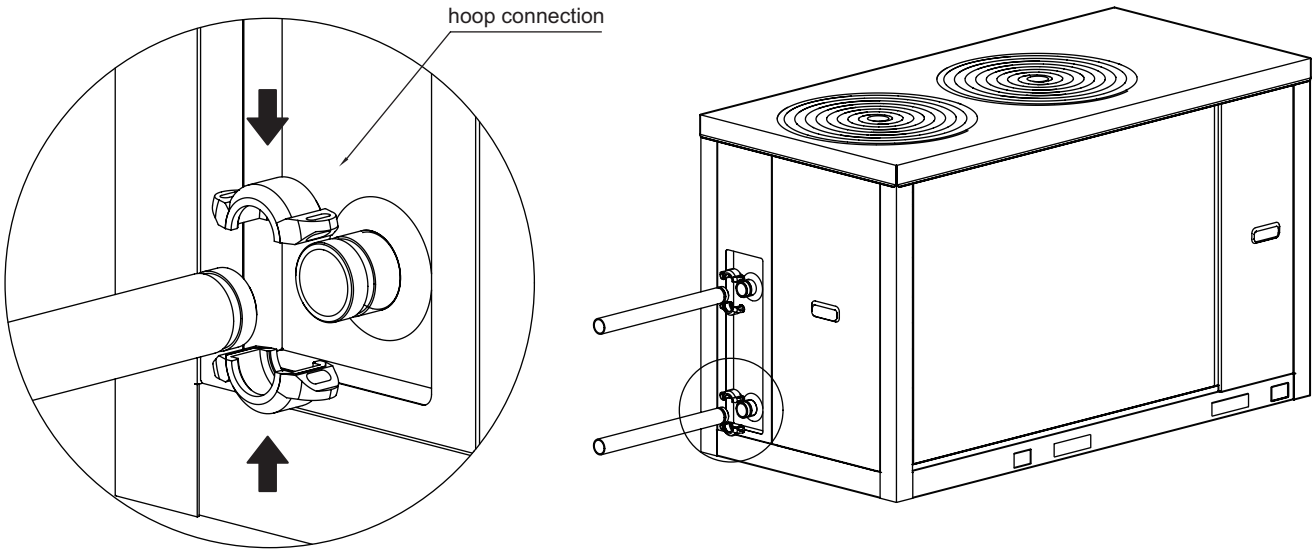


Fig. 8-29 Connection mode of KEM-60 DNS3 pipe

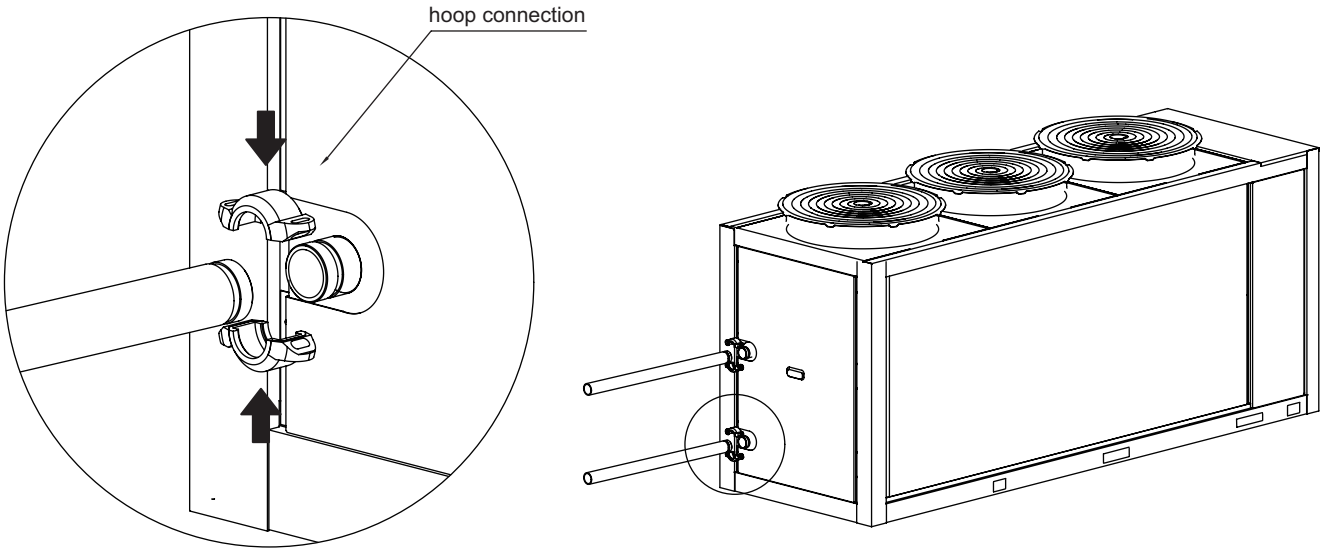


Fig. 8-30 Connection mode of KEM-90 DNS3 pipe

8.6.3 Design of the store tank in the system

kW is the unit for cooling capacity and L is the unit for G, water flow in the formula counting the minimum water flow.

Comfortable air conditioner
G = cooling capacity×3.5L

Process cooling
G = cooling capacity×7.4L

In certain occasion (especially in manufacture cooling process), for conforming the system water content requirement, it's necessary to mount a tank equipping with a cut-off baffle at the system to avoid water short-circuit, Please see the following schemes:

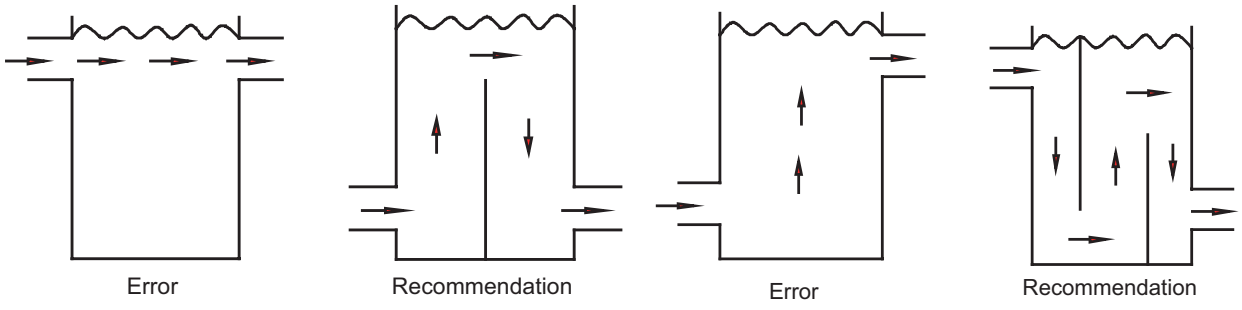


Fig. 8-31 Design of the store tank

8.6.4 Minimum water flow

The minimum chilled water flow is shown in the table 8-13. If the system flow is less than the minimum unit flow rate, the evaporator flow can be recirculated, as shown in the diagram.

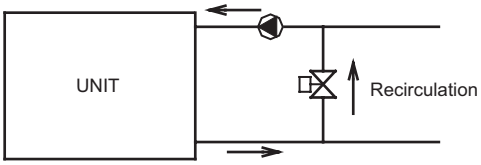


Fig. 8-32 For minimun water flow rate

8.6.5 Maximum water flow

The maximum chilled water flow is limited by the permitted pressure drop in the evaporator. It is provided in the table 8-13. If the system flow is more than the maximum unit flow rate, bypass the evaporator as shown in the diagram to obtain a lower evaporator flow rate.

