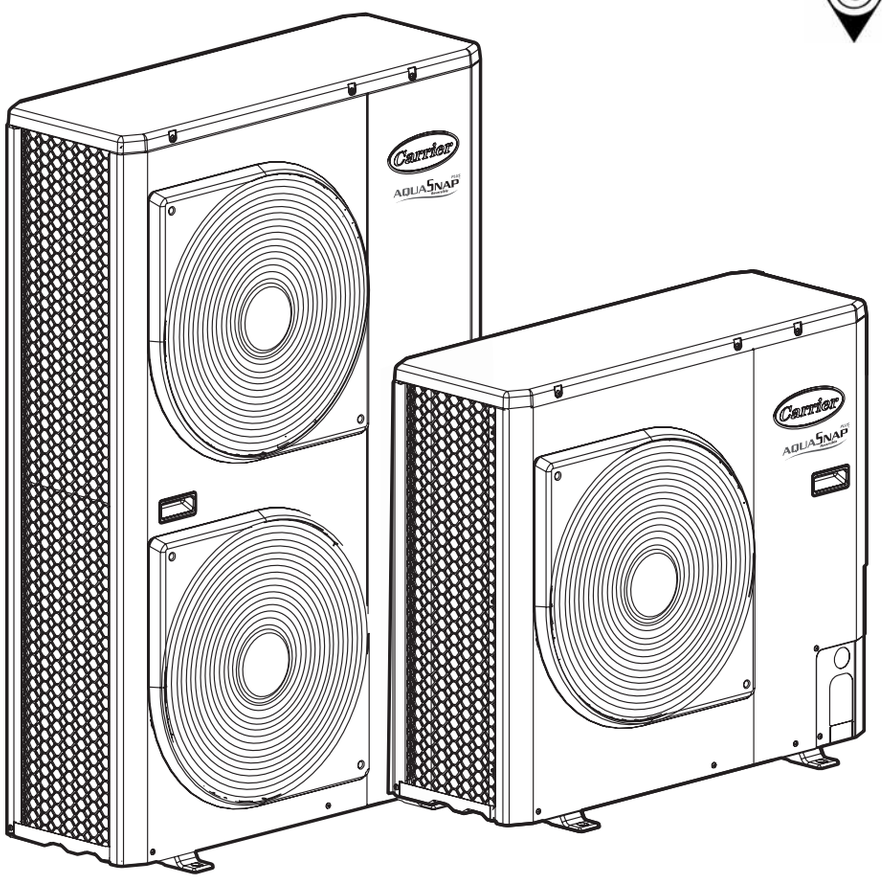
Carrier

Quality Management Systems

30AWH004HB/30AWH006HB/30AWH008HB/30AWH012HB/30AWH015HB

30AWH004XB/30AWH006XB/30AWH008XB/30AWH012XB/30AWH015XB

30AWH004NX/30AWH006NX/30AWH008NX/30AWH012NX/30AWH015NX



SERVICE MANUAL

Carrier Engineering Department of Italy

November, 2010

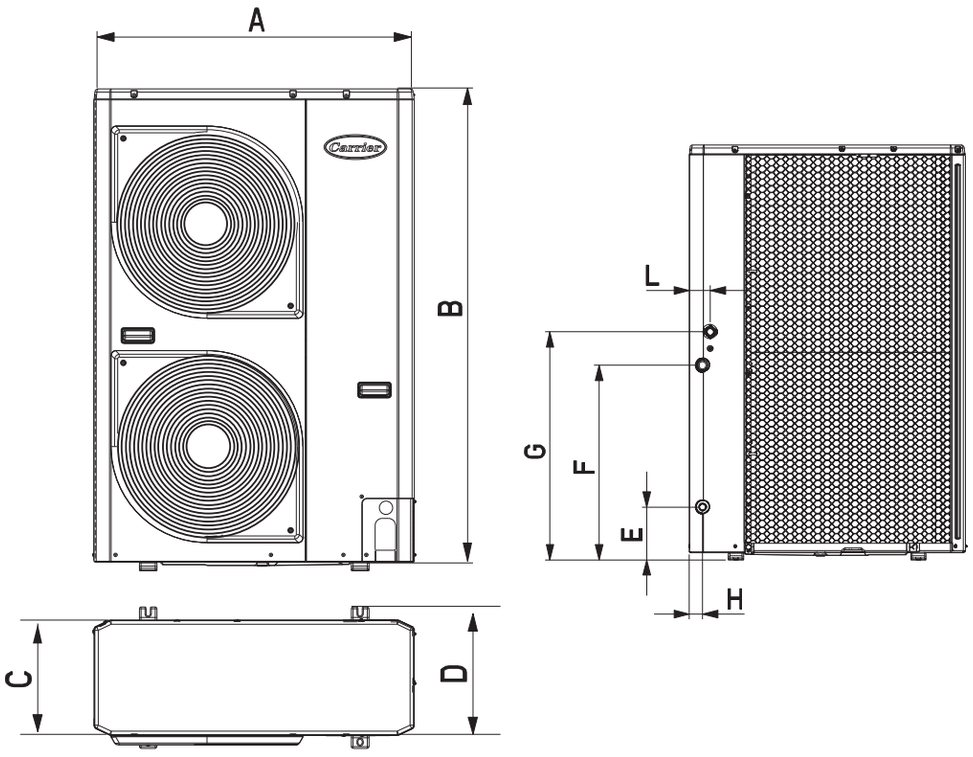
TABLE OF CONTENTS

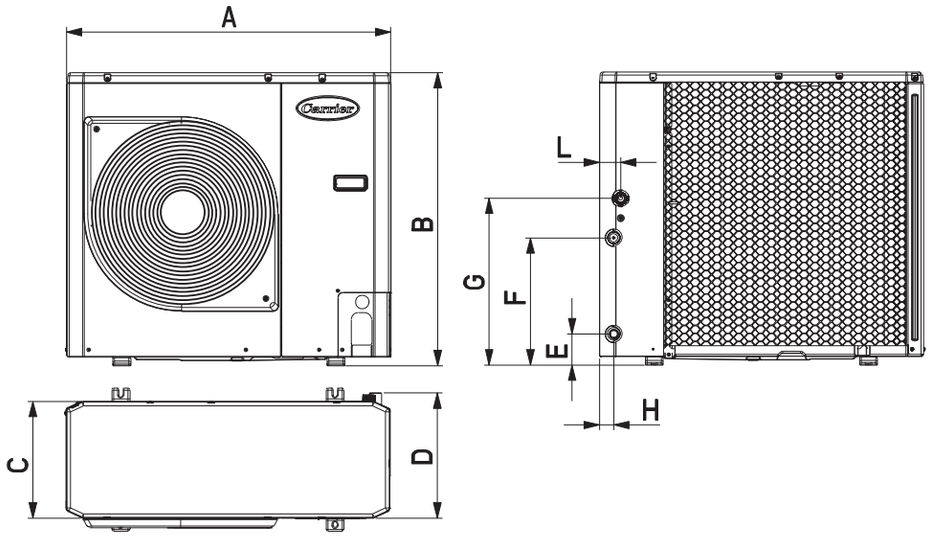
1.1 Unit specifications

MODEL NAME		30AWH004HB 30AWH004XB 30AWH004NX	30AWH006HB 30AWH006XB 30AWH006NX	30AWH008HB 30AWH008XB 30AWH008NX
TYPE		AIR/WATER INVERTER HEAT PUMP	AIR/WATER INVERTER HEAT PUMP	AIR/WATER INVERTER HEAT PUMP
ELECTRICAL (V-Ph-Hz)		230-1-50		
COMPRESSOR	TYPE	Hermetic compressor BLDC Single Rotary	Hermetic compressor BLDC Twin Rotary	Hermetic compressor BLDC Twin Rotary
	MAKER	TOSHIBA	TOSHIBA	TOSHIBA
	MODEL	DA89X1C-23FZ	DA111A1F-20F1	DA150A1F-20F
	Nominal Output kW	0,75	0,75	1,10
	POLE	4 poles	4 poles	4 poles
	CAPACITY Btu/h	2650 - 9042	3300 - 11260	4470 - 15252
	EER Btu/hW	13,3	13,5	13,2
REFRIGERANT CHARGED	kg	R410A – 1,195	R410A - 1,350	R410A - 1,810
LIQUID RECEIVER	Manufacturer	Frigomec		
	Volume (in l)	0,50	0,50	0,67
REFRIGERANT CONTROL PMV	Pulse Motor Valve Manufacturer	Pacific		Fujikoki
	Model	SEV16RC9	SEV16RC9	CAM-30YGTF
OUTDOOR COIL	W*H*D (mm)	925*777.6*12,7	910*777.6*25,4	890*777.6*38,1
	ROW-CIR	1*3	2*6	3*6
	FIN-TUBE/OD	7-LSW/7	7-LSW/7	7-LSW/7
	FIN PITCH (FPI)	1.41 (18)	1.41 (18)	1.41 (18)
FAN UNIT	FAN	1 Propeller fan	1 Propeller fan	1 Propeller fan
	MOTOR	S-23567FV-5	S-23567FV-5	S-23567FV-5
	RATING OUTPUT (W)	43		
	RATING VOLTAGE (V)	140		
	RATING ROTATION SPEED (l/min)	1000	1000	1000
	Rotation speed (rpm)	200 - 600	200 - 600	200 - 680
	Max Flow (m^3/h)	2520	2464	2465
SYST.RUNNING CURRENT	max (A)	7,2	11	14
SYST.POWER INPUT	max (kW)	2	2.3	2.7
INSTALLATION FUSE	type	10 A Type B	15 A Type B	15 A Type B
OUTER DIMENSION	HEIGHT (mm)	821		
	WIDTH (mm)	908		
	LENGTH (mm)	326		
TOTAL WEIGHT kg	Unit without hydronic module	60	58	68
	Unit with hydronic module	63	61	71
PIPING	BPHE INLET PIPE ASSY	Ø 22 mm, th.1mm		
	PUMP INLET PIPE ASSY	Ø 22 mm, th.1mm		
	Refrigernat BPHE	Ø 12.7 mm (1/2 ") th 0.89 Ø 6.35 mm (1/4 ") th 0.71	Ø 12.7 mm (1/2 ") th 0.89 Ø 6.35 mm (1/4 ") th 0.71	Ø 12.7 mm (1/2 ") th 0.89 Ø 6.35 mm (1/4 ") th 0.71
	Refrigerant	Ø 6.35 mm (1/4 ") th 0.71 Ø 7.94 mm th 0.71	Ø 6.35 mm (1/4 ") th 0.71 Ø 7.94 mm th 0.71	Ø 6.35 mm (1/4 ") th 0.71 Ø 7.94 mm th 0.71
BPHE	MAKER	ALFA LAVAL	ALFA LAVAL	ALFA LAVAL
	MODEL	ACH30-26H	ACH30-36H	ACH30-48H
	NUMBER OF PLATES	26	36	48
	Design Pressure (bar)	45	45	45
	Test Pressure (bar)	69	69	69
PUMP	Manufacturer	Salmson		
	Model	NYL 63-15		
	SETTINGS	3 speed (manual setting)		
HYDRONIC CIRCUIT	NET WATER VOLUME	H 1	H 1	H 1.2
		X 0.8	X 0.8	X 1.0
	EXPANSION TANK VOLUME	H 2	H 2	H 2
		X N.A.	X N.A.	X N.A.
	MAXIMUM WATER SIDE OPERATING PRESSURE (kPa)	300		
	WATER PRESSURE DROP, X VERSION (CHF) (kPa)	16	9.5	14.5
	AVAILABLE STATIC PRESSURE, H VERSION (AC) (kPa)	47	43	40
INSTALLATION CABLES	POWER SUPPLY	H07 RN-F 3x2.5mm2		
	NUI CONNECTIONS	H03 VV-F 4x0.75mm2		
	SUI CONNECTIONS	H03 VV-F 6x0.75mm2		
SOUND POWER LEVEL	{Lw dB(A)} Cool-Heat	64.0 - 62.0	64.0 - 62.0	65.0 - 64.0

MODEL NAME		30AWH012HB 30AWH012XB 30AWH012NX	30AWH015HB 30AWH015XB 30AWH015NX
TYPE		AIR/WATER INVERTER HEAT PUMP	AIR/WATER INVERTER HEAT PUMP
ELECTRICAL (V-Ph-Hz)		230-1-50	230-1-50
COMPRESSOR	TYPE	Hermetic compressor BLDC Twin Rotary	Hermetic compressor BLDC Twin Rotary
	MAKER	TOSHIBA	TOSHIBA
	MODEL	DA420A3F-21M	DA422A3F-26M
	Nominal Output kW	3.75	3.75
	POLE	8 poles	4 poles
	CAPACITY W - Btu/h	13100 - 44697	13100 - 44697
	EER Btu/hW	12.8	13.1
REFRIGERANT CHARGED	kg	R410A - 2.450	R410A - 3.385
LIQUID RECEIVER	Manufacturer	Frigomec	
	Volume (in l)	0,88	0,88
REFRIGERANT CONTROL PMV	Pulse Motor Valve Manufacturer	Saginomiya Seisakusho Inc	Saginomiya Seisakusho Inc
	Model	UKV-25D	UKV-25D100
OUTDOOR COIL	W*H*D (mm)	910*1296*25.4	890*1321*38.1
	ROW-CIR	2*8	2*(6+1)
	FIN-TUBE/OD	7-LSW/7	13-LSW/9,52
	FIN PITCH (FPI)	1.41 (18)	1.69 (15)
FAN UNIT	FAN	2 Propeller fans	2 Propeller fans
	MOTOR	S-28567FV-6	ICF-280-A100
	RATING OUTPUT (W)	63	97
	RATING VOLTAGE (V)	140	280
	RATING ROTATION SPEED (l/min)	805	1050
	Rotation speed (rpm)	250 - 730	200 – 820
	Max Flow (m^3/h)	6358	6120
SYST.RUNNING CURRENT	max (A)	23	20
SYST.POWER INPUT	max (kW)	5.1	5.1
INSTALLATION FUSE	type	25 A Type D	25 A Type D
OUTER DIMENSION	HEIGHT (mm)	1363	
	WIDTH (mm)	908	
	LENGTH (mm)	326	
TOTAL WEIGHT kg	Unit without hydronic module	99	124
	Unit with hydronic module	105	130
PIPING	BPHE INLET PIPE ASSY	Ø 22 mm, th.1mm	
	PUMP INLET PIPE ASSY	Ø 22 mm, th.1mm	
	Refrigernat BPHE	Ø 12.7 mm (1/2 ") th0.89mm Ø 9.52 mm (3/8 ") th 0.71mm	Ø 12.7 mm (1/2 ") th 0.89mm Ø 9.52 mm (3/8 ") th 0.71mm
	Refrigerant	Ø 7.94 mm th 0.71 Ø 9.52 (3/8 ") th 0.89	Ø 7.94 mm th 0.71 Ø 9.52 (3/8 ") th 0.89
BPHE	MAKER	ALFA LAVAL	ALFA LAVAL
	MODEL	ACH-70X-36H	ACH-70X-36H
	NUMBER OF PLATES	36	36
	Design Pressure (bar)	45	45
	Test Pressure (bar)	69	69
PUMP	Manufacturer	Salmson	
	Model	SXM 25-60	
	SETTINGS	3 speed (manual setting)	
	NET WATER VOLUME	H 2.5 / H 2.5	
		X 2.3 / X 2.3	
	EXPANSION TANK VOLUME	H 3 / H 3	
		X N.A. / X N.A.	
	MAXIMUM WATER SIDE OPERATING PRESSURE (kPa)	300	
	WATER PRESSURE DROP, X VERSION (CHF) (kPa)	26.0	33.0
	AVAILABLE STATIC PRESSURE, H VERSION (AC) (kPa)	45	30
INSTALLATION CABLES	POWER SUPPLY	H07 RN-F 3x2.5mm2	
	NUI CONNECTIONS	H03 VV-F 4x0.75mm2	
	SUI CONNECTIONS	H03 VV-F 6x0.75mm2	
SOUND POWER LEVEL	{Lw dB(A)} Cool-Heat	68.0 - 67.0	69.0 – 68.0

1.2 Dimensions





30AWH	A	B	C	D	E	F	G	H	L
004	908	821	326	350	87	356	466	40	60
006	908	821	326	350	87	356	466	40	60
008	908	821	326	350	87	356	466	40	60
012	908	1363	326	350	174	640	750	44	69
015	908	1363	326	350	174	640	750	44	69

Precautions for safety

Ensure that all Local, National and International regulations are satisfied.
• Read this "PRECAUTIONS FOR SAFETY" carefully before Installation.
• The precautions described below include the important items regarding safety. Observe them without fail.
• After the installation work, perform a trial operation to check for any problem. Follow the Owner's Manual to explain how to use and maintain the unit to the customer.
• Turn off the main power supply switch (or breaker) before the unit maintenance.
• Ask the customer to keep the Installation Manual together with the Owner's Manual.

Explanation of illustrated marks

		
Indicates prohibited items.	Indicates mandatory items.	Indicates cautions (including danger/warnings).

Explanation of indications

DANGER	WARNING	CAUTION
Indicates contents will cause death or serious injury if used incorrectly.	Indicates contents could cause death or serious injury if used incorrectly.	Indicates contents could cause an injury or damage to property, furniture or pets if the instructions are not followed carefully.

General notes

• Please ensure this is read thoroughly and kept for future reference.
• Before any repairs or maintenance is carried out an assessment of the potential risks must be undertaken, and appropriate measures taken to ensure the safety of all personnel.
• Do not attempt to repair, move, modify or re-install the unit on your own.

LIABILITY

The manufacturer declines any liability and invalidate the unit warranty for damage resulting from:
• Improper installation; including failure to follow instructions in the manuals.
• Modifications or errors in the electrical or refrigerant or water connections.
• Unapproved units coupling; including other manufacturers units.
• Use of the unit under condition other than those indicated.

All of the packaging materials used for your new appliance are compatible with the environment and can be recycled.

Units handling

	Ensure adequate personal protective equipment is used.
	Inspect equipment for damage due to improper transportation or handling: file an immediate claim with the shipping company.
	Dispose of the packaging material in accordance with local requirements.
	When lifting the unit, absolutely do not use hooks inserted in the side handles, use special equipment (e.g. lifting devices, trolleys, etc.).
	Do not step or put anything on the unit. It may cause an injury or damage the unit.
	Do not place containers filled with liquids or other objects onto the unit.

This appliance must not be used by persons (and children) with reduced physical, emotional or mental faculties or by persons with no experience or knowledge if they are not under the control of a person responsible for their safety, or if not instructed to the use of this appliance. Make sure that children do not play with the appliance.

2.1 General precautions for safety

- Ask an authorized dealer or qualified installation professional to install/ maintain the heat pump. Inappropriate installation may result in water leakage, electric shock or fire.
- Turn off the main power supply switch or breaker before attempting any electrical work. Make sure all power switches are off. Failure to do so may cause electric shock.
- When moving the heat pump for installation into another place, be very careful not to enter any gaseous matter other than the specified refrigerant into the refrigeration cycle.
- If air or any other gas is mixed in the refrigerant, the gas pressure in the refrigeration cycle becomes abnormally high and it may cause pipe burst and injuries on persons.
- Do not modify this unit by removing any of the safety guards or by by-passing any of the safety interlock switches.
- After unpacking the unit, examine it carefully for possible damage.
- Do not install in a place that might increase the vibration of the unit.
- To avoid personal injury (with sharp edges), be careful when handling parts.
- Perform installation work properly according to the Installation Manual. Inappropriate installation may result in water leakage, electric shock or fire.
- When the heat pump is installed in a small room, provide appropriate measures to ensure that the concentration of refrigerant leakage occurred in the room does not exceed the critical level.
- Install the heat pump securely in a location where the base can sustain the weight adequately.
- If the heat pump is not installed correctly, accidents may occur due to the falling unit.
- If refrigerant gas has leaked during the installation work, ventilate the room immediately. If the leaked refrigerant gas comes in contact with fire, noxious gas may generate.
- After the installation work, confirm that refrigerant gas does not leak. If refrigerant gas leaks into the room and flows near a fire source, such as a cooking range, noxious gas might generate.
- Electrical work must be performed by a qualified electrician in accordance with the Installation Manual.
- Use the specified cables for wiring and connect them firmly to the terminals.
- To prevent external forces applied to the terminals from affecting the terminals:
  - Be sure to provide grounding. Do not connect ground wires to gas pipes, water pipes, lightning rods or ground wires for telephone cables.
  - Do not install the heat pump in a location subject to a risk of exposure to a combustible gas.

2.2 R-410A

This heat pump adopts the new HFC refrigerant (R410A) which does not destroy ozone layer.

- R-410A refrigerant operates at 50%-70% higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with R-410A.
- R-410A refrigerant cylinders have a dip tube which allows liquid to flow out with the cylinder in a vertical position with the valve at the top.
- R-410A systems should be charged with liquid refrigerant. Use a commercial type metering device in the manifold hose in order to vaporize the liquid refrigerant before it enters in the unit.
- As for other HFC, R-410A refrigerant is only compatible with oils recommended by the compressor manufacturer.
- A vacuum pump is not enough to remove moisture from oil.
- Oils absorb moisture rapidly. Do not expose oil to atmosphere.
- Never open system to atmosphere while it is under vacuum.
- When the system must be opened for service, break vacuum with dry nitrogen.
- Do not vent R-410A into the atmosphere.

2.3 Electrical connections

All electrical connections are the responsibility of the installer.

⚠ DANGER

Electrical shock can cause severe personal injury or death. These operations are carried out by qualified personnel only.

⚠ WARNING

- This unit complies with Machinery Directive (2006/42/EC), electromagnetic compatibility (2004/108/EC) and pressure equipment (EEC/97/23) Directives.
- To avoid electric shock or fire make sure these operations are carried out by qualified personnel only.
- Ensure that national safety code requirements have been followed for the main supply circuit.
- Follow all current national safety code requirements.
- Ensure that a properly sized and connected ground wire is in place.
- Check that voltage and frequency of the mains power supply are those required; the available power must be adequate to operate any other possible appliances connected to the same line.
- Check that the impedance of the mains power supply is in conformance with the unit power input indicated in the rating plate of the unit.
- Make sure that properly sized disconnecting and safety switches are installed closed to the unit
- The disconnection devices from the mains supply must allow full disconnection under the conditions provided for by overvoltage class III.

⚠ CAUTION

- Connect the connecting cable correctly. If the connecting cable is connected in a wrong way, electric parts may be damaged.
- Connection to the mains supply is of the Y type; therefore, the cable must only be replaced by the technical support in order to prevent any risk.
- Use the specified cables for wiring and connect them firmly to the terminals.

⚠ WARNING

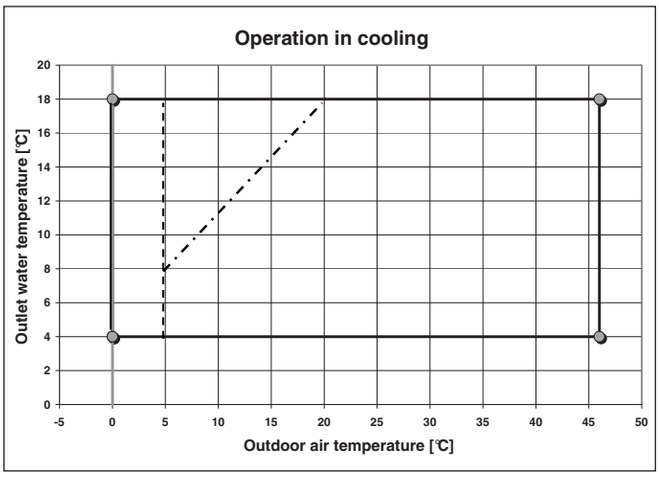
- Be sure to provide grounding; inappropriate grounding may cause electric shock.
- Do not connect ground wires to gas pipes, water pipes, lightning rods or ground wires for telephone cables.

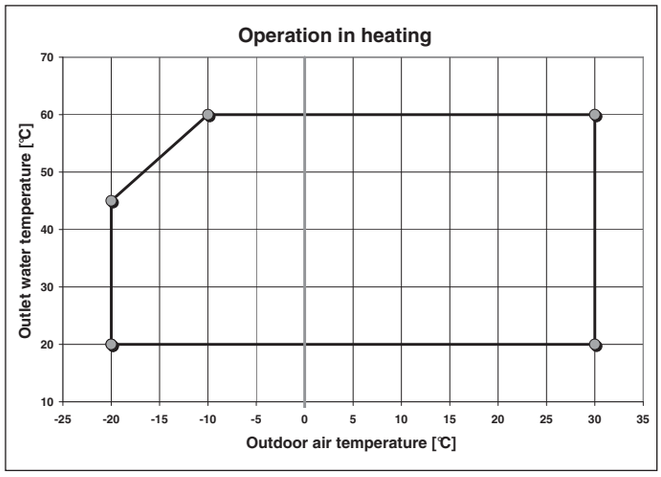
⚠ DANGER:

Do not modify this unit by removing any of the safety guards or by by-passing any of the safety interlock switches.

Contact the qualified service if one of the following events takes place:
- hot or damaged power supply cable;
- unusual noise during operation;
- frequent operation of the protection devices;
- unusual smell (such as smell of burning).

2.4 Operating limits





NOTE: *For the 30AWH 004_ and 30AWH006_ units use a minimum External Air Temperature of +5 °C. (- -30AWH006_ ,-·-30AWH004_)*

MODEL NAME	30AWH004HB 30AWH004XB 30AWH004NX	30AWH006HB 30AWH006XB 30AWH006NX	30AWH008HB 30AWH008XB 30AWH008NX	30AWH012HB 30AWH012XB 30AWH012NX	30AWH015HB 30AWH015XB 30AWH015NX
Operating voltage limits	230 - 50	230 – 50	230 - 50	230 - 50	230 - 50
	207 - 253	207 - 253	207 - 253	207 - 253	207 - 253

INSTALLATION

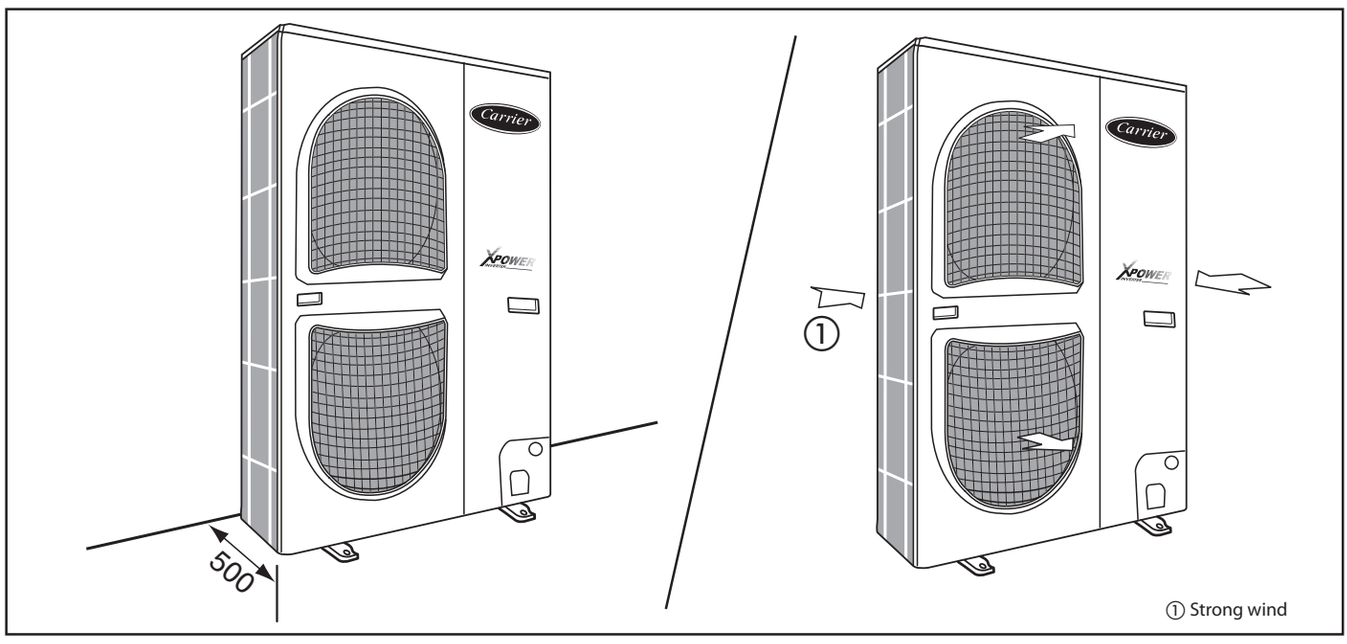
- SITING THE UNIT
- WATWER CONNECTIONS
- ELECTRICAL CONNECTIONS
- CONTROL WIRING (OPTIONAL)
- POWER WIRING
- FILLING THE SYSTEM FLUSHING WATWER AN AIR
- CHEECKING FOR WATWER LEAKS
- CONFIGURING AND CHECKING THE SYSTEM

Installation location

- A location which provides a sufficient space around the unit.
- A location where the operation noise and discharged air are not disruptive to your neighbours.
- A location that is not exposed to a strong wind.
- A location that does not block a passage.
- When the unit is installed in an elevated position, be sure to secure its feet.
- There must be sufficient space for carrying in the unit.
- A location where the drain water does not cause a problem.
- If the unit is installed in an area where heavy snowfalls may occur, must be raised at least 200 mm above the usual snow level.
- The support must be suitable for the unit weight.

CAUTION:
- Install the unit in a location where the discharge air is not blocked.
- When an unit is installed in a location that is exposed to a strong wind like a coast or on a high storey of a building, ensure normal fan operation by using a duct or a wind shield.
- When installing the unit in a location that is constantly exposed to a strong wind such as the upper stairs or rooftop of a building, apply windproof measures referring to the following:

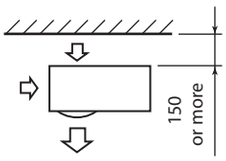
Examples:
- Install the unit so that the discharge port of the heat pump is set at right angle to any seasonal wind direction.
- Supposing the wind direction during the operation season of the heat pump, install the unit so that the discharge port is set at right angle to the wind direction.
- Installation in the following places may result in product faults. Do not install the unit in such places below.
- A location full of machine oil.
- A location full of sulphuric gas.
- A location where high-frequency radio waves are likely to be generated as from audio equipment, welders, and medical equipment.



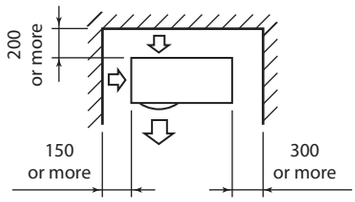
Minimum clearances

Obstacle at rear side
Upper side is free

Single unit installation

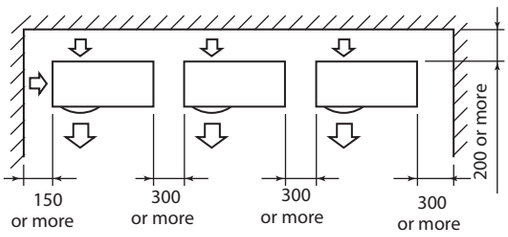


Obstacles at both right and left sides.



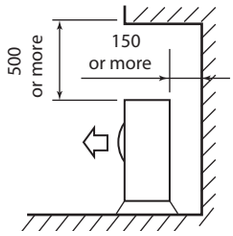
• The height of the obstacle should be lower than the height of the outdoor unit.

Serial installation of two or more units



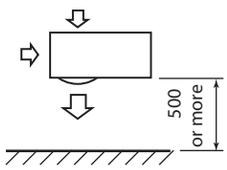
• The height of the obstacle should be lower than the height of the outdoor unit.

Obstacle at rear side
Obstacle also at the upper side

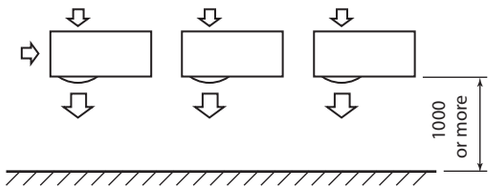


Obstacle at front side
Upper side is free

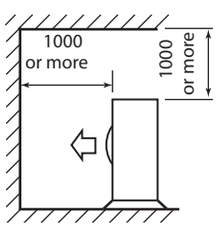
Single unit installation



Obstacles at both right and left sides.



Obstacle at front side
Obstacle also at the upper side

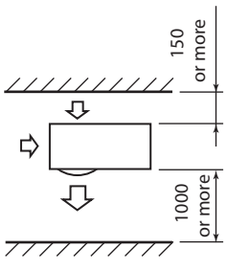


Minimum clearances

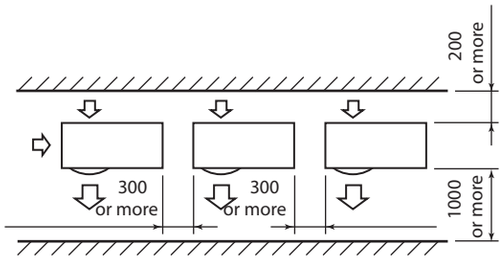
Obstacles at both front and rear sides
Standard installation

Open the upper side and both right and left sides.
The height of obstacle at both front and rear side, should be lower than the height of the outdoor unit.

Single unit installation

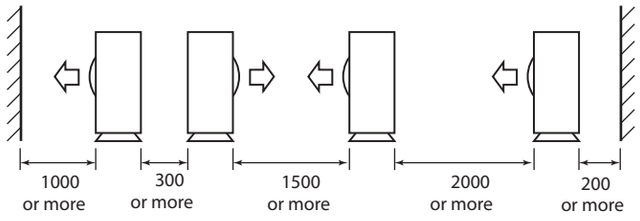


Serial installation of two or more units

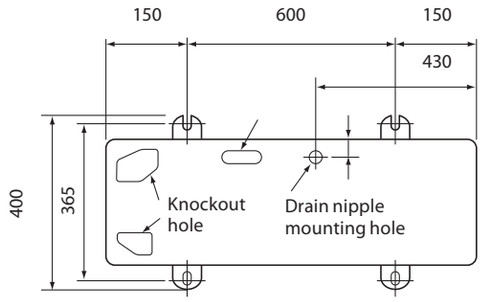


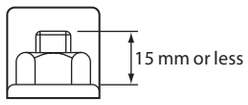
Serial installation at front and rear sides
Standard installation

Open the upper side and both right and left sides.
The height of obstacle at both front and rear side, should be lower than the height of the outdoor unit.



3.2 Preliminary operations





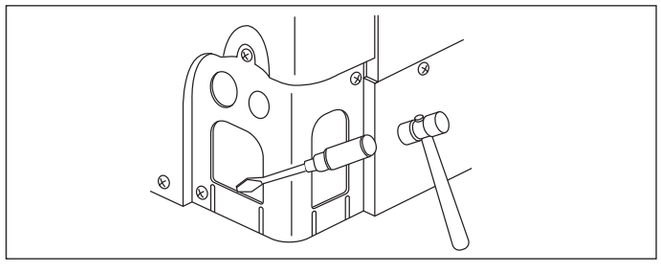
- Set the out margin of the anchor bolt to 15mm or less.

Before installation, check strength and horizontality of the base so that abnormal sound does not generate.
According to the dimensions and clearances, fix the base firmly with the anchor bolts (Anchor bolt, nut: M10 x 2 pairs).

If the unit is installed in a very windy place, protect the fan with a wind protection screen and check that it works correctly.

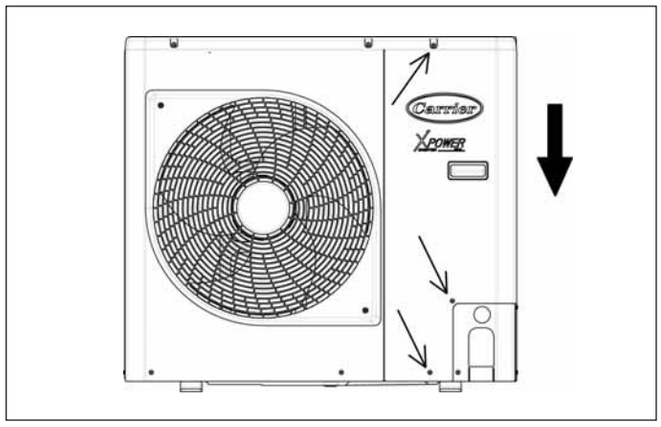
3.2.1 Opening cable knockouts

There is a pre-cut part that can be removed for running wires.
Do not remove the unit front panel for easier drilling of the knockouts.
The pre-cut section of the sheet can be removed by punching the 3 connection points along the line first using a screwdriver and finally with your hands. When the cable knockout is open, remove the burrs and fit the cable protective bush supplied with the unit for cable protection.



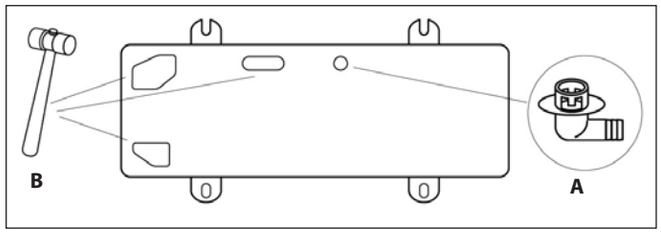
3.2.1 How to remove the front panel

1. Remove screws of the front panel.
2. Pull the front panel downward with the handle.



3.2.1 Drain hose and base pan knockouts

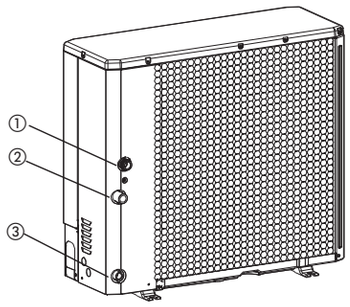
In case of draining through the drain hose, attach the drain nipple (**A**) and use the drain hose (Inner diam.: 16 mm) sold on the market. When there is a possibility of freezing of drain at the cold district or a snowfall area, be careful for drainage ability of drain.
The drainage ability increases when knockout holes on the base pan are opened. (Open the knockout hole to outside using a hammer (**B**), etc.).

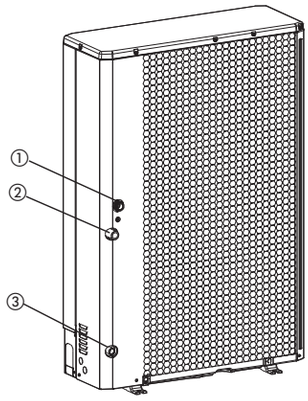


3.3 Water connections

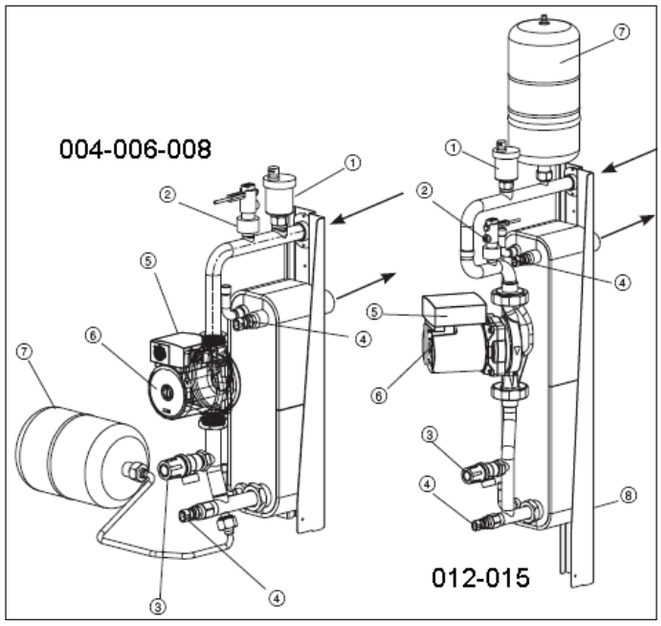
3.3.1 Hydronic module

The 30AWH__H units are equipped with an integrated hydronic module that allows fast installation with the aid of a few external components. The 30AWH__X and 30AWH__NX units, on the other hand, do not have a circulation pump and expansion vessel. For this reason, they must be provided outside. In any case, all the necessary protections and valves are to be inserted in the water circuit inside the unit. Refer to the figure below for the exact connection of the water pipes.



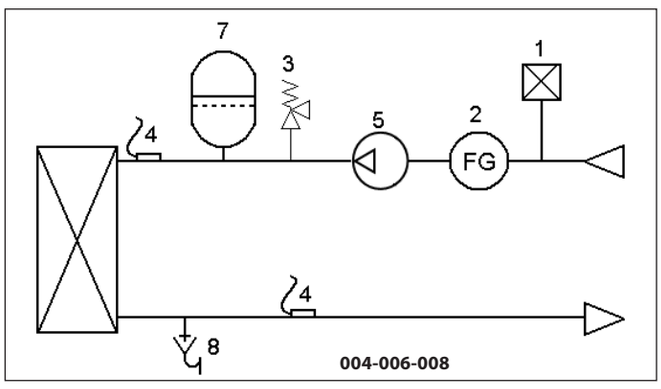


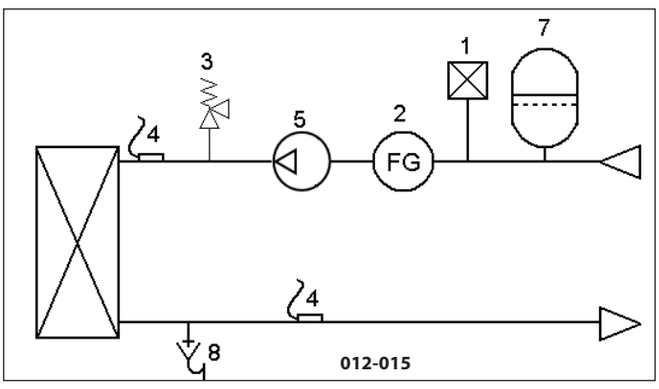
① Entering water (1" GAS – M)
② Leaving water (1" GAS – M)
③ Drain water (1/2 " GAS – F)



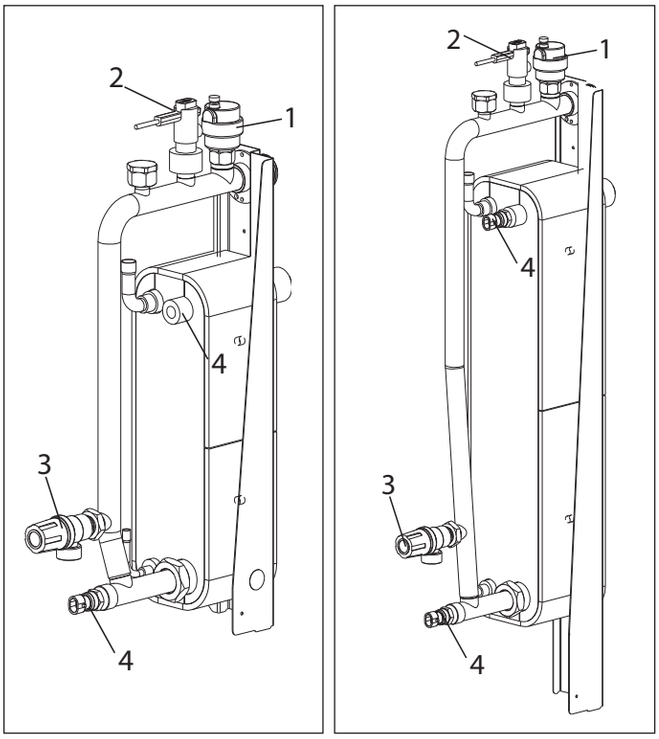
① automatic purge valve
② flow switch
③ safety valve (outlet 1/2')
④ temperature probe
⑤ circulation pump
⑥ plug to unblock the seizing pump
⑦ expansion vessel
⑧ water drain

		Unit	30 AWH				
			004	006	008	012	015
Nominal water flow	Std	l/s	0,20	0,28	0,33	0,58	0,69
Water loop content for 30AWH_H units	Min	l	14	21	28	42	49
	Max	l	65	65	65	95	95
Max water loop pressure	Max	kPa	300	300	300	300	300
Filling water pressure	Min	kPa	120	120	120	120	120
Max elevation 30AW upper	Max	m	20	20	20	20	20





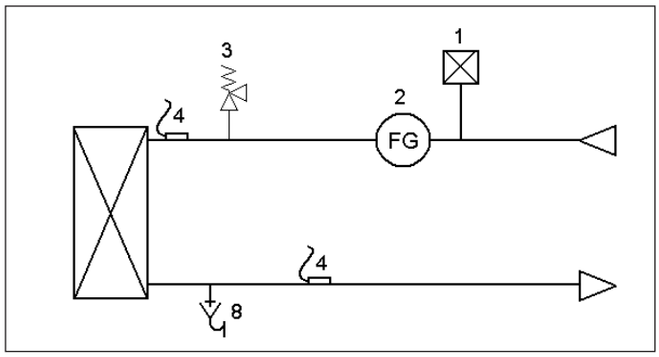
30AWH__X , 30AWH__NX integrated water circuit



1. automatic purge valve
2. flow switch
3. safety valve (outlet 1/2')
4. temperature probe

		Unit	30 AWH				
			004	006	008	012	015
Nominal water flow	Std	l/s	0,20	0,28	0,33	0,58	0,69
Water loop content for 30AWH__X, 30AWH__NX	Min	l	14	21	28	42	49
	Max	l	According to expansion vessel installed				
Max water loop pressure	Max	kPa	300	300	300	300	300
Filling water pressure	Min	kPa	120	120	120	120	120
Max elevation 30AW upper	Max	m	20	20	20	20	20

Note: The correct dimensioning of the expansion vessel is left to the installer as a function of the type of plant.
The discharge of the safety valve can be channelled to the outside of the machine using the pre-cut holes. In this case, it is necessary to provide a open drain funnel.