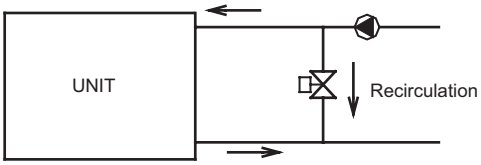


Fig. 8-33 For maximum water flow

8.6.6 Minimum and Maximum water flow

Table 8-13 (unit: m^3/h)

Item / Model	Water flow rate	
	Minimum	Maximum
KEM-30 DNS3	3.8	6.4
KEM-60 DNS3	8.0	13.0
KEM-90 DNS3	10.2	16.5

8.6.7 Selection and installation of the pump

8.6.7.1 Select the pump

a. Select the water-flow of the pump
The rated water-flow must no less than the unit rated water-flow; in terms of multi-connect the units, that water-flow must no less than total units' rated water-flow.
b. Select the lift of the pump.
H=h1+h2+h3+h4
H: The lift of the pump.
h1: Main unit water resistance.
h2: Pump water resistance.
h3: Water resistance of the longest water-loop distance, includes: pipe resistance, different valve's resistance, flexible pipe resistance, pipe elbow and three-way resistance, two-way resistance or three-way resistance, as well as filter resistance.
H4: the longest terminal resistance.

8.6.7.2 Installation the pump

a. The pump should be installed at the water inlet pipe, both of which sides must mount the soft connectors for vibration-proof.
b. The backup pump for the system (recommended).
c. Units must with a main unit controls (Please see Fig. 8-22 for the controls wiring diagram).

8.6.8 Water quality control

8.6.8.1 Water quality control

When industrial water is used as chilled water, little furring may occur; however, well water or river water, used as chilled water, may cause much sediment, such as furring, sand, and so on. Therefore, well water or river water must be filtered and softened in softening water equipment before flowing into chilled water system. If sand and clay settle in the evaporator, circulation of chilled water may be blocked, and thus leading to freezing accidents; if hardness of chilled water is too high, furring may occur easily, and the devices may be corroded. Therefore, the quality of chilled water should be analyzed before being used, such as PH value, conductivity, concentration of chloride ion, concentration of sulfide ion, and so on.

8.6.8.2 Applicable standard of water quality for the unit

Table 8-14

PH value	6.8-8.0
Total hardness	<70ppm
Conductivity	<200μV/cm (25°C)
Sulfide ion	No
Chloride ion	<50ppm
Ammonia ion	No
Sulfate	<50ppm
Silicon	<30ppm
Iron content	<0.3ppm
Sodium ion	No requirement
Calcium ion	<50ppm

8.6.9 Installation of multi-module water system pipeline

Multi-module combination installation involves special design of the unit, so relevant explanation is given as follows.

8.6.9.1 Installation mode of multi-module combination water system pipeline

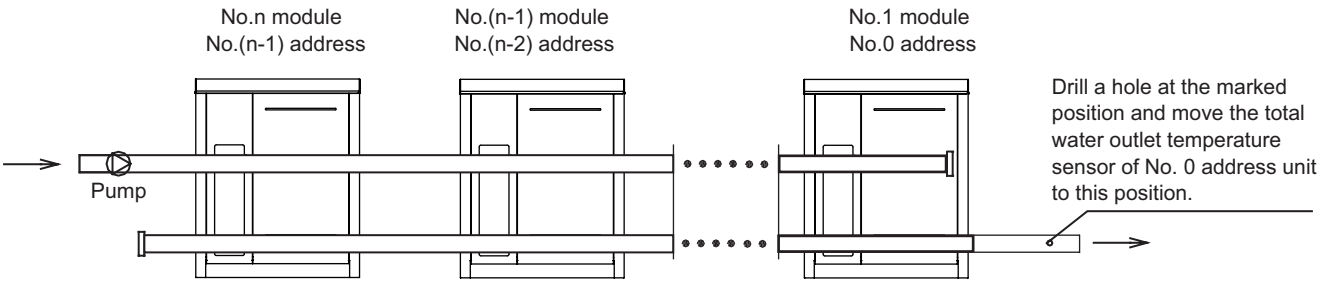


Fig.8-34 Installation of multi-module (no more than 16 modules)

CAUTION

KEM-30 DNS3 and KEM-60 DNS3 can be connected in the same water system, while KEM-90 DNS3 can not be connected with other models.

8.6.9.2 Table of diameter parameters of main inlet and outlet pipes

Table 8-15

Cooling capacity(kW)	Total inlet and outlet water pipe inside nominal diameter
15≤Q≤30	DN40
30<Q≤90	DN50
90<Q≤130	DN65
130<Q≤210	DN80
210<Q≤325	DN100
325<Q≤510	DN125
510<Q≤740	DN150
740<Q≤1300	DN200
1300<Q≤2080	DN250

CAUTION

Please pay attention to the following items when installing multiple modules:
- Each module corresponds to an address code which cannot be repeated.
- Main water outlet temperature sensor and auxiliary electric heater are under control of the main module.
- The unit can be started up through the wired controller only after all addresses are set and the aforementioned items are determined. The wired controller is ≤500m away from the outdoor unit.

8.6.10 Installation of single or multiple water pumps

8.6.10.1 DIP switch

The choice of DIP switch see Table 8-6 in detail when single or multiple water pumps are installed for KEM-30 DNS3 and KEM-60 DNS3.
The choice of DIP switch see Table 8-7 in detail when single or multiple water pumps are installed for KEM-90 DNS3.

Pay attention to the following problems:
a. If the DIP switch is inconsistent, and the error code is FP, the unit is not allowed to operate.
b. Only the main unit has the water pump output signal when single water pump installed, auxiliary units has no water pump output signal.
c. The water pump control signal is available for both the main unit and auxiliary units when multiple pumps installed.

8.6.10.2 Installation of water pipe system

a. Single water pump

Piping does not require a one-way valve when single water pump is installed, refer to figure as follow.

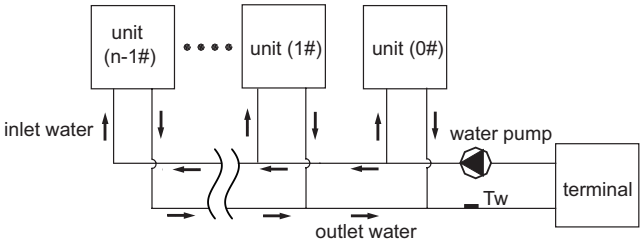


Fig. 8-35 Installation of single water pump

b. Multiple water pumps

Each unit is required to install a one-way valve when multiple pumps are installed, refer to figure as follow.

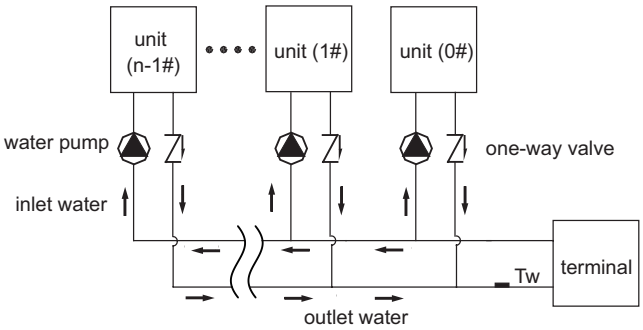


Fig. 8-36 Installation of multiple water pump

8.6.10.3 Electric wiring

Only the main unit requires wiring when single water pump installed, auxiliary units do not require wiring. All of the main unit and auxiliary units require wiring when multiple water pumps installed. For specific wiring, see figure 8-19 and 8-20.

9. START-UP AND CONFIGURATION

9.1 Initial start-up at low outdoor ambient temperature

During initial start-up and when water temperature is low, it is important that the water is heated gradually. Failure to do so may result in concrete floors cracking due to rapid temperature change. Please contact the responsible cast concrete building contractor for further details.