3.3.2 Water connections

Make the plate heat exchanger hydraulic connections with the necessary components, using material which will guarantee that the screwed joints are leakproof.
The typical hydraulic circuit diagrams (par. 3.3.3) show a typical water circuit installation.
For an application with a water circuit, the following recommendations must be taken into account:

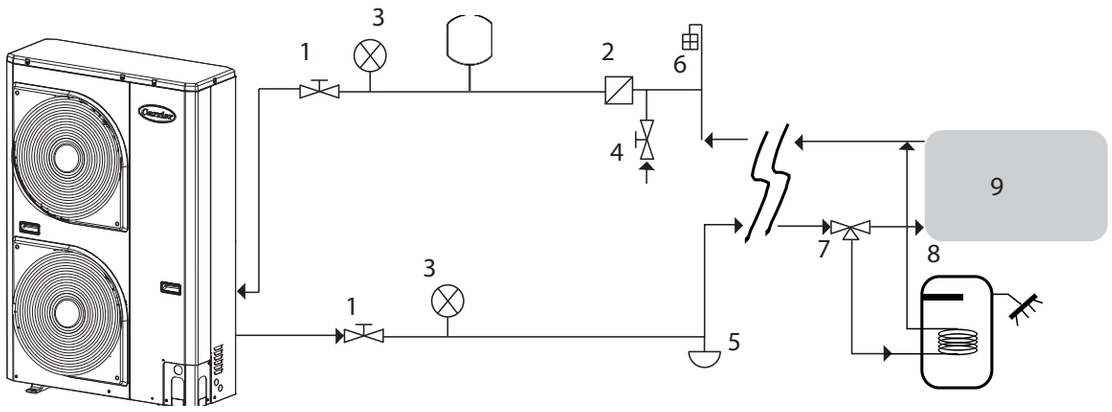
1. The pump must be fitted immediately before of the heat exchanger and after the connection to the system return (unit without hydronic module).
2. It is advisable to install shut-off valves to allow isolation of the most important circuit components, as well as the heat exchanger itself. These valves (ball, globe or butterfly valves) should produce a minimum loss of charge when they are open.
3. Provide unit and system drains and vents at the lowest system point.
4. Install purges in the higher sections of the installation.
5. Pressure ports and pressure gauges should be installed upstream and downstream of the water pump.
6. All piping must be adequately insulated and supported.

ATTENTION:

1. The presence of particles in the water can lead to obstructions in the heat exchanger. It is therefore necessary to protect the heat exchanger inlet with an extractable mesh filter. The filter mesh gauge must be at least 10 mesh/cm^2.
2. After assembling the system, or repairing the circuit, the whole system must be thoroughly cleaned with special attention paid to the state of the filters.
3. Pump flow rate control is made through a flow control valve, which must be installed on the delivery pipe during installation.
4. When water has to reach temperatures below 5°C, or the equipment is installed in areas subject to temperatures below 0°C, it is necessary to mix water with inhibited ethylene glycol in suitable quantity.

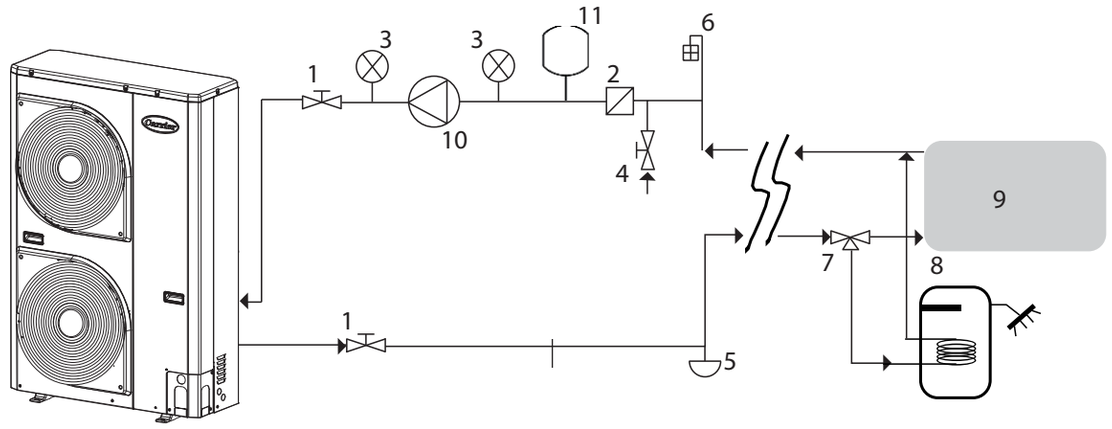
3.3.3 Typical hydraulic circuit diagrams

Hydraulic circuit diagrams for 30AWH___H



1. shut-off valves
2. line filter for water (10 mesh/cm^2)
3. pressure gauges
4. filling valve
5. system drain valve (at the lowest points of the circuit)
6. air flushing valve (in the highest parts of the circuit)
7. 3-way valve
8. sanitary water accumulation tank
9. inside system

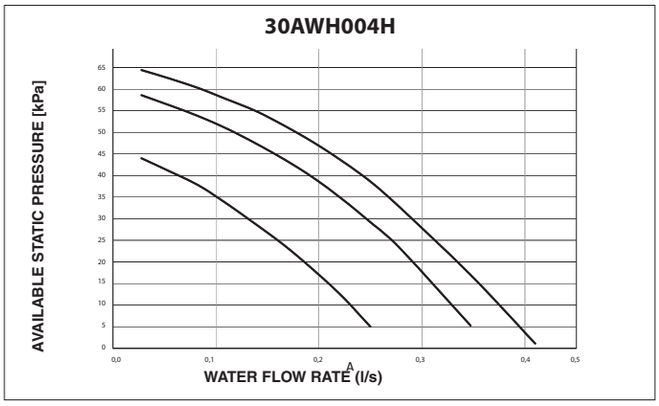
Hydraulic circuit diagrams for 30AWH___X and 30AWH___NX

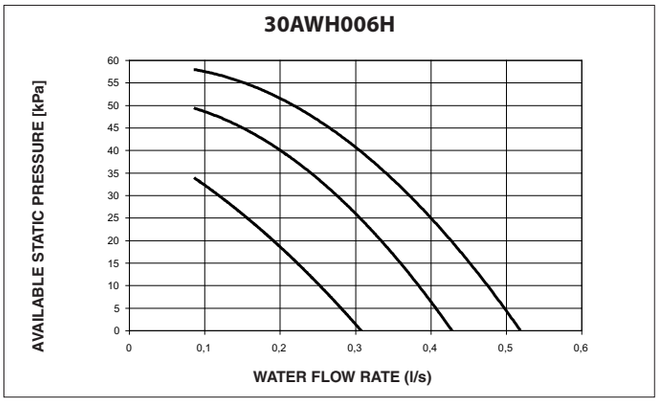


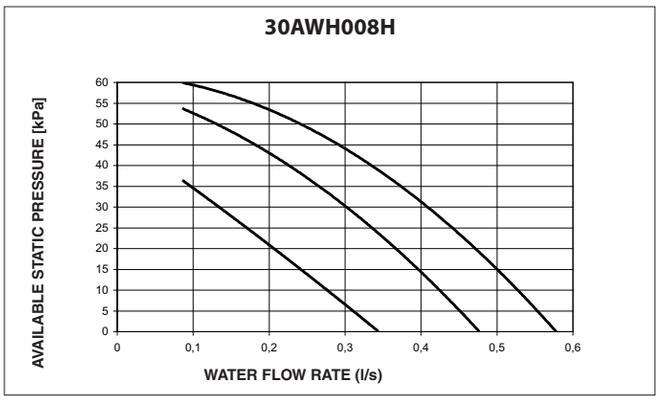
1. shut-off valves
2. line filter for water (10 mesh/cm^2)
3. pressure gauges
4. filling valve
5. system drain valve (at the lowest points of the circuit)
6. air flushing valve (in the highest parts of the circuit)
7. 3-way valve
8. sanitary water accumulation tank
9. inside system
10. water circulation pump
11. expansion vessel

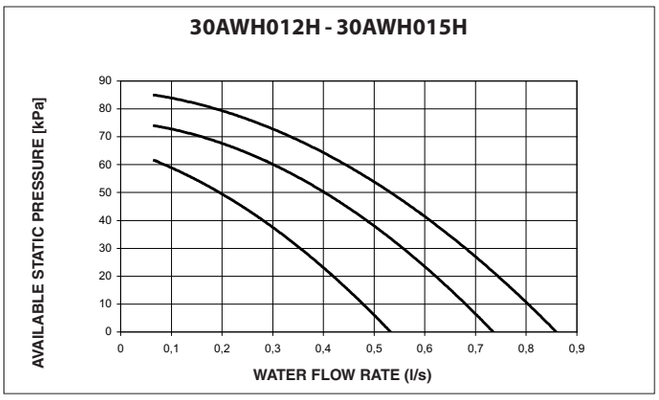
TO PREVENT THE WATER CIRCUIT FREEZING DURING DEFROST OPERATION OR CONTINUOUS COMPRESSOR FREQUENCY MODULATIONS, BE SURE OF THE MINIMUM RECOMMENDED VOLUME IN THE WATER LOOP

3.3.4 Available static pressure (H version)

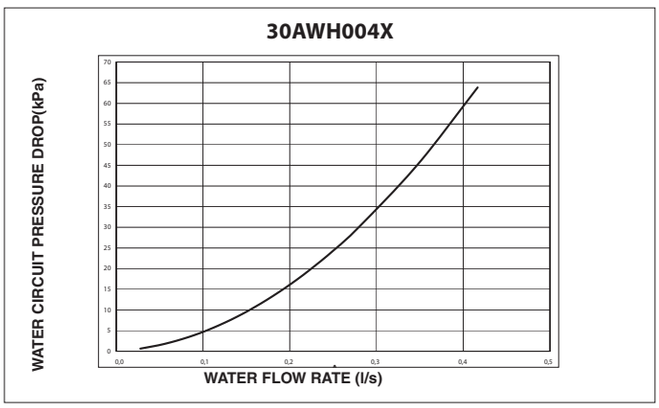


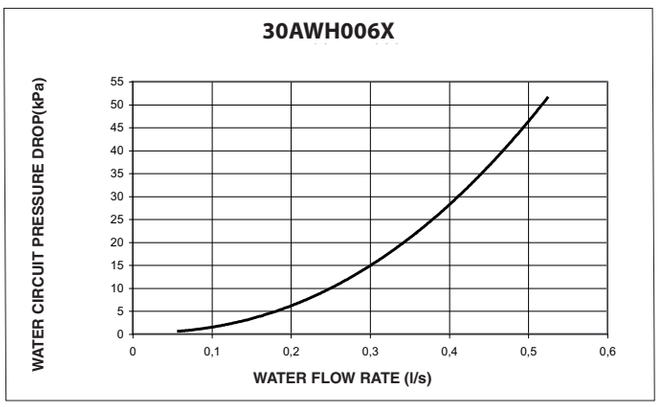


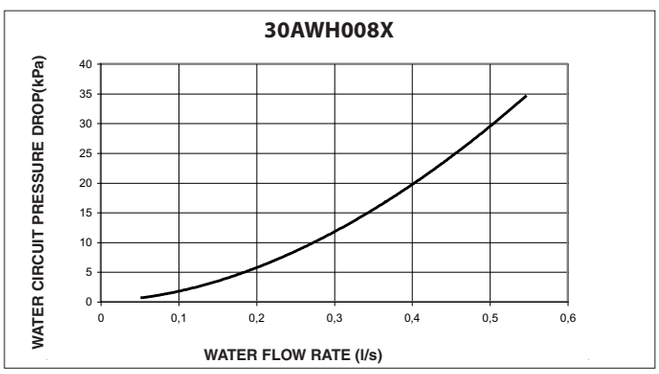


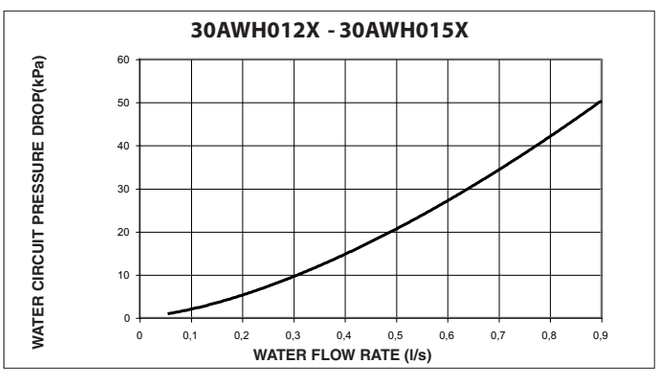


3.3.5 Water circuitpressure drop (X and NX version)



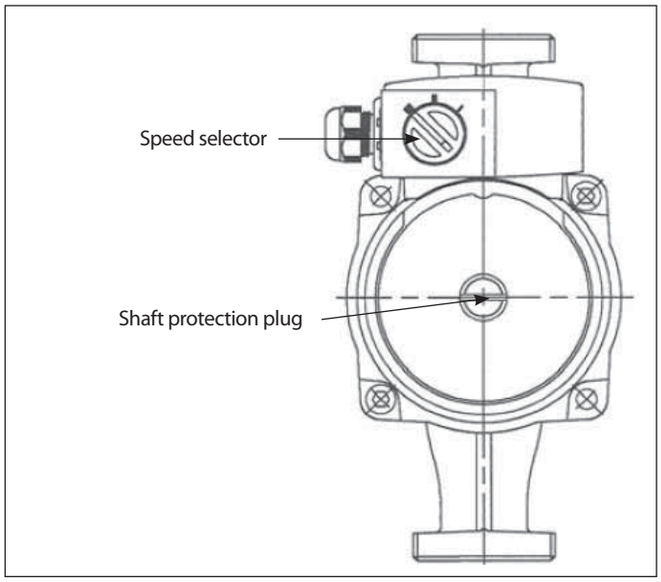






3.3.6 Circulating water Pump (only H version)

Water flow setting



Pumps have a manual speed selector (3 speed settings) which allow for adjustment of speed to match the requirements of the system.

Pump Speed Setting procedure:
The best speed setting will provide adequate circulation and provide the correct flow and return temperature differentials. This will achieve maximum economy and efficiency.

1. Set the speed selector to minimum (one)
2. Open all thermostatic or manual radiator valves to maximum
3. Set any room thermostatic controls to maximum
4. Start up system and pump should start
5. Wait 10~15 mins and measure water temperature differential (leaving water temperature-entering water temperature)
6. Water Temperature Differential should be 5-6°C, if Water delta temperature is more than 6°C select a higher pump speed An alternative solution is measure water pressure differential between unit water IN-OUT pipes and select pump speed to match the unit nominal water flow (see unit available static pressure curves).

Anti-seizing pump

The 30AWH__H units are equipped with protection against the seizing of the pump motor shaft. To allow this function, do not empty the system or disconnect the power during long periods of inactivity.
In any case, if the pump rotor shaft seizes after a long period of inactivity, the user must do the following to unblock it:

- Disconnect the power
- Remove the front panel
- Unscrew the shaft-protection plug on the back of the pump
- Insert a screwdriver in the slot and turn the rotor shaft
- Remount the protection plug
- Reconnect the power

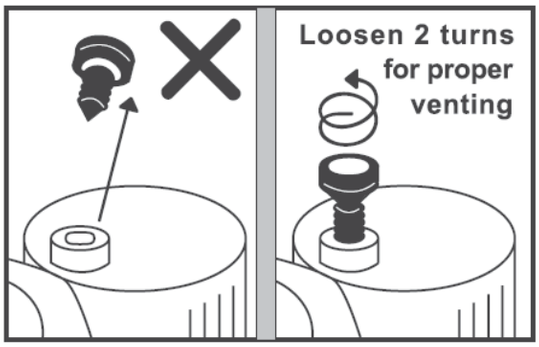
3.3.7 External water pump selection (X and NX version)

Pump has to be selected in order to provide nominal water flow at expected water loop pressure loss.
Centrifugal Pump Curves.
Water loop pressure loss estimation at nominal water flow is needed to define water pump size.

Pump Speed Setting procedure is the same used for 30AWH---H version. An alternative solution is measure water pressure differential before and after external water pump and select pump speed to match the unit nominal water flow (see water pump curves)

3.3.8 Water loop charging, system cleaning and Water Characteristics

Charge the water loop, with water, until the pressure on the hydro unit reads 0.15MPa (1.5bar)
Setting NUI Code104 (installation mode) = 1 water pump is forced on.
Loosen the cap of the air purge valve located on the top of back up heater to purge air from the water circuit. If air remains in the system the system will not operate correctly.



Looking for Code 111 (water flow switch status) the installer can verify if the water fill operating is completed (when water is flowing, parameter 111 = 1)
When completing the Test Run, during the commissioning of the system, the water pressure in the system may drop below 1,5 bar. In this event please add more water to the system.
In the case of a new installation, or cleaning the circuit, it is necessary to perform a preventive cleaning of the system.
In order to guarantee the good operation of the product, each time you clean the system, replace the water or add glycol, check that the liquid appears clear, without visible impurities and that the hardness is less than 20 °f.

3.3.9 Expansion vessel (Volume calculation)

An expansion vessel has to be added in the water loop with 30AWH___X and 30AWH___NX.
The capacity of the internal expansion vessel fitted in 30AWH__H :

- 2 liters for sizes 004, 006 and 008
- 3 liters for size 012 and 015 . (For this model the expansion vessel has been dimensioned for a typical terminal fan coil water loop)

If water loop content is higher than specified in the installation manual, an additional expansion vessel has to be added.
The expansion volume can be calculated using the following formula.

$$V = \frac{\varepsilon \times Vs}{1 - \frac{P_1}{P_2}}$$

Where:
V: Necessary total vessel capacity (L)
ε: Water expansion coefficient at average hot water temperature
Vs: Total water volume in the closed system (Do not include Hot Water Cylinder)
P1: System pressure at tank setting position (Mpa_abs*). (Pipe inner pressure during pump operation before heating device operates = water supply pressure)
P2: Maximum pressure used during operation at tank setting position (Mpa_abs*=safety valve setting pressure)

* The absolute pressure valve (abs.) is obtained by adding the atmospheric pressure (0,1 MPa (1 bar)) to the gauge pressure.
The initial pressure of this expansion Vessel is 0.1Mpa (1 bar).
The release pressure of the safety valve is 0.3Mpa (3 bar).

Water temperature and expansion coefficient (ε)		Water temperature and expansion coefficient (ε)	
Hot water temperature (°C)	**Expansion rate (ε)**	**Hot water temperature (°C)**	**Expansion rate (ε)**
0	0.0002	50	0.0121
4	0.0000	55	0.0145
5	0.0000	60	0.0171
10	0.0003	65	0.0198
15	0.0008	70	0.0229
20	0.0017	75	0.0258
25	0.0029	80	0.0292
30	0.0043	85	0.0324
35	0.0050	90	0.0961
40	0.0078	95	0.0967
45	0.0100	-	-

Example: *Maximum hot water temperature 55°C, initial water charge 0.2MPa and system volume 200 litres. The calculated Vessel capacity is:*

$$11.6 = \frac{0.0145 \times 200}{1 - \frac{(0.2 + 0.1)}{(0.3 + 0.1)}}$$

		Unit	30 AWH				
			004	006	008	012	015
Nominal water flow	Std	l/s	0,20	0,28	0,33	0,58	0,69
Water loop content for 30AWH___H units	Min	l	14	21	28	42	49
	Max	l	65	65	65	95	95
Max water loop pressure	Max	kPa	300	300	300	300	300
Filling water pressure	Min	kPa	120	120	120	120	120
Max elevation 30AW upper	Max	m	20	20	20	20	20

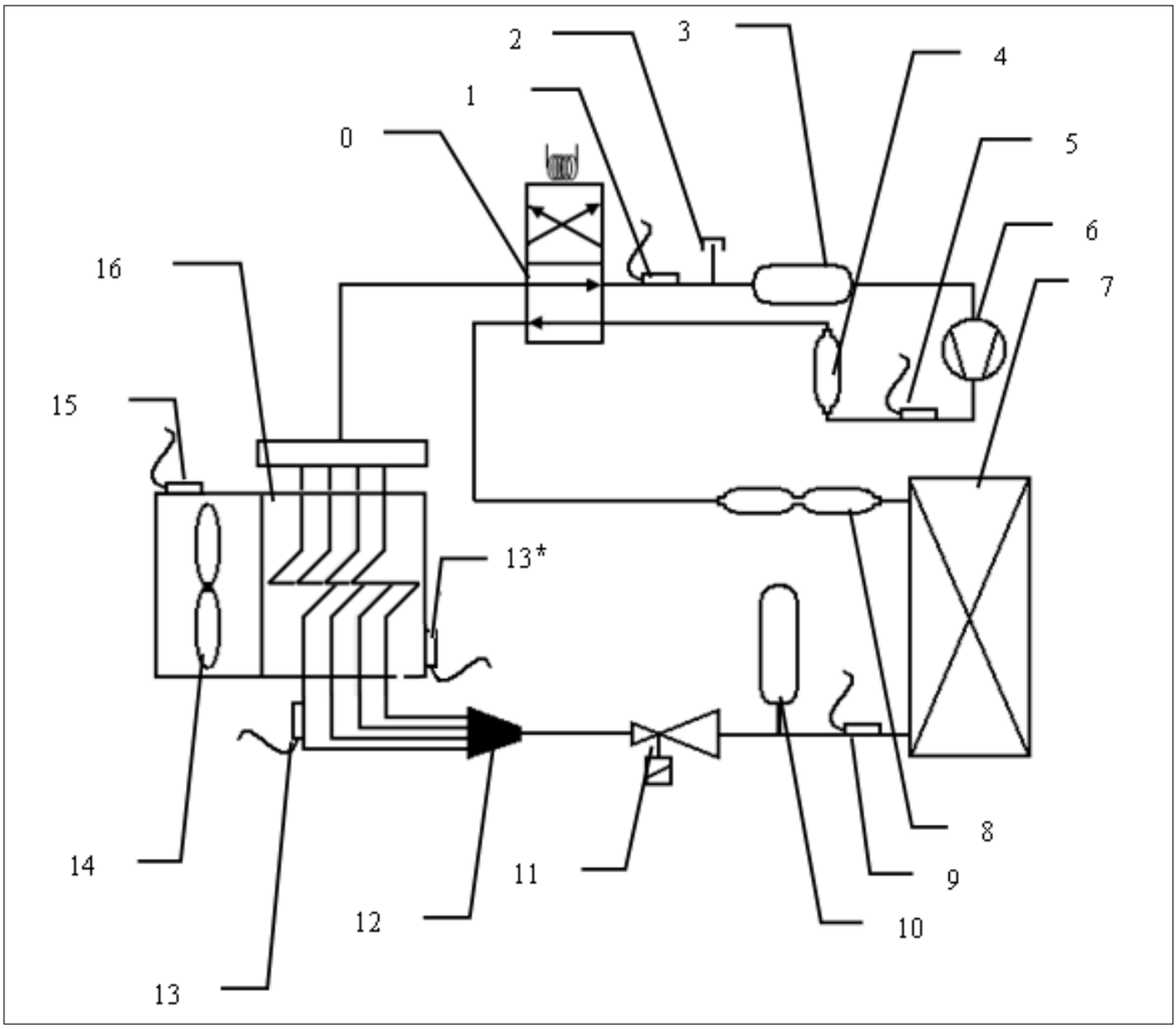
Pipe water content			
Internal Diameter		Outer diameter	Liters / meter
copper	12 mm	14 mm	0,11 l/m
	14 mm	16 mm	0,15 l/m
	16 mm	18 mm	0,20 l/m
	20 mm	22 mm	0,31 l/m
	25 mm	28 mm	0,49 l/m
	32 mm	35 mm	0,80 l/m
steel	"12.7 mm (1/2")"	3/8" Gas	0,13 l/m
	"16.3 mm (5/8")"	1/2" Gas	0,21 l/m
	"21.7 mm (7/8")"	3/4" Gas	0,37 l/m
	"27.4 mm (11/16")"	1' Gas	0,59 l/m

	% Inhibited Ethylene Glycol	10%	20%	30%	40%
	Freezing temperature (*)	-4 °C	-9 °C	-15 °C	-23 °C
Correction Factors	Capacity	0,996	0,991	0,983	0,974
	Absorbed power	0,990	0,978	0,964	1,008
	Loss of head	1,003	1,010	1,020	1,033
(*) Note: Temperature values are indicative. Always refer to the temperatures indicated for the specific product used					

TABLE TO USE FOR CALCULATING THE WATER CONTENT IN THE SYSTEM		
Installed Unit		.....
Unit content (*)	l	.....
Pipe content (**)	l	.....
Uses (fan-coil, panels, radiators, etc.) (***)	l	.....
Total content (****)	l	.....

(*) Consult the technical data table
(**) Consult the pipe water content table
(***) Consult the manual for the installed uses
(****) The water content of the system must be between the minimum and maximum values for the units with hydronic kit and greater than the minimum value for units without hydronic kit. The minimum value is necessary to provide optimal comfort.
For units without hydronic kit, add a suitable expansion vessel to the water content of the system.

3.4 Refrigerant schematics



Refrigerant Circuit			
N°	**Component**	**N°**	**Component**
0	4-way valve	9	TR sensor
1	TS sensor	10	Liquid tank
2	Check joint	11	Pulse Motor Valve
3	Accumulator	12	Distributor
4	Muffler	13	TE sensor
5	TD sensor	13*	TL sensor (only 015)
6	DC twin rotary compressor	14	Propellor fan
7	BPHE	15	TO sensor
8	Muffler	16	Heat exchanger

All field electrical connections are the responsibility of the installer.

WARNING

Make water connections before electrical connections.
Make ground connection prior to any other electrical connections

			30AWH				
		Unit	004_	006_	008_	012_	015_
Power supply		V- ph - Hz	230 - 1 -50				
Allowable Voltage Range		V	207 ÷ 253				
Maximum power drawn		kW	2	2.3	2,7	5.1	5.1
Maximum current drawn		A	7,2	11	14	23	20
Power Fuses	Type		gL type				
	Current	A	10 - B type	15 - B type	15 - B type	25 - D type	25 - D type
Power supply cables		mm^2	H07RN-F 3 x 2.5mm^2				
Maximum Pump Current External circulation		A	2				
Use cables H03VV-F 4x0.75 mm^2 to connect the control to wire NUI and H03VV-F 6x0.75 mm^2 to connect the control to wire SUI							

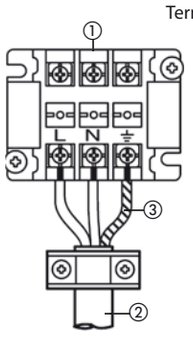
Check the supply voltage and frequency of the unit.
Remove the front panel, the electric parts appear at the front side.
The power supply cables can be inserted into the pipe holes. Be sure to fix the power cable with bundling band to avoid contact with the compressor and the hot pipes.
To ensure good tensile strength, the electric cables must be fastened using the cable-holder on the plate (Only for size 015 use the strain relif supplied with the unit).

WARNING:
- Wrong wiring may cause a burn-out to some electrical parts.
- Be sure to use the cord clamps attached to the product.
- Do not damage or scratch the conductive core and inner insulator of power and inter-connecting cables when peeling them.
- Use the power and Inter-connecting cables with specified thickness, specified type and protective devices required.
- Connect the connecting cable to the terminal as identified with their respective numbers on the terminal block of the unit.

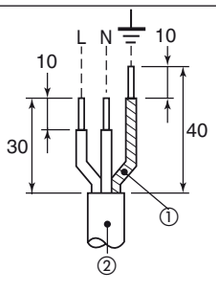
- The mains supply connecting cable, must be H07 RN-F type (245 IEC 57) or higher, with synthetic rubber insulation with Neoprene coating, according to EN 60335-2-40 codes.

- The installation fuse (10 B type, 15 B type or 25 D type in according with the version) must be used for the power supply line of this heat pump.
- Incorrect/incomplete wiring might cause an electrical fire or smoke.
- Prepare the exclusive power supply for the heat pump.
- Ensure that mains supply connection is made through a switch that disconnects all poles, with contact gap of a least 3 mm.

Terminal block



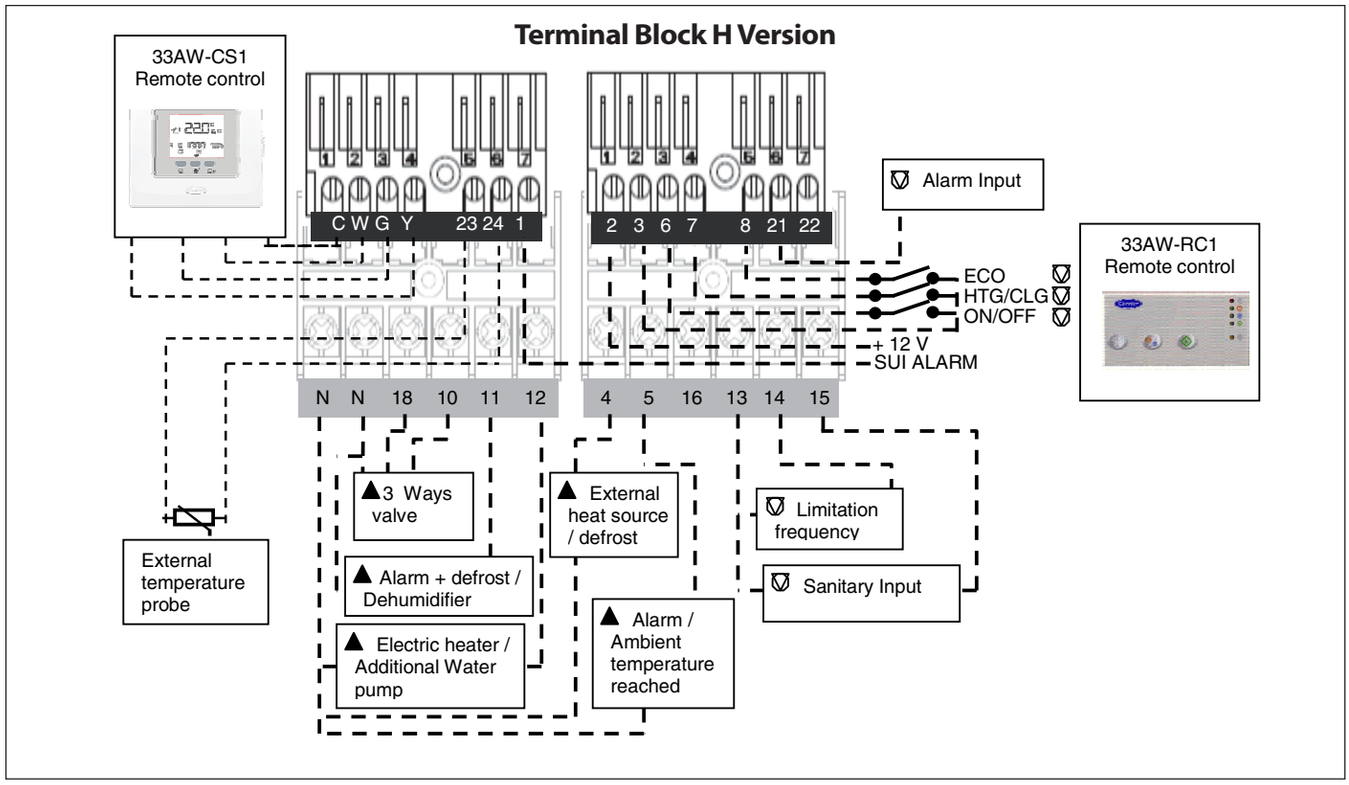
① Power supply terminal block
② Power cable
③ Ground connector

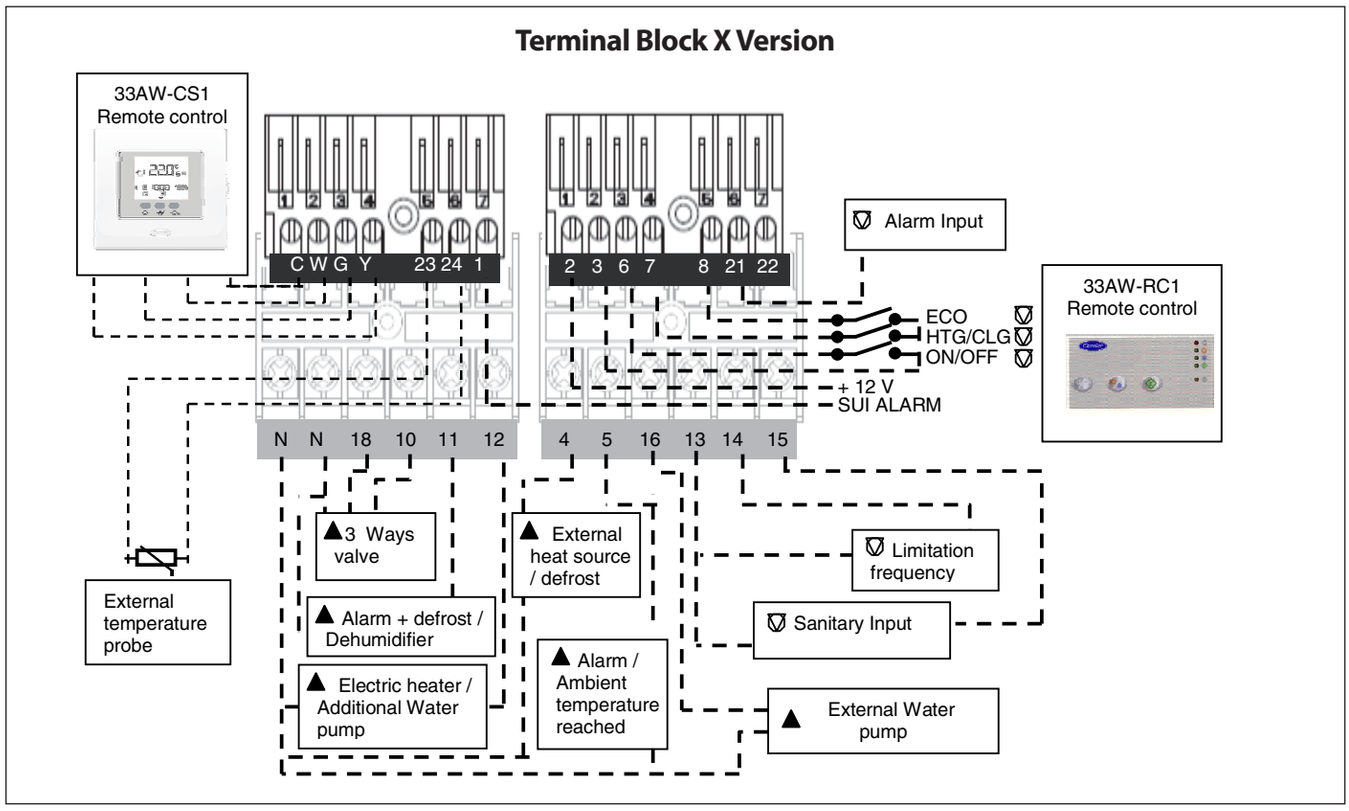


① Earth line
② Power cable

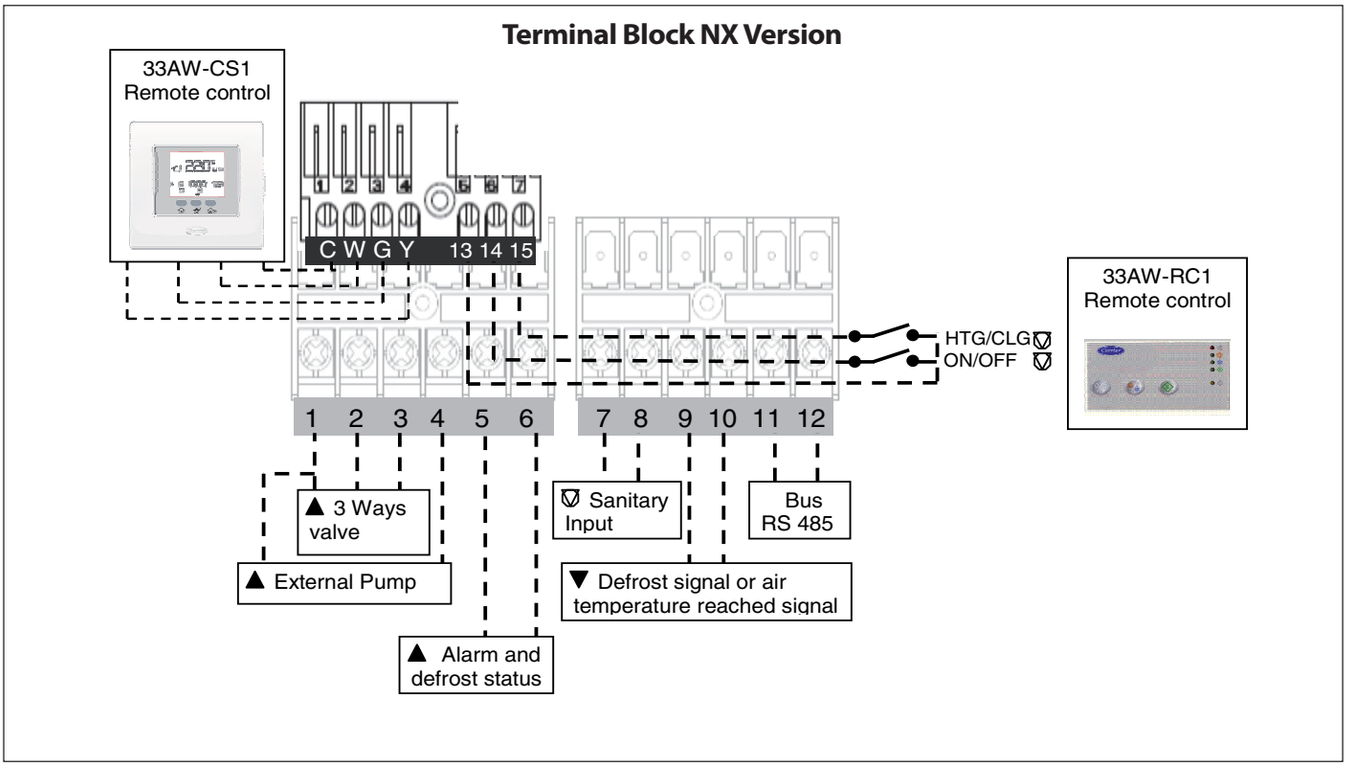
The unit can be controlled and set via:
- User Comfort Interface wire control 33AW-CS1 (Optional)
- Wire remote control 33AW-RC1 (Optional)
- Switches (not supplied)

4.1 Auxiliary electrical connections





▲ Output Dry-contact, High voltage
▽ Input Dry-contact, Low voltage



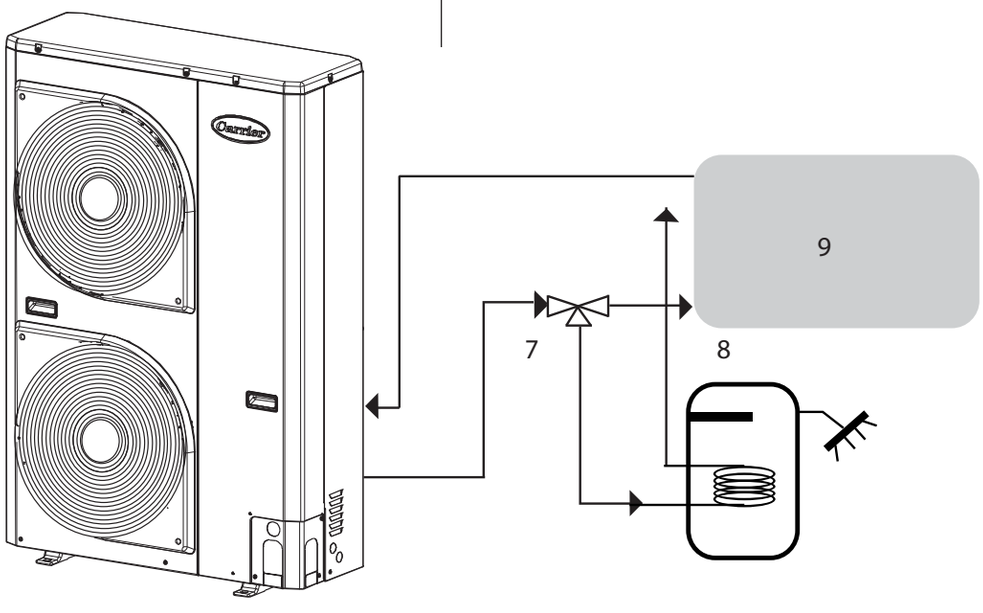
4.1.1 Sanitary hot water

The 30AWH units drive a 3-way valve (7) to manage a sanitary water accumulation tank. The operating logic provides that, in the case of a request for sanitary water by an accumulation tank (8), the system controls a 3-way valve to direct the hot water only to the tank and to operate at the maximum capacity to provide water at 60 °C (compatible with the operating envelope).
Procedure to install a three way valve:

1. Install three way valve on water piping closer as possible to AQUASNAP
2. Connect electrically three way valve to N, 18, 10 terminals (1,2 and 3 pins in NX version) ; in case of three way valve with spring return, only connect N and 10 terminals
3. Connect Sanitary Hot Water dry contact thermostat/request (eg. 45°C ON, 55°C OFF) to 13 and 15 terminals (7 and 8 in NX version)

Closing that contact, GMC drives three way valve and AQUASNAP runs at 60 °C in heating mode to obtain hot water (priority SHW); when contact opens, GMC drives back the system in the previous mode (cooling, heating or off).
Attention:

1) The sanitary water request has higher priority than the programmed operating mode in both heating and cooling mode.
2) NUI code 146 configure SHW logic when Aquasnap unit is in OFF mode.



4.1.2 External heat source

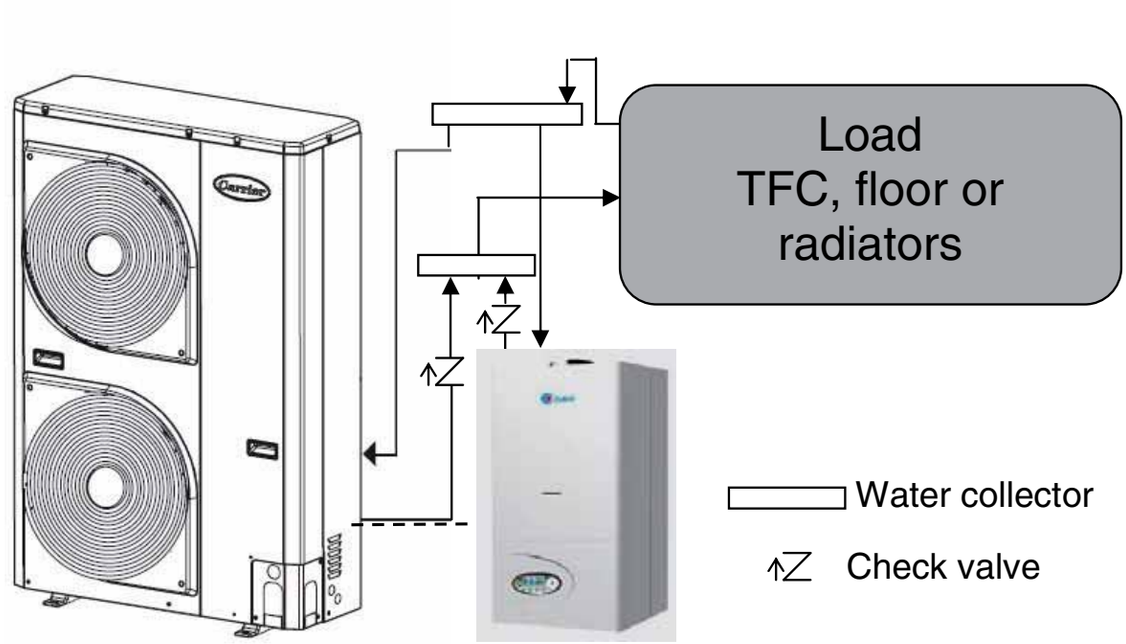
An External Heat Source can be driven by Aquasnap Plus.
For this feature is necessary install 33AW-CS1 interface
Procedure to install an External Heat Source

1. Connect electrically EHS to N and 4 terminals to a relay that drives EHS
2. Configure parameter 106 through 33AW-CS1 interface (1 for EHS)
3. Configure outdoor temperature limits (parameter 148 and 150).

When the OAT is less than second parameter both the HP and the EHS will be operative as per algorithm.
When the OAT is less than first parameter Aquasnap is switched in off mode and EHS is activated (eg.with par.148 = -2 EHS is activated with OAT < -2°C + hysteresis)

4. To change the delta T needed to activate the EHS change the parameter 152. (Factory default 5 °C).

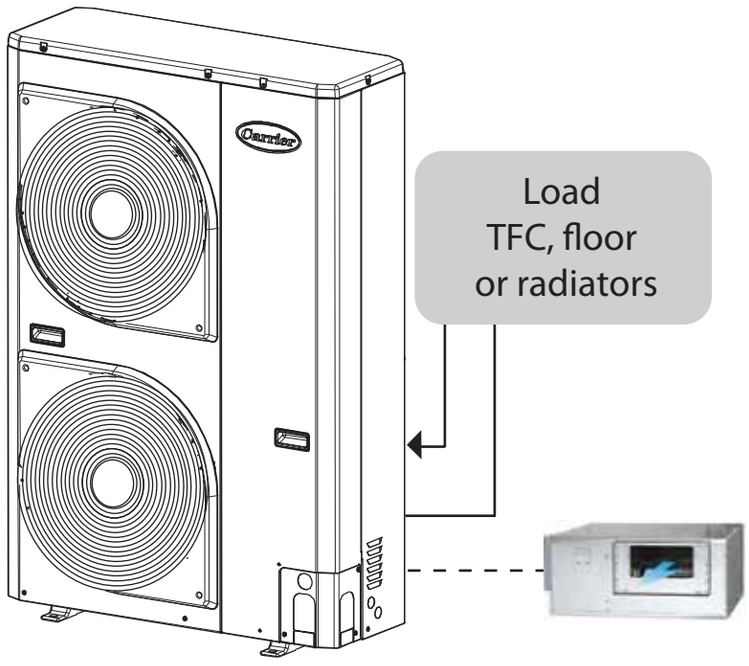
Examples of water circuitation:



4.1.3 Dehumidifier or a Humidifier

A Dehumidifier or a Humidifier can be driven by Aquasnap Plus using humidity sensor into 33AW-CS1 interface.
For this feature is necessary install 33AW-CS1 interface

1. Connect electrically a Dehumidifier or a Humidifier to N, 11 terminals to a relay that drives Dehumidifier (NO contact) or a Humidifier (NC contact)
2. Configure parameter 108 through 33AW-CS1. (2 for dehumidifier /Humid.)
3. Configure ambient humidity limit (parameter 107) where Dehumidifier or a Humidifier is activated (eg. with par.107 = 65, Dehumidifier is activated with ambient humidity >UR65%.)



4.1.4 Silent/night mode

Silent/night mode is a system setting to limit maximum AQUASNAP noise level.
Noise level is reduced limiting maximum compressor frequency.

Eg.: reducing at 75% max compressor frequency, maximum noise level is reduced of 3dBA

1. Configure code 5 through 33AW-CS1 interface or through DST (2 for Silent/night mode active).
2. Configure compressor frequency reduction (Nui code 6); maximum compressor frequency parameter range is from 50 to 100%
3. Select Silent/night mode on scheduling
   This feature is available using 33AW-CS1 interface dry contact to frequency reduction mode (PINS 13-14).

With the contact closed, the unit will operate with a maximum frequency lower than the standard one, otherwise it will operate in standard mode.

Short-Cut to Frequency reduction Mode

Press the active key among Hold (🔒) key for 10 seconds to make Night mode active and can de-activate the Night mode by pressing the Hold (🔒) key again for 10 seconds. When Frequency reduction / Night / Silence mode is active, NUI will display the (🔒) Icon. If FR mode is active, this will always override the selection done in program schedule.

4.1.5 Stop Unit or Defrosting signals

There are several signals available on the terminal strip to indicate particular conditions or the stop of the external unit.
The available signals are:

- Defrosting: When operating in Heating mode, depending on the external environmental conditions, the unit could perform defrosting cycles to clean the external battery of any ice formations. Under these conditions, it is not possible to guarantee the requested temperature output water temperature, which could reduce general comfort. (PINS: 4-N or 11-N, NUI CODE: 106 or 108)
- Alarm: Indicates an alarm condition that stops the compressor. (PINS: 5-N or 11-N, NUI CODE: 147 or108)
- Ambient Temperature Reached: If suitably programmed using the User Comfort Interface, and operating with this interface, a signal is provided that indicates that the ambient temperature has been reached. This signal can be used to turn off fan coils. (PINS: 5-N, NUI CODE: 147)

Several outputs are used for more than one condition. It is possible to configure these outputs through the User Comfort Interface installation menu (refer to the 33AW-CS1 manual).
Refer to the tables of next page and figures on paragraph 4.1 for the correct pin-outs and use of the signals.

4.1.6 External temperature probe

If the positioning of the external unit could induce a non-representative reading of the external temperature by the probe positioned on the machine, an additional temperature probe can be provided (NTC 2 wire, 3kΩ @ 25°C, Carrier code: 33AW-RAS01) remote. Connect the terminals of the probe between PINS 23 and 24 of the terminal strip.

4.1.7 External water circulator for 30AWH__X and 30AWH__NX units

Units without an integrated pump allow driving an external one.

The signal is supplied between PINS 16 and N of the terminal strip (PINS 1 and 4 for the NX version).

4.1.8 Additional Water pump (PINS 12-N)

It is managed in the following way:
If OAT > temperature set in nui code 148
The additional water pump activation depending by the nui code 156

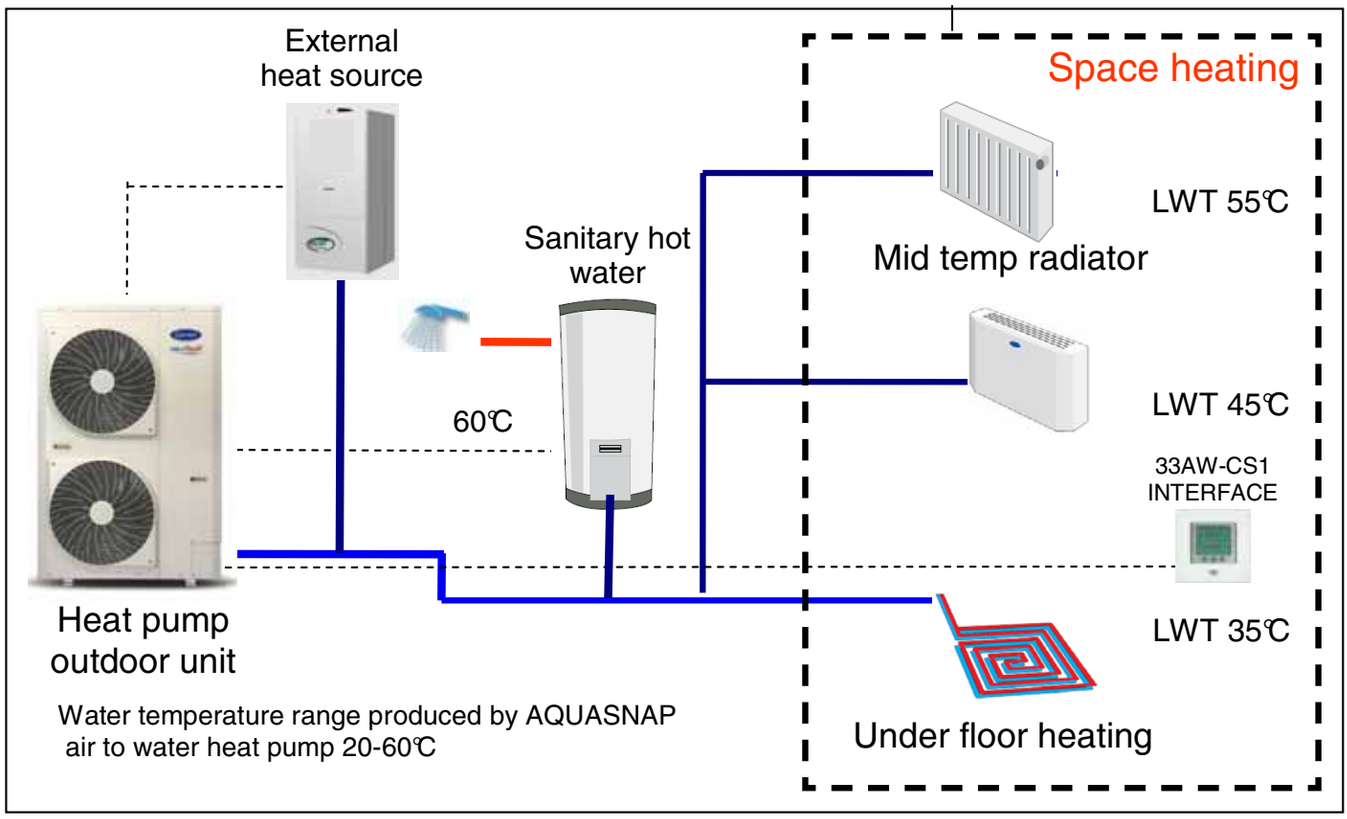
1. ON/ OFF depending on the outdoor unit water pump logic, in case of SHW activation ADD WP is ON;
2. ON/ OFF depending on the outdoor unit water pump logic, in case of SHW activation ADD WP is OFF;

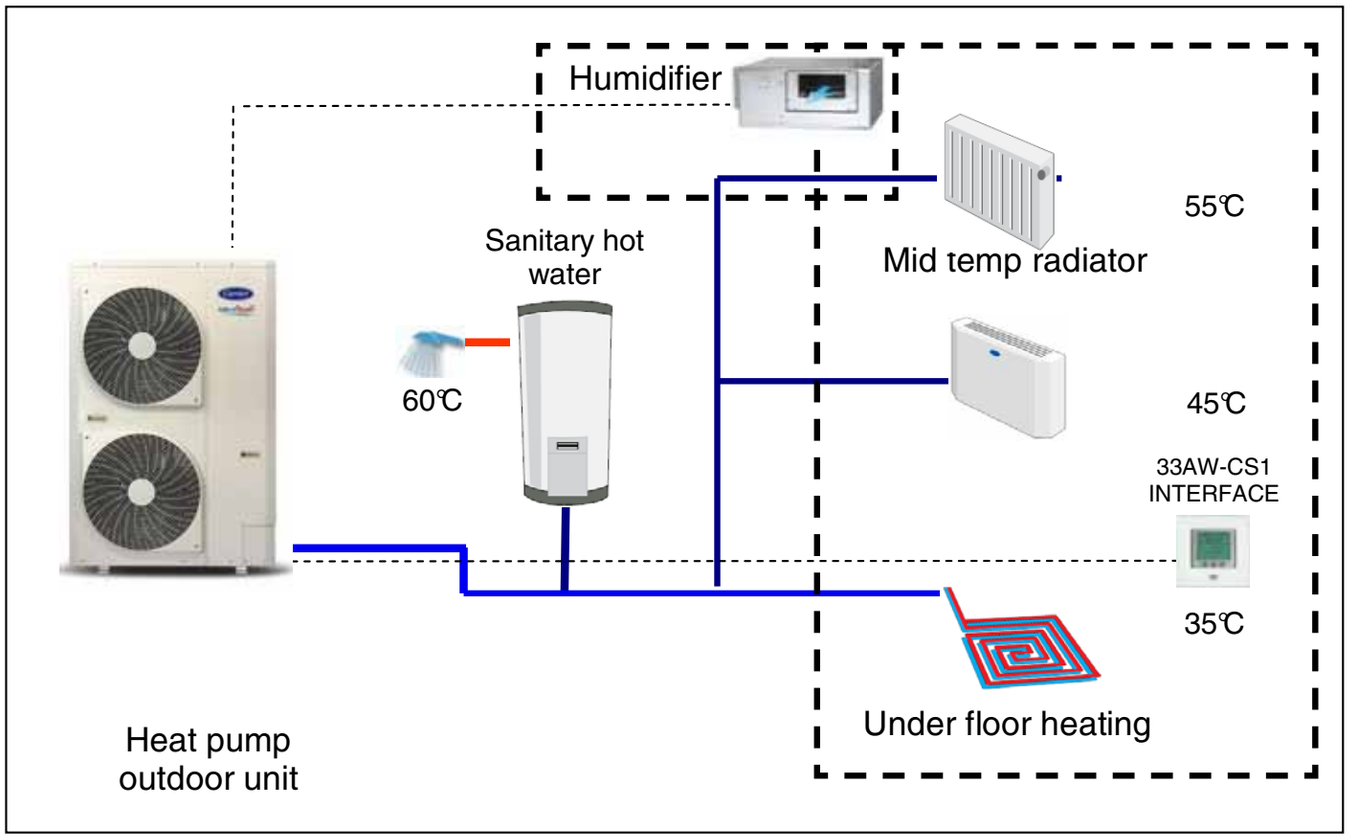
If OAT < temperature set in nui code 148
The additional water pump activation depending by the nui code 157 (0. always ON, 1. always OFF or 2. ON/OFF depending by EHS).

30AWH__H				
Description	**PIN**	**Signal**	**Limits**	**33AW-CSI Installation Menu Code**
Additional external temperature probe	23 - 24	Input (NTC 3kΩ @25°C)	N.A.	126
Sanitary Water Request	13 - 15	Input (contact switch quality >25mA@12V)	N.A.	153
Maximum Frequency Reduction Compressor	13 - 14	Input (contact switch quality >25mA@12V)	N.A.	5-6.
3-way valve	10 - 18 - N	Output 230Vac (18-N: Power Suply, 10:Signal)	1 ph ~ 230V, 2A	N.A.
1- External Heat Source Request 2- Defrost	4 - N	Relay Output Contact	1 ph ~ 230V, 2A	106 - 148 -150 -151 - 152 -154 -155
1- Alarm 2- Ambient temperature reached	5 - N	Relay Output Contact	1 ph ~ 230V, 2A	147
1- Alarm + defrost 2- Humidifier	11 - N	Relay Output Contact	1 ph ~ 230V, 2A	107 - 108
1- Trace heater 2- Additional WP	12 - N	Relay Output Contact	1 ph ~ 230V, 2A	156 - 157
Alarm input	21	Input (contact switch quality >25mA@12V)	N.A.	N.A.
ON / OFF	6 - 3	Dry contact	N.A.	N.A.
NORMAL / ECO Mode	8 - 3	Dry contact	N.A.	N.A.
Heating / Cooling Mode	7 - 3	Dry contact	N.A.	N.A.
30AWH__X				
Description	**PIN**	**Signal**	**Limits**	**33AW-CSI Installation Menu Code**
Additional external temperature probe	23 - 24	Input (NTC 3kΩ @25°C)	N.A.	126
Sanitary Water Request	13 - 15	Input (contact switch quality >25mA@12V)	N.A.	153
Maximum Frequency Reduction Compressor	13 - 14	Input (contact switch quality >25mA@12V)	N.A.	5-6
3-way valve	10 - 18 - N	Output 230Vac (18-N: Power Suply, 10:Signal)	1 ph ~ 230V, 2A	N.A.
1- External Heat Source Request 2- Defrost	4 - N	Relay Output Contact	1 ph ~ 230V, 2A	106 - 148 -150 -151 - 152 -154 -155
1- Alarm 2- Ambient temperature reached	5 - N	Relay Output Contact	1 ph ~ 230V, 2A	147
1- Alarm + defrost 2- Humidifier	11 - N	Relay Output Contact	1 ph ~ 230V, 2A	107 - 108
1- Trace heater 2- Additional WP	12 - N	Relay Output Contact	1 ph ~ 230V, 2A	156 - 157
Alarm input	21	Input (contact switch quality >25mA@12V)	N.A.	N.A.
External water pump	16 - N	Relay Output Contact	1 ph ~ 230V, 2A	N.A.
ON / OFF	6 - 3	Dry contact	N.A.	N.A.
NORMAL / ECO Mode	8 – 3	Dry contact	N.A.	N.A.
Heating / Cooling Mode	7 – 3	Dry contact	N.A.	N.A.
30AWH__NX				
Description	**PIN**	**Signal**	**Limits**	**33AW-CSI Installation Menu Code**
Sanitary Water Request	7 - 8	Input (contact switch quality >25mA@12V)	N.A.	N.A.
3-way valve	1 - 2 - 3	Output 230Vac	1 ph ~ 230V, 2A	N.A.
Water Circulator	1 - 4	Output 230Vac	1 ph ~ 230V, 2A	N.A.
Alarm	5 - 6	Input (contact switch quality >25mA@12V)	N.A.	147
Defrost	9 - 10	Input (contact switch quality >25mA@12V)	N.A.	106
BUS RS485	11 - 12			

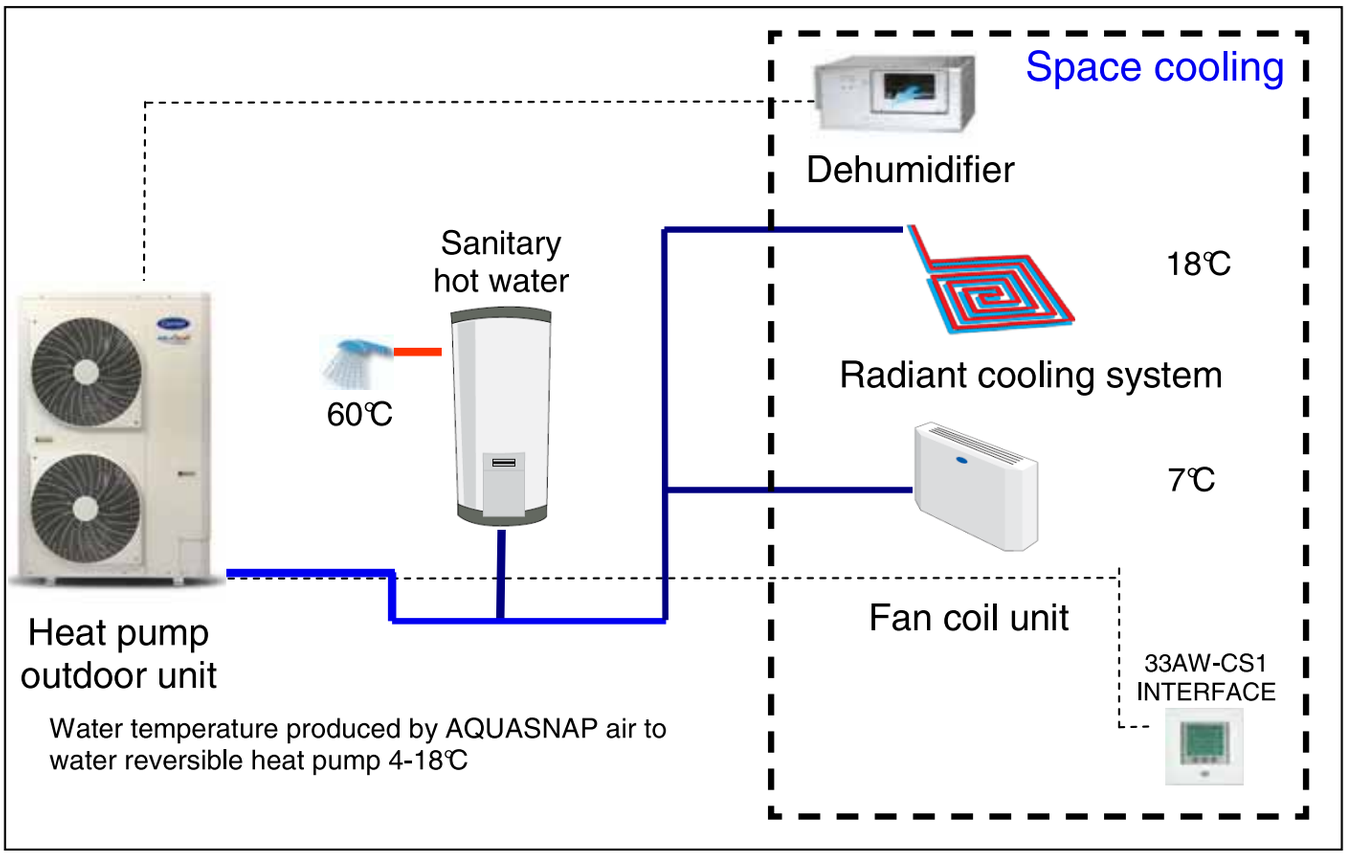
4.2 Applications

Heating Applications





Cooling Applications



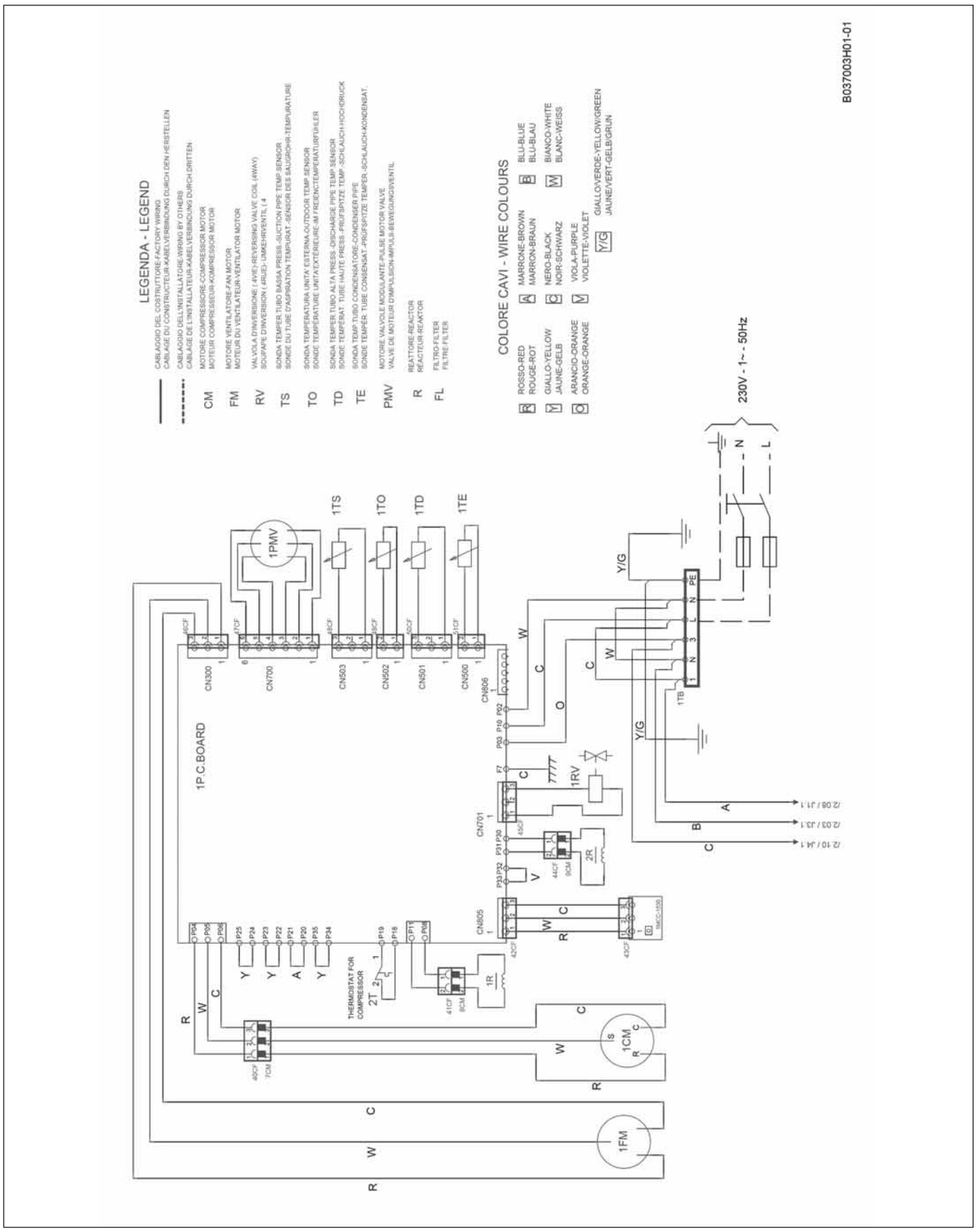
4.3 Range Description (Systems capacity)

	HEATING					COOLING				
EWT-LWT OAT	30-35°C 7/6°C		40-45°C 7/6°C			23-18°C 35°C		12-7°C 35°C		
	Capacity kW	COP W/W	Capacity kW	COP W/W	LWA [dB(A)]	Capacity kW	EER W/W	Capacity kW	EER W/W	LWA [dB(A)]
30AWH004HB	4.10	4,05	3.90	3.2	62	4.90	4.05	3.30	2.91	64
30AWH006HB	5.80	4.20	5.80	3.01	62	7.00	3.61	4.70	2.91	64
30AWH008HB	7.20	3.91	7.40	3.16	64	7.80	3.90	5.80	2.91	65
30AWH012HB	11.90	3.91	12.95	3.01	67	13.45	3.61	10.20	2.91	68
30AWH015HB	14.50	4.06	14.0	3.21	68	16.00	3.81	13.00	2.91	69
30AWH004XB /NX	4.08	4.13	3.88	3.25	62	4.79	4.04	3.20	2.93	64
30AWH006XB /NX	5.76	4.30	5.76	3.06	62	6.86	3.62	4.56	2.90	64
30AWH008XB /NX	7.16	3.98	7.36	3.20	64	7.66	3.95	5.64	2.89	65
30AWH012XB /NX	11.86	3.95	12.91	3.03	67	13.15	3.57	9.90	2.86	68
30AWH015XB /NX	14.47	4.09	13.96	3.22	68	15.66	3.76	12.68	2.86	69

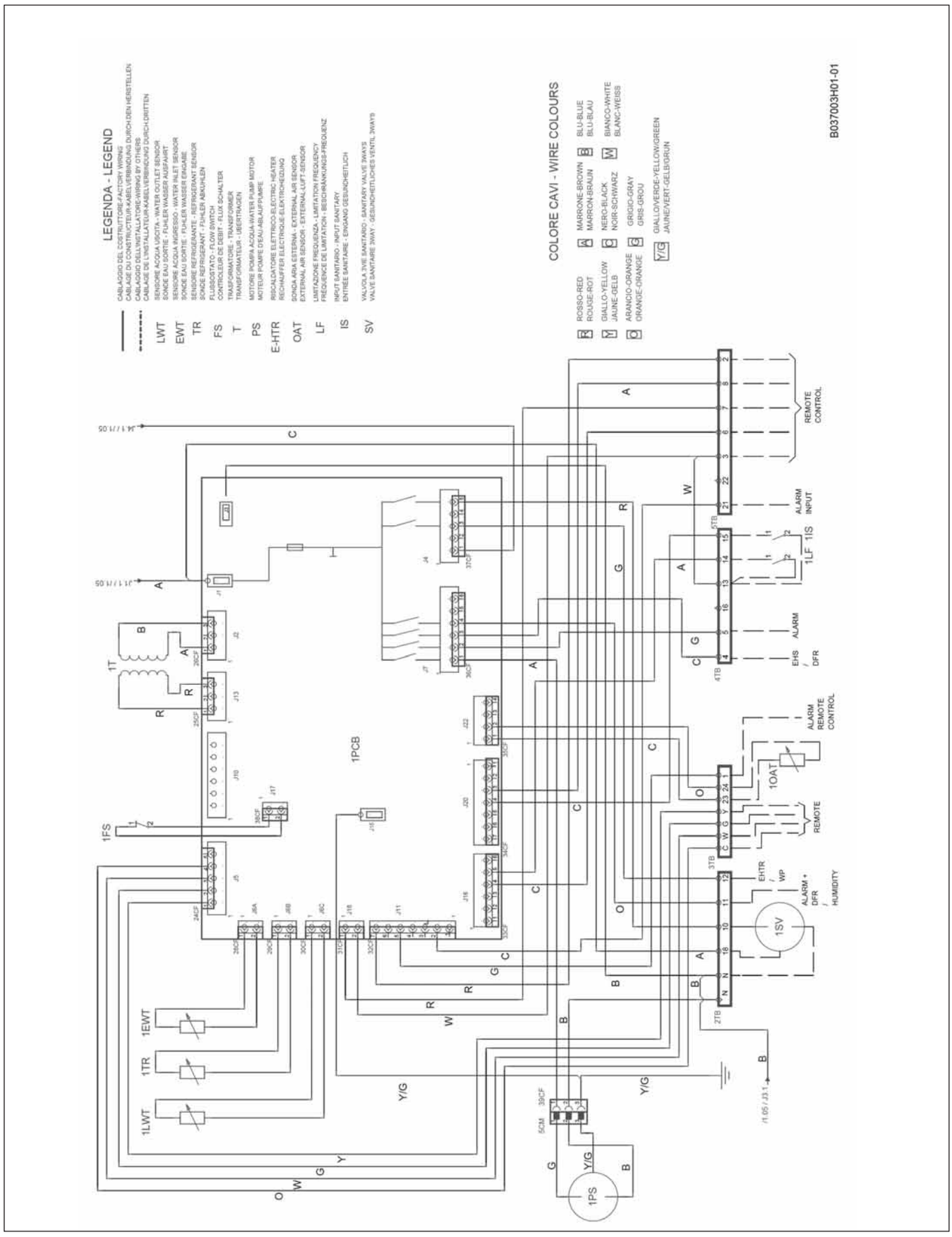
Data according to EN14511

4.4 Wiring diagrams

Inverter control size 004HB



GMC control size 004HB



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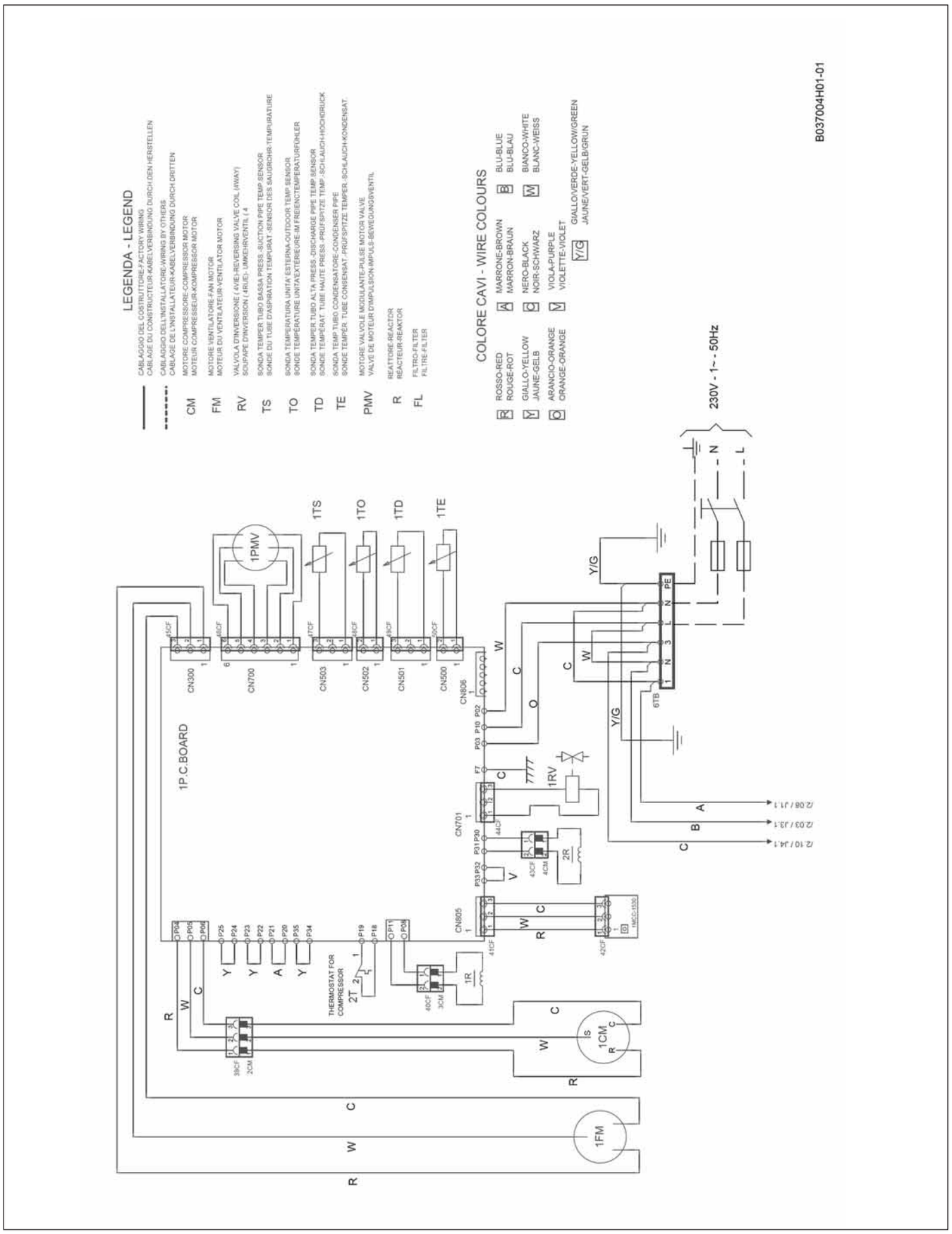

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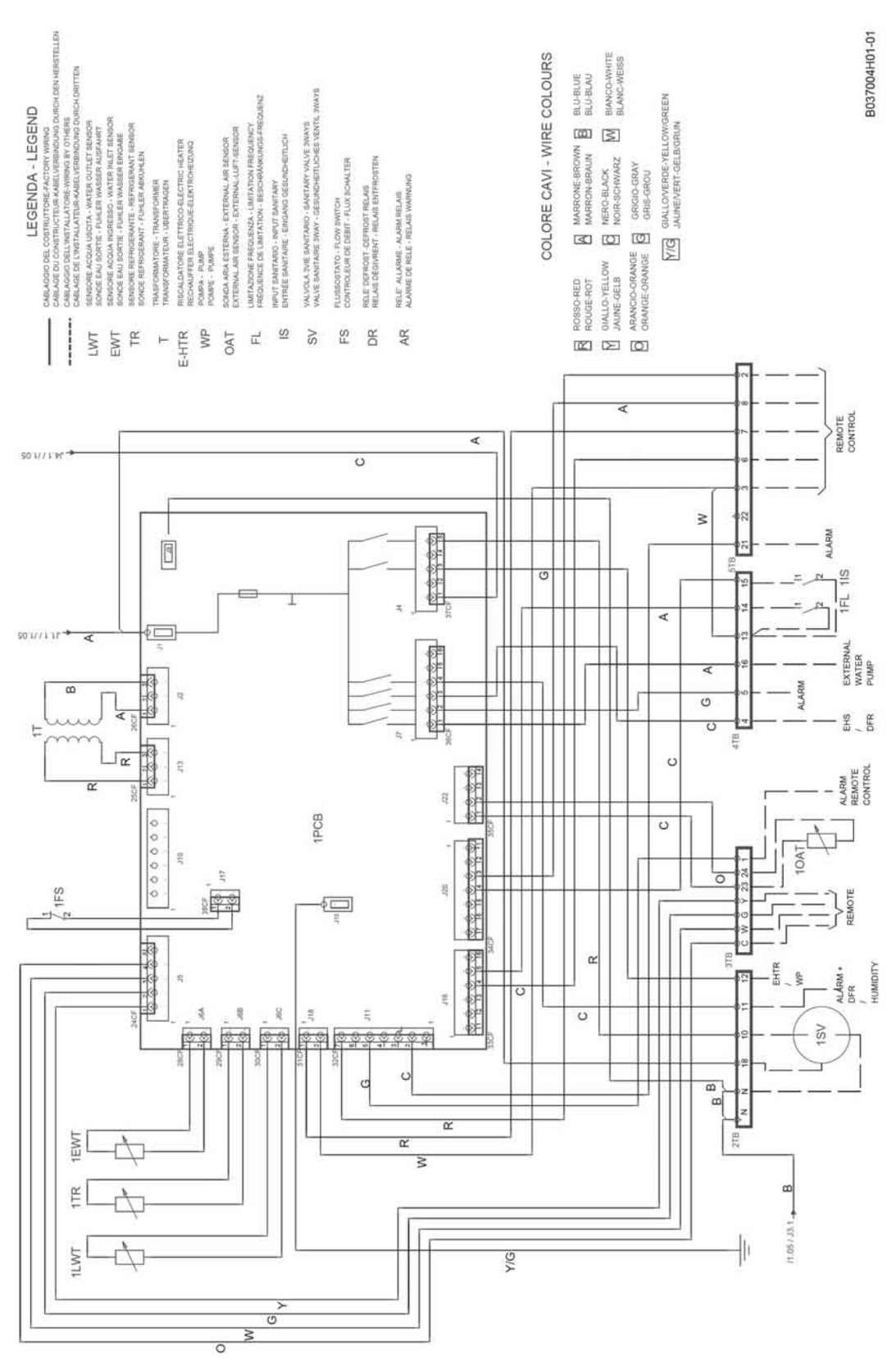
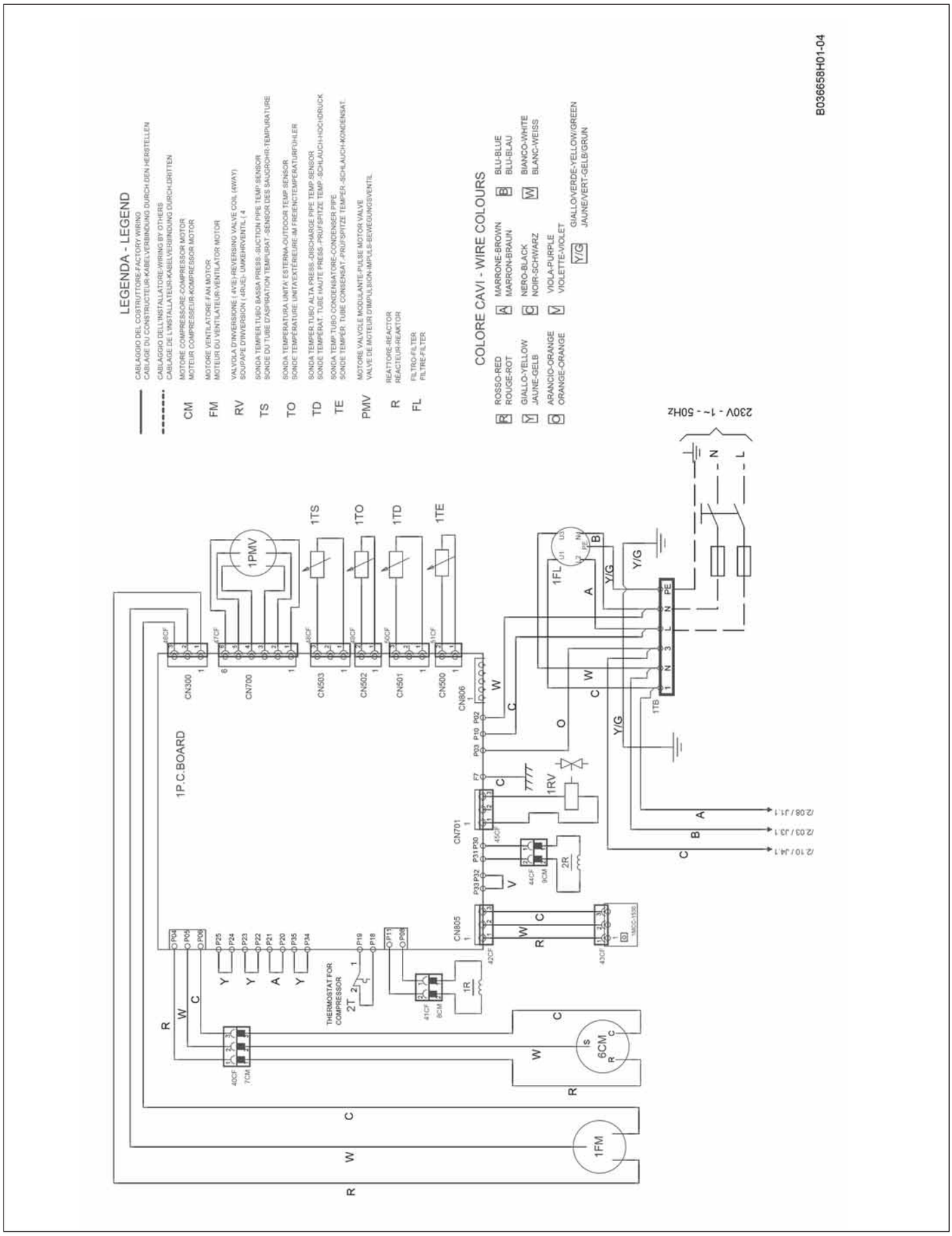


Inverter control size 006HB



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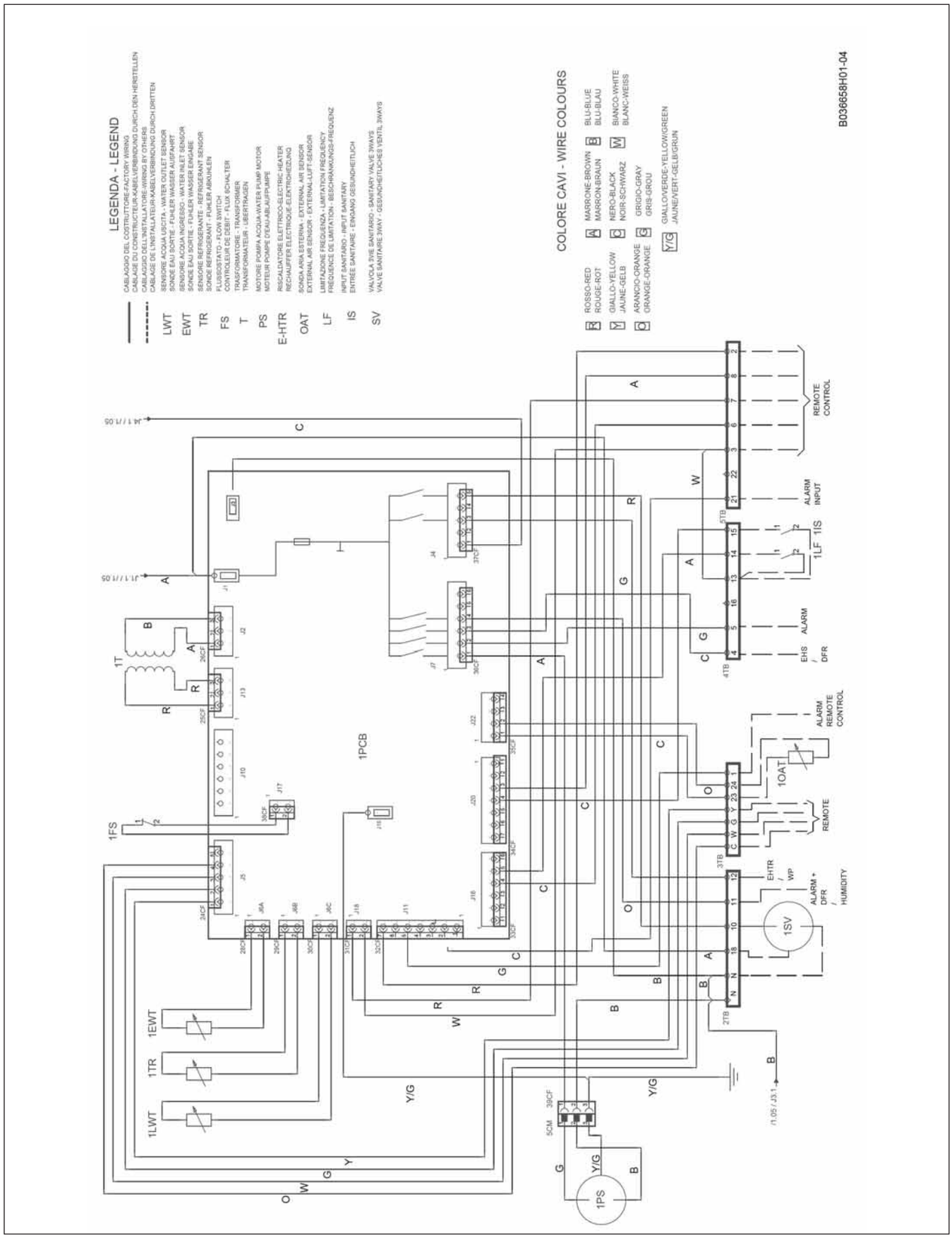

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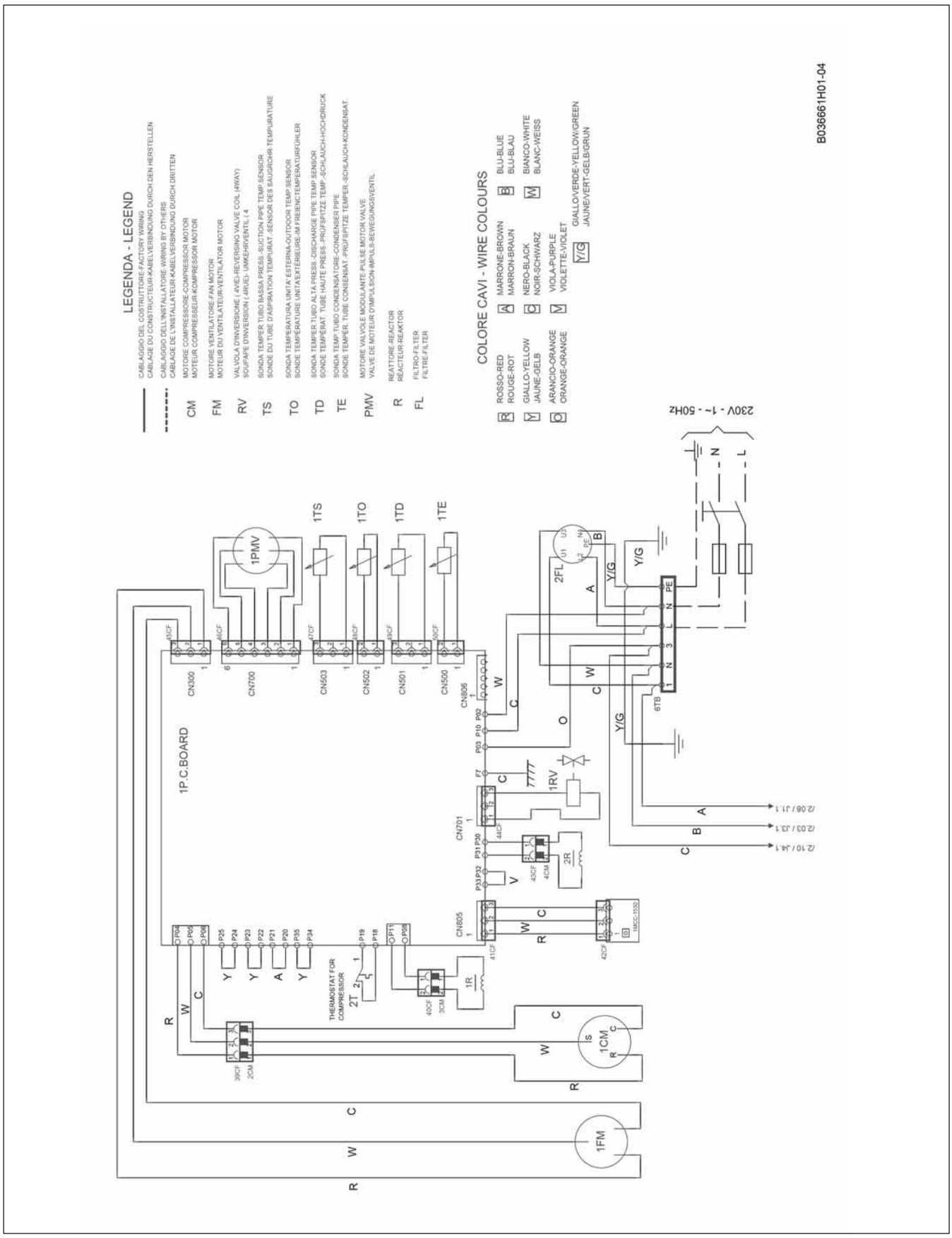