To do so, the lowest water flow set temperature can be decreased to a value between 25°C and 35°C by adjusting the FOR SERVICEMAN. Refer to "FOR SERVICEMAN/special function/ preheating for floor"

9.2 Points for attention prior to trial run

a. After the water system pipeline is flushed several times, please make sure that the purity of water meets the requirements; the system is re-filled with water and drained, and the pump is started up, then make sure that water flow and the pressure at the outlet meet the requirements.
b. The unit is connected to the main power 12 hours before being started up, to supply power to the heating belt and pre-heat the compressor. Inadequate pre-heating may cause damages to the compressor.
c. Setting of the wired controller. See details of the manual concerning setting contents of the controller, including such basic settings as refrigerating and heating mode, manual adjustment and automatic adjustment mode and pump mode. Under normal circumstances, the parameters are set around standard operating conditions for trial run, and extreme working conditions should be prevented as much as possible.

10. FINAL CHECK AND TEST RUN

10.1 Check item table after installation

Table 10-1

Checking item	Description	Yes	No
Whether installing site is meet for requirements	Units are fixed mounting on level base.		
	Ventilating space for heat exchanger at the air side is correct		
	Maintenance space is correct.		
	Noise and vibration is correct.		
	Sun radiation and rain or snow proof measures are corrects.		
	External physical is correct.		
Whether water system is meeting for require-ments	Pipe diameter is correct		
	Thermal insulation is correct		
	Water discharge is correct		
	Water quality control is correct		
	Flexible pipe's connection is correct		
	Pressure control is correct		
Whether electric wiring system is meeting for requirements	Switch capacity is correct		
	Chained control is correct		
	Phase sequence of power supply is meeting for require-ment		
	Fuse capacity is correct		
	Voltage and frequency are correct		
	Connecting tightly between wires		
	Operation control device is correct		
	Safety device is correct		

10.2 Trial run

a. Start up the controller and check whether the unit displays a fault code. If a fault occurs, remove the fault first, and start the unit according to the operating method in the “unit control instruction”, after determining that there is no fault existing in the unit.
b. Conduct trial run for 30 minutes. When the influent and effluent temperature becomes stabilized, adjust the water flow to nominal value, to ensure normal operation of the unit.
c. After the unit is shut down, it should be put into operation 10 min later, to avoid frequent start-up of the unit. In the end, check whether the unit meets the requirements according to the contents in Table 11-1,11-2.

CAUTION

The unit can control start-up and shut-down of the unit, so when the water system is flushed, the operation of the pump should not be controlled by the unit.

Do not start up the unit before draining the water system completely.

The target flow controller must be installed correctly. The wires of the target flow controller must be connected according to electric control schematic diagram, or the faults caused by water breaking while the unit is in operation should be the user’s responsibility.

Do not re-start the unit within 10 min after the unit is shut down during trial run.

When the unit is used frequently, do not cut off the power supply after the unit is shut down; otherwise the compressor cannot be heated, thus leading to its damages.

If the unit is not in service for a long time, and the power supply needs to be cut off, the unit should be connected to the power supply 12 hours prior to re-starting of the unit, to pre-heat the compressor, the pump, the plate heat exchanger and the differential pressure value.

11. MAINTENANCE AND UPKEEP

11.1 Failure information and code

In case the unit runs under abnormal condition, failure protection code will display on both control panel and wired controller, and the indicator on the wired controller will flash with 1Hz. The display codes are shown in the following table:

Table11-1 KEM-30 DNS3 and KEM-60 DNS3

Error No.	Code	reason	note
1	E0	Main control parameter memory EPROM failure or inverter module A, B-- Parameter memory EPROM failure	Recovered upon failure recovery
		1E0--> Main control parameter memory EPROM failure	Recovered upon failure recovery, spot check query
		2E0-->Inverter module A--Parameter memory EPROM failure	Recovered upon failure recovery
		3E0-->Inverter module B--Parameter memory EPROM failure	Recovered upon failure recovery
2	E1	Phase sequence failure of main control board check	Recovered upon failure recovery
3	E2	Main control and wired control communication failure	Recovered upon failure recovery
4	E3	Total water outlet temperature sensor failure (main unit valid)	Recovered upon failure recovery
5	E4	Unit water outlet temperature sensor failure	Recovered upon failure recovery
6	E5	Condenser tube temperature sensor failure	Recovered upon failure recovery
8	E7	Ambient temperature sensor failure	Recovered upon failure recovery
10	E9	Water flow detection failure (recovered through button)	Protection occurs 3 times in 60 minutes and the failure can be recovered by power disconnection only.
12	Eb	1Eb-->Taf1 cooling evaporator low-temperature antifreeze protection sensor failure	Recovered upon failure recovery
		2Eb-->Taf2 cooling evaporator low-temperature antifreeze protection sensor failure	Recovered upon failure recovery
13	EC	Auxiliary unit module reduction (displayed by wired controller)	--
14	Ed	1Ed-->A system discharge temperature sensor failure	Recovered upon failure recovery
		2Ed-->B system discharge temperature sensor failure	Recovered upon failure recovery
16	EF	Unit water return temperature sensor failure	Recovered upon failure recovery
17	EH	System self-check failure alarm	Recovered upon failure recovery
18	EL	Electronic lock failure (reserved)	Recovered upon failure recovery
19	EP	Discharge temperature sensor failure alarm	Recovered upon failure recovery
20	EU	Total cooling outlet temperature sensor (Tz/7) error	Recovered upon failure recovery
21	P0	System high-pressure protection or discharge temperature protection	Protection occurs 5 times in 120 minutes and the failure can be recovered by power disconnection only.
22	P1	System low pressure protection	Protection occurs 5 times in 120 minutes and the failure can be recovered by power disconnection only.
25	P4	System A current protection	Protection occurs 5 times in 120 minutes and the failure can be recovered by power disconnection only.
26	P5	System B current protection	Protection occurs 5 times in 120 minutes and the failure can be recovered by power disconnection only.
27	P6	1P6-->IPM module failure, system A protection	--
		2P6-->IPM module failure, system B protection	
28	P7	High temperature protection of system condenser and total cold water outlet temperature Tz/7	--
30	P9	Water inlet and outlet temperature difference protection	Recovered upon failure recovery

31	PA	Cooling return water temperature too high	Recovered upon failure recovery
32	Pb	Winter antifreeze protection	Recovered upon failure recovery
33	PC	Evaporator pressure low in cooling	Recovered upon failure recovery
35	PE	Cooling evaporator low-temperature antifreeze protection (recovered through button)	Recovered upon failure recovery
37	PH	Heating T4 too high temperature protection	Recovered upon failure recovery
38	PL	Tfin module too high temperature protection	Protection occurs 3 times in 100 minutes and the failure can be recovered by power disconnection only.
40	PU	1PU-->DC fan A module protection	Recovered upon failure recovery
		2PU-->DC fan B module protection	Recovered upon failure recovery
41	H0	1H0: IPM module communication failure	Recovered upon failure recovery
		2H0: IPM module communication fault	Recovered upon failure recovery
42	H1	Over/under-voltage protection	Recovered upon failure recovery
45	H4	1H4: PP protection occurs 3 times in 60 minutes (power failure recovery)	Reserved
		2H4: PP protection occurs 3 times in 60 minutes (power failure recovery)	Reserved
47	H6	1H6: A system bus voltage failure (PTC)	Recovered upon failure recovery
		2H6: B system bus voltage failure (PTC)	Recovered upon failure recovery
72	Fb	Pressure sensor failure	Recovered upon failure recovery
74	Fd	Air suction temperature sensor failure	Recovered upon failure recovery
76	FF	1FF DC fan A failure	Protection occurs 3 times in 20 minutes and the failure can be recovered by power disconnection only.
		2FF DC fan B failure	Protection occurs 3 times in 20 minutes and the failure can be recovered by power disconnection only.
79	FP	DIP inconsistency of multiple water pumps	Power failure recovery required
101	L0	Inverter module protection	Recovered upon failure recovery
102	L1	DC bus low voltage protection	Recovered upon failure recovery
103	L2	DC bus high voltage protection	Recovered upon failure recovery
105	L4	MCE failure	Recovered upon failure recovery
106	L5	zero speed protection	Recovered upon failure recovery
108	L7	phase sequence error	Recovered upon failure recovery
109	L8	Compressor frequency variation more than 15Hz within one second protection	Recovered upon failure recovery
110	L9	Actual compressor frequency differs from target frequency by more than 15Hz protection	Recovered upon failure recovery
146	dF	Defrosting prompt	Recovered upon failure recovery