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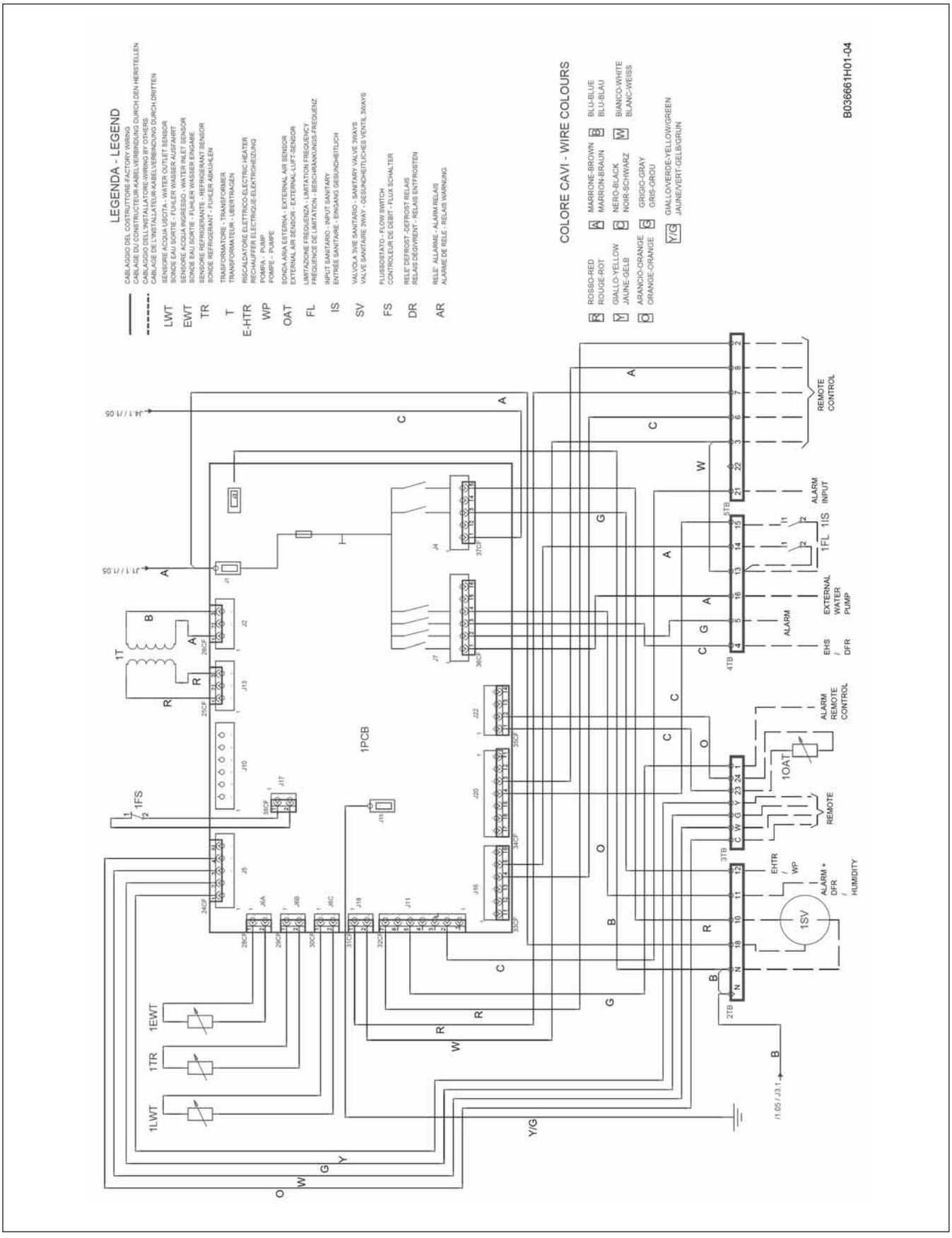

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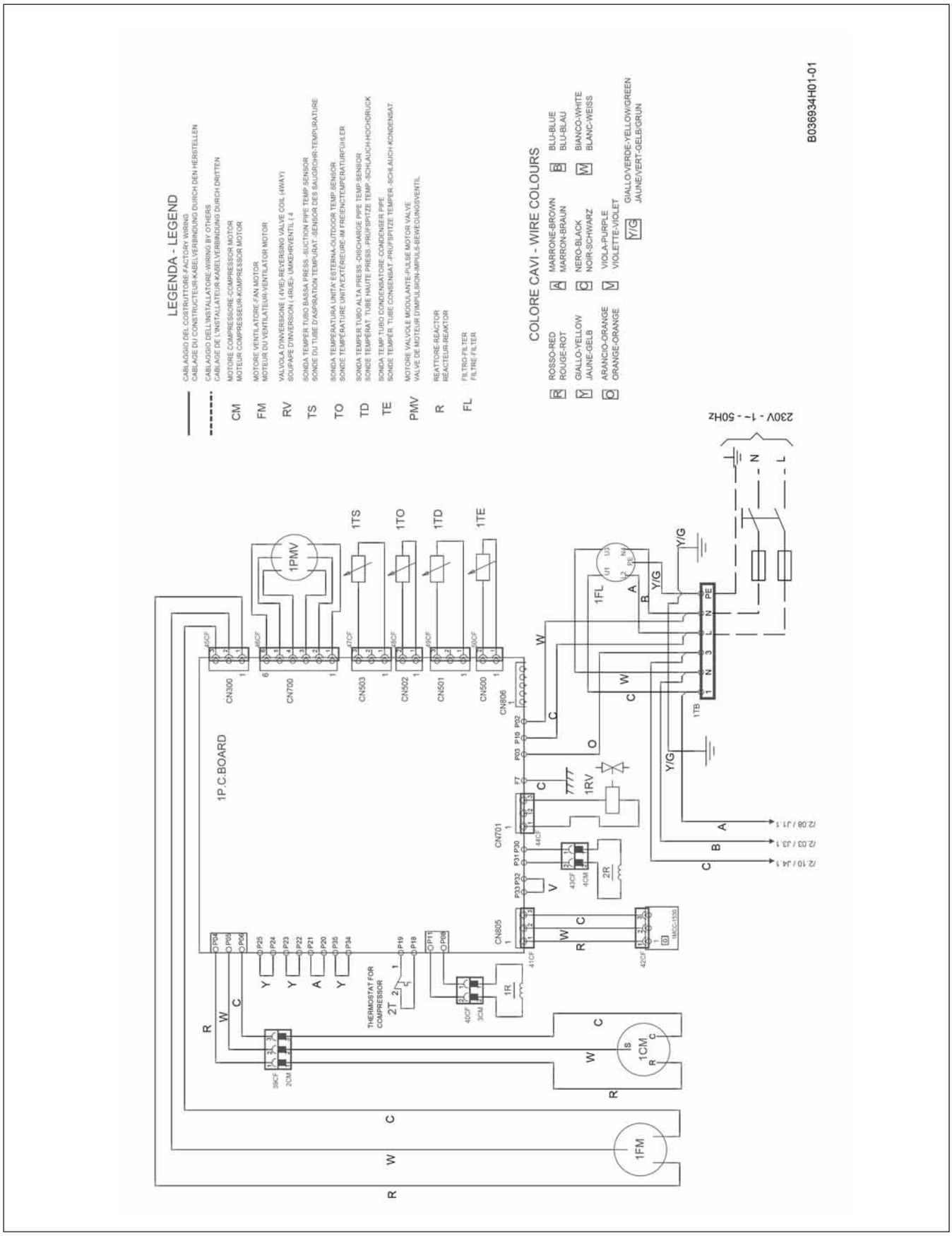

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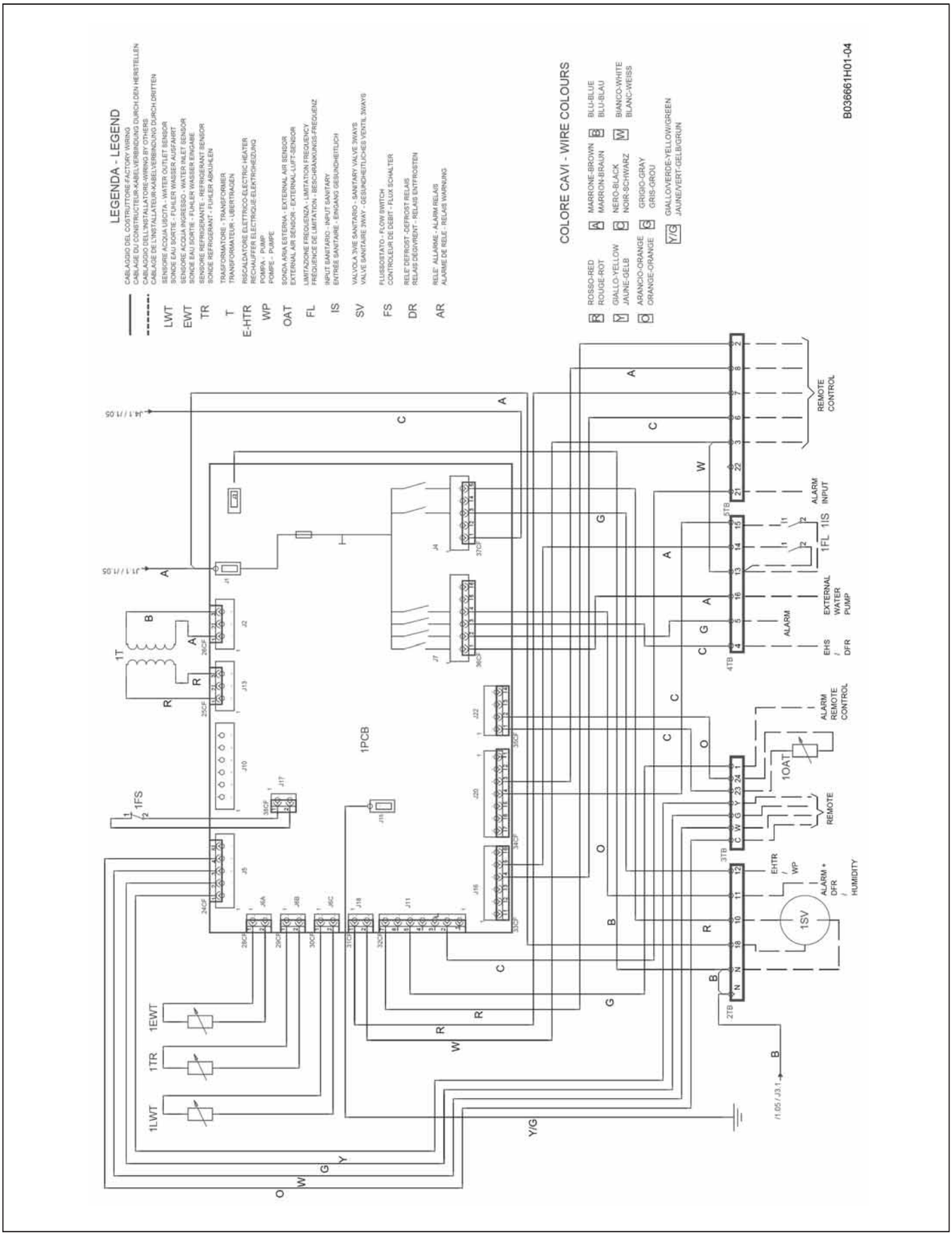
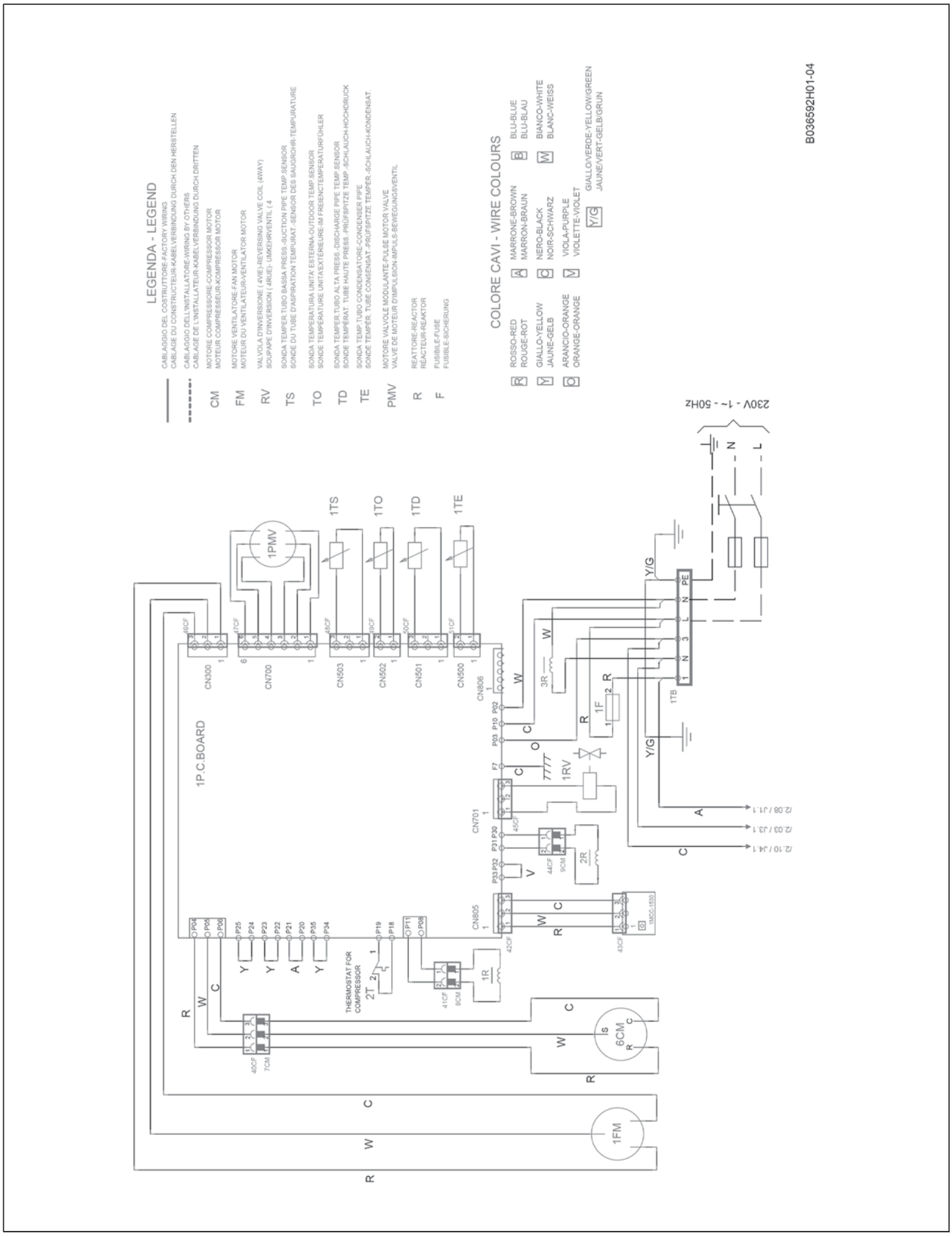
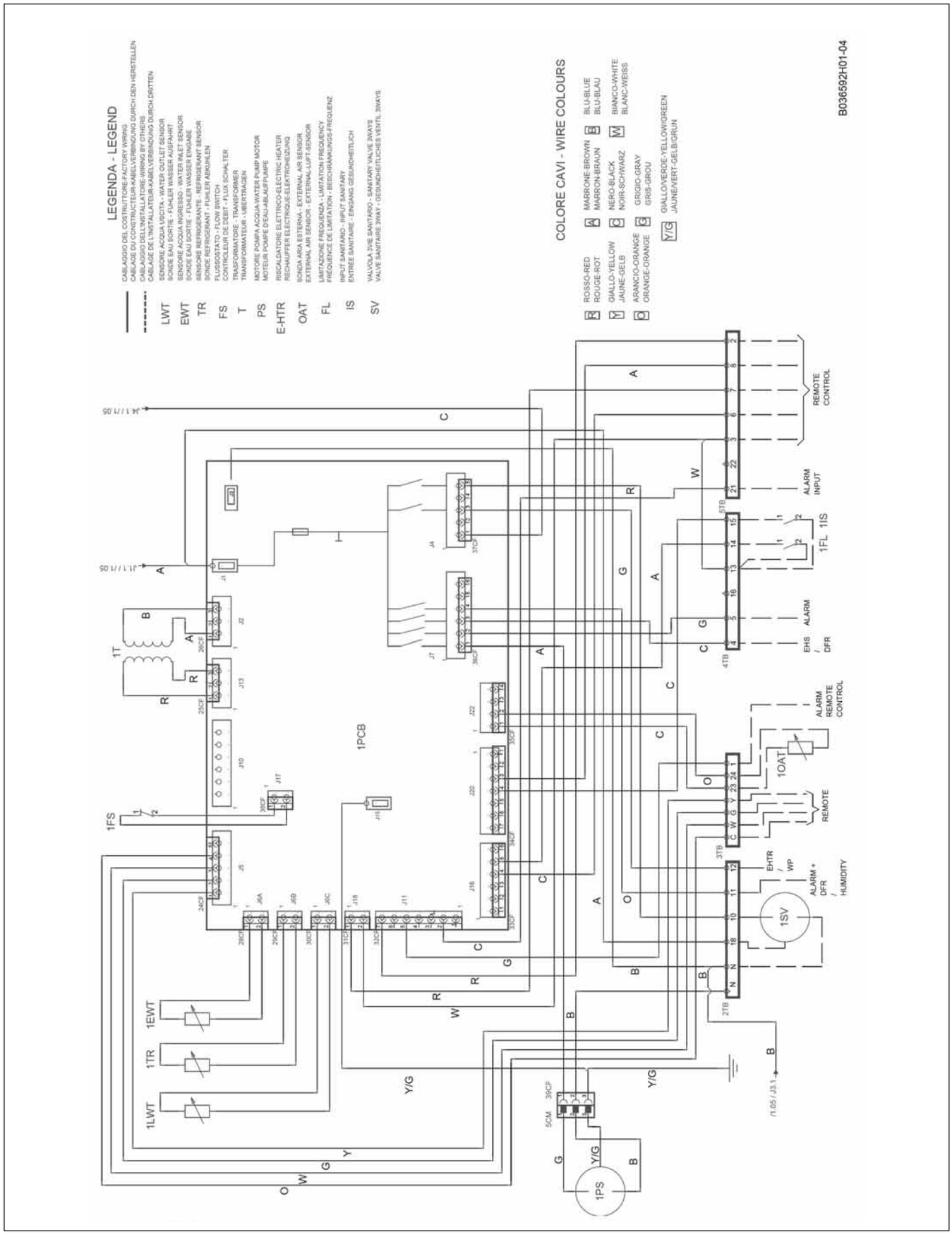


Inverter control size 008HB



GMC control size 008HB



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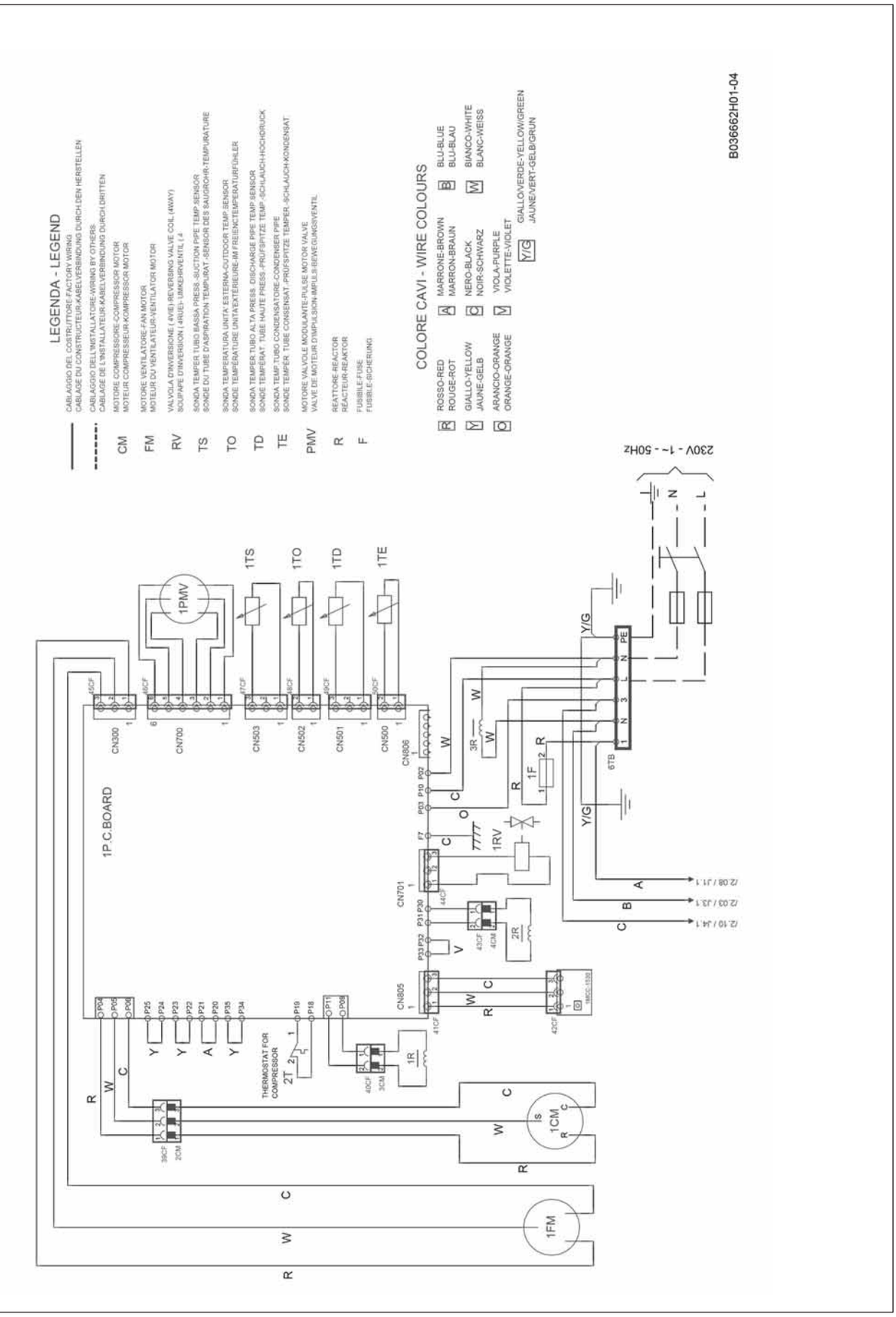

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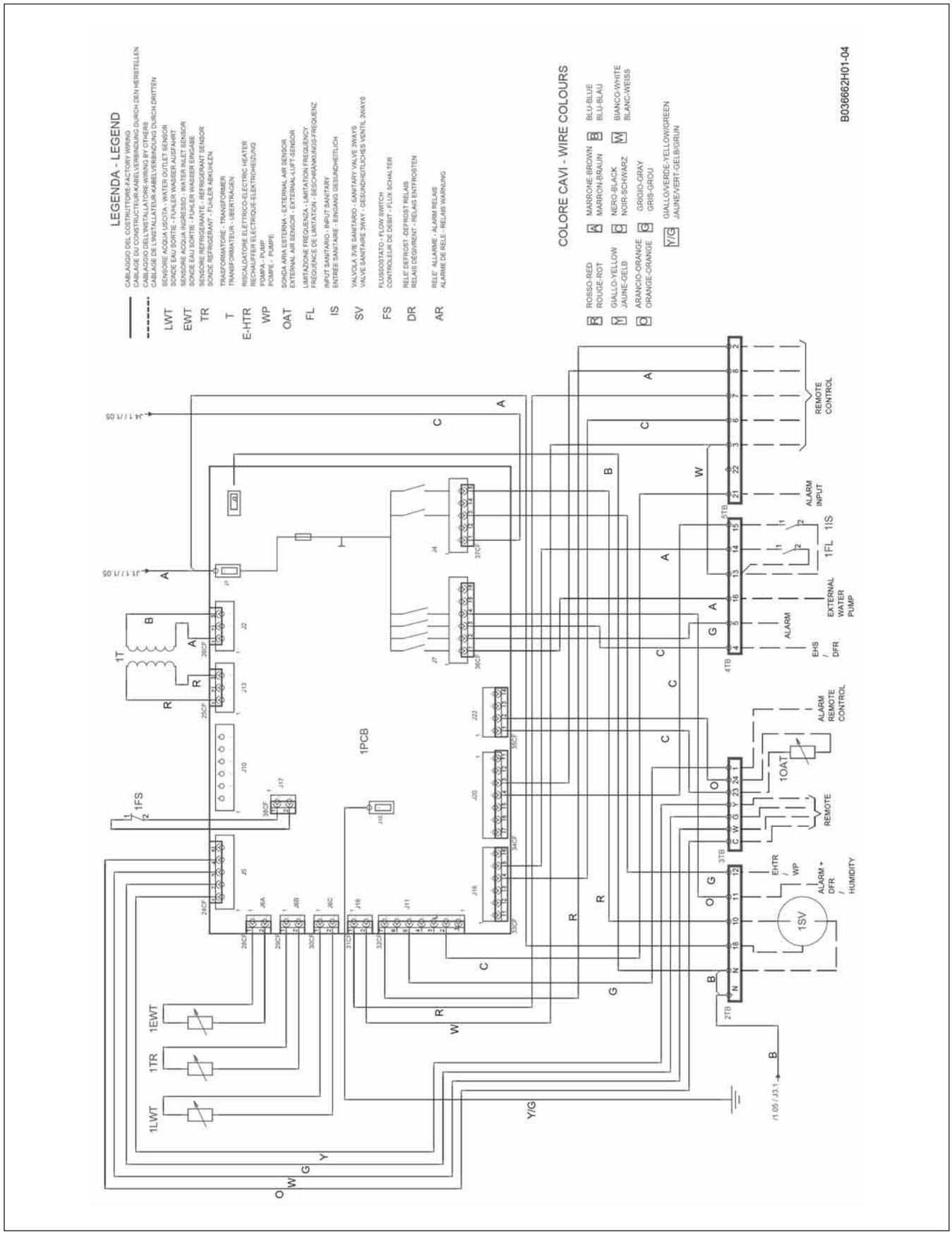

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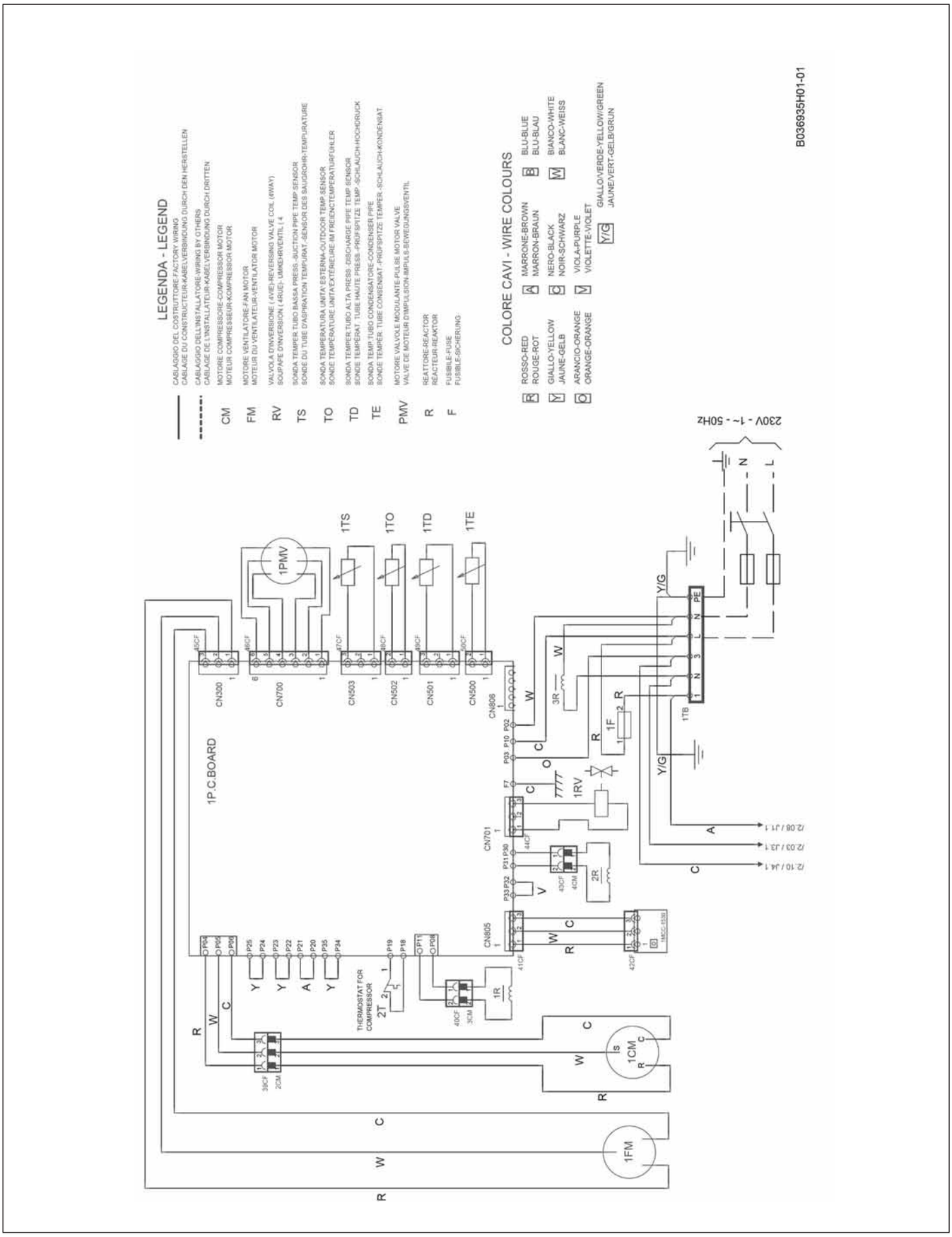

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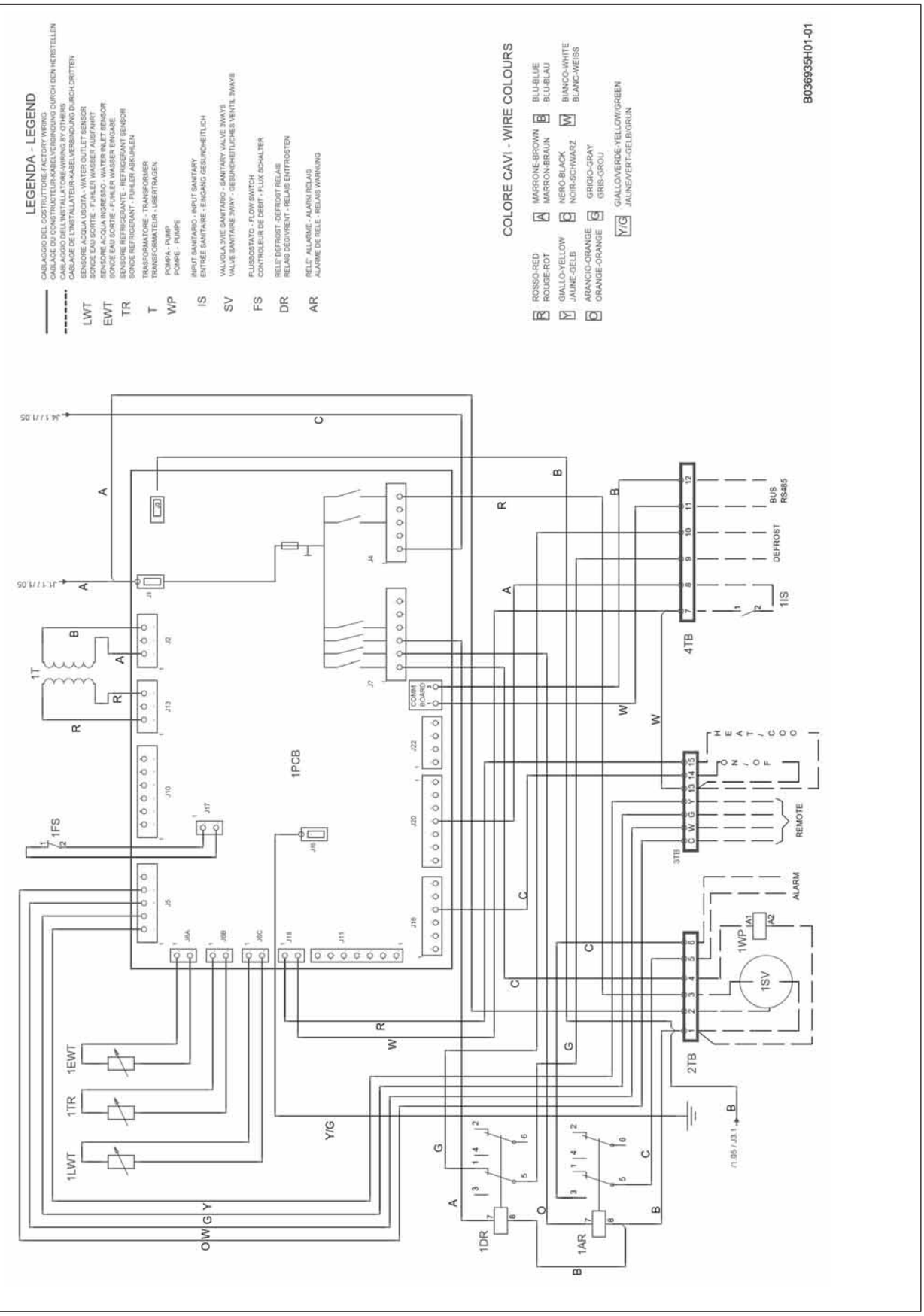
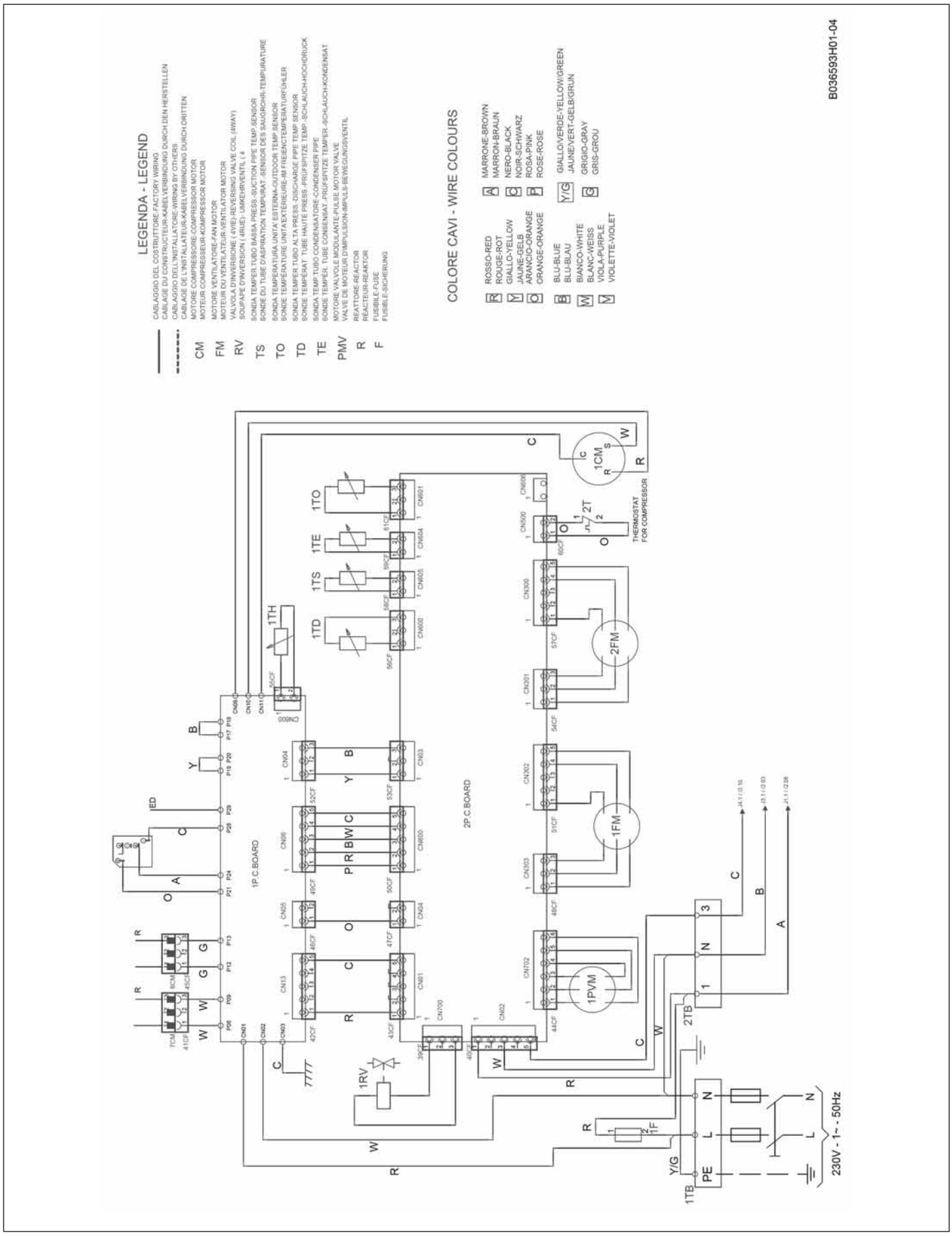
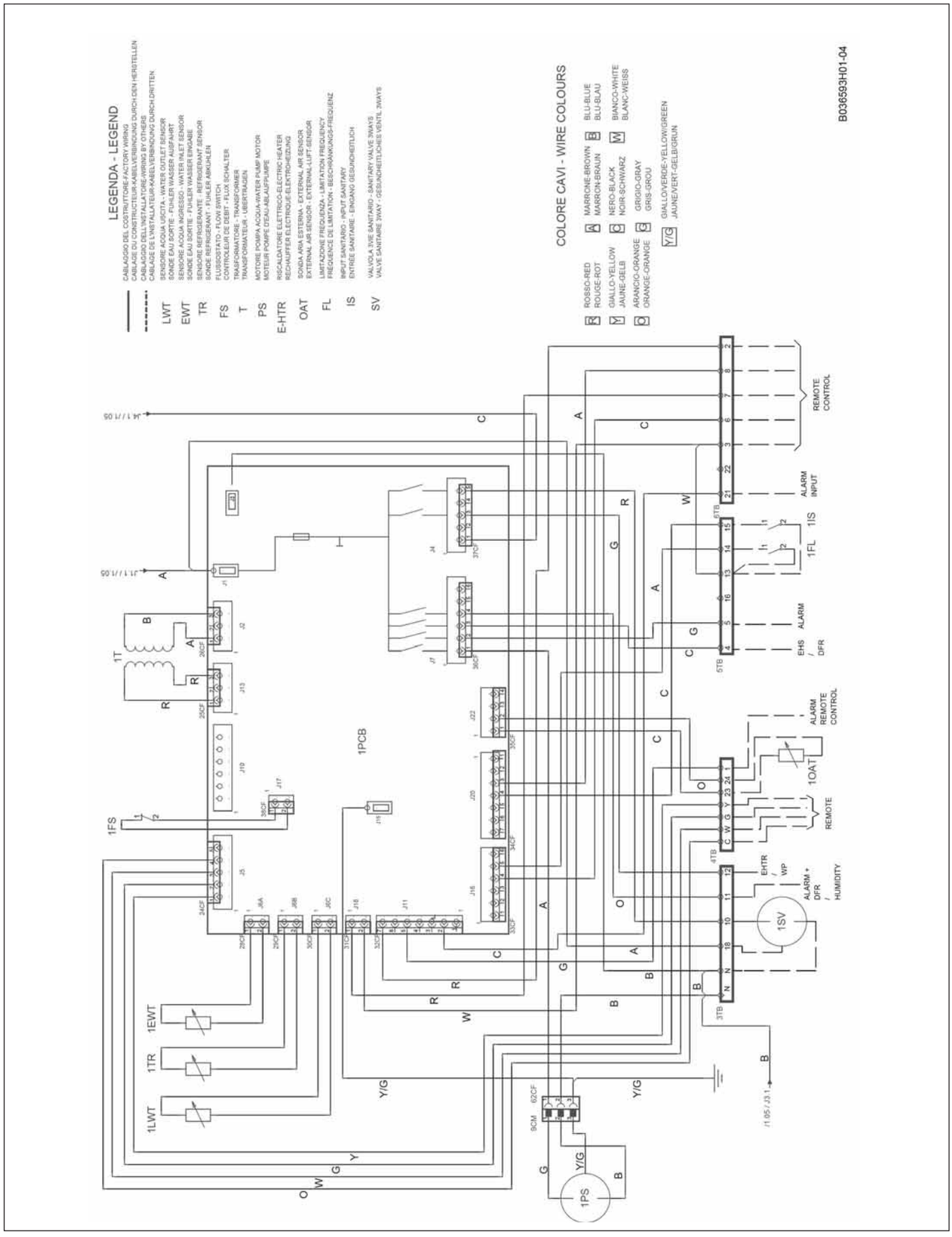


Inverter control size 012HB



GMC control size 012HB



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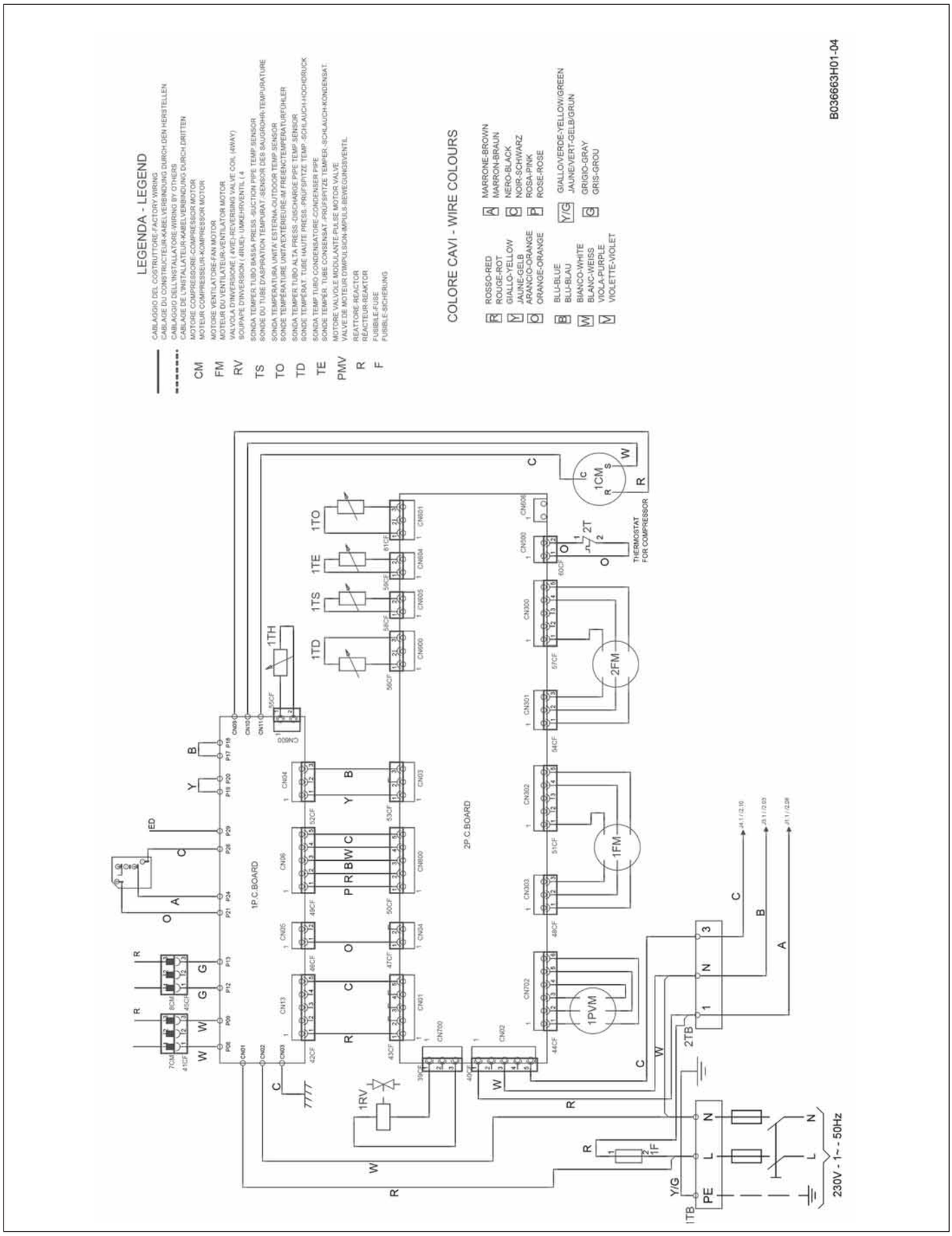

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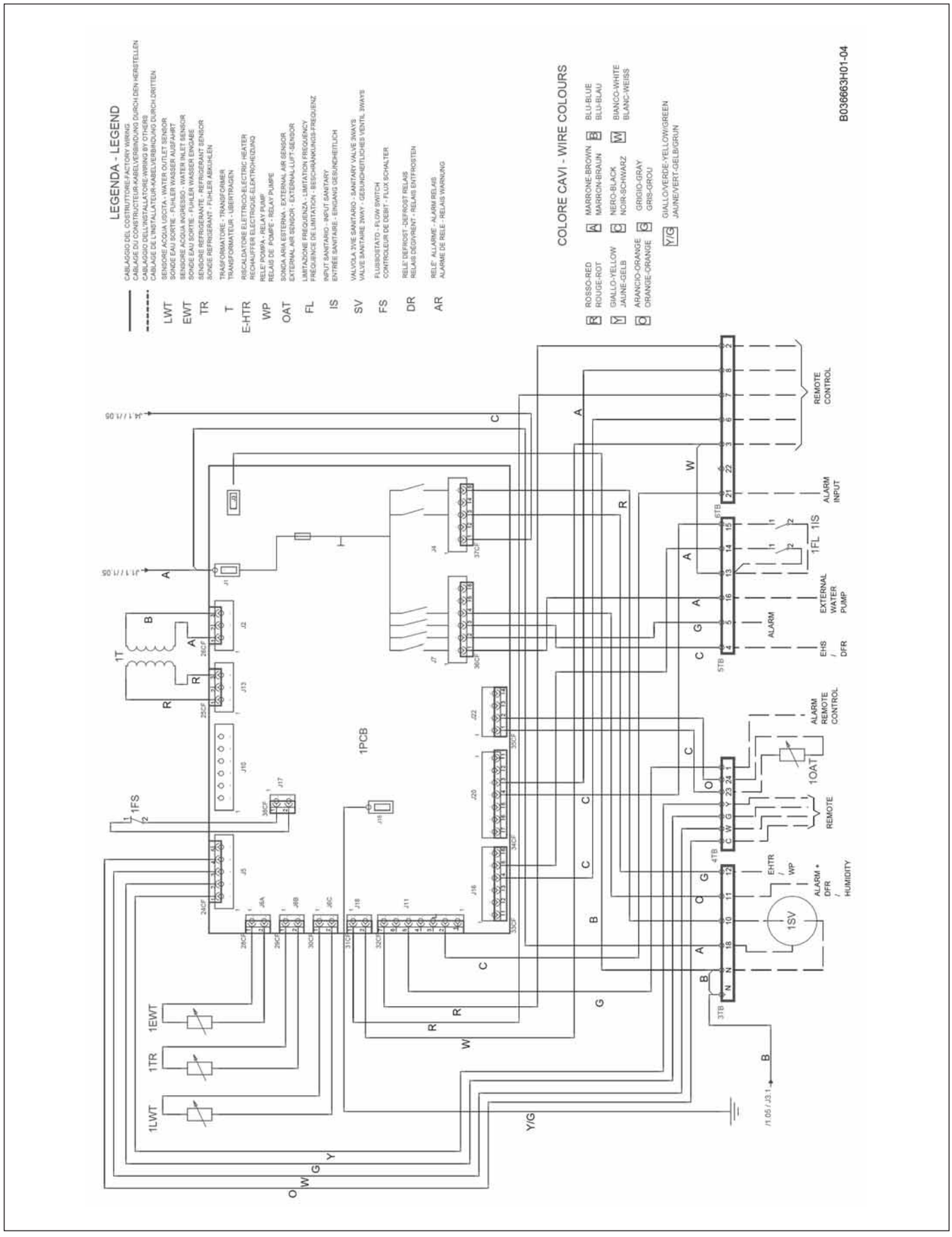

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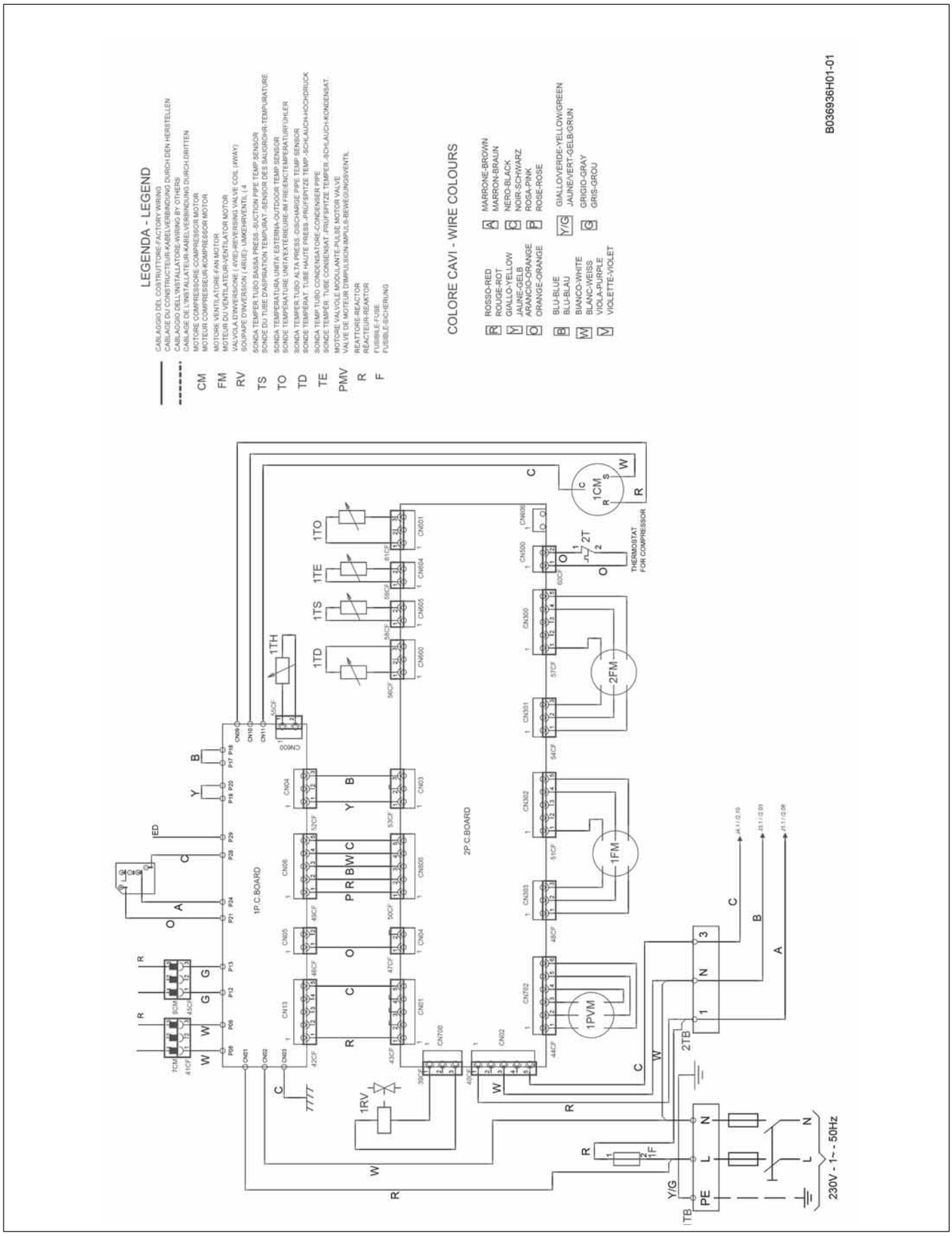

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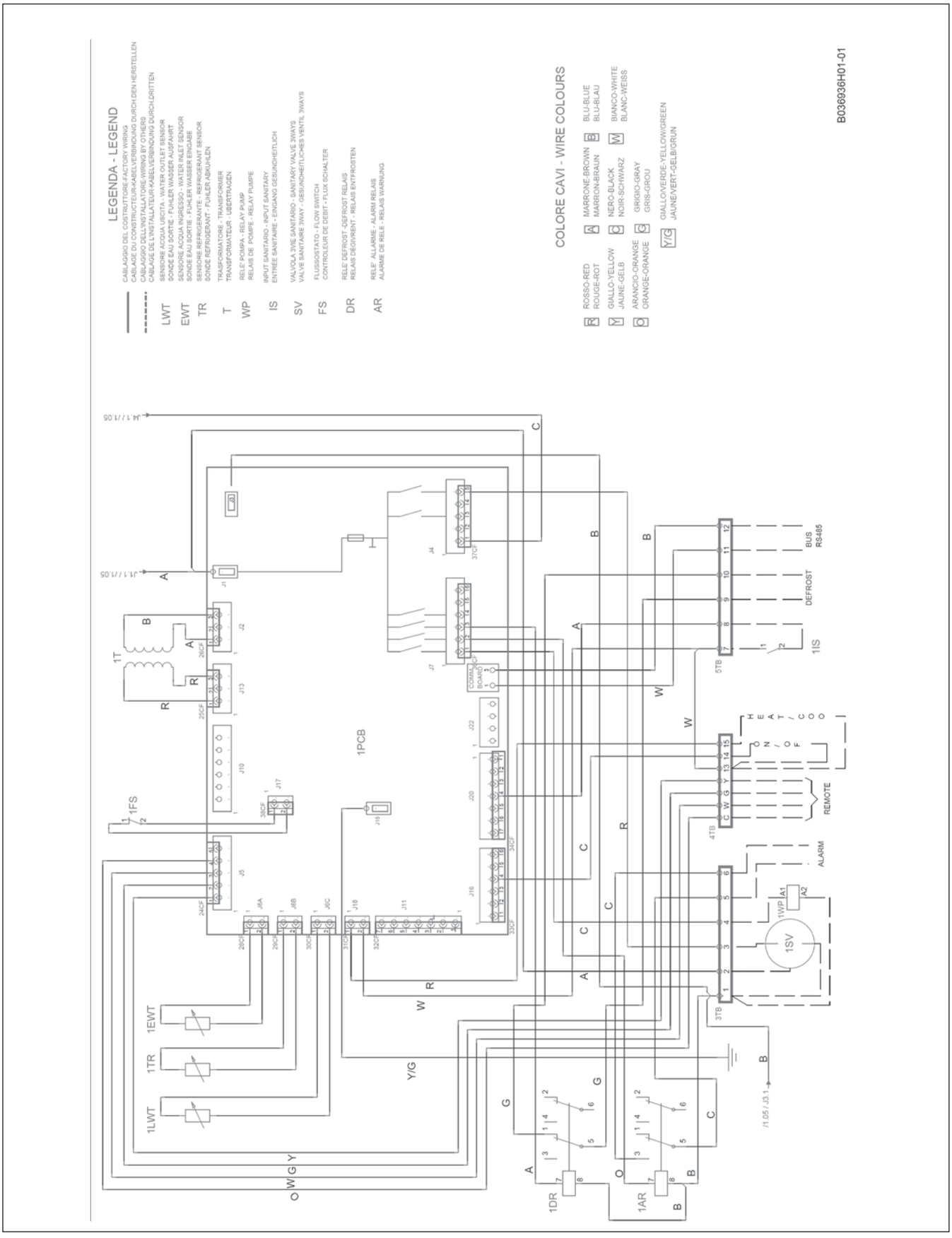
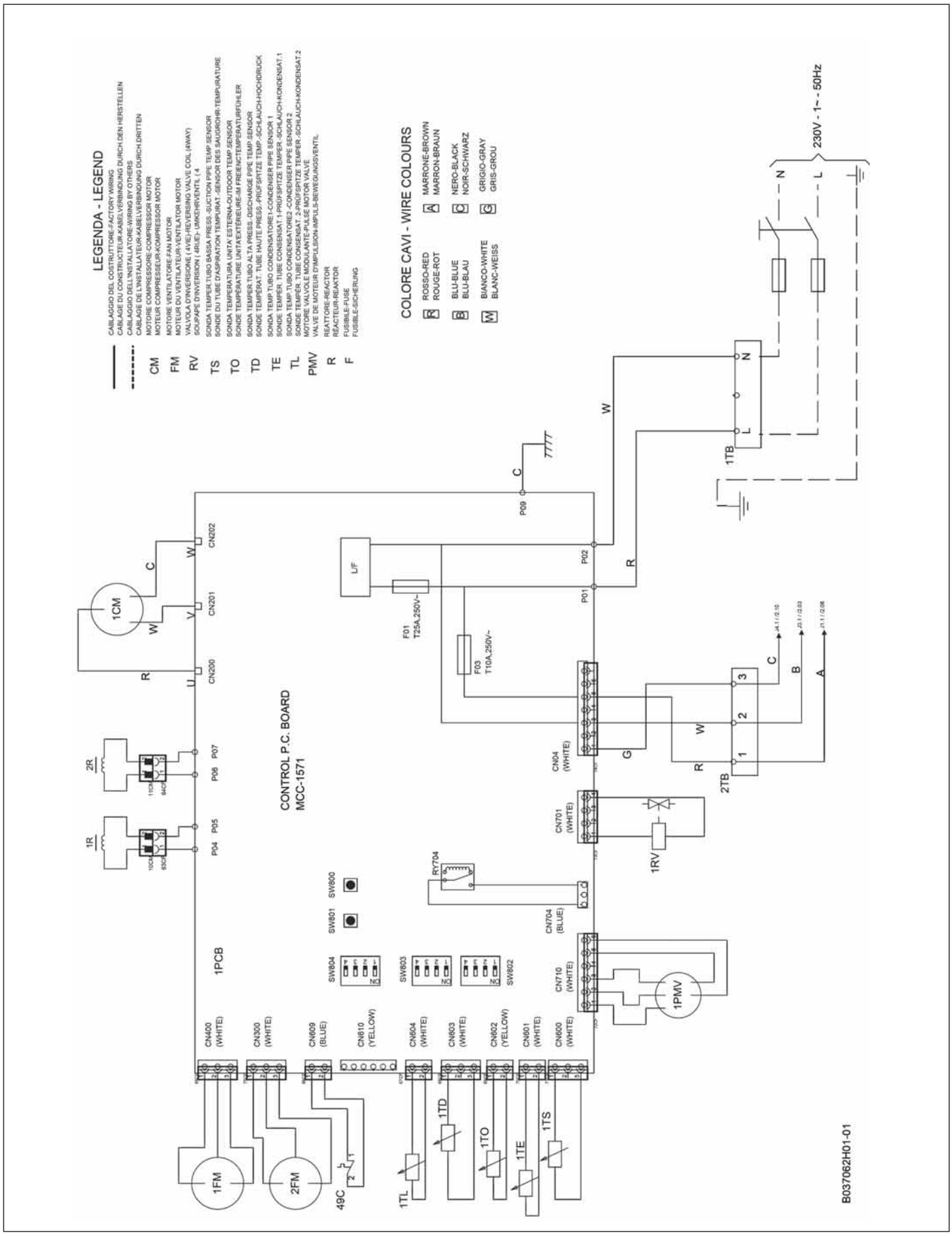


Inverter control size 015HB



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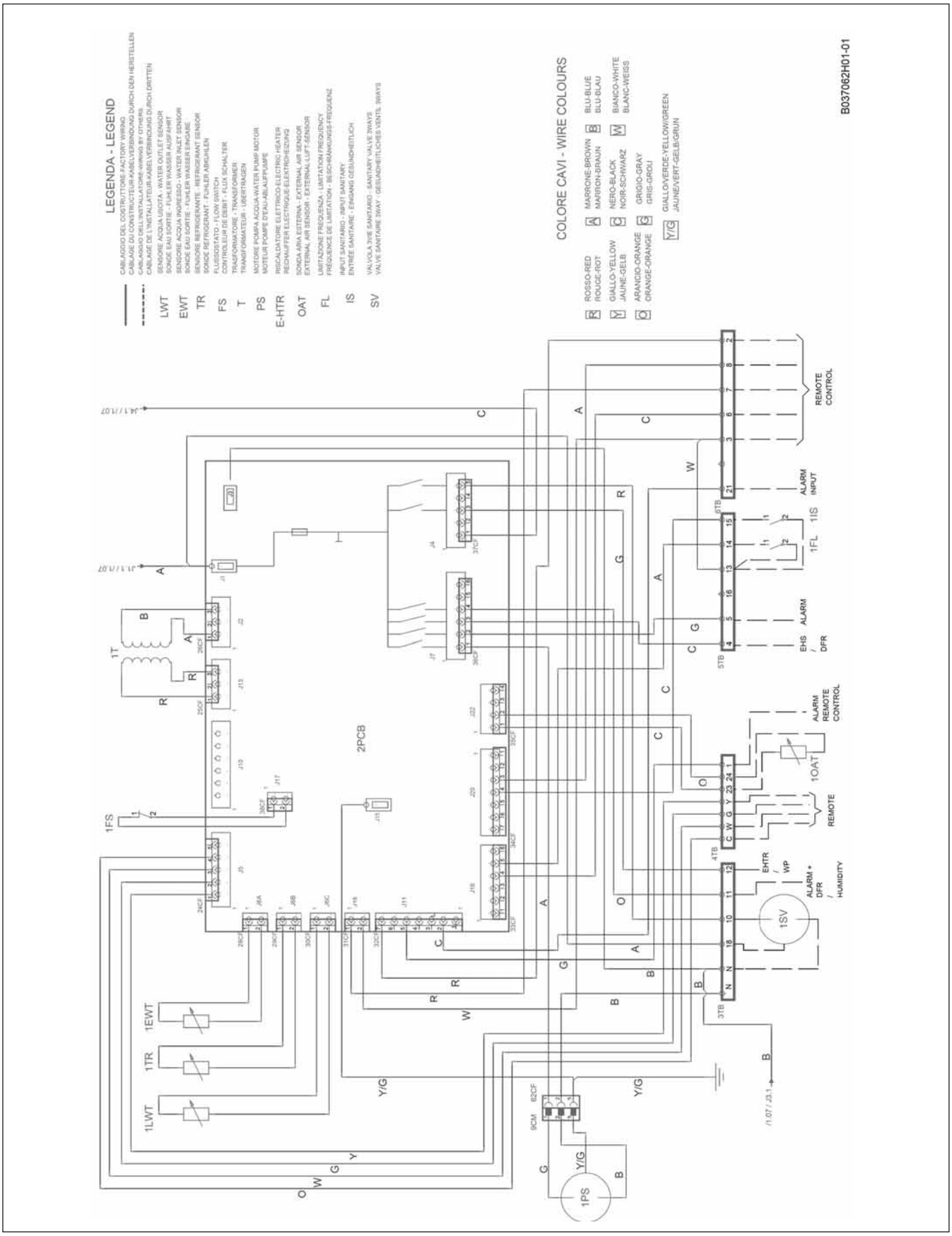

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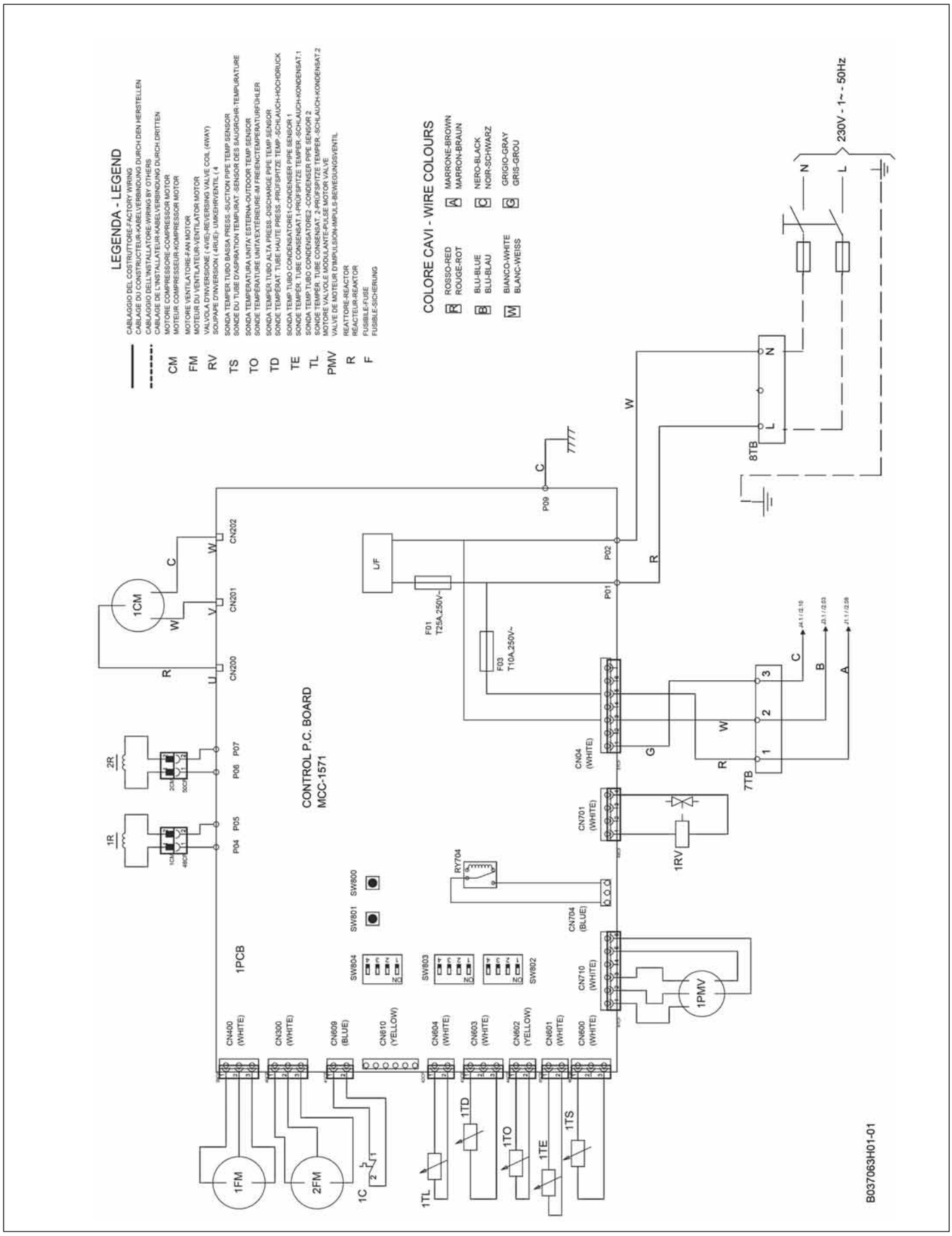

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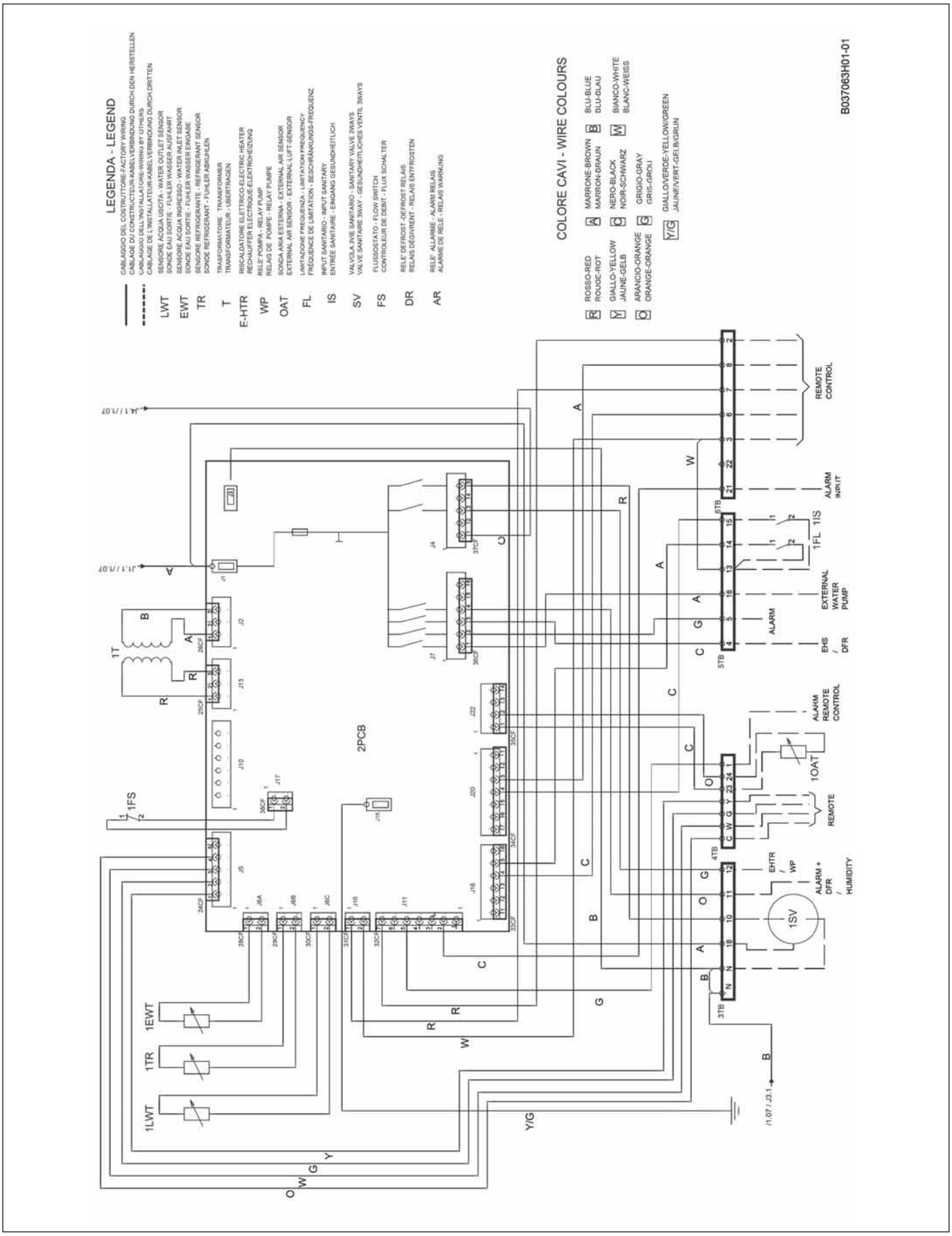
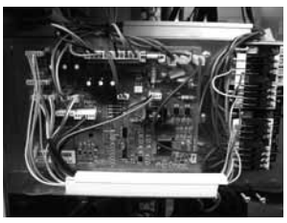
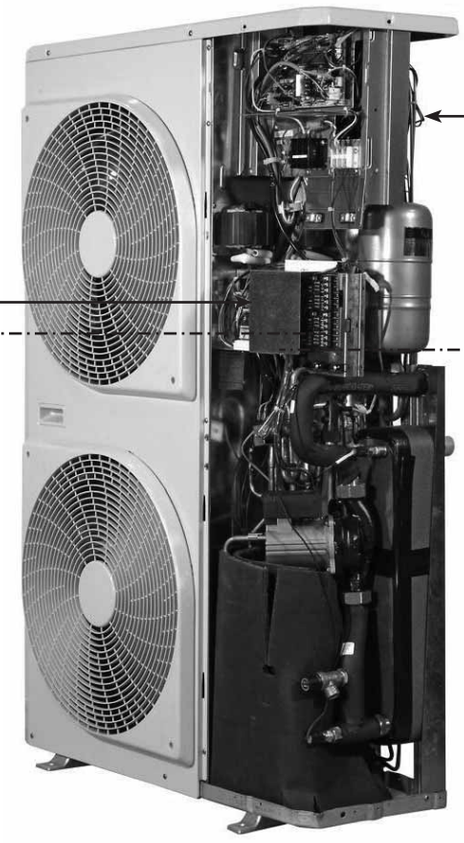


GMC controller



Inverter controller



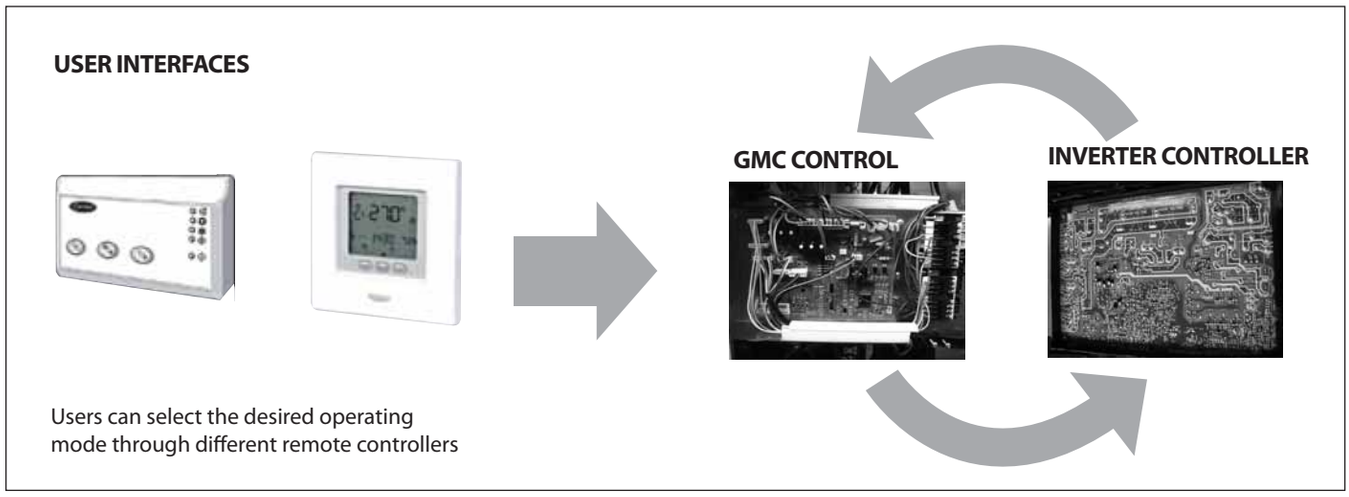
30AWH012_
30AWH015_

30AWH004_
30AWH006_
30AWH008_

Wired remote (RC1)
Code: 33AW-RC1_

Wired remote (CS1)
Code: 33AW-CS1_

5.1 Introduction



Control is based on the GMC platform developed by Carrier. For the 30AWH AquaSnap PLUS inverter chiller / heat pump a new GMC board has been developed as well as new algorithms have been implemented. The GMC control elaborates the request from the user interface and translates it into a message for the chiller unit control. It continuously analyzes the water, indoor ambient conditions and the customer requests sending updated signals to the chiller unit control.
The chiller unit control takes care of the system reliability and satisfies the requests coming from Inverter control tuning chiller unit fan, PMV, compressor.
The chiller unit control continuously sends back signals to the Inverter control.

5.2 Unit Control

The main flow of logic in this control is as follows: The control reads in inputs from discrete inputs, analog inputs, communications. These inputs are then processed by mode control. After the mode control comes the protections that protect the unit from damage. After the protections, the outputs are energized or de-energized. Then the loop repeats itself.
High voltage communications is used to communicate from the GMC board to inverter control.
Maximum values are maximum compressor frequency allowed unless limited by a protection or message received from the User Interface. The User Interface can limit the maximum compressor frequency from 50% to 100%.

A2W Size	Inverter Capacity (kW)	GMC Control returned to Inverter (HP)	Minimum Cooling (Hz)	Maximum Cooling (Hz)	Minimum Heating (Hz)	Maximum Heating (Hz)
4	4	1,25	20	90	20	95
6	6	1,75	10,2	100	10,2	104
8	8	3	10,2	82	10,2	104
12	12	5	15	65	15	60
15	15	6	10,2	65	10,2	70

When power supply is reset

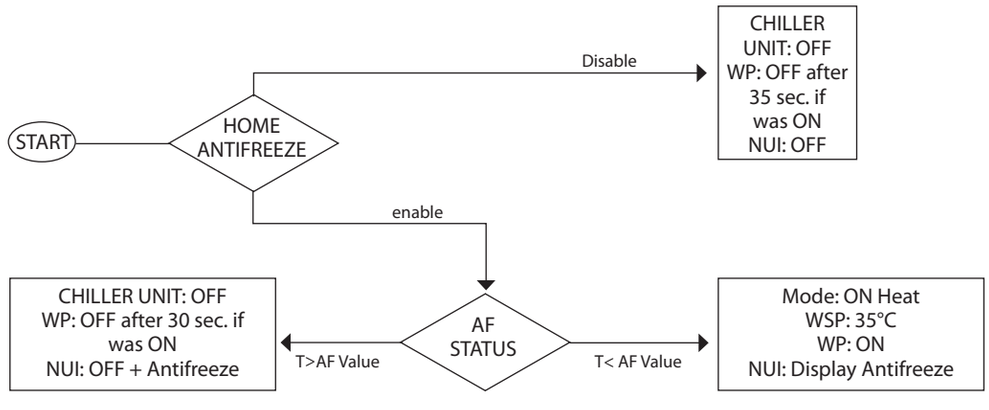
When a unit is powered up, depending on its Auto Start configuration, it will start up with its last operating parameters, or OFF Mode. The EEPROM is available for saving the operating environment of the control in the event of a power-reset condition. If not configured for auto start, at the power up the system will remain in OFF Mode. All the NUI codes will be restored on a power up condition.	

Fail Mode

When the unit has a diagnostic failure, fail mode is executed. If the Operating Mode is FAIL then the on board LED will blink the fault code, send the Forced Off message to the Unit in case of not recoverable error and Water pump remains energized. In addition and if connected, the same message code will be sent to NUI and, as an alternative, the alarm relay output should be activated as defined.	

Anti Freeze Protection in Off Mode

This algorithm protects the room from freezing when in Off Mode and if selected by the User (HOME ANTIFREEZE enabled) that can also select the Antifreeze Temperature. An hysteresis of - 0°C /+2°C should be applied.



AF: Anti-Freeze NUI Code 2

Operating mode selection

The operating mode is selected based on the command chosen by the remote control.

Cooling Mode
Depending by the system configuration and when the operating mode is cool, the system could operate as follows:
With Comfort NUI (CS1).
With SUI (RC1) / Dry inputs.
The WSP (Water Set Point) will be defined as follow:
- Fixed WSP: as per the appropriate variable value (Standard and Eco)
- Climatic Curve depending by OAT (see the controls manuals and the paragraph 7.3.5)

For more information about the cooling mode logics used to determine the WSP, refers to the SUI or NUI manuals.

Heating Mode
Depending by the system configuration and when the operating mode is Heat, the system could operate as follows:
With Confort NUI (CS1).
With SUI (RC!) / Dry inputs

The WSP will be defined as follow:
- Fixed WSP: as per the appropriate variable value (Standard and Eco)
- Climatic Curve depending by OAT (see the controls manuals and the paragraph 7.3.5)

Off Mode
If the Operating Mode is OFF then:
- All outputs must be de-energized except those turn on by protections.
- Send Forced OFF Message to the unit
- Water pump is de-energized AFTER 30 SEC.
- Antifreeze and all protections algorithms will be always operative
- Sanitary Hot Water management in OFF mode is based on code 153 (1: always active 2: active only in HTG or CLG mode)

In case of User Interface is Simple User Interface (dry contacts). The code 100 must be 0 or 1 & code 101 must be 0.
If the value of the code 146 is 2 the state of the unit is "Controlled Off Cycle". This feature is available in Heating mode, in Cooling mode and in SHW demand. Every time the compressor turns on a timer restarts to count the Compressor Run Time (CRT).
When the dry contact Off signal is received, the "Controlled Off Cycle" feature reads the Compressor Run Time:
- If CRT < 18 minutes the compressor frequency is progressively reduced from the current to the minimum value until CRT >18 minutes.
- If CRT > 18 minutes the unit is turned Off

OAT: Outdoor Air Temperature
WSP: Water Set Point

Compressor Frequency Calculation

- When the Frequency reduction mode is activated through the NUI Bus, RS 485 bus or Limitation Frequency Input, the max compressor frequency
F(n) = Maximum Cooling/Heat Hz * FREQ REDUCT (that value could be set between 50% and 100%).
- When the Unit Mode is OFF, the unit operates in cool/heat satisfied mode with a compressor frequency of zero, F(n) =0.

Calculating Frequency

The calculated water temperature exiting exchanger and calculated set point are continuously monitored. The frequency is calculated on the values of LWT and WSP. If the leaving water temperature changes causing a positive delta or if the calculated set point changes, a normal demand calculation is performed every 90 seconds (60 in heat mode). Now the frequency is calculated on the values of E(n) and ΔE(n).

Demand vs. Satisfied

- When the compressor is off and delta F > 0, the compressor is allowed to start, F = max (Fcmin, F(n)) (or in heating F = max (Fhmin, F(n))) , and demand calculations execute every 90 (60 in Heat mode) seconds.
- When the compressor is off send Cool/Heat Satisfied message to the unit.
- When the compressor is on send the Cool/Heat Demand message to the unit.

Water pump is always energized

LWT: Leaving water temperature
WSP: calculated water set point
F(n): frequency sent to the unit, clamped between zero and Fcmax
E(n)=LWT- WSP
ΔE(n): E(n-1)-E(n)
Fcmax: maximum compressor speed allowed in cooling
Fcmin: minimum compressor speed allowed in cooling
Fhmax: maximum compressor speed allowed in heating
Fhmin: minimum compressor speed allowed in heating

Dehumidifier activation (X and H terminal block pins 11 – N)

External dehumidifier source is based on NUI Relative Humidity value, (For this feature is necessary install 33AW-CS1 interface). Two codes shall be accesses through NUI: Code 108: It is for defining availability of external dehumidifier. 1 = Alarm or Defrost 2 = External Dehumidifier activation Code 107: - It is Relative Humidity Limit value to activate the heat source. - If Relative Humidity is higher than Humidity Limit, Output PINS 11-N must be forced ON and display dry mode icon on NUI. Output should be forced OFF when Relative Humidity is less than selected value - 5%. Protections are activated based on operative Mode.	NUI code 108 and 107

Compressor Short Cycling Protection (Timeguard)

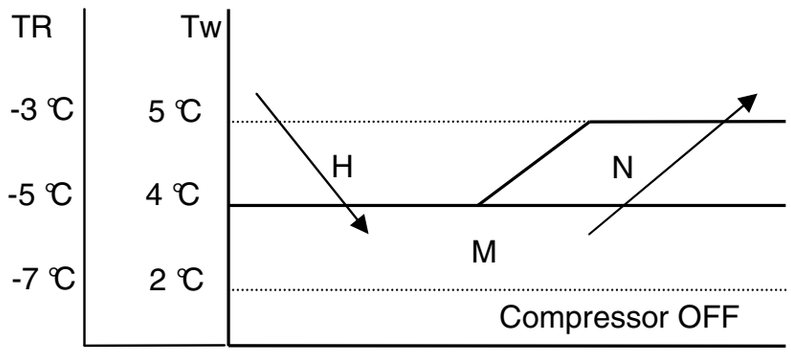
For reliability purposes when the compressor goes from On to Off, it must remain off for a minimum of 2 minutes and 30 seconds. During that time F(n) = 0, and a Cool Satisfied or Heat Satisfied message is sent to the Unit depending on the mode. To avoid short and frequent on/off cycles, the control algorithm will avoid unit turning on until 10 minutes have elapsed, if last on cycle was shorter than 10 minutes. (The maximum number of cycles for hours is six). When the compressor is ready to turn on a random delay of 0 – 31 seconds holds the compressor off. Water Pump remains always ON during Timeguard.	

Minimum Compressor Run Time

For reliability purposes this algorithm forces the compressor to run for a minimum amount of time. Once the compressor is running, it must run for a minimum of 3 minutes before switching off. This protection is ignored when: - A diagnostic forces the compressor off - User requests the unit to turn off - A/C Power Interruption - A mode change occurs - 20 second loss of high voltage communications - High temperature protection	

Water Freeze Protection

When the water starts gets too cold, there is the risk of freezing in the heat exchanger.
Certain actions are taken to prevent freezing.
This protection starts if TR or Tw go down particular values as per conditions below.

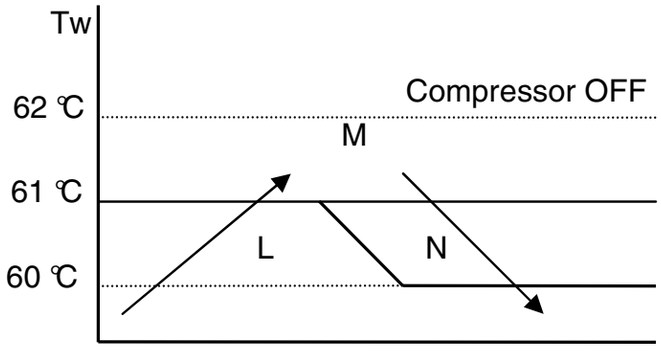


While in Zone N or H the frequency can't increase.
While in Zone M the frequency is forced to decrease until Fcmin.
Below zone M turn off the compressor and set mode OFF.

Tw:
Min(Actual Water Temperature Entering, Actual Water Temperature Exiting)
Fr(n):
real frequency from the Unit
Fcmin:
minimum compressor speed allowed in cooling
TR:
Refrigerant temperature

High Temperature Protection

When the water starts to get to hot, this is a sign that the pressure in the system is increasing.
Certain actions are taken to decrease the pressure.



While in Zone N or L the frequency can't increase.
While in Zone M the frequency is forced to decrease until Fcmin.
If Tw≥62 or Trl' > 65°C then turn off the compressor and set F = 0.

Tw: Max(Actual Water Temperature Entering, Actual Water Temperature Exiting)
Tr: Actual Refrigerant Temperature
Fr(n): real frequency from the chiller unit
Fhmin: minimum compressor speed allowed in heating

Anti frost protection

This function shall run when the unit is manually stopped or shutdown due to alarm. It shall protect the water exchanger against freezing risk because of low outside temperature conditions.
The following logic shall be used:
- 3 different fall down threshold limits have been be defined to sequentially power On:
  - o Trace Heater (first intervention) (when installed).
  - o Water Pump (second intervention)
  - o Unit On in Heat Mode (and TH Off)
- 3 different rise up threshold limits have been defined to sequentially Power Off:
  - o Unit Off (and TH On)
  - o Water Pump Off
  - o Trace heater Off

		TH	WP	HP
Threshold A	[(EWT or LWT < (DELTA SP + 4°C))]	ON	OFF	OFF
Threshold B	[(EWT or LWT < (DELTA SP + 3°C))]	ON	ON	OFF
Threshold C	[(EWT or LWT < (DELTA SP + 2°C)]	OFF	ON	ON
Threshold D	[(EWT and LWT > (DELTA SP + 5°C)]	OFF	OFF	OFF

DELTA SP: NUI CODE 109
WP: Water Pump
TH: Trace heater
HP: Heat Pump
OAT: Outdoor Air Temperature
EWT: Enter Water Temperature
LWT: Leaving Water Temperature

A/C Power Interruption

This algorithm handles the case of losing A/C line cycles.
If the A/C waveform is lost for 70 milliseconds, force the compressor off by sending Forced Off signal to Unit. Then send cool satisfied or heat satisfied until time guard expires.

Envelope Limitation Protection

This function limits frequency based on a combination of OAT and LWT, in order to guarantee the unit envelope. The envelope limits are different for heating and cooling mode and change from a size to another.

HEATING
-20 °C ≤OAT≤30 °C
20 °C≤LWT≤60 °C

COOLING
0 °C ≤ OAT ≤ 46 °C
4 °C ≤ LWT ≤ 18 °C

For more details see par 2.4 Operation Limits
When the OAT and/or LWT values are out of these limits the Aquasnap unit doesn't stop but it works in particular conditions in order to preserve the compressor (frequency and for uptime limitation).

OAT: Outdoor Air Temperature
LWT: Leaving Water Temperature

Unit Status and Defrost output or Tair Setpoint status

Based on the NUI code 147 set-up, the Output J7 Pin 2 (N-5 on the terminal block) could play for one of these Functions: - ALARM: The intent of this output is to point out the alarm condition. This signal could be used by an external control to verify if the Unit is able to operate with the requested function. - Tair SETPOINT STATUS: The intent of this output is to give signal to a potential Fan Coil System when the T ambient set-up measured by the NUI is reached. A hysteresis of +1°C / – 1°C is used. This signal could be used like a window contact by the Fan Coil to stop the fans and/or the water valves.	NUI code 147

Sanitary water Input and 3 Way Valve Output

The combination of the Sanitary Water Inputs and Outputs should be able to manage an external Sanitary Water Boiler and this is the logic that is driving this function: - When an external Sanitary Water Boiler needs hot water from the units, it close the dry contact Pins 13-15 on the terminal block. - The routing that is always running in order to verify Input changes detect this need and the unit mode, whichever it is the current status, become in HEAT mode at the max allowed WSP admitted as per the Enveloped Limitation protection. - In case of no alarm or defrost is active, the 3 Way Valve Output (pins N-10-18 on terminal block) become ON while, vice versa, this output is always OFF in case of alarm and/or Defrost - In addition, the NUI, if available, will display the relative Icon. - The code 153 (SHW in off mode) determines if the SHW Logic shall be active or not when. System Mode is OFF. In Heat or Cool Mode the SHW logic is always actives. NOTE: when SHW is ON, EHS is always OFF	**SHW:** Sanitary Hot Water **EHS:** External Heat Source **WSP:** water set-point NUI code 153

Water Pump On / Off Management

The water pump should be always ON apart if any alarms are active or if the unit is in OFF mode (selected or forced by the unit itself). When the system turn OFF the water pump must be ON for additional 30 seconds. When the unit is stopped for more than 24 hours the pump shall be started for 45 seconds; starting the pump periodically for few seconds increases the life time of the pump. <u>If OAT < temperature set in code 148</u> The main water pump activation depending by the code 155 (0. always ON, 1. always OFF or 2. ON/ OFF depending by EHS)	**SHW:** Sanitary Hot Water **EHS:** External Heat Source NUI codes 148, 155

Additional water Pump On / Off Management

The management for the additional water pump, linked to the pin 12 on the X and H terminal block, is the following: <u>If OAT > temperature set in code 148</u> The additional water pump activation depending by the code 156 1. ON/ OFF depending by main WP logic, in case of SHW activation ADD WP is ON; 2. ON/ OFF depending by main WP logic, in case of SHW activation ADD WP is OFF; <u>If OAT < temperature set in code 148</u> The additional water pump activation depending by the code 157 (0. always ON, 1. always OFF or 2. ON/ OFF depending by EHS)	**SHW:** Sanitary Hot Water **EHS:** External Heat Source **WP:** Water Pump **ADD WP:** Additional Water Pump NUI codes 148, 156, 157

Flow Switch Protection

If water is not flowing through the heat exchanger, the compressor cannot turn on and if it is on it is forced off. Water Pump will be forced On or Off as per flow switch output: - If flow switch contact is open (no water flow) Unit and WP turn OFF. - The system retries to start for 5 times before displaying alarm. The compressor is allowed to turn on if requested to when the water is flowing through the heat exchanger (flow switch contact OFF) and timeguard has expired.	Settings: Size 4kW = 300 l/h Other Sizes = 420 l/h

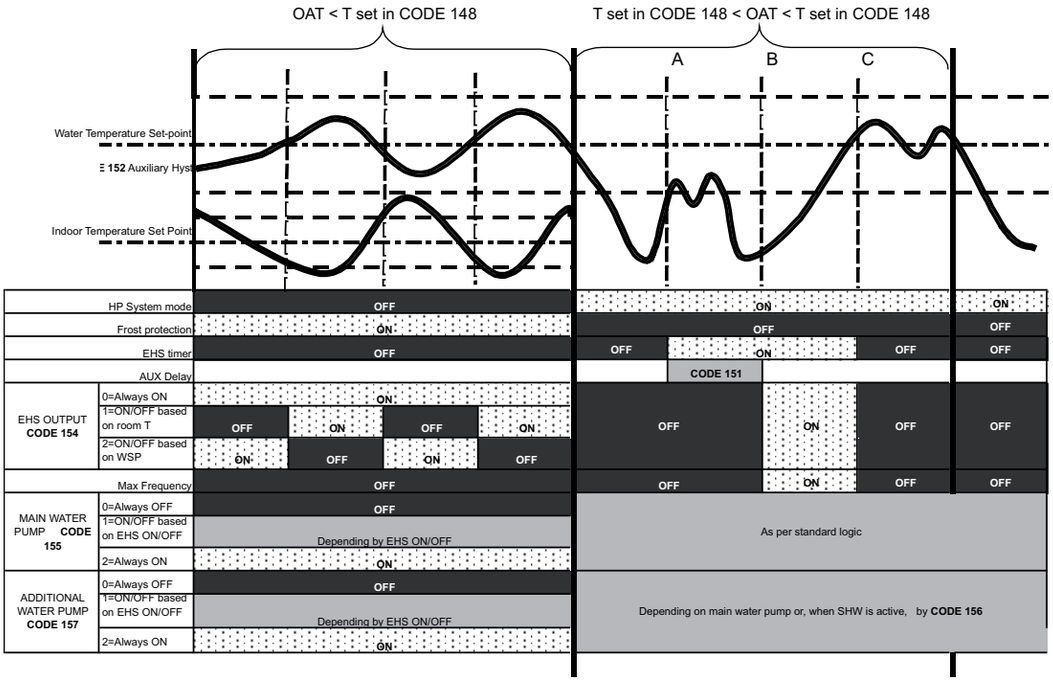
Backup External Heat Source functionality (X and H terminal block pins 5 – N)

This functionality is valid when user mode is HEATING MODE.
Between pins 5 and N of terminal strip (see paragraph 4.1) an output is available (1 ph ~ 230V, 2A max) to activate a backup external heat source (such as Electric Heater or Boiler).
This functions is activates using the NUI.
NUI Codes for this function:

106: 1 for External heat source (2 for Defrost Output)
148: OAT limit for External heat source (-20°C / +65°C)
150: Auxiliary OAT limit. This code is defining the EHS threshold value under witch both HP and EHS will be operative as per algorithm. (-20°C / +30°C)
151: Auxiliary Delay. Delay time before switching the back-up EHS ON min. (1 min / 60 min)
152: Auxiliary Hysteresis. Delta T needed to activate the Auxiliary Heater. (1°C / 20°C)
153: SHW in OFF MODE. This code is defining if, when System mode is OFF, the SHW logic can be activated.
154: EHS OUTPUT. This code is defining the EHS output status when EHS is activated and OAT<Code 148
155: Main water pump vs EHS OAT. This code is defining the water pump logic when EHS is activated and OAT<Code 148
156: Additional WP vs SHW (0 Trace heater Output active)
157: Additional WP (X and H terminal block pins 12 – N)

SHW: Sanitary Hot Water
EHS: External Heat Source
HP: Heat Pump
OAT: Outdoor Air Temperature
WP: Water Pump

NUI Codes
106, 148,
150, 151,
152, 153,
154, 155,
156, 157



<u>If code 148 < OAT < code 150:</u>

When LWT is below the water set-point minus the auxiliary hysteresis (code 152) starts the EHS timer (A). When the set delay (code 151) is passed (B) the External Heat Source turns ON and the HP is regulated at the max frequency. The EHS turns OFF when the LWT reached the water temperature set point (C) (EHS timer is set to 0). The additional water pump will be activated depending by main water pump (always ON if main water pump is ON) and by the code 156 (ON or OFF as per SHW activation).