Table 11-2 KEM-90 DNS3

Error No.	Code	reason	note
1	E0	Main control parameter memory EPROM failure	Recovered upon failure recovery
2	E1	Phase sequence failure of main control board check	Recovered upon failure recovery
3	E2	Main control and wired control communication failure	Recovered upon failure recovery
4	E3	Total water outlet temperature sensor failure (main unit valid)	Recovered upon failure recovery
5	E4	Unit water outlet temperature sensor failure	Recovered upon failure recovery
6	E5	1E5 condenser tube temperature sensor T3A failure	Recovered upon failure recovery
		2E5 condenser tube temperature sensor T3B failure	Recovered upon failure recovery
8	E7	Ambient temperature sensor failure	Recovered upon failure recovery
9	E8	Power supply phase sequence protector output failure (reserved)	Recovered upon failure recovery
10	E9	Water flow detection failure (recovered through button)	Protection occurs 3 times in 60 minutes and the failure can be recovered by power disconnection only.
12	Eb	1Eb-->Taf1 cooling evaporator low-temperature antifreeze protection sensor failure	Recovered upon failure recovery
		2Eb-->Taf2 cooling evaporator low-temperature antifreeze protection sensor failure	Recovered upon failure recovery
13	EC	auxiliary unit module reduction	Recovered upon failure recovery
14	Ed	1Ed-->A system discharge temperature sensor failure	Recovered upon failure recovery
		2Ed-->B system discharge temperature sensor failure	Recovered upon failure recovery
15	EE	1EE EVI plate heat exchanger refrigerant temperature T6A sensor failure	Recovered upon failure recovery
		2EE EVI plate heat exchanger refrigerant temperature T6B sensor failure	
16	EF	Unit water return temperature sensor failure	Recovered upon failure recovery
17	EH	System self-check failure alarm	Recovered upon failure recovery
19	EP	Discharge temperature sensor failure alarm	Recovered upon failure recovery
20	EU	Tz/7 Coil final outlet temperature sensor error	Recovered upon failure recovery
21	P0	System high-pressure protection or discharge temperature protection	Protection occurs 3 times in 60 minutes and the failure can be recovered by power disconnection only.
22	P1	System low pressure protection	Protection occurs 3 times in 60 minutes and the failure can be recovered by power disconnection only.
23	P2	Tz/7 Coil final outlet temperature too high	Recovered upon failure recovery
25	P4	System A current protection	Protection occurs 3 times in 60 minutes and the failure can be recovered by power disconnection only.
26	P5	System B current protection	Protection occurs 3 times in 60 minutes and the failure can be recovered by power disconnection only.
27	P6	Module failure	Protection occurs 3 times in 60 minutes and the failure can be recovered by power disconnection only.
28	P7	High temperature protection of system condenser	Protection occurs 3 times in 60 minutes and the failure can be recovered by power disconnection
30	P9	Water inlet and outlet temperature difference protection	Protection occurs 3 times in 60 minutes and the failure can be recovered by power disconnection
32	Pb	Winter antifreeze protection	Recovered upon failure recovery
33	PC	Evaporator pressure low in cooling	Recovered upon failure recovery
35	PE	Cooling evaporator low temperature antifreeze protection	Recovered upon failure recovery
37	PH	Heating T4 too high temperature protection	Valid for heating
38	PL	Tfin module too high temperature protection	Protection occurs 3 times in 100 minutes and the failure can be recovered by power disconnection only.
40	PU	1PU-->DC fan A module protection	Recovered upon failure recovery
		2PU-->DC fan B module protection	Recovered upon failure recovery
		3PU-->DC fan C module protection	Recovered upon failure recovery
46	H5	pressure too high or low	Recovered by power disconnection
50	xH9	Drive model not matched	x indicates the compressor: 1 indicates compressor A, and 2 indicates compressor B.

55	HE	1HE Not insert electronic expansion valve A error	Recovered upon failure recovery
		2HE Not insert electronic expansion valve B error	Recovered upon failure recovery
		3HE Not insert electronic expansion valve C error	Recovered upon failure recovery
61	F0	1F0: IPM module communication failure	Recovered upon failure recovery
		2F0: IPM module communication failure	Recovered upon failure recovery
63	F2	Superheat insufficient	Protection occurs 3 times in 240 minutes and the failure can be recovered by power disconnection only.
65	F4	1F4: L0 or L1 protection occurs 3 times in 60 minutes (power failure recovery)	Recovered upon failure recovery
		2F4: L0 or L1 protection occurs 3 times in 60 minutes (power failure recovery)	Recovered upon failure recovery
67	F6	1F6: System A DC bus voltage fault (PTC)	Recovered upon failure recovery
		2F6: System B DC bus voltage fault (PTC)	Recovered upon failure recovery
70	F9	1F9: TF1 radiator temperature sensor failure 1 F9	Recovered upon failure recovery
		2F9: TF2 radiator temperature sensor failure 2 F9	Recovered upon failure recovery
72	Fb	Pressure sensor error	Recovered upon failure recovery
74	Fd	Suction temperature sensor failure	Recovered upon failure recovery
76	FF	1FF DC fan A failure	Failure can only be recovered by disconnecting the power
		2FF DC fan B failure	Failure can only be recovered by disconnecting the power
		3FF DC fan C failure	Failure can only be recovered by disconnecting the power
79	FP	DIP inconsistency of multiple water pumps	Power failure recovery required
88	C7	If PL occurs 3 times, the system reports the C7 failure	Power failure recovery required
101	L0	Inverter module protection	Recovered upon failure recovery
102	L1	DC bus low voltage protection	Recovered upon failure recovery
103	L2	DC bus high voltage protection	Recovered upon failure recovery
105	L4	MCE failure	Recovered upon failure recovery
106	L5	zero speed protection	Recovered upon failure recovery
108	L7	Phase sequence error	Recovered upon failure recovery
109	L8	Compressor frequency change over 15Hz	Recovered upon failure recovery
110	L9	Compressor frequency phase difference 15Hz	Recovered upon failure recovery
146	dF	Defrosting prompt	Recovered upon failure recovery

11.2 Digital display of main board

The data display area is divided into Up area and Down area, with two groups of two-digit half 7-segment digital display, respectively.

a. Temperature display
Temperature display is used for displaying the total outlet water temperature of unit system, outlet water temperature, condenser pipe temperature T3A of system A, condenser pipe temperature T3B of system B, outdoor environmental temperature T4, anti-freezing temperature T6 and setting temperature Ts, with allowable data display scope -15°C-70°C. If the temperature is higher than 70°C, it is displayed as 70°C. If there is no effective date, it displays "— —" and indication point ºC is on.

b. Current display
Current display is used for displaying Modular unit system A compressor current IA or system B compressor current IB, with allowable display scope 0A~99A. If it is higher than 99A, it is displayed as 99A. If there is no effective date, it displays "— —" and indication point 𝔸 is on.

c. Failure display
It is used for displaying the total failure warning date of unit or that of Modular unit, with failure display scope E0~EF, E indicating failure, 0~F indicating failure code. "E-" is displayed when there is no failure and indication point # is on at the same time.

d. Protection display
It is used for displaying the total system protection data of unit or the system protection data of Modular unit, with protection display scope P0~PF, P indicating system protection, 0~F indicating protection code. "P-" is displayed when there is no failure.

e. Unit number display
It is used for displaying the address number of the currently selected Modular unit, with display scope 0~15 and indication point is on at the same time.

f. Display of online unit number and startup unit number
They are used for displaying the total online Modular units of the whole unit system and the number of the Modular unit under running state, respectively, with display scope 0~16.
Any time when the spot check page is entered to display or change Modular unit, it is needed to wait for the up-to-date data of the Modular unit received and selected by wired controller.
Before receiving the data, the wired controller only displays "——" on the data display Down area, and the Up area displays the address number of the Modular unit. No page can be turned, which continues until the wired controller receives the communication data of this Modular unit.