<u>If OAT < code 148:</u>

The HP turns OFF (frost protection is active)
The EHS turns ON/OFF depending by setting of the code 154 (Always ON, Based on Room temperature or Water Temperature).
The main water pump activation depending by the code 155 (always ON, always OFF or depending by EHS status)
The auxiliary water pump activation depending by the code 157 (always ON, always OFF or depending by EHS status)
NOTE:
In case of SHW activation (pins 13-15 closed) heat pump will turn on and backup heater will turn off. This will happen in both the above strategies based on OAT value.
In case of EHS installation it is mandatory to install a thermal switch on the water circuit to protect the system from too high water temperatures. This protection item has to be located Immediately downsteam the EHS (according to local/national legislations).

System Diagnostics

The control contains diagnostic tests to verify the integrity of the system.
The On Board LED is located on the circuit board. It is used to display normal operation status and diagnostic fault code information.
The control board status LED will flash at a rate of one (1) second ON and one (1) second OFF while the control is operating normally.
When in a diagnostic fault code, it will blink out the fault code.
Once a failure occurs, the system is considered failed. The failure could be recoverable or not. The lowest diagnostic number that is active will be the fault code that is displayed.

When a diagnostic is active the onboard LED will blink the fault code out. The sequence will be 4 seconds with the onboard LEDs off. The onboard LED will blink at a rate of half second on, half second off for each number in the tens digit. Then 2 seconds off. The onboard LED will blink at a rate of half second on, half second off for each number in the ones digit. If the fault code is less than 10 the delay will be 6 seconds between onboard LED flash sequences.
Fault Codes associated with diagnostic will be available through communications.
Fault code 14 and 8 shall be give top priority and shall by pass other fault codes. Fault codes priority order shall be the same as in the given below table in absence of Fault codes 14 and 8.

SUI Alarm:
When any diagnostic is active and in case SUI is connected, SUI Alarm LED shall blink as just the same way as Onboard LED. In absence of diagnostics SUI Alarm LED shall remain OFF.

Fault codes on NUI:
Main Board shall communicate the diagnostic with NUI. User or Installer can view these fault codes through an entry into User settings mode or Installer settings Mode and scroll to the fault code as mentioned in the Variable table. NUI shall scroll all the active fault codes. In absence of diagnostics, NUI shall display blank. NUI shall also manage to store the latest 4 fault codes and Installer can view this value by scrolling to Fault code History parameter.
For more information about the fault code on controls NUI and/or SUI refer to their specific manuals.
For specification of fault code refer to the specific paragraph:
"6.2 GMC alarm codes"

Recoverable: self healing diagnostic
Not Recoverable: Must cycle power up to the unit to fix the system.

Output test

This test will be used by the Installer to test and/or to force ON the outputs, setting the code 104 on the NUI:

0. No test
1. Water pump
2. Alarm / Ambient temperature reached
3. External Heat Source / Defrost
4. Alarm + defrost / Humidity
5. Trace Heater / Additional Water Pump
6. 3 Way Valve
7. SUI Alarm
8. N.A.

To perform any output test, the Unit must be in Off (if not, Off must be forced). After 10 minutes the unit automatically exit from output test.To perform any output test, the Unit must be in Off (if not, Off must be forced).

NUI Code 104

Pulse Modulating Valve [PMV] control (cooling and heating operation)

Pulse Modulation Valve is a refrigerant bi-flow electronic expansion device driven by a stepper motor.
It's use to optimize refrigerant superheating and avoid refrigerant liquid back into the compressor.
1) The PMV is controlled with 50 to 500 pulses during the operation, respectively.
2) The PMV is controlled using the temperature difference between:
TS sensor and TR sensor in cooling mode; TS sensor and TE sensor in heating mode. The target is to maintain the temperature difference from 1 to 5K.
3) During max loading conditions, the refrigerant circuit pressures & temperatures can increase excessively, so the PMV is controlled by the TD sensor.

REQUIREMENT

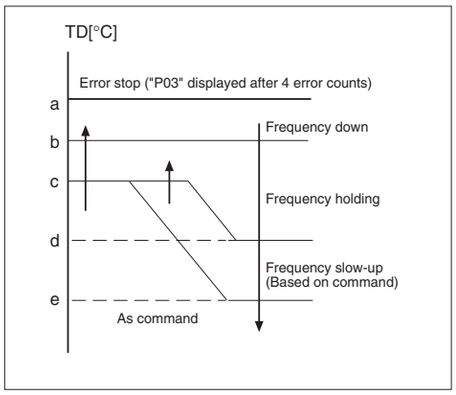
A sensor problem can cause a liquid flow-back or abnormal overheating condition, resulting in a reduction of the compressor life. In the case of compressor failure, be sure to check the resistance measurement of all sensors in the refrigeration cycle and replace if necessary when replacing the compressor.

TS: Suction temperature
TR: Refrigerant temperature
TE: Entering (in Heat exchanger) temperature

Discharge temperature release control

1) This function controls the compressor frequency, when the discharge temperature has increased due to max load condition or during PMV control. It subdivides the frequency control up to a unit of 0.6 Hz to stabilize the cycle.
2) When the discharge temperature is detected in an abnormal stop zone, the unit stops the compressor and restarts it after 2 minutes, 30 seconds (time guard). The error count is cleared when operation of 10 minutes without error occurs. If the abnormal stop zone has been detected 4 times without clearing, an error code is displayed.
* Possible causes include excessive amount of refrigerant, defective PMV, or blockage in the refrigeration cycle.

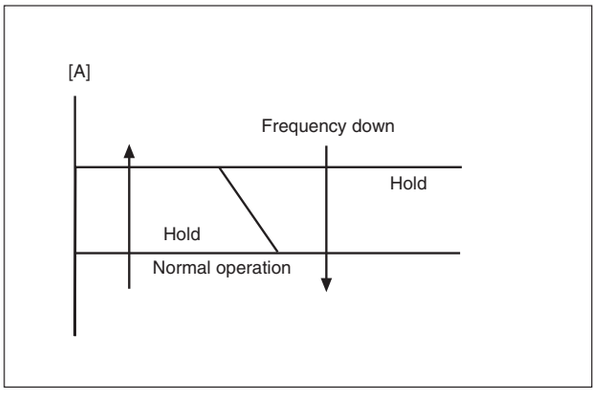
TD: Discharge temperature



	a	b	c	d	e
30AWH004	117	112	108	105	98
30AWH006	117	112	108	105	98
30AWH008	117	107	103	100	93
30AWH012	111	106	100	95	90
30AWH015	111	109	106	103	96

Current release control

The output frequency and the output voltage are controlled by AC current detected on the P.C. board.
The max current value of the inverter are shown in table below.



	I1 value [A]	
	COOL	**HEAT**
30AWH004	6.3	6.3
30AWH006	8.5	10.8
30AWH008	10.1	12
30AWH012	23	23
30AWH015	20	20

Outdoor fan control

Allocations of fan tap revolutions

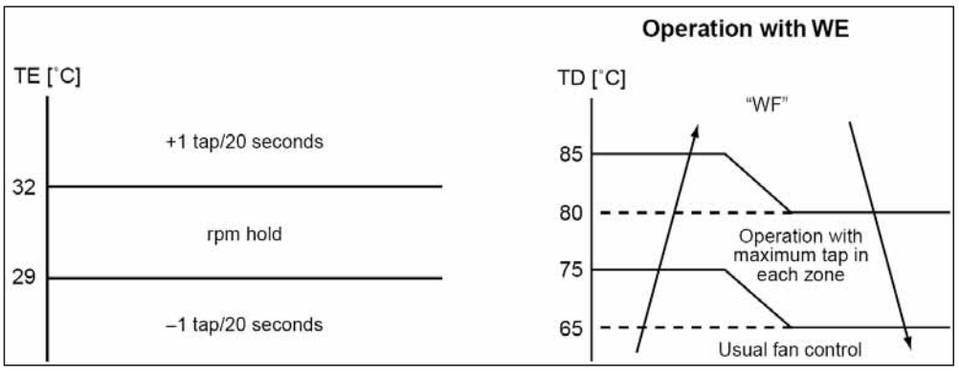
FAN TAP	W1	W2	W3	W4	W5	W6	W7	W8	W9	WA	WB	WC	WD	WE	WF	WG
30AWH004	0	200	280	320	350	380	420	460	500	530	560	580	600	600	600	600
30AWH006	0	200	250	300	350	400	450	500	550	580	600	600	600	600	600	600
30AWH008	200	240	280	310	350	380	420	450	490	520	580	630	680	680	680	-
30AWH012 Higher fan	250	260	270	280	330	380	430	480	530	590	650	700	730	750	-	-
30AWH012 Lower fan	OFF	OFF	250	260	310	360	410	460	510	570	630	380	710	730	-	-
30AWH015 Higher fan	200	240	240	260	320	380	480	540	640	740	780	780	780	780	-	-
30AWH015 Lower fan	0	0	200	280	360	400	500	560	660	760	820	820	820	820	-	-

Two different algorithms, for each size, manage fan speed, one for cooling and one for heating operations:
1) **Cooling fan control**

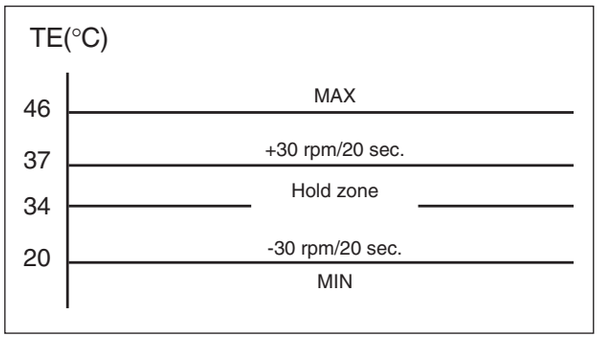
004-006 sizes.
The blowing air volume is controlled as follow:
1. When strong wind blows at outdoor side, the operation of heat pump continues with the fan motor stopped.
2. Whether the fan is locked or not detected, and the operation of heat pump stops and an alarm is displayed if the fan is locked.
3. According to each operation mode, by the conditions of outdoor temperature (TO) and compressor revolution, the speed of outdoor fan shown in the table is selected

Compressor speed (Hz)		~ 13.8		~ 31.7		32.3 ~ MAX	
		MIN	MAX	MIN	MAX	MIN	MAX
TO	TO ≤ 38 °C	W3	W4	WD	WE	WF	WG
	TO ≤ 28 °C	W3	W4	WB	WD	WE	WG
	TO ≤ 15 °C	W3	W4	W8	WB	WA	WD
	TO ≤ 5,5 °C	W2	W4	W3	W6	W5	W8
	TO ≤ 0 °C	W2	W2	W2	W3	W3	W5
	TO ≤ 0 °C	W1	W1	W1	W2	W2	W3
During ECO mode	TO ≤ 38 °C	W3	W4	WC	WD	WD	WE
	TO ≤ 38 °C	W3	W4	W3	W4	WC	WD
When To is abnormal		WE	WG	WE	WG	WE	WG

008 size
1. The outdoor fan is controlled by TE, TD, and TO sensors and also revolution frequency of the operation. The outdoor is controlled by every 1 tap of DC fan control (15 taps).
2. Only during 60 seconds after the operation has started, the fan is fixed with the maximum fan tap which corresponds to the zone in the following table. After then the fan is controlled by TE sensor temperature.
3. Considering a case that TE sensor has come out of the holder, the fan is controlled so that revolution frequency of the fan increases regardless of TE if temperature of TD sensor has risen.



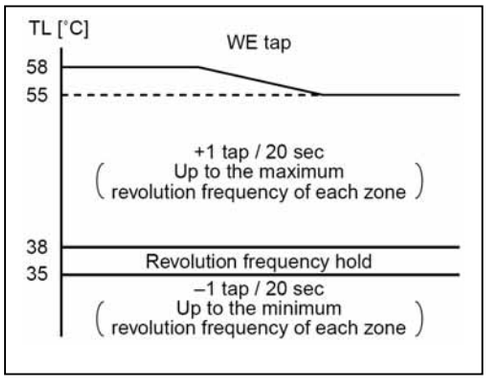
The output frequency and the output voltage are controlled by AC current detected on the P.C. board.
The max current value of the inverter are shown in table below.



TO	TO < 5C	5 <= TO < 10C	10 <= TO < 15C	15 <= TO < 20C	20 <= TO < 25C	25 <= TO	TO error
MIN	W1	W2	W3	W4	W5	WA	W1
MAX	W6	W8	WA	WC	WE	WE	WE

015 size

1. The outdoor fan is controlled by TL sensor, TO sensor and the operation frequency. The outdoor fan is controlled by every 1 tap of DC fan control (14 taps).
2. Only for 60 seconds after the operation has started, the maximum fan tap corresponding to the zone in the following table is fixed and then the fan is controlled by temperature of TL sensor.



Temp. range	20 Hz or lower		20 Hz to 45HZ		45 Hz or higher	
	MIN	**MAX**	**MIN**	**MAX**	**MIN**	**MAX**
38 °C ≤ TO	W6	WC	W8	WC	WA	WD
29 °C ≤ TO < 38°C	W5	WB	W7	WC	W9	WC
15 °C ≤ TO < 29°C	W4	W8	W6	WA	W8	WC
5 °C ≤ TO < 15°C	W3	W6	W5	W8	W7	WA
0 °C ≤ TO < 5°C	W2	W4	W4	W6	W5	W8
- 4 °C ≤ TO < 0°C	W2	W3	W3	W5	W4	W6
TO< - 4°C	W1	W2	W1	W4	W2	W6
TO error	W1	WC	W1	WC	W2	WD

2) Heating fan control

004-006 sizes

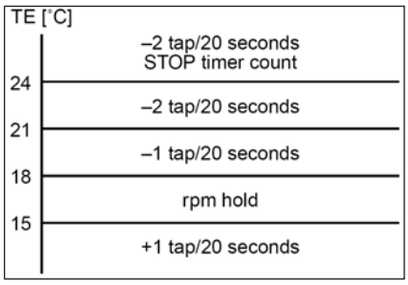
The blowing air volume at the outdoor unit side is controlled as follow:

1. When strong wind blows at outdoor side, the operation of heat pump continues with the fan motor stopped.
2. Whether the fan is locked or not detected, and the operation of heat pump stops and an alarm is displayed if the fan is locked.
3. According to each operation mode, by the conditions of outdoor temperature (TO) and compressor revolution, the speed of outdoor fan shown in the table is selected.

Compressor speed (Hz)		~ 16.8	~ 47.9	48.5 ~ MAX
		MIN	MAX	MAX
TO	TO ≤ 15 °C	W4	W9	WA
	TO < 15 °C	W4	WA	WB
	TO < 5.5 °C	W9	WB	WE
	TO < -5.0 °C	WC	WD	WE
During ECO mode	TO ≥ 15 °C	W4	W4	W7
	TO < 15 °C	W4	W4	W9
	TO < 5.5 °C	W6	W4	WA
	TO < 5.5 °C	W8	WB	WC
When To is abnormal		WB	WC	WE

008 size

1. The outdoor fan is controlled by TE sensor, TO sensor and the operation frequency. (From Min. W1 to Max. are controlled according to the following table.)
2. During 3 minutes after start-up, the fan is fixed with the maximum fan tap corresponding to zone in the following table. After then the fan is controlled by temperature of TE sensor.
3. If status, TE > 24°C continues for 5 minutes, the operation stops. This status is same to the usual Thermo-OFF which has no alarm display, and the fan restarts after 2 minutes and 30 seconds. This intermittent operation is not abnormal



Temp. range	f <38.9 Hz	38.9 Hz ≤ f <67.6 Hz	67.6 Hz ≤ f
10 °C ≤ TO	W7	W8	W9
5 °C ≤ TO < 10°C	WA	WB	WD
-5 °C ≤ TO < 5°C	WE	WF	WF
TO ≤ - 5°C	WE	WF	WF
TO error	WE	WF	WF

012 size

1. This control function lowers the fan tap according to the TE sensor value when the outdoor temperature is high.
2. When a status TE > 20C is detected continuously for 5 minutes, the operation may stop. Thisstatus does not output an error code and is assumed as usual status of thermo-OFF. The fan restarts after approx. 2 minutes 30 seconds and this intermittent operation is not an issue.
3. This control function does not work for 30 minutes after activation, 1 minute after defrosting and during defrost operation

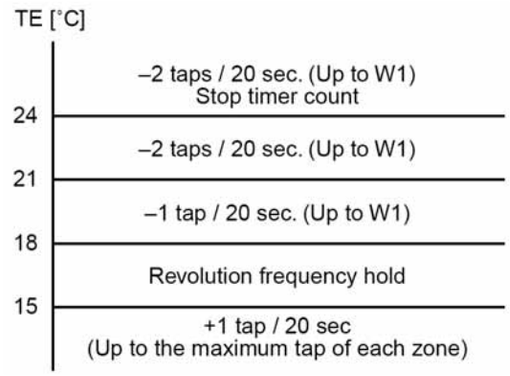
Control for fan tap by outdoor temperature in normal operation.

TO	10≤TO	5≤TO<10	TO<5
MIN	W1	W1	W1
MAX	WE	WE	WE

015 size

1. The outdoor fan is controlled by TE sensor, TO sensor and the operation frequency. (Control from minimum W1 to maximum (according to the following table)
2. For 3 minutes after the operation has started, the maximum fan tap corresponding to the zone in the following table is fixed and then the fan is controlled by temperature of TE sensor.
3. When TE e 24°C continues for 5 minutes, the compressor stops. It is the same status as the normal thermostat- OFF without error display. The compressor restarts after approx. 2 minutes 30 seconds and this intermittent operation is not abnormal.

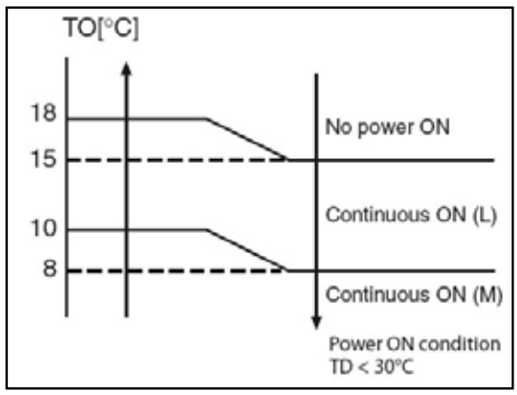
Temp. range	20 Hz or lower	20 Hz to 45HZ	45 Hz or higher
	MAX	MAX	MAX
10 °C ≤ TO	W7	W8	W9
5 °C ≤ TO < 10°C	W9	WA	WB
-3 °C ≤ TO < 5°C	WB	WB	WC
-10 °C ≤ TO < -3°C	WC	WC	WC
TO ≤ - 10°C	WD	WD	WD
TO error	WD	WD	WD

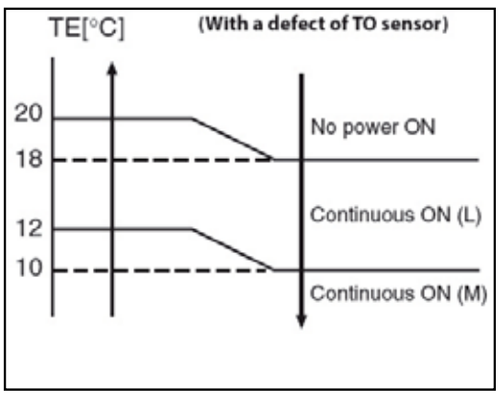


Coil heating control (compressor warm up process)

1. This control routine maintains sufficiently heated the compressor stopped by powering on the windings instead of a crankcase heater. The control purpose is to prevent slackness of refrigerant inside the compressor.
2. To avoid compressor damaging during the installation test mode or after long compressor off time, it's advised to start the system when the control has interrupted the compressor warm up process.
3. A judgment for electricity is performed by TD and TO sensors. In the event of TO sensor failure, a backup control is automatically performed by TE sensor (judging the TO sensor defect checking the outdoor LED display).
4. The right coil heating is controlled by TD and TE sensor.
5. For each model, the compressor warm up process is interrupted turning off the power supply when TD is 30°C or more

TO: Outdoor Temperature
TE: Entering (in Heat exchanger) temperature
TD: Discharge temperature

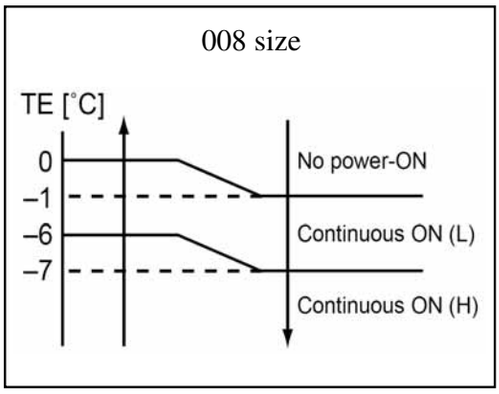




	004	006-008	012	015
L	10W	10W	25W	40W*
M	30W	30W	50W	40W

NOTIFICATION

It is not an abnormal phenomenon that electro-noise may be heard while heating the coil.



*intermittent power-on: 10 minutes on, 5 minutes off

High-Pressure suppression TE control

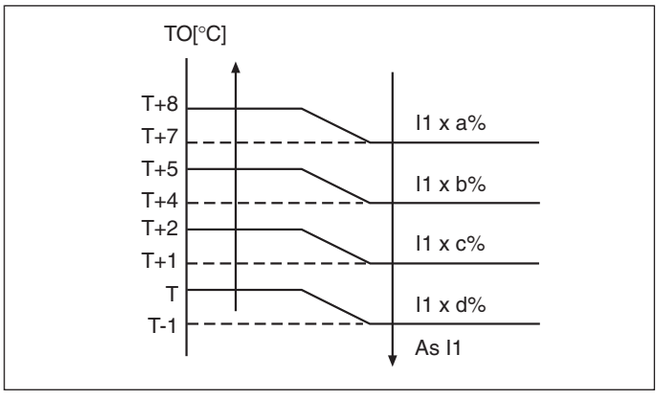
1. This control routine suppresses that pressure which becomes abnormally too high during the cooling operation. 2. It stops the compressor if TE ≥ 67°C and count 1 on the error counter. After 2 minutes 30 seconds of compressor off (time guard) if TE < 67°C, the compressor is enable to restart. After the compressor restart, the unit current is continuously controlled for minimum 30 minutes fixing the limit from 70% to 90% of the control value defined for current release control. The error counter will be cleared if TE < 67 for 10 minutes of continuous operation. 3. When TE ≥ 67°C is detected again within 10 minutes, 1 is added to the error counter and restart is repeated. 4. If the errors counted are 10, the value is considered as a malfunctioning and the system operation is locked out .	**TE:** Entering (in Heat exchanger) temperature

Over-current preventive control

1. This control routine stops the compressor when over-current preventive circuit has detected an abnormal current. 2. The compressor restarts with error count 1 after 2 minutes 30 seconds (time guard). 3. If the error counted are 4, the value is considered as a malfunctioning and the system operation is locked out.	

Current release value shift control

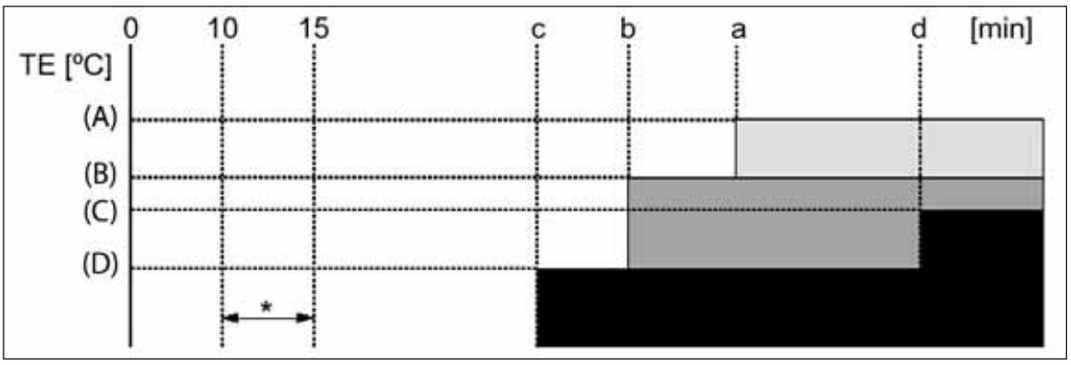
1. This control routine prevents troubles of the electron parts such as G-Tr of inverter compressor drive system and compressor's troubles during cooling operation.
2. This control corrects the current release control value (I1) by TO sensor value.
3. The value corrected is based upon the following control diagram and correction value table.



	T	a	b	c	d
30AWH004	39°C	70%	80%	90%	95%
30AWH006					
30AWH008					
30AWH012					
30AWH015					

Defrost control (Only in heating opearation)

In heating operation, defrost operation is performed when TE sensor temperature satisfies any condition in A zone to D zone.



a	b	c	d	(A)	(B)	(C)	(D)	
27'70''	27'40''	34'	-	-5	-7	-	-20	Size 004-006
29	29	35	-	-4	-6	-10	-25	Size 008
34	40	55	90	-5	-10	-13	-18	Size 012
39	45	55	150	-5	-10	-2	-23	Size 015

A zone	Defrost operation is performed in this zone when TE0-TE ≥ 3**** continued for T seconds**
B zone	Defrost operation is performed in this zone when TE0-TE ≥ 3**** continued for T seconds**
C zone	Defrost operation is performed when this zone continued for T seconds**
D zone	Defrost operation is performed when this zone continued for T seconds**

* The minimum TE value between 10 and 15 minutes of compressor run time is stored inside the memory as TE0. TE0 is calculated after each compressor restart in heating operation.
** 120 sec for sizes 004 , 006, 012
*** 2,5 for 004 and 006 sizes
****2,5 for 008 size

During the defrost:
- the revolutions frequency of compressor change to guarantee the right quantity of oil inside the compressor
- the PMV position is fixed

The defrost operation is immediately finished if TE sensor temperature has become ε °C or more, or it also is also finished when defrost operation has continued for τ minutes.

size	004	006	008	012	015
Є [°C]	+8		+12		
τ [min]	15			10	

For 004, 006 and 008 sizes, defrost operation is also finished if TE is kept at+5°C or higher for 80seconds.
For 012 and 015 sizes, defrost operation is also finished if -7 ≤ TE < 12 has continued for 60 seconds.

After defrost operation has finished, the compressor and the outdoor fan start heating operation after stopped for approx. 50 seconds.

TE: Entering (in Heat exchanger) temperature
TE0: minimum TE value calculated 10-15 min. after each compressor restart in heating operation

6.1 Diagnostic

6.1 Inverter alarms

6.1.1 Error codes 30AWH012 only

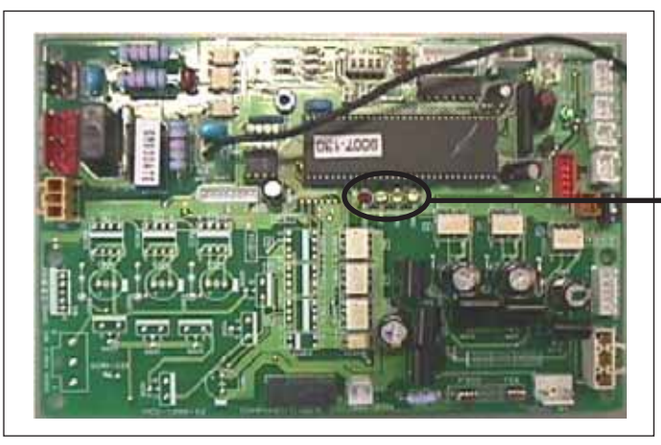
Troubles of the unit can be diagnosed by LED indications on the cycle control P.C. board of the unit. When multiple errors are detected, the latest error is displayed.

- When LED is On, there is the main cause of trouble on the objective part of control at CDB side and the unit stops.
- When LED Flashing, there is the main cause of trouble on the objective part of control at PC board side and the unit stops.
- When compressor case thermostat operates, the communication is interrupted on the serial circuit. If the case thermostat operation happens continuously, a serial communication error occurs because of a serial message has been sent.
- Before a check, confirm each bit of the DIP switch is set to OFF position.

LED indication and code checking

LED indication	Cycle control P.C. board LED indication				Cause
	D800	D801	D802	D803	
D800 O: Red D801 O: Yellow D802 O: Yellow D803 O: Yellow ◊: Flashing ●: Off ○: On	○	●	●	●	Heat exchanger sensor (TE) error
	●	●	○	●	Suction sensor (TS) error
	○	○	●	●	Hot gas discharge sensor (TD) error
	●	○	●	○	High-pressure protection error
	●	○	●	●	Outdoor air temperature sensor error (TO)
	○	○	○	●	Outdoor motorised fan error DC
	○	●	●	○	Communication error between IPDU (Abnormal stop)
	●	○	●	○	High-pressure release operation
	●	○	○	●	Discharge temp. error: hot gas is too high
	○	○	●	○	EEPROM error
	●	●	○	○	Communication error between IPDU (No abnormal stop)
	◊	●	●	●	G-Tr short-circuit protection
	●	◊	●	●	Detect circuit error
	◊	◊	●	●	Current sensor error
	●	●	◊	●	Comp. lock error
	◊	●	◊	●	Comp. break down

IPDU are the Inverter Board.



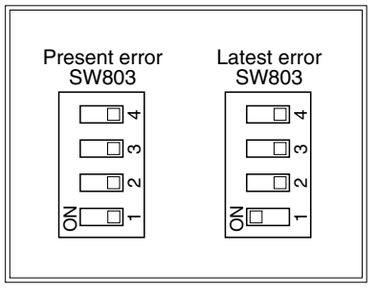
LED indication

ATTENTION: Problems of 30AWH004 -30AWH006 -30AWH008 units can be diagnosed by GMC board.

6.1.2 Error codes 30AWH015 only

The error which is generating at present and the latest error (Latest error information including present)
can be confirmed by lighting LED D800 toD804 on the control P.C. board.

a) When all DIP switch SW803 are OFF, the status of error which is generating at present is displayed.
b) <1> only of DIP switch SW803 is turned on, the error which generated before (Latest error information including present) is displayed.
c) If there is an error, any of LED D800 to D804 goes on. (Display 1)
d) When pushing the pushdown button switch SW800 for approx. 1 second, the display is exchanged. (Display 2)
e) When pushing SW800 again or after 2 minutes, the status returns to that of Display 1.



(Legend)

- ● D800 (Yellow)
- ● D801 (Yellow)
- ◎ D802 (Yellow)
- ● D803 (Yellow)
- ● D804 (Yellow)
- ○ D805 (Green)

● : Go off, ○ : Go on, ◎ : Flash

Display 1) (Initial display)	Display 2) (SW800 operation)	Error contents
●●●●●○	●●●●●○	Normal
○○●●○○	●●◎●●○	Discharge temp. sensor (TD) error
	●◎◎●●○	Heat exchanger temp. sensor (TE) error
	◎◎◎●●○	Heat exchanger temp. sensor (TL) error
	●●●◎●○	Outside temp. sensor (TO) error
	●●◎◎●○	Suction temp. sensor (TS) error
	◎●◎◎●○	Heat sink temp. sensor (TH) error
	◎◎◎◎●○	Heat exchanger sensor (TE, TS) miswiring
	◎◎◎◎◎○	EEPROM error
●●○●○○	◎●●●●○	Compressor break down
	●◎●●●○	Compressor lock
	◎◎●●●○	Current detection circuit error
	●●◎●●○	Case thermostat operation
●○○●○○	●◎●◎●○	Model unset
	◎●◎◎◎○	Communication error between MCU
	◎◎◎◎◎○	Other error (Compressor disorder, etc.)
○○○●○○	◎◎●●●○	Discharge temp. error
	◎●◎●●○	Power supply error
	◎◎◎●●○	Heat sink overheat error
	◎◎◎◎●○	Gas leak detection
	◎◎●●◎○	4-way valve reverse error
	●●◎●◎○	High pressure protective operation
	●◎◎●◎○	Fan system error
	●◎●◎◎○	Driving element short-circuit
	◎●◎◎◎○	Position detection circuit erro

The values detected by the controller, such as temperature sensor or current value are simply confirmed.

(Legend)

- ● D800 (Yellow)
- ● D801 (Yellow)
- ● D802 (Yellow)
- ● D803 (Yellow)
- ● D804 (Yellow)
- ○ D805 (Green)

● : Go off, ○ : Go on

LED display \ Item setup	Temperature sensor (°C) (TD SW803, TE SW803, TS SW803, TO SW803, TL SW803, TH SW803, TA SW803, TC SW803, TCJ SW803)	Current (A) (SW803)	Compressor operation frequency (rpm) (SW803)	PMV opening (Pulse) (SW803)
●●●●●○	Below –25	0 to 0.9	0 to 4	0 to 19
○●●●●○	–25 to –21	1 to 1.9	5 to 9	20 to 39
●○●●●○	–20 to –16	2 to 2.9	10 to 14	40 to 59
○○●●●○	–15 to –11	3 to 3.9	15 to 19	60 to 79
●●○●●○	–10 to – 5	4 to 4.9	20 to 24	80 to 99
○●○●●○	–5 to –1	5 to 5.9	25 to 29	100 to 119
●○○●●○	0 to 4	6 to 6.9	30 to 34	120 to 139
○○○●●○	5 to 9	7 to 7.9	35 to 39	140 to 159
●●●○●○	10 to 14	8 to 8.9	40 to 44	160 to 179
○●●○●○	15 to 19	9 to 9.9	45 to 49	180 to 199
●○●○●○	20 to 24	10 to 10.9	50 to 54	200 to 219
○○●○●○	25 to 29	11 to 11.9	55 to 59	220 to 239
●●○○●○	30 to 34	12 to 12.9	60 to 64	240 to 259
○●○○●○	35 to 39	13 to 13.9	65 to 69	260 to 279
●○○○●○	40 to 44	14 to 14.9	70 to 74	280 to 299
○○○○●○	45 to 49	15 to 15.9	75 to 79	300 to 319
●●●●○○	50 to 54	16 to 16.9	80 to 84	320 to 339
○●●●○○	55 to 59	17 to 17.9	85 to 89	340 to 359
●○●●○○	60 to 64	18 to 18.9	80 to 84	360 to 379
○○●●○○	65 to 69	19 to 19.9	95 to 99	380 to 399
●●○●○○	70 to 74	20 to 20.9	100 to 104	400 to 419
○●○●○○	75 to 79	21 to 21.9	105 to 109	420 to 439
●○○●○○	80 to 84	22 to 22.9	110 to 114	440 to 459
○○○●○○	85 to 89	23 to 23.9	115 to 119	460 to 479
●●●○○○	90 to 94	24 to 24.9	120 to 124	480 to 499
○●●○○○	95 to 99	25 to 25.9	125 to 129	500
●○●○○○	100 to 104	26 to 26.9	130 to 134	—
○○●○○○	105 to 109	27 to 27.9	135 to 139	—
●●○○○○	110 to 114	28 to 28.9	140 to 144	—
○●○○○○	115 to 119	29 to 29.9	145 to 149	—
●○○○○○	Over 120	30 to 30.9	150 to 154	—
○○○○○○	Sensor error, unconnected	Over 31	Over 155	—

∗ As TD, TL and TH are sensors for high temperature, there is error at normal temperature or below position.

∗ For current value, the current for the outdoor unit only is displayed.

6.2 GMC alarm codes

There is a LED on the GMC board that displays any board errors. The error code can be identified from the flashing LED using the following table. In the case of more than one error, the error with the highest priority will be displayed until it is resolved.
In the case of normal operation, the LED flashes at a frequency of ½ Hz.
In the case of an error, the LED remains off for 4 seconds, then at a frequency of 1Hz, it flashes a number of times equal to the error code and than remains off again for 6 seconds. If the error code has 2 digits, the flashing is interrupted for 2 seconds between the first and second digits.
Example: error 23: LED off for 4 seconds. 2 flashes at a frequency of 1Hz. Off for 2 seconds. 3 flashes at a frequency of 1Hz. Off for 6 seconds.
The cycle repeats until the LED turns off because the problem is resolved or if an error with higher priority occurs.

Fault Code	Fault	Recove-rable	UNIT STATUS	WATER PUMP	Protection function/note	Judgement and measures
2	Safety Input	Yes	OFF	OFF		If Active, turn off whole System and Output
3	Enter water Temperature Sensor (EWT)	Yes	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	1. Check the Enter water Temperature Sensor (EWT) 2. Check the GMC board
4	Actual Refrigerant Temperature Sensor (TR)	Yes	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	1. Check the Actual Refrigerant Temperature Sensor (TR) 2. Check the GMC board
5	Outdoor Air Sensor of GMC	Yes	ON	ON	All protections active	1 . Check Outdoor sensor of GMC 2 . Check GMC board
6	Loss communication to NUI control	Yes	ON	ON	System On as for last commands	1. Check cables between GMC Board and NUI 2. Check GMC boards and NUI
7	NUI control Room Sensor	Yes	ON	ON	Skip TA WSP adjustment	1 . Check indoor temperature sensor (TA) 2 . Check NUI
9	Flow Switch error / Water Pump	Yes	OFF	OFF	No protection	1 . Check drain pump winding resistance 2 . Check float switch status/functionality
10	EEProm Corrupt	No	OFF	OFF	No protection	Check con trol board. If defective, replace it
13	Loss Communication to RS485 (system configuration type 6)	Yes	ON	ON	System On as for last commands	1. Check cables 2. Check GMC board
14	Loss of Signal From inverter board or High Temperature Release	Yes	OFF	OFF	No protection	1. Check cables 2. Check inverter board
15	Exit water Temperature Sensor (LWT)	Yes	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	1. Check the Exit water Temperature Sensor (LWT) 2. Check the GMC board
16	Alarm Test	Yes	N/A	N/A	Activated if the SUI alarm output is forced on. Code 104 = 7	
17	Inverter Air Sensor (TO)	Yes	ON	ON	All protections active	1. Check the Inverter Air sensor (TO) 2. Check the Inverter board
18	G-Tr inverter short circuit protection	No	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	1 . Inverter immediately stops if even restarted. 2 . Check Inverter board for cabling error
20	Compressor position Detection Circuit error	No	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	1 . Compressor immediately stops even if restarted - check inverter board. 2 . Check 3 phase power voltage and cables
21	Inverter Current Sensor error	No	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	1. Check the inverter Current Sensor error 2. Check the Inverter board
22	Heat Exchanger Sensors (TE) / (TS)	No	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	1. Check the Heat Exchanger Sensors (TE,TS) 2. Check the inverter board
23	Discharge Temperature Sensor (TD)	No	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	1. Check the discharge Temperature Sensor (TD) 2. Check the inverter board
24	Outdoor Fan motor error	No	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	1. Defective detection of position 2. Over -current protective circuit of outdoor fan driving unit operates 3. Outdoor fan locked 4. Check the Inverter board
26	Other unit error	No	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	

27	Compressor Lock	No	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	1 . Compressor fault - replace compressor 2 . Defective cabling of compressor 3 . Check 3 phase power voltage and cables
28	Discharge Temperature error	No	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	1. Check refrigerant cycle for gas leaks 2. Failure of PMV 3. Check TD sensor operation
29	Compressor Breakdown	No	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	1. Check power supply: AC 220-240V +/- 10V 2. Overload operation of refrigerant cycle 3. Check current detection circuit at AC side
30	Low Pressure Switch	No	OFF	OFF	In off, frost protection active and compressor doesn't restart Only EH and WP	

NOTE: *Unit status OFF means that unit immediately stops.*

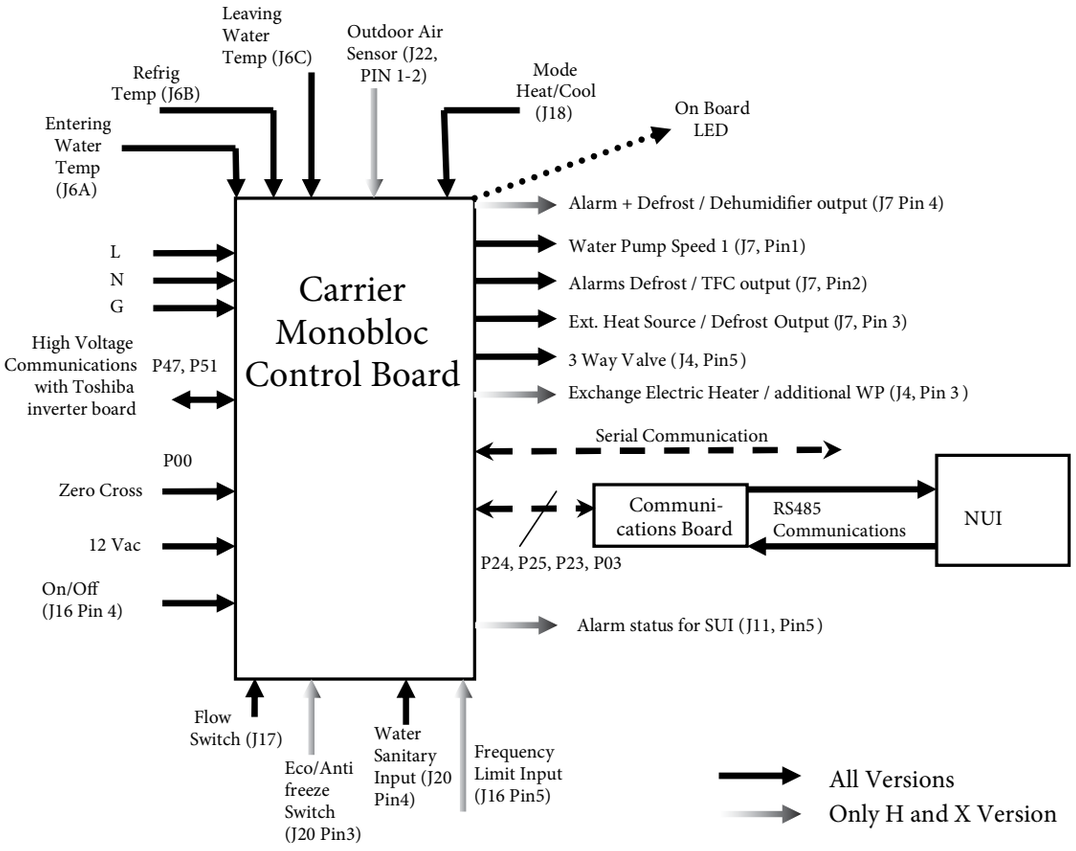
6.3 GMC I/O

PERIPHERAL INPUT DEVICE DESCRIPTION					
	Reference	**Type**	**Units**	**Min**	**Max**
Water Enter Exchanger Sensor	J6A	Sensor (Analog)	Volts	0	5
Refrigerant Sensor	J6B	Sensor (Analog)	Volts	0	5
Water Exit Exchanger Sensor	J6C	Sensor (Analog)	Volts	0	5
Outdoor Air Sensor	J22 Pin 1-2	Sensor (Analog)	Volts	0	5
Flow Switch Input	J17	Switch input (Discrete)	None	0	1
Mode (Heat/Cool)	J18 Pin 1 (pin 2 common for ECO and On/Off)	Switch input (Discrete)	None	0	1
EOL Test Start	Test	Analog	Voltage	0	5
Remote Control	J5 Pin 1 to 4	Discrete	Voltage	0	5
Zero Crossing	Zero Crossing	Discrete	Voltage (DC)	0	5
Eco	J20 Pin 3	Switch input (Discrete)	None	0	1
Communications Interrupt	Comm Int	RS485 Communications	Voltage (DC)	0	5
Power Limitation Switch	J16 Pin 5 - 1	Switch input (Discrete)	None	0	1
Inverter Rx	HV Rx	Discrete	Voltage (AC)	0	264
SanWat Dry contact	J20 Pin 4 - 7	Switch input (Discrete)	None	0	1
On/Off	J16 Pin 4	Switch input (Discrete)	None	0	1
Safety Input	J11 Pin2	Switch input (Discrete)	None	0	1