11.3 Care and maintenance

Maintenance period
It's recommended that before cooling in summer and heating in winter every year, consult local air conditioner customer service center to check and maintain the unit, to prevent air conditioner errors which bring inconvenience to your life and work.

Maintenance of main parts
a. Close attention should be paid to the discharge and suction pressure during the running process. Find out reasons and eliminate the failure if abnormality is found.
b. Control and protect the equipment. See to it that no random adjustment be made on the set points on site.
c. Regularly check whether the electric connection is loose, and whether there is bad contact at the contact point caused by oxidation and debris etc., and take timely measures if necessary. Frequently check the work voltage, current and phase balance.
d. Check the reliability of the electric elements in time. Ineffective and unreliable elements should be replaced in time.

11.4 Removing scale

After long-time operation, calcium oxide or other minerals will be settled in the heat transfer surface of the water-side heat exchanger. These substances will affect the heat transfer performance when there is too much scale in the heat transfer surface and sequentially cause that electricity consumption increases and the discharge pressure is too high (or suction pressure too low). Organic acids such as formic acid, citric acid and acetic acid may be used to clean the scale. But in no way should cleaning agent containing fluoroacetic acid or fluoride should be used as the water-side heat exchange is made from stainless steel and is easy to be eroded to cause refrigerant leakage. Pay attention to the following aspects during the cleaning and scale-removing process:
a. Water-side heat exchanger should be done be professionals. Please contact the local air-conditioner customer service center.
b. Clean the pipe and heat exchanger with clean water after cleaning agent is used. Conduct water treatment to prevent water system from being eroded or re-absorption of scale.
c. In case of using cleaning agent, adjust the density of the agent, cleaning time and temperature according to the scale settlement condition.
d. After pickling is completed, neutralization treatment needs to be done on the waste liquid. Contact relevant company for treating the treated waste liquid.
e. Protection equipments (such as goggles, gloves, mask and shoes) must be used during the cleaning process to avoid breathing in or contacting the agent as the cleaning agent and neutralization agent is corrosive to eyes, skins and nasal mucosa.

11.5 Winter shutdown

For shutdown in winter, the surface of the unit outside and inside should be cleaned and dried. Cover the unit to prevent dust. Open discharge water valve to discharge the stored water in the clean water system to prevent freezing accident (it is preferable to inject antifreezer in the pipe).

11.6 Replacing parts

Parts to be replaced should be the ones provided by our company. Never replace any part with different part.

11.7 First startup after shutdown

The following preparations should be made for re-startup of unit after long-time shutdown:
a. Thoroughly check and clean the unit.
b. Clean water pipe system.
c. Check pump, control valve and other equipments of water pipe system.
d. Fix connections of all wires.
e. It is a must to electrify the machine 12 hours before startup.

11.18 Refrigeration system

Determine whether refrigerant is needed by checking the value of suction and discharge pressure and check whether there is a leakage. Air tight test must be made if there is a leakage or parts of refrigerating system is to be replaced. Take different measures in the following two different conditions from refrigerant injection.

Total leakage of refrigerant. In case of such situation, leakage detection must be made on the pressurized nitrogen used for the system. If repair welding is needed, welding cannot be made until all the gas in the system is discharged. Before injecting refrigerant, the whole refrigeration system must be completely dry and of vacuum pumping.
a. Connect vacuum pumping pipe at the fluoride nozzle at low-pressure side.
b. Remove air from the system pipe with vacuum pump. The vacuum pumping lasts for above 3 hours. Confirm that the indication pressure in dial gauge is within the specified scope.

c. When the degree of vacuum is reached, inject refrigerant into the refrigeration system with refrigerant bottle. Appropriate amount of refrigerant for injection has been indicated on the nameplate and the table of main technical parameters. Refrigerant must be injected from the low pressure side of system.
d. The injection amount of refrigerant will be affected by the ambient temperature. If the required amount has not been reached but no more injection can be done, make the chilled water circulate and start up the unit for injection. Make the low pressure switch temporarily short circuit if necessary.

Refrigerant supplement. Connect refrigerant injection bottle on the fluoride nozzle at low-pressure side and connect pressure gauge at low pressure side.
a. Make chilled water circulate and start up unit, and make the low pressure control switch short circuit if necessary.
b. Slowly inject refrigerant into the system and check suction and discharge pressure.

CAUTION

Connection must be renewed after injection is completed.

Never inject oxygen, acetylene or other flammable or poisonous gas to the refrigeration system at leakage detection and air tight test. Only pressurized nitrogen or refrigerant can be used.

11.9 Disassembling compressor

Follow the following procedures if compressor needs to be disassembled:
a. Cut off the power supply of unit.
b. Remove power source connection wire of compressor.
c. Remove suction and discharge pipes of compressor.
d. Remove fastening screw of compressor.
e. Move the compressor.

11.10 Auxiliary electric heater

When the ambient temperature is lower than 2°C, the heating efficiency decreases with the decline of the outdoor temperature. In order to make the air-cooled heat pump stably run in a relatively cold region and supplement some heat lost due to de-frosting. When the lowest ambient temperature in the user's region in winter is within 0°C~10°C, the user may consider to use auxiliary electric heater.
Please refer to relevant professionals for the power of auxiliary electric heater.

11.11 Antifreezing

In case of freezing at the water-side heat exchanger interval channel, severe damage may be caused, i.e. heat exchange may be broken and appears leakage. This damage of frost crack is not within the warranty scope, so attention must be paid to antifreezing.
a. If the unit that is shutdown for standby is placed in an environment where the outdoor temperature is lower than 0°C, the water in the water system should be drained.
b. Water pipe may be frozen when the chilled water target flow controller and anti-freezing temperature senor become ineffective at running, therefore, the target flow controller must be connected in accordance with the connection diagram.
c. Frost crack may happen to water-side heat exchanger at maintenance when refrigerant is injected to the unit or is discharged for repair. Pipe freezing is likely to happen any time when the pressure of refrigerant is below 0.4Mpa. Therefore, the water in the heat exchanger must be kept flowing or be thoroughly discharged.

11.12 Replacement of safety valve

Replace the safety valve as follows:
a. Reclaim the refrigerant completely in the system. Doing so requires professional staff and equipment;
b. Note to protect the tank coating. Avoid damage to coating from external force or high temperature when removing and installing the safety valve;
c. Heat the sealant to screw off the safety valve. Note to protect the area where the screwing tool meets the tank body and avoid damages to the tank coating;
d. If tank coating is damaged, repaint the damaged area.

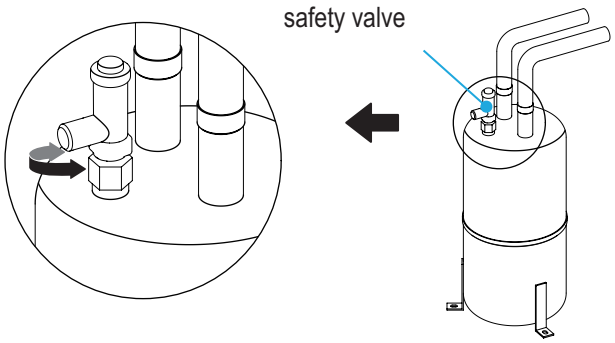


Fig.11-1 Replacement of safety valve

WARNING

Safety valve warranty period is 24 months. Under the specified conditions, if flexible sealing parts is used, the safety valve life expectancy is 24 to 36 months, if metal or PIFE sealing components is used, the average life expectancy is 36 to 48 months. Visual inspection is needed after that period, maintenance people should check the appearance of the valve body and the operating environment. If the valve body is not obvious corrosion, cracks, dirt, damage, then the valve can be used continually. Otherwise, please contact your supplier for spare part.

RECORD TABLE OF TEST RUN AND MAINTENANCE

Table 11-5

Model:	Code labeled on the unit:
Customer name and address:	Date:

1. Check temperature of chilled water or hot water

   Inlet ( ) Outlet ( )

2. Check air temperature of air-side heat exchanger:

   Inlet ( ) Outlet ( )

3. Check refrigerant suction temperature and superheating temperature:

   Refrigerant suction temperature: ( ) ( ) ( ) ( ) ( )

   Superheating temperature: ( ) ( ) ( ) ( ) ( )

4. Check pressure:

   Discharge pressure: ( ) ( ) ( ) ( ) ( )

   Suction pressure: ( ) ( ) ( ) ( ) ( )

5. Check running current: ( ) ( ) ( ) ( ) ( )

6. Whether unit has been through refrigerant leakage test? ( )

7. Whether there is noise on all the panels of unit? ( )

8. Check whether the main power source connection is correct. ( )

RECORD TABLE OF ROUTINE RUNNING

Table 11-6

Model: Date: Weather: Operation time: Startup ( ) Shutdown ( )												
Outdoor temperature	Dry bulb	°C										
	Wet bulb	°C										
Indoor temperature		°C										
Compressor	High pressure	MPa										
	Low pressure	MPa										
	Voltage	V										
	Current	A										
Air temperature of air-side heat exchanger	Inlet (dry bulb)	°C										
	Outlet (dry bulb)	°C										
Temperature of chilled water or hot water	Inlet	°C										
	Outlet	°C										
Current of water pump		A										
Note:												

12. APPLICABLE MODELS AND MAIN PARAMETERS

Table 12-1

Model		KEM-30 DNS3	KEM-60 DNS3	KEM-90 DNS3
Cooling capacity	kW	27	55	82
Heating capacity	kW	31	61	90
Standard cooling input	kW	10.8	22	36.8
Cooling rated current	A	16.7	33.9	60
Standard heating input	kW	10.5	20.3	32.8
Heating rated current	A	16.2	31.3	53.5
Power supply		380-415V 3N ~ 50		
Refrigerant	Type	R410A		
	Charging volume kg	10.5	17.0	27.0
Water pipe system	Water Folw volume (m^3/h)	5.0	9.8	15
	Hydraulic resistance lose kPa	80	50	75
	Water side heat exchanger	Plate heat exchanger		
	Max. pressure MPa	1.0		
	Min. pressure MPa	0.05		
	Inlet and outlet pip e diameter	DN40	DN50	
Air side heat exchanger	Type	Fin coil model		
	Air flow volume (m^3/h)	12500	24000	38000
Outline dimension N.W. of the unit	L (mm)	1870	2220	3220
	W (mm)	1000	1055	1095
	H (mm)	1175	1325	1513
Net Weight	kg	300	480	710
Operation Weight	kg	310	490	739
Packing dimension	L×W×H (mm)	1910×1035×1225	2250×1090×1370	3275×1130×1540

13. INFORMATION REQUIREMENTS

Table 13-1

Information requirements for comfort chillers								
Model(s)	**KEM-30 DNS3**							
Outdoor side heat exchanger	Air to water							
Indoor side heat exchanger	Water to air							
Type	Compressor driven vapour compression							
Driver of compressor:	Electric motor							
Item	Symbol	Value	Unit		Item	Symbol	Value	Unit
Rated cooling capacity	$Prate_{d,c}$	27.6	kW		Seasonal space cooling energy efficiency	$\eta_{s,c}$	160	%
Declared cooling capacity for part load at given outdoor temperature T_j					Declared energy efficiency ratio for part load at given outdoor temperature T_j			
T_j = + 35°C	P_{dc}	27.6	kW		T_j = + 35°C	EER_d	2.52	--
T_j = + 30°C	P_{dc}	22.0	kW		T_j = + 30°C	EER_d	3.64	--
T_j = + 25°C	P_{dc}	13.2	kW		T_j = + 25°C	EER_d	5.05	--
T_j = + 20°C	P_{dc}	8.1	kW		T_j = + 20°C	EER_d	6.40	--
Degradation co-efficient for chillers (*)	C_{dc}	0.9	--					
Power consumption in modes other than 'active mode'								
Off mode	P_{OFF}	0.08	kW		Crankcase heater mode	P_{CK}	0.08	kW
Thermostat-off mode	P_{TO}	0.21	kW		Standby mode	P_{SB}	0.08	kW
Other items								
Capacity control	variable				For air-to-water comfort chillers: air flow rate, outdoor measured	–	12500	m^3/h
Sound power level, indoors / outdoors	L_{WA}	-/78	dB		For water / brine-to-water chillers: Rated brine or water flow rate, outdoor side heat exchanger	–	-	m^3/h
Emissions of nitrogen oxides (if applicable)	NO_x (**)	--	mg/kWh input GCV					
GWP of the refrigerant	–	2088	kg $CO_{2\,eq}$ (100 years)					
Standard rating conditions used:	Low temperature application							
(*) If C_{dc} is not determined by measurement then the default degradation coefficient of chillers shall be 0,9. (**) From 26 September 2018.								

Table 13-2

Information requirements for comfort chillers								
Model(s):	**KEM-60 DNS3**							
Outdoor side heat exchanger of chiller:	Air to water							
Indoor side heat exchanger chiller:	Water to air							
Type:	Compressor driven vapour compression							
Driver of compressor:	Electric motor							
Item	Symbol	Value	Unit		Item	Symbol	Value	Unit
Rated cooling capacity	$Prate_{d,c}$	55.5	kW		Seasonal space cooling energy efficiency	$\eta_{s,c}$	154	%
Declared cooling capacity for part load at given outdoor temperature T_j					Declared energy efficiency ratio for part load at given outdoor temperature T_j			
T_j = + 35°C	P_{dc}	55.5	kW		T_j = + 35°C	EER_d	2.44	--
T_j = + 30°C	P_{dc}	41.8	kW		T_j = + 30°C	EER_d		--
T_j = + 25°C	P_{dc}	25.9	kW		T_j = + 25°C	EER_d	4.82	--
T_j = + 20°C	P_{dc}	11.9	kW		T_j = + 20°C	EER_d	4.82	--
Degradation co-efficient for chillers (*)	C_{dc}	0.9	--					
Power consumption in modes other than ‘active mode’								
Off mode	P_{OFF}	0.07	kW		Crankcase heater mode	P_{CK}	0.07	kW
Thermostat-off mode	P_{TO}	0.40	kW		Standby mode	P_{SB}	0.07	kW
Other items								
Capacity control	variable				For air-to-water comfort chillers: air flow rate, outdoor measured	–	24000	m^3/h
Sound power level, indoors / outdoors	LWA	-/87	dB		For water / brine-to-water rate, outdoor side heat exchanger	–	--	m^3/h
Emissions of nitrogen oxides (if applicable)	NO_x (**)	--	mg/kWh input GCV					
GWP of the refrigerant	–	2088	kg CO_2 eq (100 years)					
Standard rating conditions used:	Low temperature application							
(*) If C_{dc} is not determined by measurement then the default degradation coefficient of chillers shall be 0,9. (**) From 26 September 2018.								