PERIPHERAL OUTPUT DEVICE DESCRIPTION						
Description	Reference	Type	Units	220V min	220V Max	# Cycles / Year
Trace Heater / Additional Water pump	J4, Pin3	Relay	Voltage	198	264	15000
			Amps	0.3	2	
			Power Factor	1	1	
			Freq	48	52	
Water Pump Speed 1	J7 Pin 1	Relay	Voltage	198	264	15000
			Amps	0.3	2	
			Power Factor	0.85	0.98	
			Freq	48	52	
Alarms /TFC Contact	J7 Pin 2	Relay	Voltage	198	264	15000
			Amps	0.3	2	
			Power Factor	0.85	0.98	
			Freq	48	52	

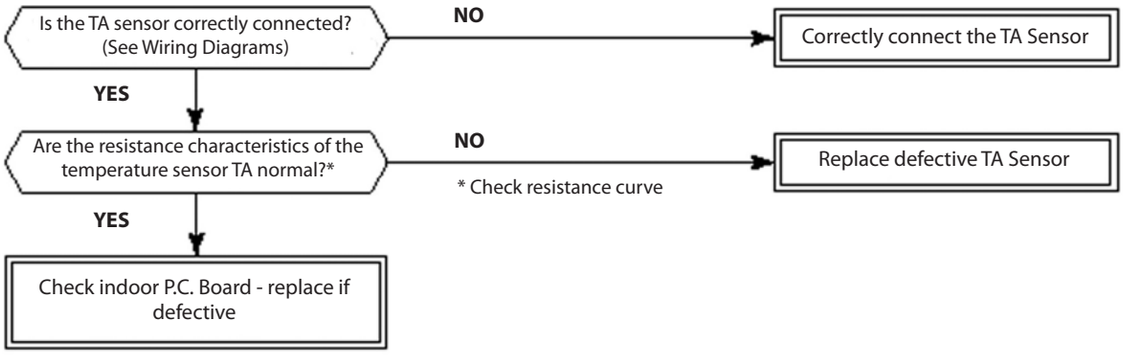
Description	Reference	Type	Units	220V min	220V Max	# Cycles / Year
EHS/defrost	J7 Pin 3	Relay	Voltage	198	264	15000
			Amps	0.3	2	
			Power Factor	0.85	0.98	
			Freq	48	52	
Alarm Status for SUI (Low and High flashing as per on board led timing)	J11 Pin5	Open collector	Voltage	10	12	N/A
			Amps	0.01	0.012	
Alarm + defrost status/ Dehumidifier	J7 Pin 4	Relay	Voltage	198	264	15000
			Amps	0.3	2	
			Power Factor	1	1	
			Freq	48	52	
			Amps	0.01	0.012	
3 Way Valve	J4 Pin 5	Relay	Voltage	198	264	15000
			Amps	0.3	2	
			Power Factor	1	1	
			Freq	48	52	
Control Board Status LED (LED Board)	Control Operating Status	LED	mAmps	4	6	N/A
2 Way Remote Control Output	J5	Bitstream	Voltage (DC)	0	18	N/A
Communications Transmit	Trans	RS485 Communications	mAmps	5	95	N/A
Communications Direction	Dir	RS485 Communications				
Inverter Transmit	HV Tx	Discrete	Voltage (AC)	0	264	N/A

6.3.1 System Block Diagram

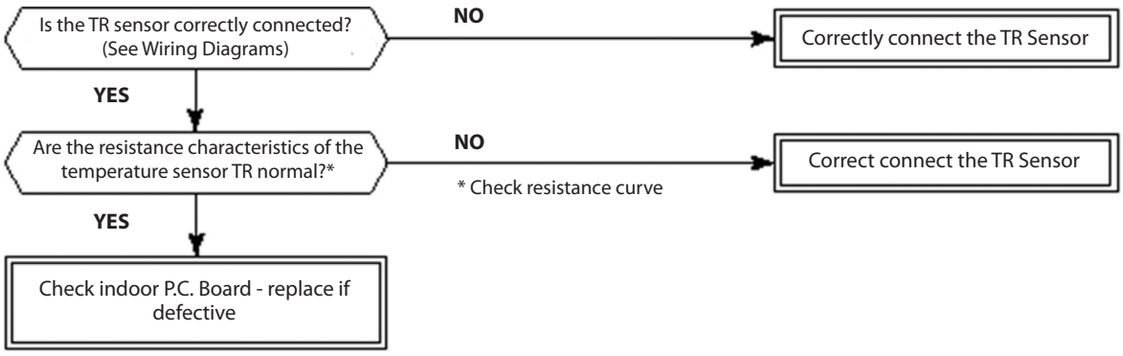


6.4 Troubleshooting

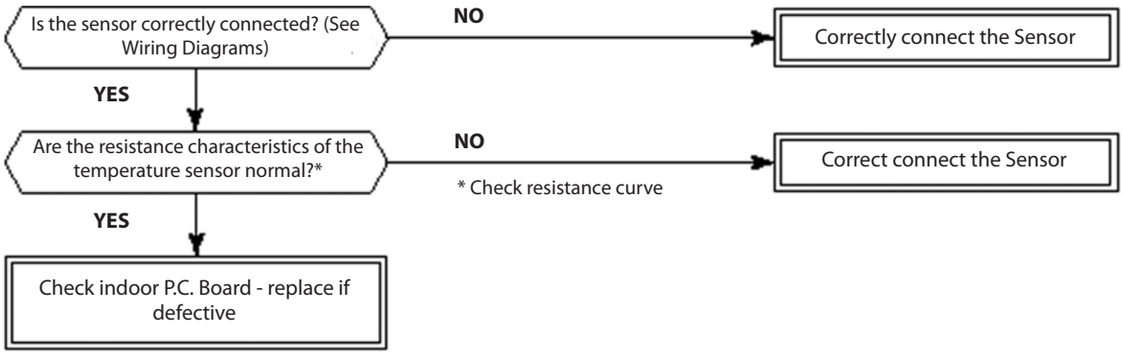
Fault code 3 – Enter Water Temperature sensor fault



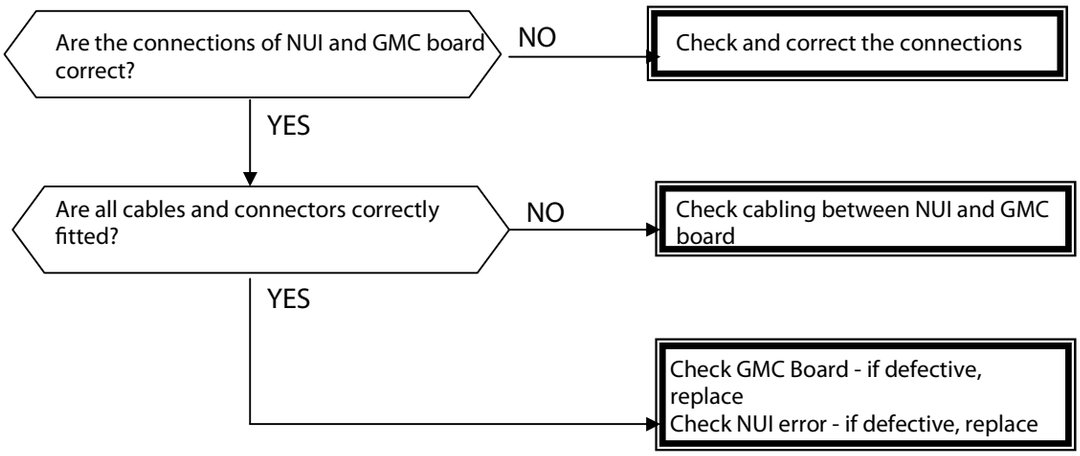
Fault code 4 – Actual Refrigerant Temperature sensor fault



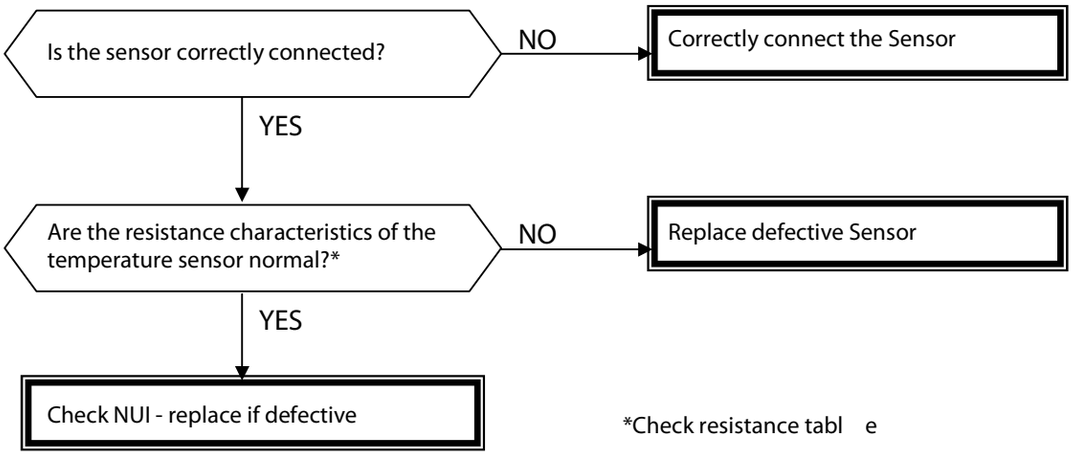
Fault code 5 – Outdoor Air sensor of GMC fault



Fault code 6 – Loss communication to NUI control

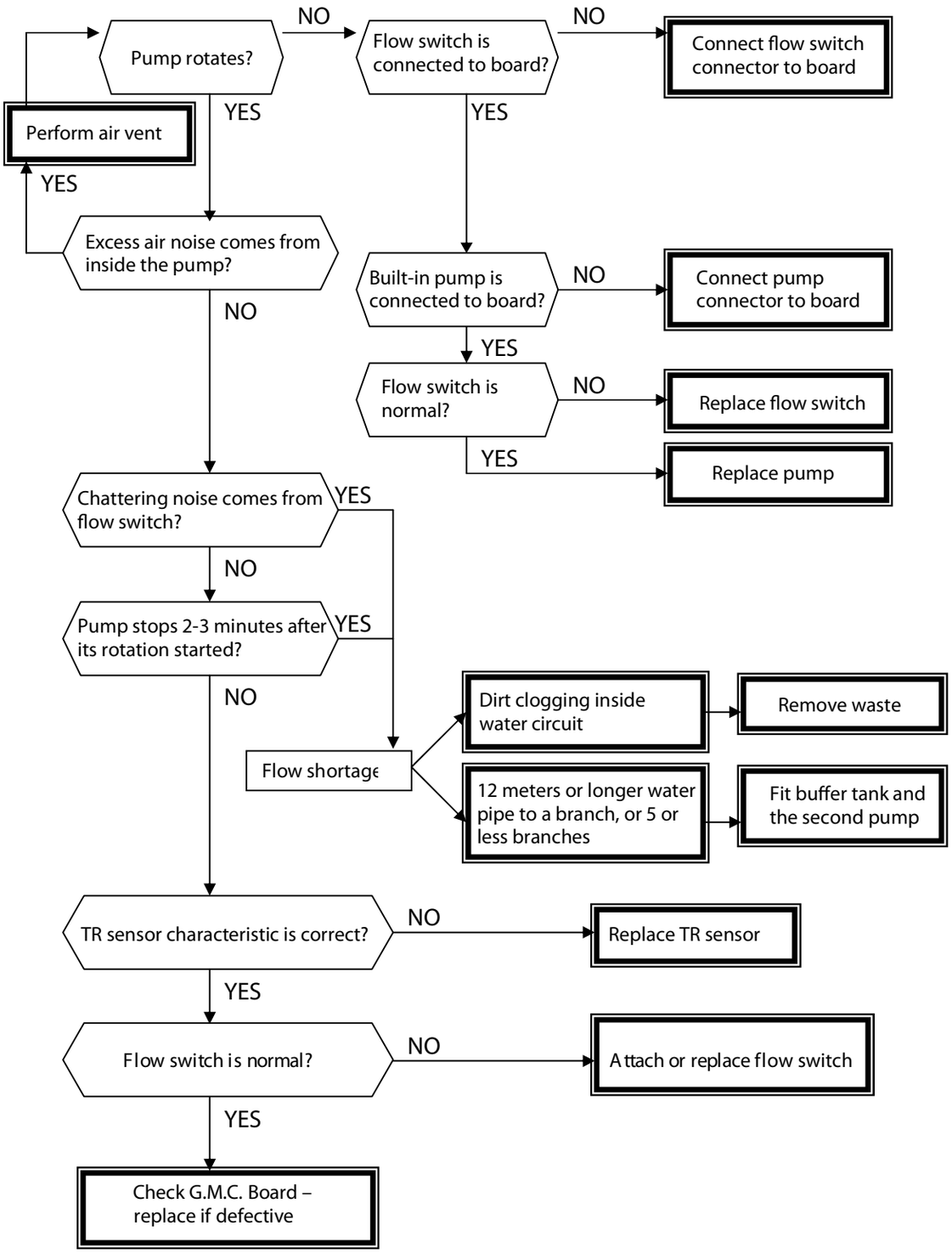


Fault code 7 – NUI control Room sensor fault

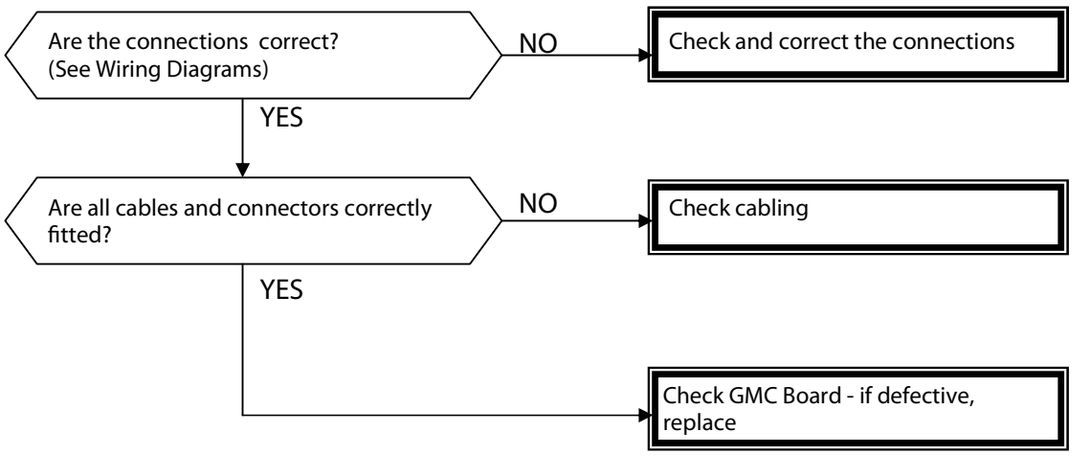


*Check resistance tabl e

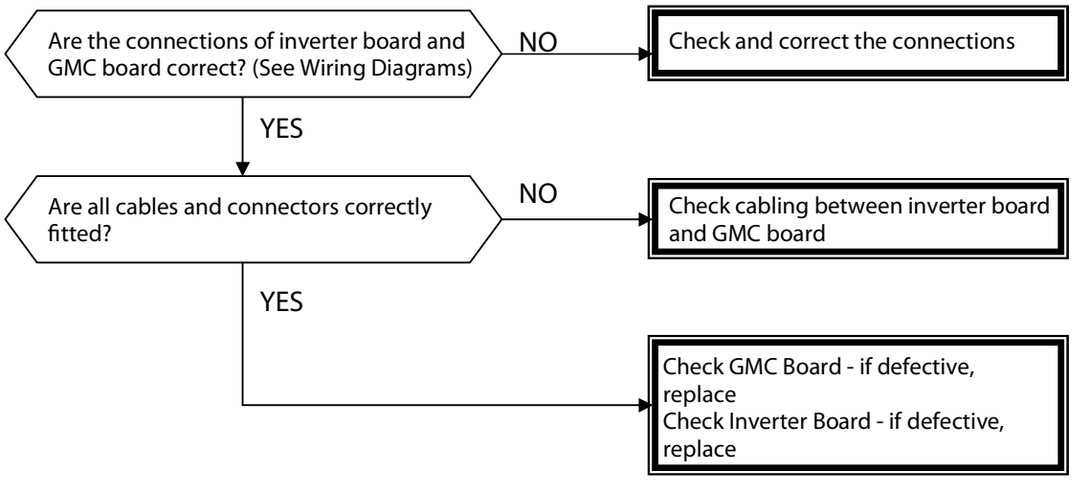
Fault code 9 – Flow Switch error / Water Pump



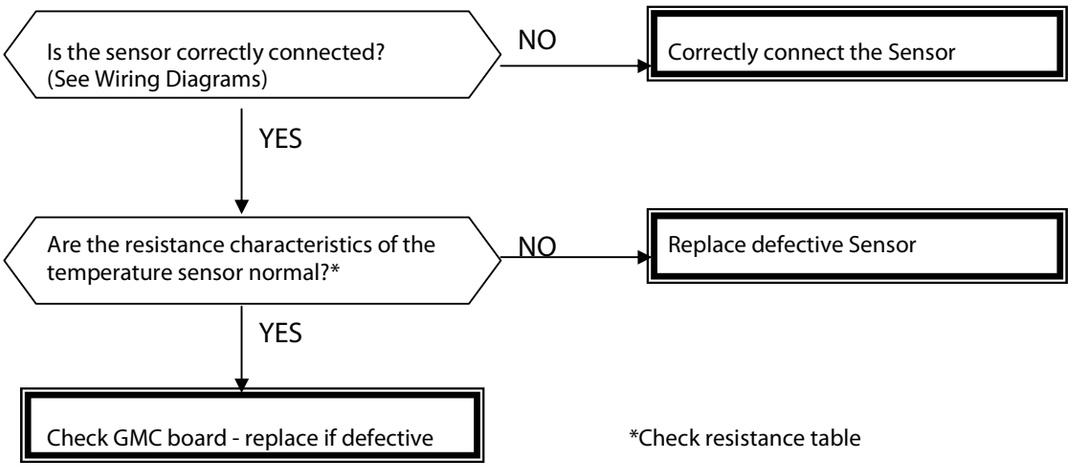
Fault code 13 – Loss communication to RS485



Fault code 14 – Loss of signal from inverter board

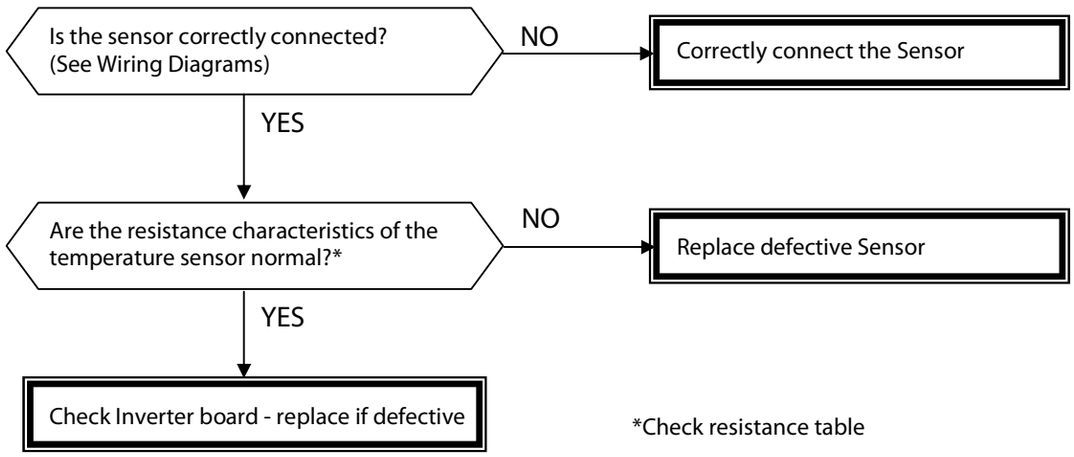


Fault code 15 – Exit water temperature sensor fault



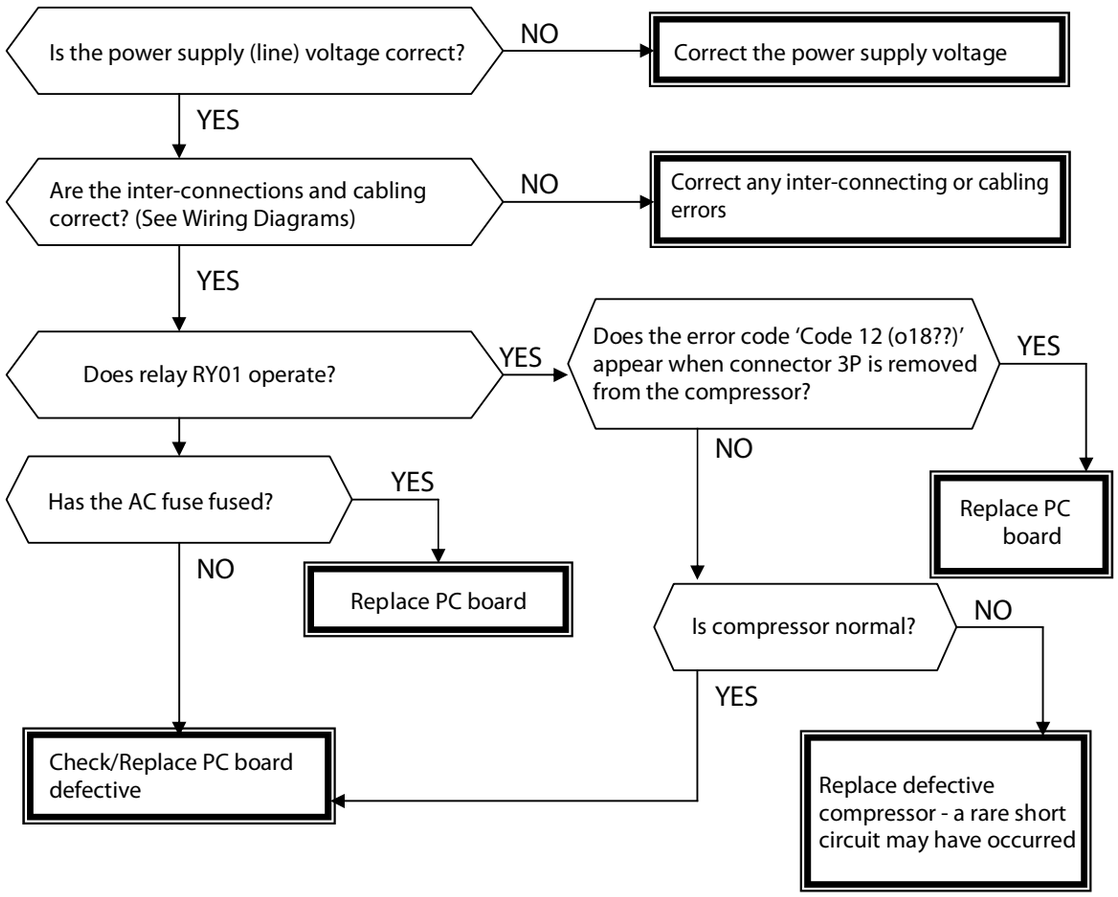
*Check resistance table

Fault code 17 – Inverter Air sensor fault

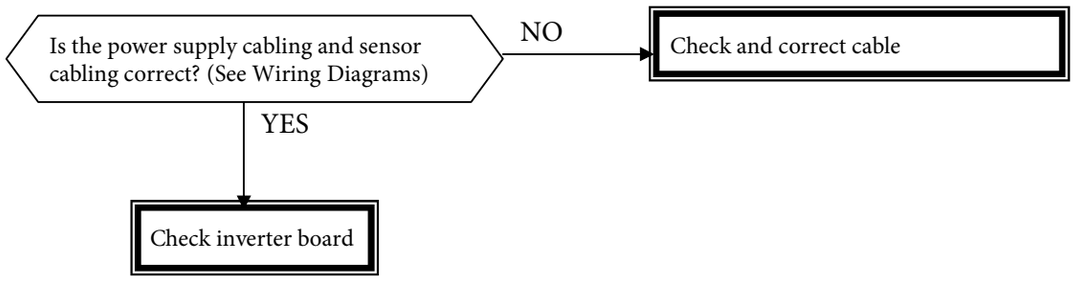


*Check resistance table

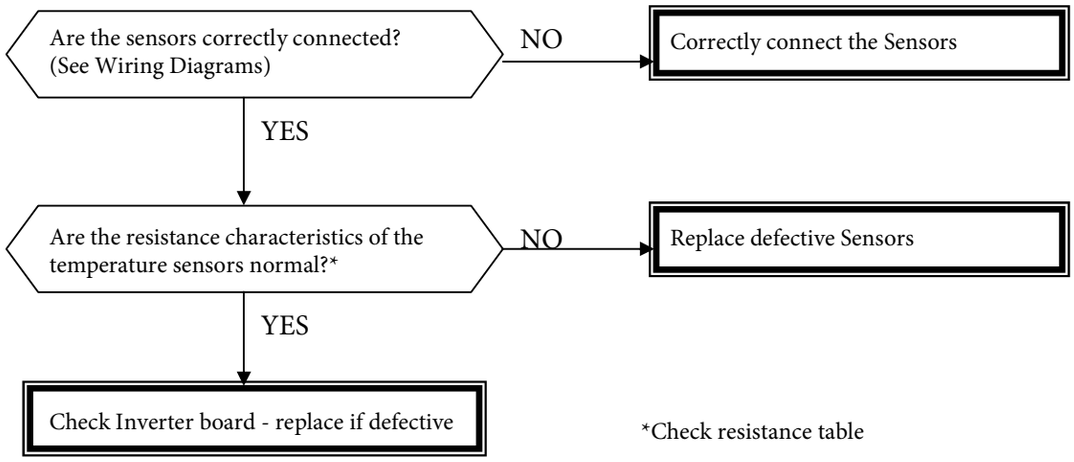
Fault code 18 – G - Tr Short-circuit protection



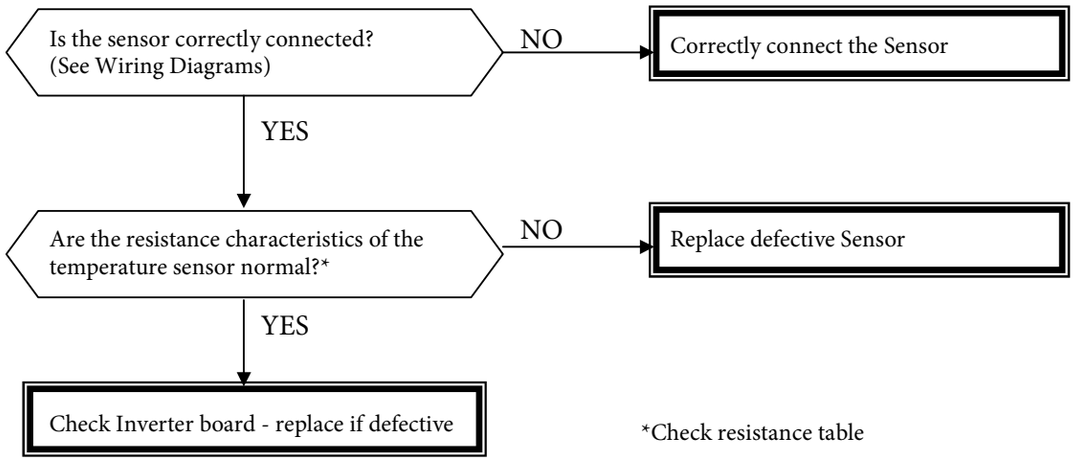
Fault code 21 – Inverter current sensor fault



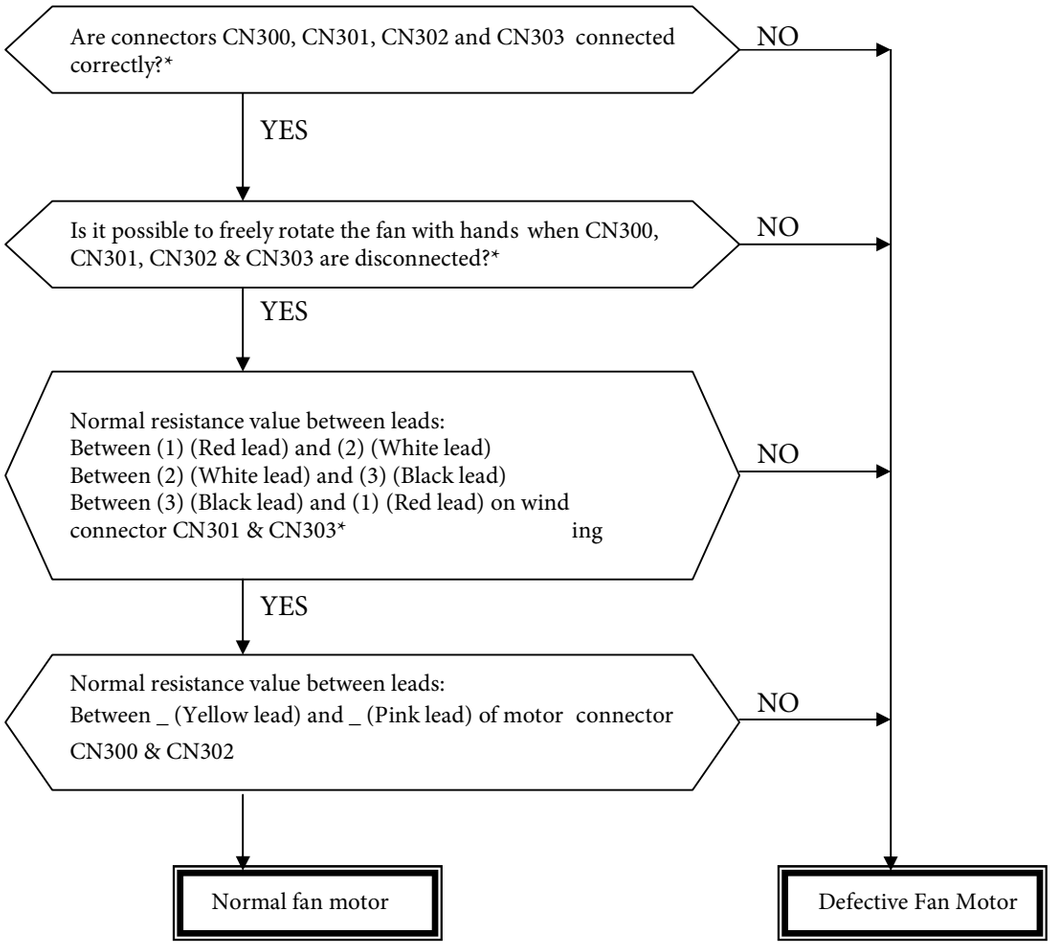
Fault code 22 – Heat exchanger Sensors TE/TS



Fault code 23 – Discharge Temperature Sensor



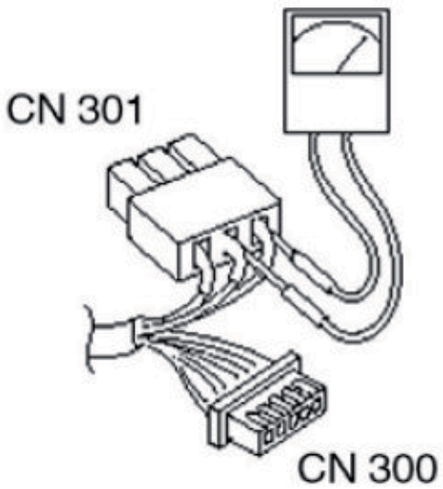
Fault code Fault code 24 – Outdoor fan motor error– Compressor lock



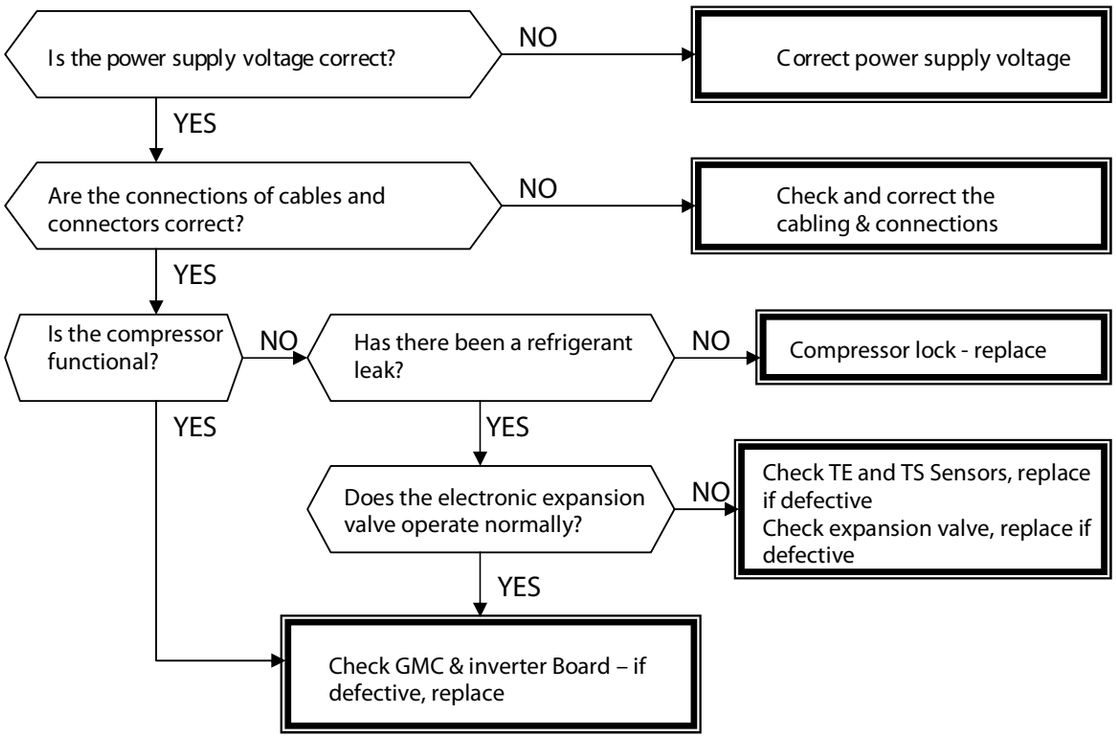
* 30AW004-006-008 have only CN300 connector
For the nominal resistance value, check the relative tables.

Note:
A Ground circuit error inside the motor is rarely detected even with the above check.
When the circuit is not normal, even after replacing the P.C. Board, replace the outdoor fan motor

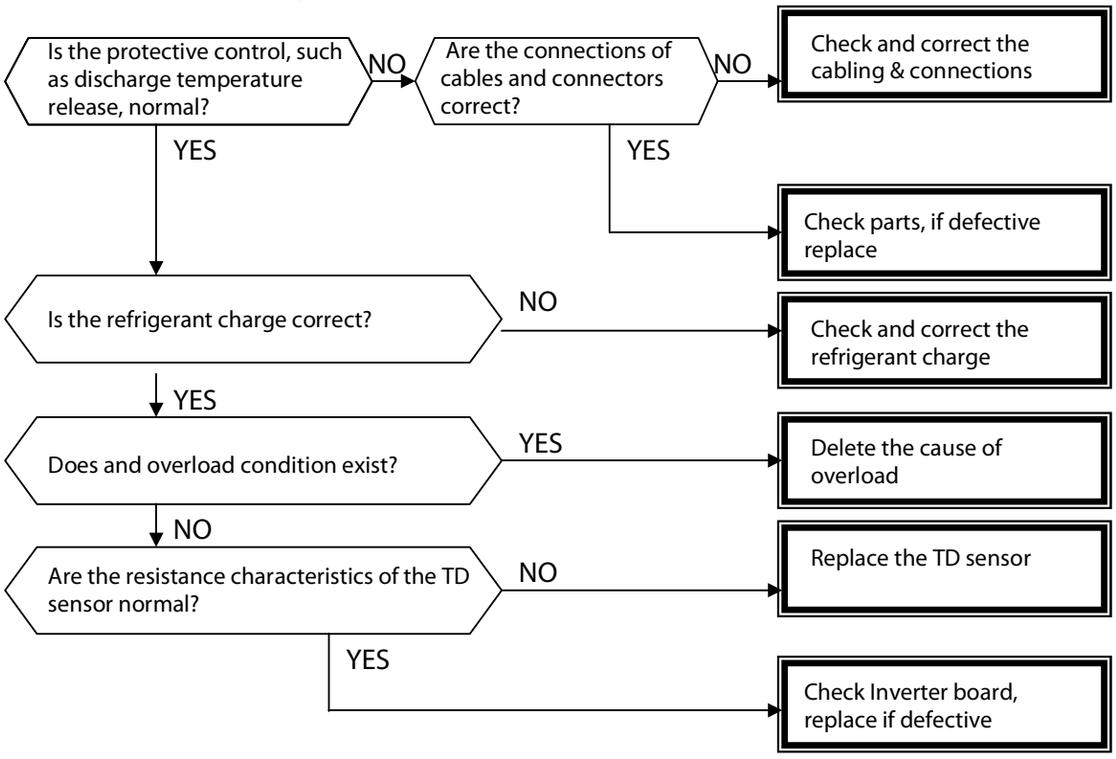
	Fan Motor Winding	Motor position detection
30AWH012 30AWH015	CN301	CN300
	CN303	CN302
30AWH004 30AWH006 30AWH008	CN300	



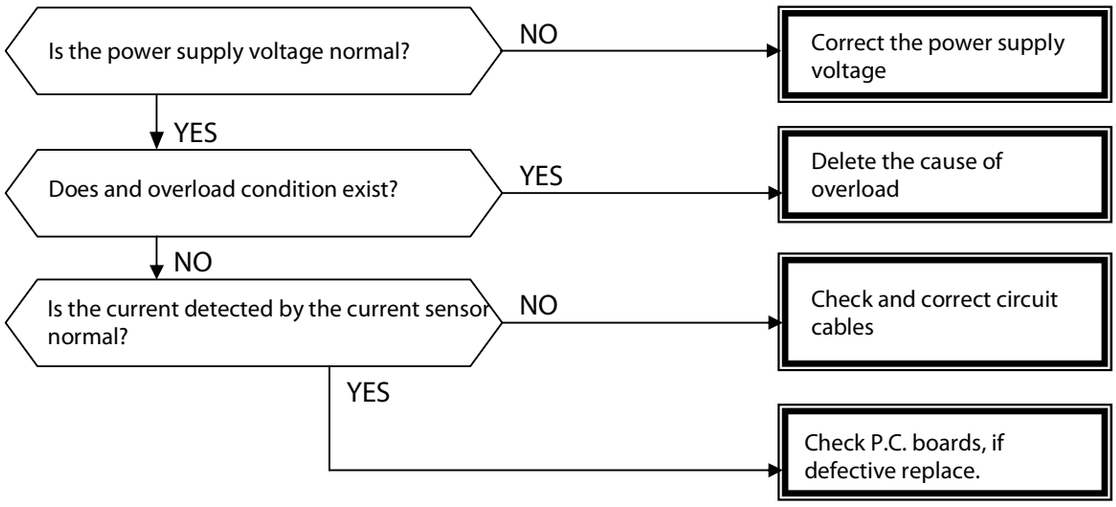
Fault code 27 – Compressor lock



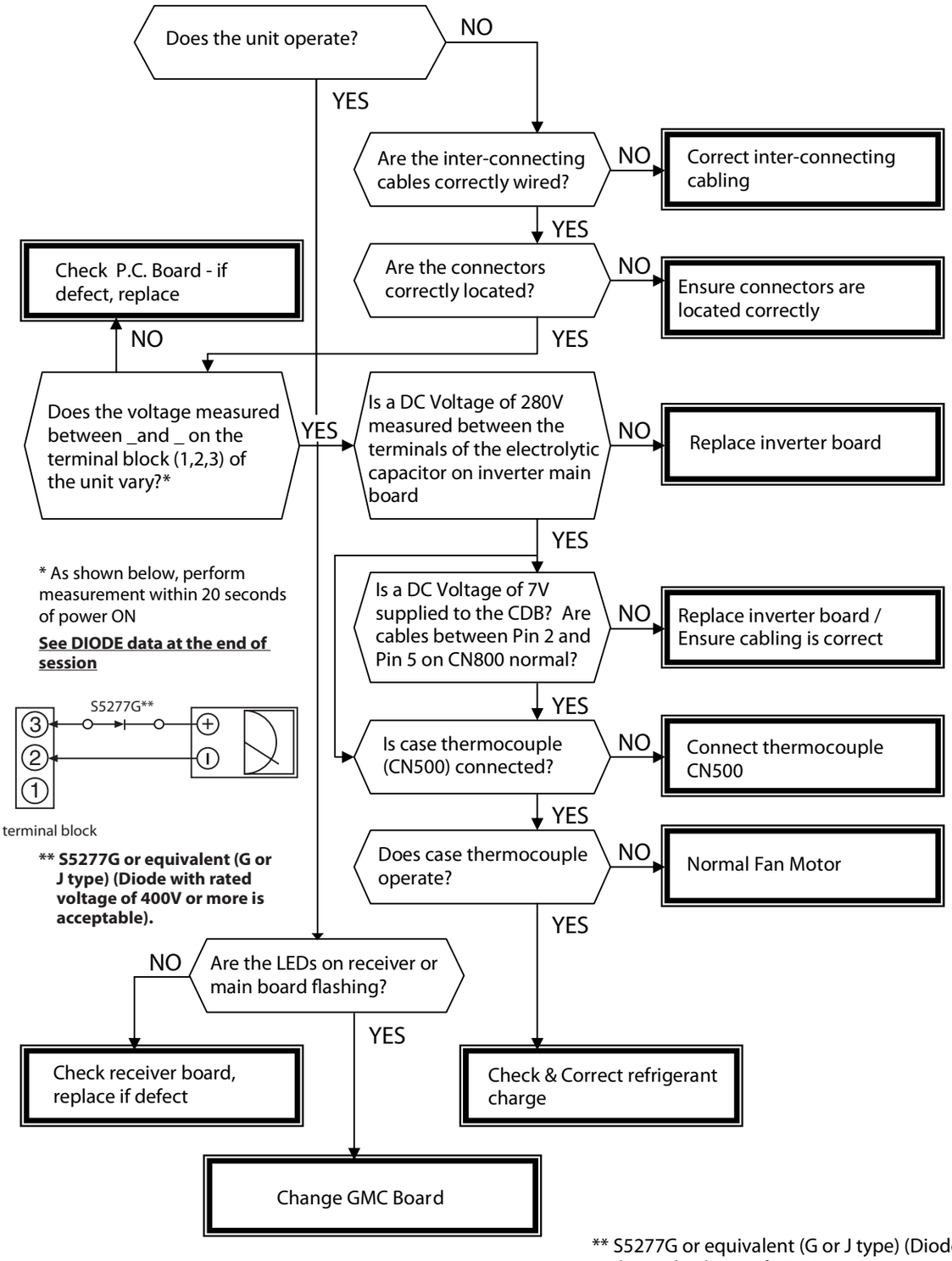
Fault code 28 – Discharge temperature error



Fault code 29 – Compressor break down



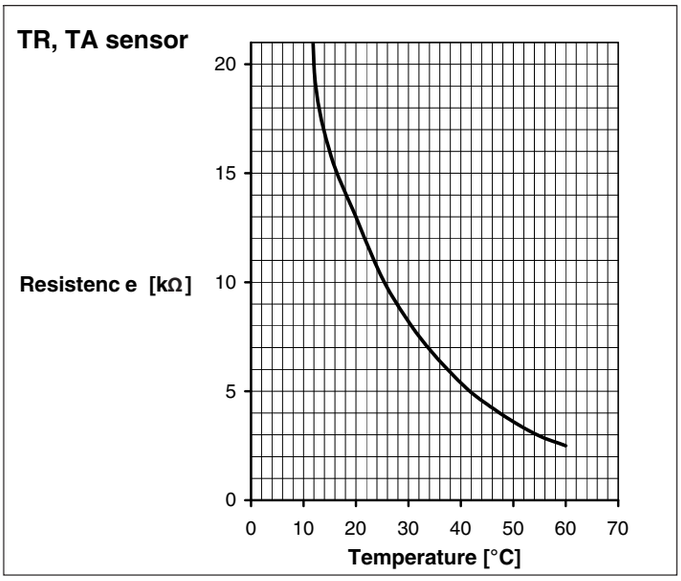
Fault code 14 – High temperature release

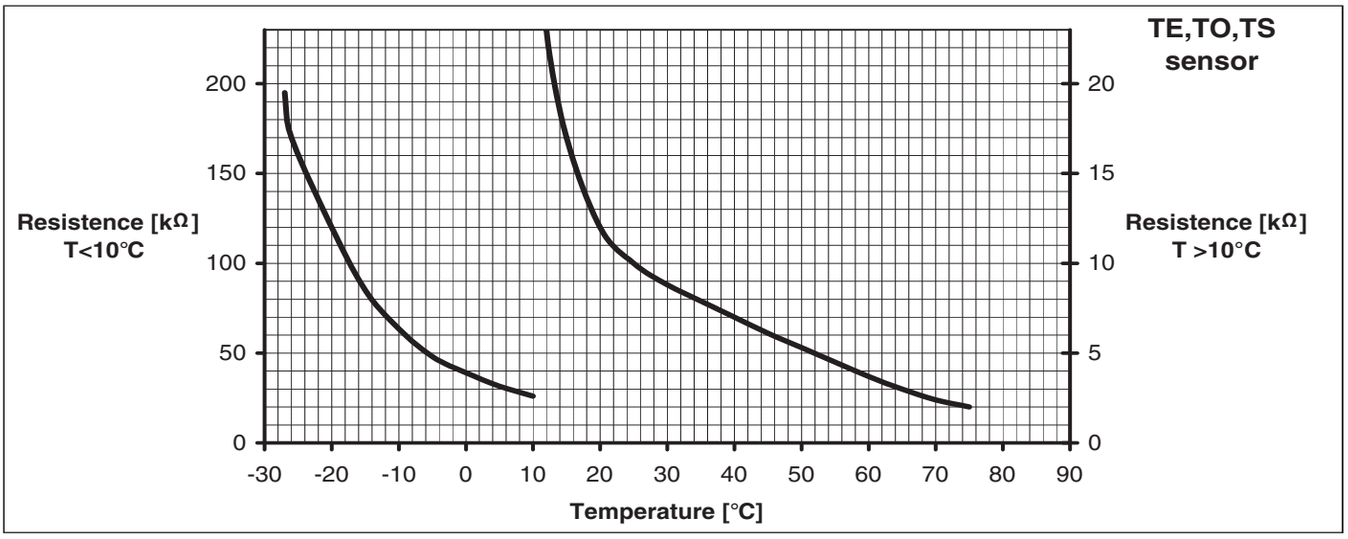


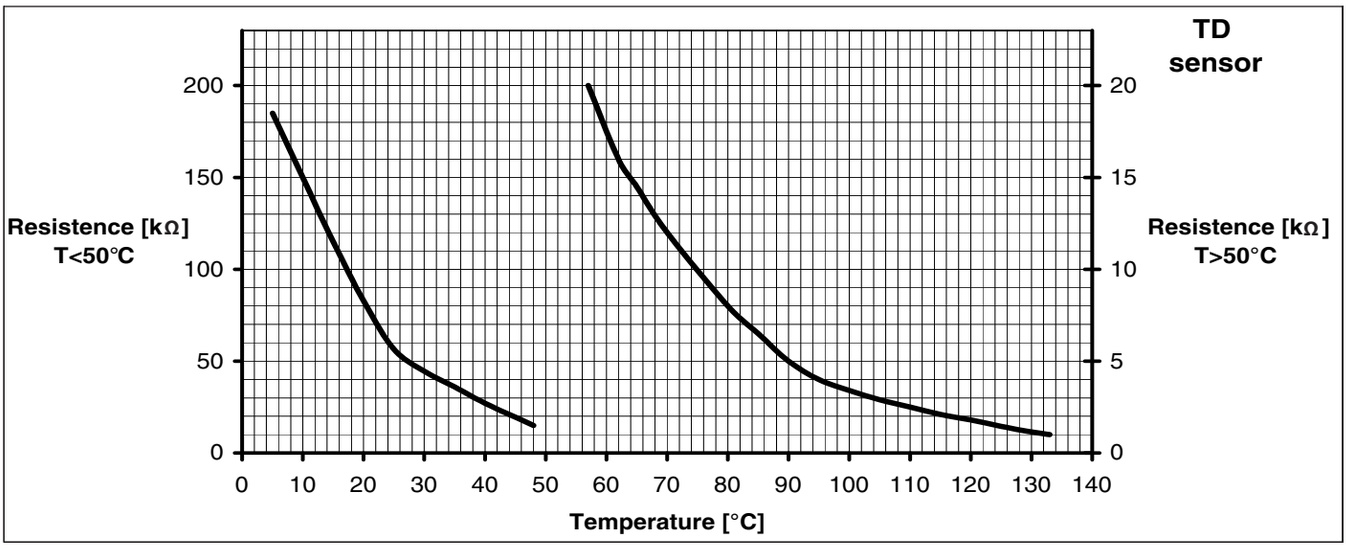
** S5277G or equivalent (G or J type) (Diode with rated voltage of 400V or more is acceptable).