Table 13-3

Information requirements for comfort chillers								
Model(s):	**KEM-90 DNS3**							
Outdoor side heat exchanger of chiller:	Air to water							
Indoor side heat exchanger chiller:	Water to air							
Type:	Compressor driven vapour compression							
Driver of compressor:	Electric motor							
Item	Symbol	Value	Unit		Item	Symbol	Value	Unit
Rated cooling capacity	$Prate_{d,c}$	82.0	kW		Seasonal space cooling energy efficiency	$\eta_{s,c}$	160	%
Declared cooling capacity for part load at given outdoor temperature T_j					Declared energy efficiency ratio for part load at given outdoor temperature T_j			
T_j = + 35°C	P_{dc}	82.0	kW		T_j = + 35°C	EER_d	2.27	--
T_j = + 30°C	P_{dc}	62.9	kW		T_j = + 30°C	EER_d	3.54	--
T_j = + 25°C	P_{dc}	41.4	kW		T_j = + 25°C	EER_d	4.40	--
T_j = + 20°C	P_{dc}	30.9	kW		T_j = + 20°C	EER_d	6.10	--
Degradation co-efficient for chillers (*)	C_{dc}	0.9	--					
Power consumption in modes other than 'active mode'								
Off mode	P_{OFF}	0.04	kW		Crankcase heater mode	P_{CK}	0.04	kW
Thermostat-off mode	P_{TO}	0.11	kW		Standby mode	P_{SB}	0.04	kW
Other items								
Capacity control	variable				For air-to-water comfort chillers: air flow rate, outdoor measured	–	38000	m^3/h
Sound power level, indoors / outdoors	LWA	-/89	dB		For water / brine-to-water chillers: Rated brine or water flow rate, outdoor side heat exchanger	–	--	m^3/h
Emissions of nitrogen oxides (if applicable)	NO_x (**)	--	mg/kWh input GCV					
GWP of the refrigerant	–	2088	kg CO_2 eq (100 years)					
Standard rating conditions used:	Low temperature application							
(*) If C_{dc} is not determined by measurement then the default degradation coefficient of chillers shall be 0,9. (**) From 26 September 2018.								

Table 13-4

Information requirements for heat pump space heaters and heat pump combination heaters								
Model(s):	KEM-30 DNS3							
Air-to-water heat pump:				[yes]				
Water-to-water heat pump:				[yes/no]				
Brine-to-water heat pump:				[yes/no]				
Low-temperature heat pump:				[yes/no]				
For low-temperature heat pumps, parameters shall be declared for low-temperature application. Otherwise, parameters shall be declared for medium-temperature application. Parameters shall be declared for average climate conditions.								
Item	Symbol	Value	Unit		Item	Symbol	Value	Unit
Rated heat output (3) at Tdesignh = -10 (-11)°C	Prated = Pdesignh	21	kW		Seasonal space heating energy efficiency	η_s	157	%
Seasonal coefficient of performance	SCOP	4.01	–		Active mode coef. of performance	$SCOP_{on}$	x.xx	–
					Net seasonal coef. of performance	$SCOP_{net}$		–
Tj = – 7°C	Pdh	19.2	kW		T_j = – 7°C	COPd	2.59	–
Tj = + 2°C	Pdh	10.9	kW		T_j = + 2°C	COPd	3.84	–
Tj = + 7°C	Pdh	7.2	kW		T_j = + 7°C	COPd	5.21	–
Tj = + 12°C	Pdh	8.7	kW		T_j = + 12°C	COPd	7.10	–
Tj = bivalent temperature	Pdh	22.2	kW		T_j = bivalent temperature	COPd	2.34	–
Tj = operation limit temperature	Pdh	22.2	kW		T_j = operation limit temperature	COPd	2.34	–
For air-to-water heat pumps: T_j = – 15°C (if TOL < – 20°C)	Pdh	x,x	kW		For air-to-water heat pumps: T_j = – 15°C (if TOL < – 20°C)	COPd	x,xx	–
Bivalent temperature (maximum +2°C)	Tbiv	-10	°C		For air-to-water HP: Operation limit temperature (maximum -7°C)	TOL	-10	°C
Cycling interval capacity for heating at T_j = -7°C	Pcych	x,x	kW		Heating water operating limit temperature	WTOL	x	°C
Degradation coefficient (4) at T_j = -7°C	Cdh	x,xx	—		Cycling interval efficiency at T_j= +7°C	COPcyc	x,xx	–
Cycling interval capacity for heating at T_j = +2°C	Pcych	x,x	kW		Cycling interval efficiency at T_j= +12°C	COPcyc	x,xx	–
Degradation coefficient (4) at T_j = +2°C	Cdh	x,xx	—		Cycling interval efficiency at T_j= +7°C	COPcyc	x,xx	–
Cycling interval capacity for heating at T_j = +7°C	Pcych	x,x	kW		Cycling interval efficiency at T_j= +12°C	COPcyc	x,xx	–
Degradation coefficient (4) at T_j = +7°C	Cdh	x,xx	—					
Cycling interval capacity for heating at T_j = +12°C	Pcych	x,x	kW					
Degradation coefficient (4) at T_j = +12°C	Cdh	x,xx	—					
Power consumption in modes other than active mode					Supplementary heater (to be declared even if not provided in the unit)			
Off mode	P_{OFF}	0.08	kW		Rated heat output (3)	Psup = sup(Tj)	x,x	kW
Thermostat-off mode	P_{TO}	0.21	kW		Type of energy input			
Standby mode	P_{SB}	0.08	kW					
Crankcase heater mode	P_{CK}	0.08	kW					
Other items					Outdoor heat exchanger			
Capacity control	fixed/variable	variable			For air-to-water HP: Rated air flow rate	$Q_{airsource}$	12500	m^3/h
Sound power level, indoors	L_{WA}	x	dB(A)		For water-to-water: Rated water flow rate	$Q_{watersource}$	x	m^3/h
Sound power level, outdoors	L_{WA}	78	dB(A)		For brine-to-water: Rated brine flow rate	$Q_{brinesource}$	x	m^3/h
Contact details	Name and address of the manufacturer or its authorised representative.							
(1) For heat pump space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(Tj). (2) If Cdh is not determined by measurement then the default degradation coefficient is Cdh = 0,9.								

Table 13-5

Information requirements for heat pump space heaters and heat pump combination heaters								
Model(s):	**KEM-60 DNS3**							
Air-to-water heat pump:				[yes]				
Water-to-water heat pump:				[yes/no]				
Brine-to-water heat pump:				[yes/no]				
Low-temperature heat pump:				[yes/no]				
Equipped with a supplementary heater:				[yes/no]				
Heat pump combination heater:				[yes/no]				
For low-temperature heat pumps, parameters shall be declared for low-temperature application. Otherwise, parameters shall be declared for medium-temperature application. Parameters shall be declared for average climate conditions.								
Item	Symbol	Value	Unit		Item	Symbol	Value	Unit
Rated heat output (3) at Tdesignh = -10 (-11)°C	Prated = Pdesignh	31	kW		Seasonal space heating energy efficiency	η_s	151	%
Seasonal coefficient of performance	SCOP	3.85	–		Active mode coef. of performance	$SCOP_{on}$	X.XX	–
					Net seasonal coef. of performance	$SCOP_{net}$	X.XX	–
T_j = – 7°C	Pdh	27.3	kW		T_j = – 7°C	COPd	2.70	–
T_j = + 2°C	Pdh	17.1	kW		T_j = + 2°C	COPd	3.69	–
T_j = + 7°C	Pdh	15.4	kW		T_j = + 7°C	COPd	5.04	–
T_j = + 12°C	Pdh	12.5	kW		T_j = + 12°C	COPd	6.43	–
T_j = bivalent temperature	Pdh	27.3	kW		T_j = bivalent temperature	COPd	2.70	–
T_j = operation limit temperature	Pdh	31.5	kW		T_j = operation limit temperature	COPd	2.50	–
For air-to-water heat pumps: T_j = – 15°C (if TOL < – 20°C)	Pdh	x,x	kW		For air-to-water heat pumps: T_j = – 15°C (if TOL < – 20°C)	COPd	x,xx	–
Bivalent temperature (maximum +2°C)	Tbiv	-7	°C		For air-to-water HP: Operation limit temperature (maximum -7°C)	TOL	-10	°C
Cycling interval capacity for heating at T_j = -7°C	Pcych	x,x	kW		Heating water operating limit temperature	WTOL	x	°C
Degradation coefficient (4) at T_j = -7°C	Cdh	x,xx	—		Cycling interval efficiency at Tj= +7°C	COPcyc	x,xx	–
Cycling interval capacity for heating at T_j = +2°C	Pcych	x,x	kW		Cycling interval efficiency at Tj= +12°C	COPcyc	x,xx	–
Degradation coefficient (4) at T_j = +2°C	Cdh	x,xx	—					
Cycling interval capacity for heating at T_j = +7°C	Pcych	x,x	kW		Cycling interval efficiency at Tj= +7°C	COPcyc	x,xx	–
Degradation coefficient (4) at T_j = +7°C	Cdh	x,xx	—		Cycling interval efficiency at Tj= +12°C	COPcyc	x,xx	–
Cycling interval capacity for heating at T_j = +12°C	Pcych	x,x	kW					
Degradation coefficient (4) at T_j = +12°C	Cdh	x,xx	—					
Power consumption in modes other than active mode					Supplementary heater (to be declared even if not provided in the unit)			
Off mode	P_{OFF}	0.08	kW		Rated heat output (3)	Psup = sup(Tj)	x,x	kW
Thermostat-off mode	P_{TO}	0.40	kW		Type of energy input			
Standby mode	P_{SB}	0.08	kW					
Crankcase heater mode	P_{CK}	0.08	kW					
Other items					Outdoor heat exchanger			
Capacity control	fixed/variable	variable			For air-to-water HP: Rated air flow rate	$Q_{airsource}$	24000	m^3/h
Sound power level, indoors	L_{WA}	x	dB(A)		For water-to-water: Rated water flow rate	$Q_{watersource}$	x	m^3/h
Sound power level, outdoors	L_{WA}	87	dB(A)		For brine-to-water: Rated brine flow rate	$Q_{brinesource}$	x	m^3/h
Contact details	Name and address of the manufacturer or its authorised representative.							
(1) For heat pump space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(Tj). (2) If Cdh is not determined by measurement then the default degradation coefficient is Cdh = 0,9.								

Table 13-6

Information requirements for heat pump space heaters and heat pump combination heaters							
Model(s):	**KEM-90 DNS3**						
Air-to-water heat pump:				[yes]			
Water-to-water heat pump:				[yes/no]			
Brine-to-water heat pump:				[yes/no]			
Low-temperature heat pump:				[yes/no]			
Equipped with a supplementary heater:				[yes/no]			
Heat pump combination heater:				[yes/no]			
For low-temperature heat pumps, parameters shall be declared for low-temperature application. Otherwise, parameters shall be declared for medium-temperature application. Parameters shall be declared for average climate conditions.							
Item	Symbol	Value	Unit		Item	Symbol	Value	Unit
Rated heat output (3) at Tdesignh = -10 (-11)°C	Prated = Pdesignh	66.3	kW		Seasonal space heating energy efficiency	η_s	157	%
Seasonal coefficient of performance	SCOP	3.99	–		Active mode coef. of performance	$SCOP_{on}$	X.XX	–
					Net seasonal coef. of performance	$SCOP_{net}$	X.XX	–
T_j = – 7°C	Pdh	58.7	kW		T_j = – 7°C	COPd	2.49	–
T_j = + 2°C	Pdh	35.9	kW		T_j = + 2°C	COPd	3.78	–
T_j = + 7°C	Pdh	28.2	kW		T_j = + 7°C	COPd	5.46	–
T_j = + 12°C	Pdh	33.0	kW		T_j = + 12°C	COPd	7.02	–
T_j = bivalent temperature	Pdh	58.7	kW		T_j = bivalent temperature	COPd	2.49	–
T_j = operation limit temperature	Pdh	65.2	kW		T_j = operation limit temperature	COPd	2.13	–
For air-to-water heat pumps: T_j = – 15°C (if TOL < – 20°C)	Pdh	x,x	kW		For air-to-water heat pumps: T_j = – 15°C (if TOL < – 20°C)	COPd	x,xx	–
Bivalent temperature (maximum +2°C)	Tbiv	-7	°C		For air-to-water HP: Operation limit temperature (maximum -7°C)	TOL	-10	°C
Cycling interval capacity for heating at T_j = -7°C	Pcych	x,x	kW		Heating water operating limit temperature	WTOL	x	°C
Degradation coefficient (4) at T_j = -7°C	Cdh	x,xx	—		Cycling interval efficiency at T_j= +7°C	COPcyc	x,xx	–
Cycling interval capacity for heating at T_j = +2°C	Pcych	x,x	kW		Cycling interval efficiency at T_j= +12°C	COPcyc	x,xx	–
Degradation coefficient (4) at T_j = +2°C	Cdh	x,xx	—					
Cycling interval capacity for heating at T_j = +7°C	Pcych	x,x	kW		Cycling interval efficiency at T_j= +7°C	COPcyc	x,xx	–
Degradation coefficient (4) at T_j = +7°C	Cdh	x,xx	—		Cycling interval efficiency at T_j= +12°C	COPcyc	x,xx	–
Cycling interval capacity for heating at T_j = +12°C	Pcych	x,x	kW					
Degradation coefficient (4) at T_j = +12°C	Cdh	x,xx	—					
Power consumption in modes other than active mode					Supplementary heater (to be declared even if not provided in the unit)			
Off mode	P_{OFF}	0.04	kW		Rated heat output (3)	Psup = sup (Tj)	x,x	kW
Thermostat-off mode(heating)	P_{TO}	0.11	kW		Type of energy input			
Standby mode	P_{SB}	0.04	kW					
Crankcase heater mode	P_{CK}	0.04	kW					
Other items					Outdoor heat exchanger			
Capacity control	fixed/variable	variable			For air-to-water HP: Rated air flow rate	$Q_{airsource}$	38000	m_3/h
Sound power level, indoors	L_{WA}	x	dB(A)		For water-to-water: Rated water flow rate	$Q_{watersource}$	x	m_3/h
Sound power level, outdoors	L_{WA}	89	dB(A)		For brine-to-water: Rated brine flow rate	$Q_{brinesource}$	x	m_3/h
Contact details	Name and address of the manufacturer or its authorised representative.							
(1) For heat pump space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(Tj). (2) If Cdh is not determined by measurement then the default degradation coefficient is Cdh = 0,9.								

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