6.4.1 Relational graph of temperature sensor resistance value and temperature

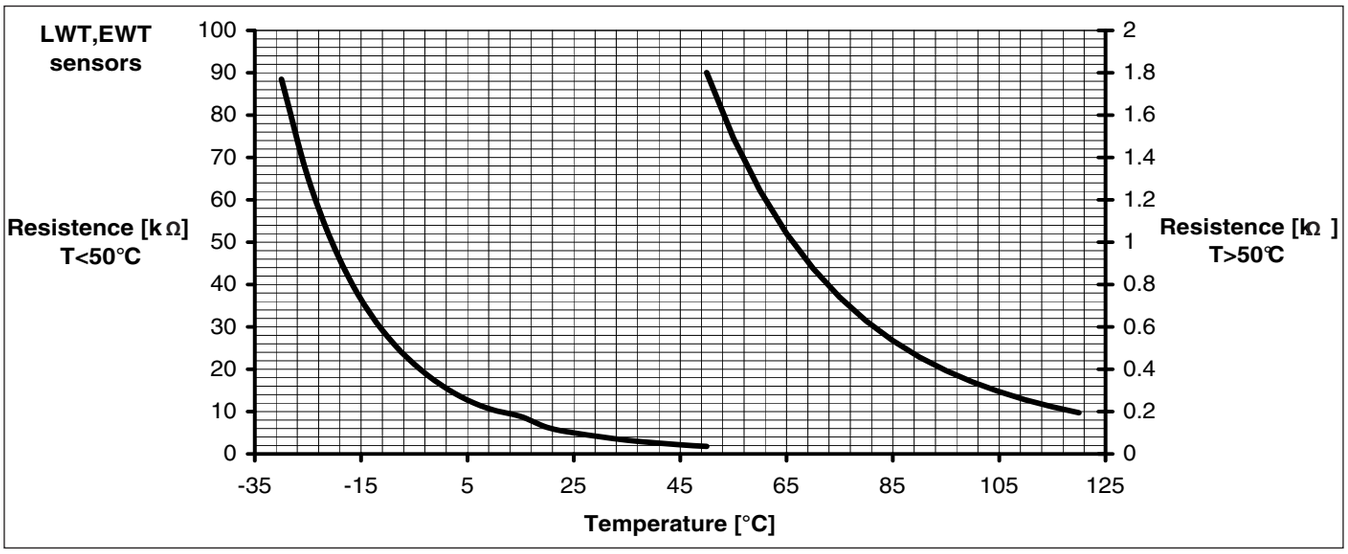
For 004, 006, 008, 012, sizes



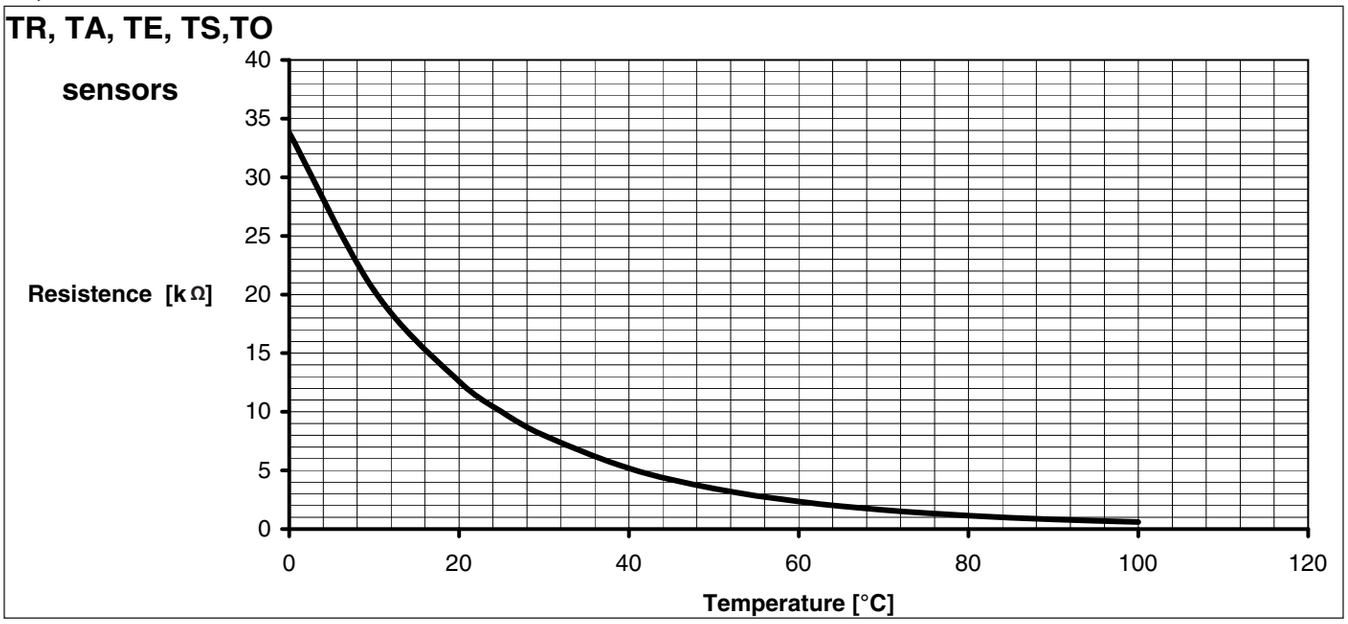


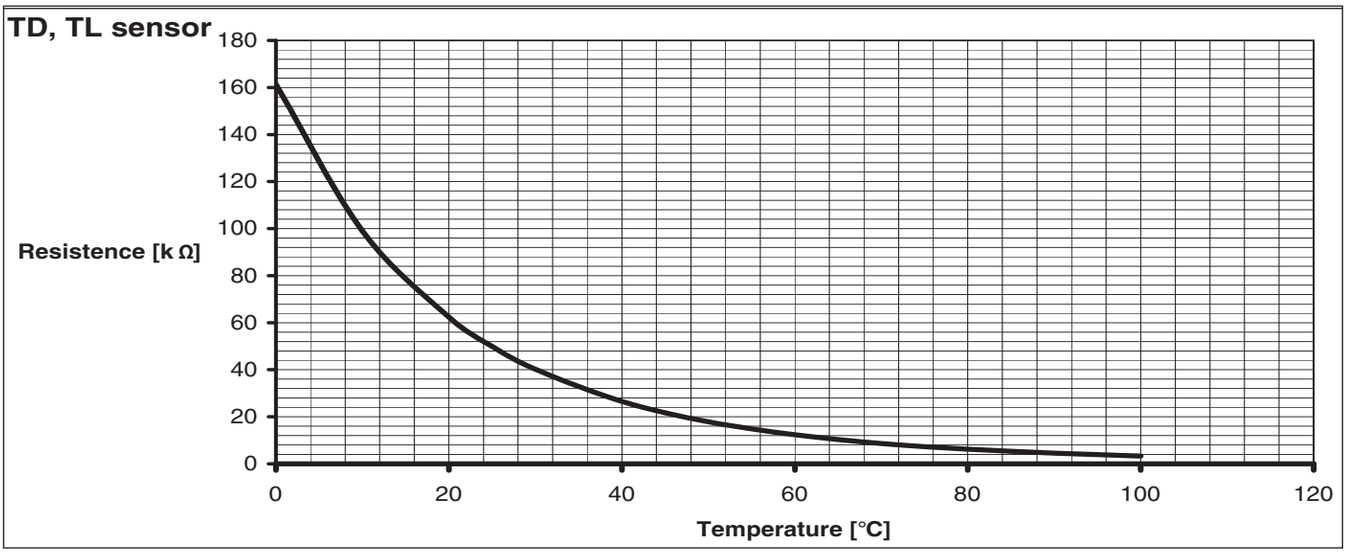


For 004, 006, 008, 012, 015 sizes



Only 015 size

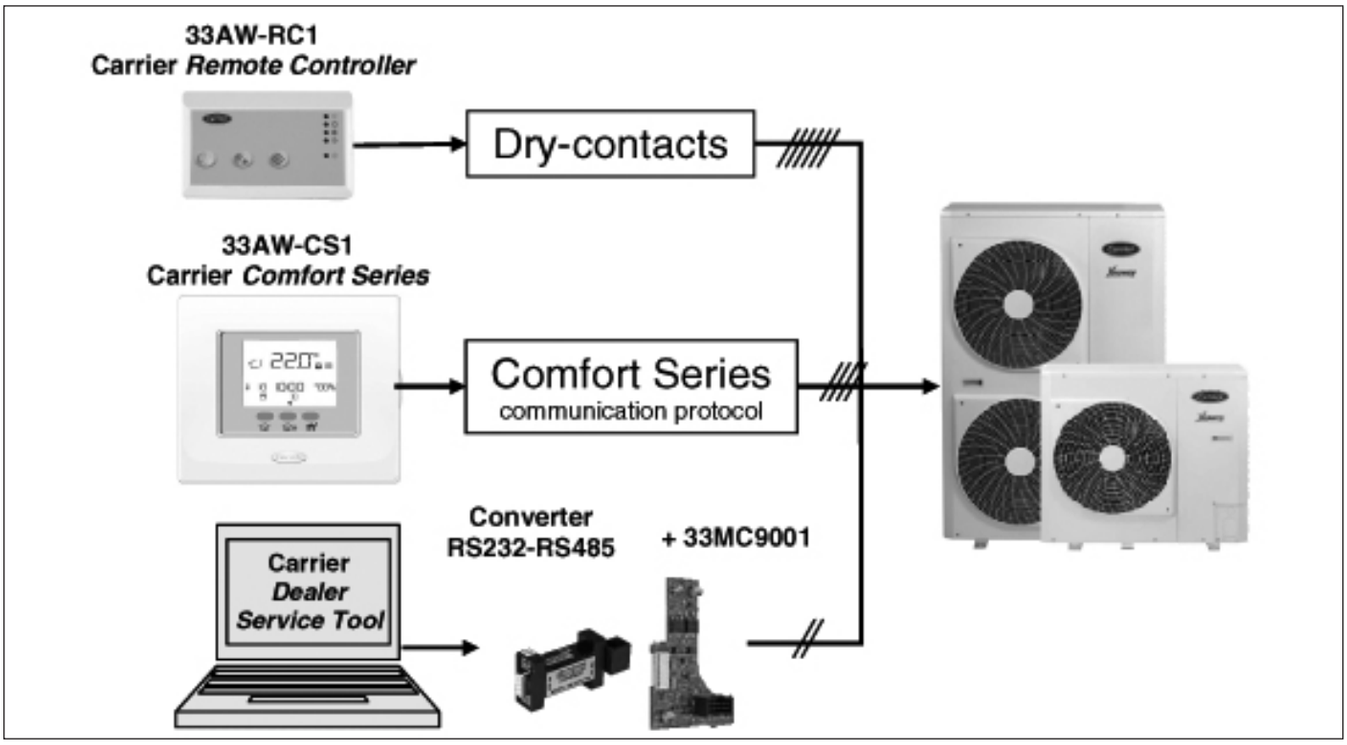




6.4.1 Resistance values of main components

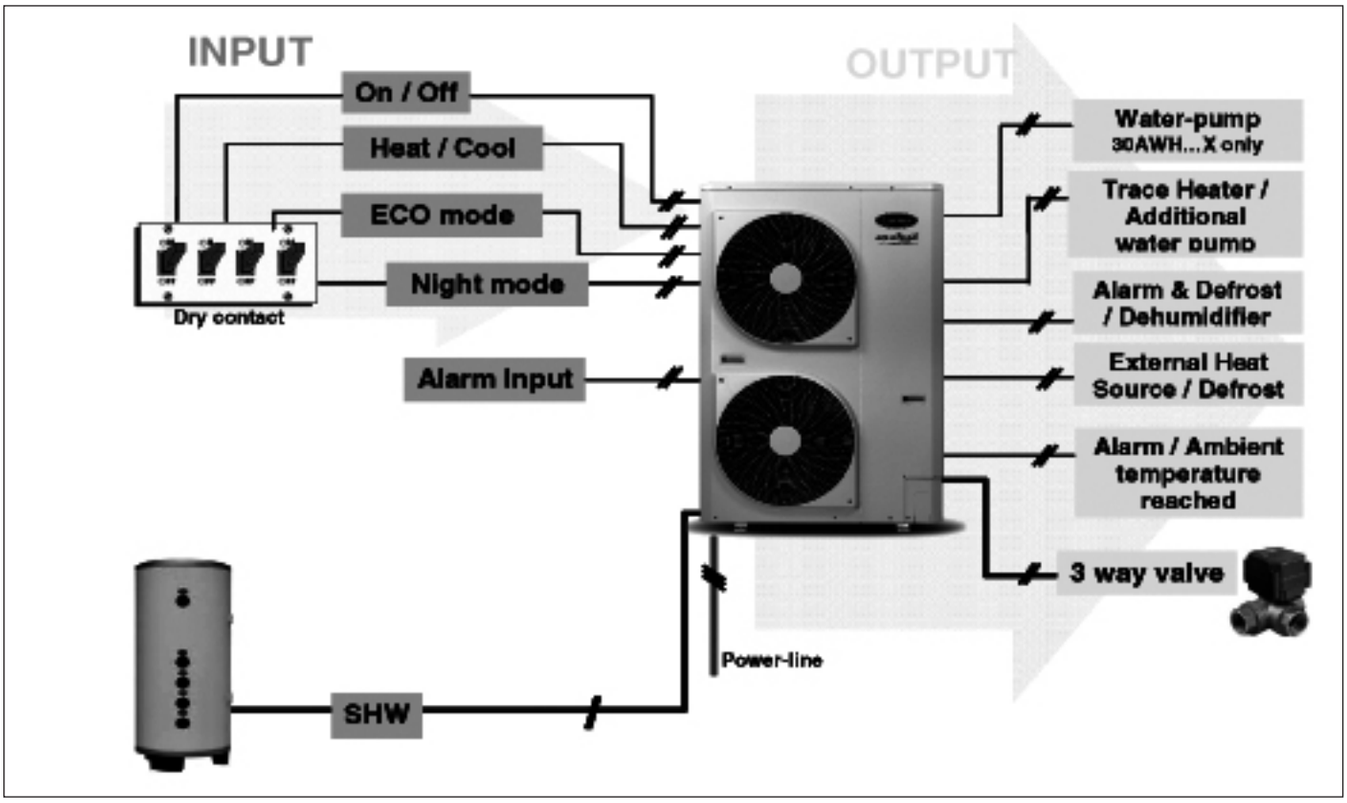
	4		6		8		12		15	
	Ω	T ref [°C]	Ω	T ref [°C]	Ω	T ref [°C]	Ω	T ref [°C]	Ω	T ref [°C]
PMV	46±4	25	46±4	25	46±4	20	46±3	20	46±3	20
4 Way	1795±150	25	1795±150	25	1765±150	24	1774±150	24	1489±150	22
Fan motor	22±2	25	22±2	25	22.4±2	24	35.2±2	24	17.9±2	22
	21.9±2	25	21.9±2	25	22.6±2	24	34.8±2	24	18.9±2	22
	21.9±2	25	21.9±2	25	22.6±2	24	35±2	24	17.7±2	22

HP size: 4-6-8 kW		**V1**	**V2**	**V3**	
Pump: NYL 63-15	Main	246.1±20	177.4±20	108.8±10	**Ω**
	Aux	137.8±10	137.8±10	137.8±10	**Ω**
	T ref [°C]	23	23	23	**°C**
HP size: 12-15 kW		**V1**	**V2**	**V3**	
Pump: SXM 25-60	Main	144.7±15	107.3±10	70.9±7	**Ω**
	Aux	72.8±7	72.8±7	72.8±7	**Ω**
	T ref [°C]	23	23	23	**°C**



The AquaSnap PLUS can use the following user interfaces:
- dry contacts;
- the AquaSnap PLUS 33AW-RC1 remote controller;
- the 33AW-CS1 Comfort Series programmable thermostat
- the Carrier Dealer Service Tool.

7.1 Dry contacts control

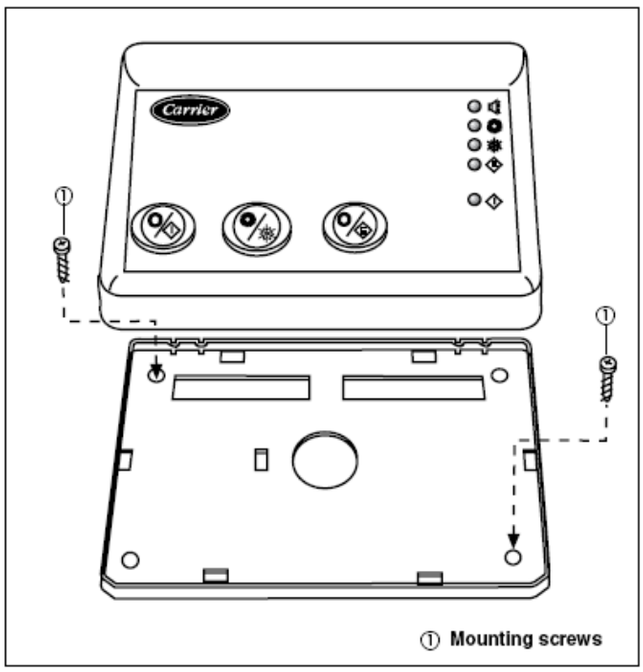


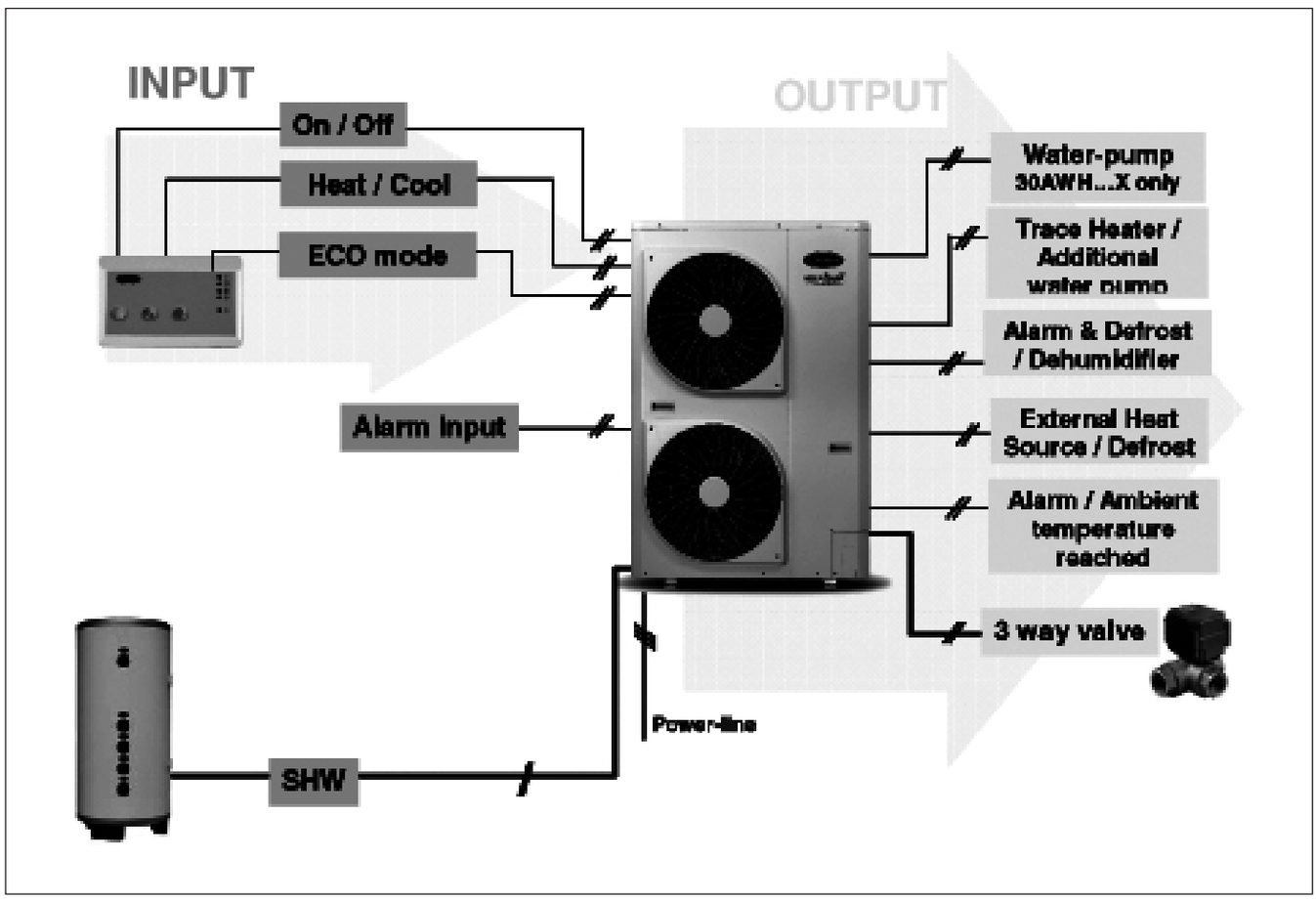
7.2 33AW-RC1 user interface

WARNING:

Before installing the remote controller, turn off all power to the unit that will supply power to the remote controller. Electrical shock can cause personal injury or death.

- Open the remote controller rear mounting base to expose mounting holes. The base can be removed to simplify mounting (snap apart carefully at hinge to separate mounting base from remainder of the remote controller).
- Route the remote controller wires through the large hole in the mounting base. Level mounting base against wall (for aesthetic value only).
- Mark the wall through the 2 mounting holes. Drill two 5 mm mounting holes in wall where marked.
- Secure mounting base correctly to wall with 2 screws and anchors provided, (additional anchoring holes available for more secure mounting if needed) making sure all wires extend through hole in mounting base.
- Adjust length and routing of each wire to reach the proper terminal in the connector block on the mounting base. (Strip only 6 mm of insulation from each wire to prevent adjacent wires from shorting together when connected).
- Match and connect equipment wires to proper terminals in the connector block.
- Both power and communication wires must be connected correctly for proper remote controller operation.
- Push any excess wire into the wall and against mounting base..





7.2.1 I/O features details

On /Off
Standard Off Mode or Frequency to 0 can be selected by code 146 if used an external thermostat
Heat / Cool
- Fixed Water Set Point can be selected for Heat (code 113) and Cool (code 115)
- Floating WSP based on OAT Climatic Curve can be selected (Installer customized CC or predefined Carrier CC) code 112, 117-125

ECO
Different delta (from 1 to 10°C) on fixed WSP can be defined for Heat (code 114) and Cool (code 116)
Night Mode
(Frequency Reduction) To reduce max noise, max frequency can be reduced (code 5, 6)
Sanitary Hot Water
In case SHW dry contact input is exercised, unit is always moved in Heat mode at the max WSP
Water Pump
For x and NX version, 230VAC WP output is on terminal block (230V 2A max)
Alarm & Defrost
In case of Unit alarm or Defrost, an output is available on terminal block (H version 230V, X version dry contact)
External Heat Source
When an EHS is requested a 230V output is energized to drive an external heat source
SHW 3Way Valve
In case of SHW input is activated, unit is forced in heat mode at max WSP and a 230 VAC 2A max output is available to drive, a 3WV
Alarm code
An alternate 5V signal is activated to point out on SUI the error code

7.2.2 Main settings

		CODE	33AW-RC1 AND DRY-CONTACTS SETTINGS
Unit ON/OFF mode input		146	OFF or Controlled Off cycle
Heating & cooling mode input		302	Heat only, Cool only or Reversible
Leaving Water Temperature (LWT) set-point	in heating	113	From + 20°C to +60°C
	in cooling	115	From +4°C to +25°C
Climatic curve		112	No predefined Climatic Curve (Installer has to draw CC) 1-12 HTG CC 1-2 CLG CC See Nui manual or paragraph 7.3.5 for climatic curve details.
Remote Out-door Air Temperature sensor		126	Enabled or disabled (when disabled the 30AWH OAT sensor is enabled)
ECO mode input	in heating	114	From 1°C to 20°C lower than LWT set-point (113)
	in cooling	116	From 1°C to 10°C higher than LWT set-point (115)
Night mode	input	005	Enabled or Disabled
	frequency	006	Form 50% to 100% of the compressor nominal frequency
Sanitary Hot Water (SHW)	demand input	-	Enabled Max. LWT allowed within the compressor envelope (switch off at +62°C)
	3W valve output	-	Enabled
External Heat Source / Defrost output		106	Alternative heat-source (e.g. gas-boiler) or Defrost output
Alarm or Terminal Fan-coil contact		147	Alarm or terminal Fan-coil
Alarm Defrost or humidity selection		108	Alarm Defrost or humidity selection
Water pump output		-	Enabled

For more details refer to specific manuals

7.3 33AW-CS1 User interface

Three different applications:

1. Service tool, for programming (customs settings) and diagnosis purposes, when temporarily wired to the 30AWH…
2. All of the above, plus remote controller and programmer, when installed in a room that is not representative of the indoor temperature and relative humidity (e.g. basement, technical room, garage, etc.).
3. All of the above, plus room thermostat and hygrostat, and many customizable functions.

Carrier's NUI series programmable user interface is wall-mounted, low-voltage user interface which maintains room temperature by controlling the operation of a heating and/or air conditioning system. "Heat pump", " Air conditioner" and "Heat only" are available, with the present versions. A variety of features are provided including separate heating and cooling set-points, keypad lockout, backlighting, and built-in installer test etc. Programming features include 7-day (all days the same), 5/2 (Mon-Fri and Sat-Sun) and 1-day (all 7 days individually) with 2 or 4 or 6 periods per day.
This Installation Instruction covers installation, configuration, and startup of NUI. For operational details, consult the Owner's Manual.

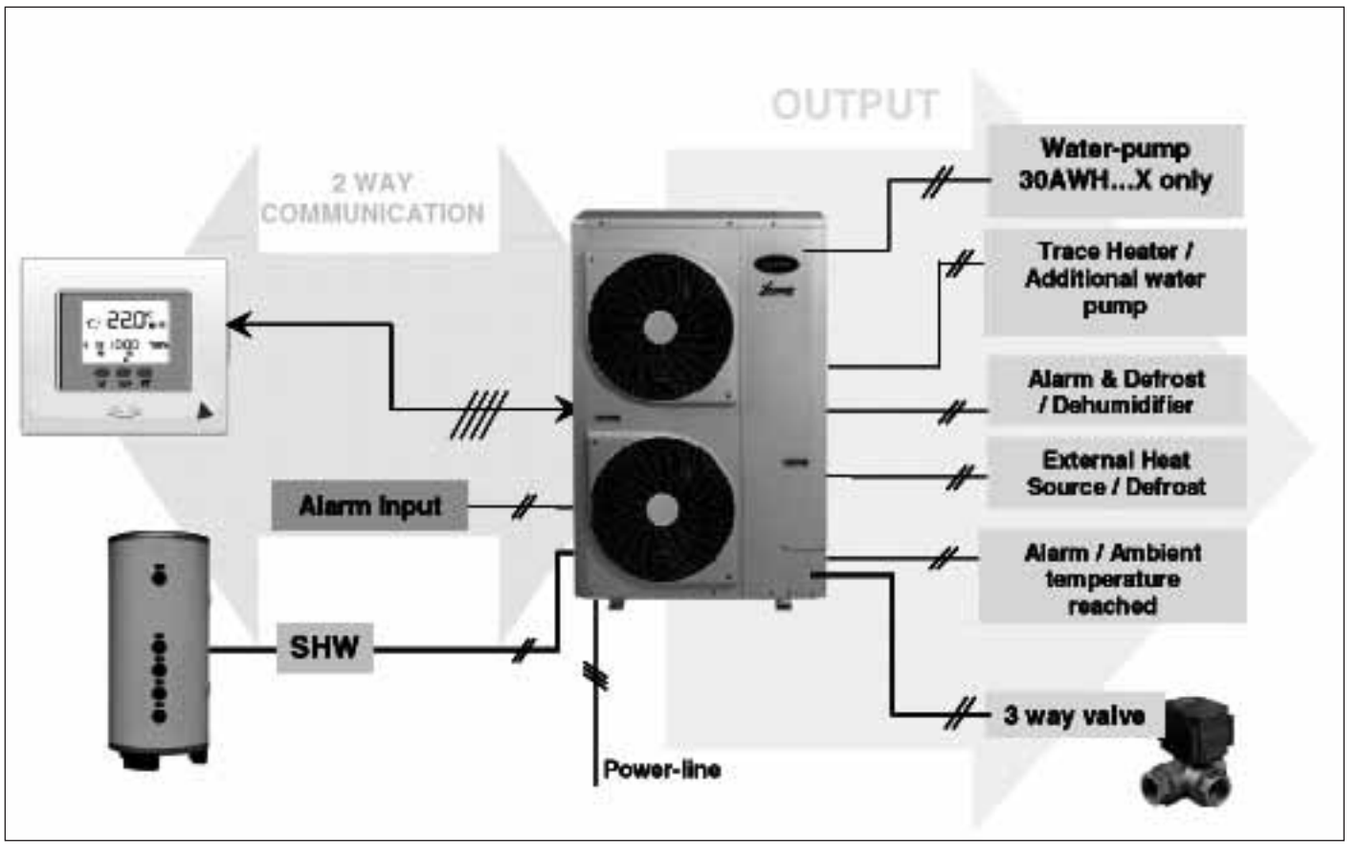
WARNING:
Before installing the remote controller, turn off all power to the unit that will supply power to the remote controller. Electrical shock can cause personal injury or death.

User Interface Location

· Approximately 5 ft (1.5m) from floor.
· Close to or in a frequently used room, preferably on an inside partitioning wall.
· On a section of wall without pipes or duct work.
User Interface should NOT be mounted
· Close to a window, on an outside wall, or next to a door leading to the outside.
· Exposed to direct light or heat from the sun, a lamp, fireplace, or other temperature-radiating objects which could cause a false reading.
· Close to or in direct airflow from supply registers and return-air registers.
· In areas with poor air circulation, such as behind a door or in an alcove.

Install User Interface

1. Turn OFF all power to unit.
2. If an existing User Interface is being replaced:
a. Remove existing User Interface from wall.
b. Disconnect wires from existing User Interface, one at a time.
c. As each wire is disconnected, record wire colour and terminal marking.
3. Open the NUI (mounting base) to expose mounting holes. The base can be removed to simplify mounting. Press the thumb release at thetop of the NUI and snap apart carefully to separate mounting base from remainder of the NUI.
4. Route the NUI wires through large hole in mounting base. Level mounting base against wall and mark wall through 2 mounting holes.
5. Drill two 5mm mounting holes in wall where marked.
6. Secure mounting base to the wall with 2 anchors and screws provided making sure all the wires extend through hole in the mounting base.
7. Adjust length and routing of each wire to reach proper terminal and connector block on mounting base with 6.5mm of extra wire. Strip only 6.5mm of insulation from each wire to prevent adjacent wires from shorting together when connected.
8. Match and connect equipment wires to proper terminals of the connector blocks. Refer to wiring diagram for more details.
9. Push any excess wire into wall and against mounting base. Seal hole in wall to prevent air leaks. Leaks can affect operation.
10. Snap case back together. Attach thermostat to back plate by inserting tab on bottom edge and hinging up until top snap secures.
11. Close thermostat assembly making sure pins on back of circuit board align with sockets in connector.
12. Turn ON power to unit.

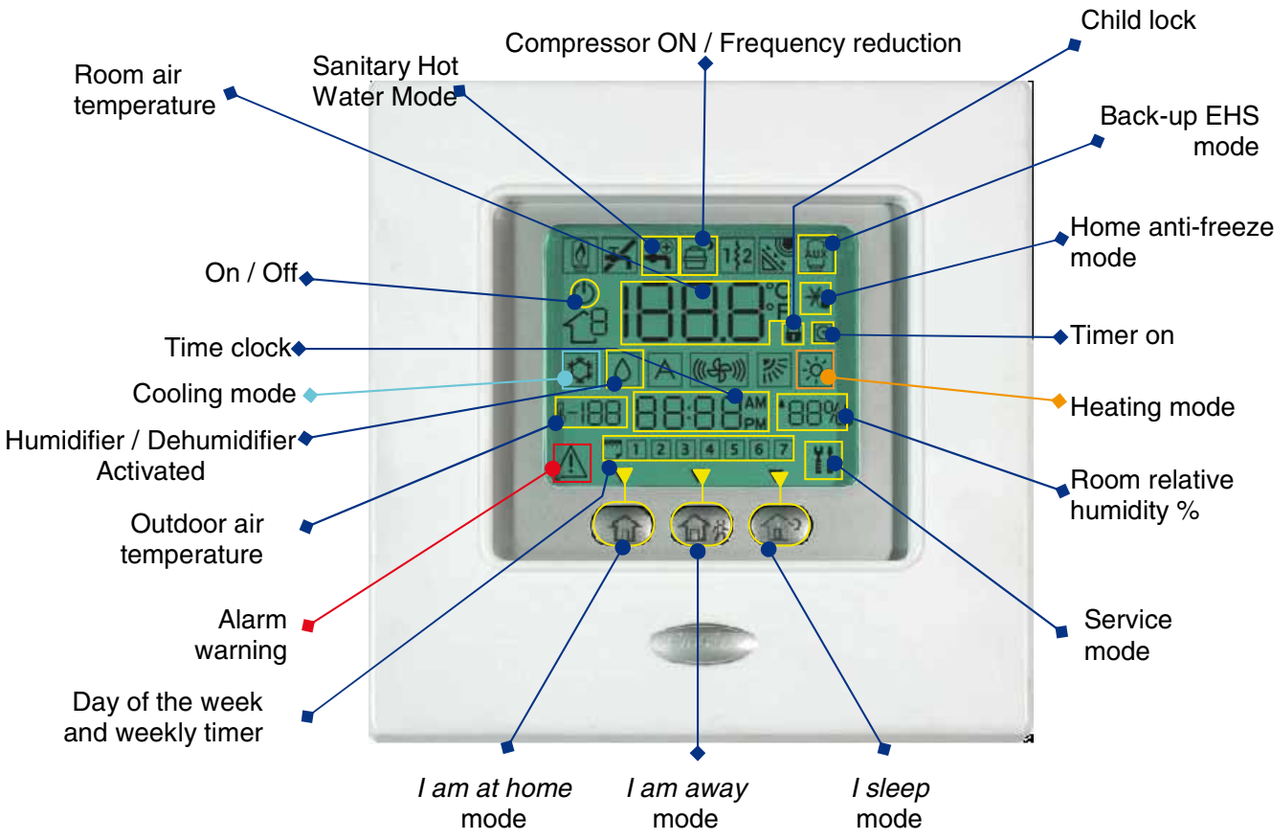


7.3.1 Main functions

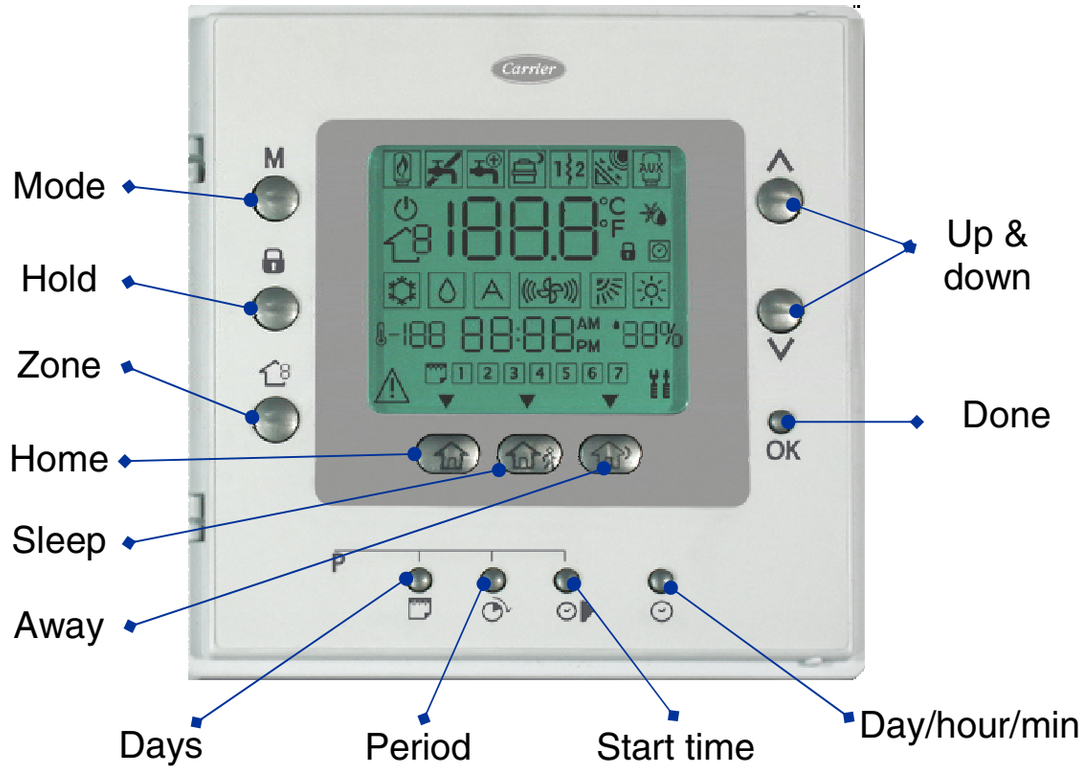
User functionality (comfort):
- One touch interface to select 3 different room temperature set
- point mode: Home, Sleep, Away
- Display of:
  - Climatic display: Room T, OAT T and Room RH%
  - Time and day of the week
  - Heat source (Heat Pump, Night, SHW, EHS)
  - Mode: Off, Off with home antifreeze, Heat and Cool
  - Alarms
  - Room set-point mode
- Room UR% set point to drive a Dehumidifier / Humidifier
- Scheduling: 2-4-6 periods/day, room sp mode, Heat Pump
- On/Off and night option
- Room sensor adjustment
- Different temperature value can be displayed
- Key pad can be locked
- Set point can be temporary or permanently modified
- Shortcut to Night mode (button for 10 sec)

- Multipurpose user Interface: Comfort, Programmer Control and Service tool
- Main Commissioning features:
  - Force outputs on and test Hydraulic circuit (code 104)
  - Define different system type and user interface (code 100, 101)
  - Configure terminal block outputs (code 106, 107, 108,147)
  - Water temperature set points/climatic curves (code 112 to 125)
  - Frost Protection set points (code 109)
  - Controlled OFF setting (code 146)
  - Backup Heater strategy (code 148, 150, 151, 152)
  - Sanitary mode setup (code 153)
  - External Sensor installed (code 126)
- Main Service features:
  - Read Heat Pump temperatures (code127 to 130, 137, 138, 139, 145)
  - Display Compressor Hz (code 132, 133, 134)
  - Display flow switch status (code 111)
  - Alarm / history (code 22 & 23)
  - Display Compressor /water pump run time (code 135, 144)

7.3.2 Displayed icons



7.3.3 Control buttons



For more details refer to specific manuals.

7.3.4 Codes table

Code Nr.	Name	DESCRIPTION	VALUE RANGE		STANDARD
			Min	Max	
1	MODE	This code is use to select the Unit Mode: 0. Off 2. Cooling 3. Heating	-	-	0. Off
2	HOME ANTIFREEZE	This code is use to enable the Home Atifreeze option when the system is Off: 1. Disable	1	2	1. Disable
3	HOME ANTIFREEZE TEMPERATURE	This code is use to select the threshold temperature value under witch the Home Antifreeze protection starts (-0/+2 °C of hysteresis).	6°C	12°C	6°C
4	ADJUST WATER TEMPERATURE SET-POINT	This code is use to adjust the water set-point changing the setted climatic curve. The value setted modifies the maximum temperature of heating and cooling climatic curves.	-5°C	+5°C	0°C
5	FREQUENCY REDUCTION MODE	This code is use to activate Silence / Frequency Reduction / Night mode: 1. Not Active 2. Active	1	2	1. Not active
6	FREQUENCY REDUCTION VALUE	This code is use to set the value of the outdoor unit frequency reduction in %.	50%	100%	75%
7 (🔒)	ROOM MODE	This code is only displayed from the NUI based on room mode selection: 1. Home 2. Sleep 3. Away	1	3	1
8 (🔒)	CONTROL ROOM SET-POINT	This code displays the control room set-point set by the user.	12°C	38°C	20°C
9 (🔒)	ROOM AIR TEMPERATURE	This code displays the room air temperature read by the internal NUI Thermistor.	-20°C	50°C	-
10 (🔒)	RELATIVE HUMIDITY SENSOR VALUE	This code displays the relative humidity value read by the internal NUI sensor.	0	100	-

Code Nr.	Name	DESCRIPTION	VALUE RANGE		STANDARD
			Min	Max	
11 (🔒)	OUTDOOR TEMPERATURE	This code displays the Outdoor Air Temperature. The valid OAT value is used with this priority: 1. OAT from GMC thermistor (if it is installed) 2. OAT from inverter, read by TO sensor.	-30°C	90°C	-
12 (🔒)	GMC OUTDOOR AIR TEMPERATURE	This code displays the Outdoor Air Temperature read by GMC thermistor.	-	-	-
13	TEMPERATURE ROOM SENSOR ADJUSTMENT	This code is use to adjust the temperature read by the sensor in order to recover bad positioning of the user interface.	-5°C	+5°C	0°C
14	DAY PERIOD	This code is use to select how many period per day will be available for the scheduling: 2 4 6	2	6	4
15	HOME HEAT TEMPERATURE	With this code the User can select the HOME Temperature set-point in Heating Mode	12°C	38°C	20°C
16	HOME COOL TEMPERATURE	With this code the User can select the HOME Temperature set-point in Cooling Mode	12°C	38°C	24°C
17	SLEEP HEAT TEMPERATURE	With this code the User can select the SLEEP Temperature set-point in Heating mode	12°C	38°C	18°C
18	SLEEP COOL TEMPERATURE	With this code the User can select the SLEEP Temperature set-point in Cooling Mode	12°C	38°C	26°C
19	AWAY HEAT TEMPERATURE	With this code the User can select the AWAY Temperature set-point in Heating mode	12°C	38°C	15°C
20	AWAY COOL TEMPERATURE	With this code the User can select the AWAY Temperature set-point in Cooling Mode	12°C	38°C	28°C
21 (🔒)	USER ROOM SET-POINT	This code displays the room set-point that the user, pressing the temporary/hold button, is selecting as temporary or hold.	12°C	38°C	20°C
22 (🔒)	FAULT CODE	This code displays the last fault code occurred.	-	-	-
23 (🔒)	FAULT HISTORY	This code displays the recent 4 fault codes stored.	-	-	-
100	SYSTEM TYPE	This code is use to set the System type: 1. A2W Monobloc fixed Water Temperature Value (dry contacts) 2. A2W Monobloc Climatic Curve setup (dry contacts) 3. A2W Monobloc Comfort with NUI 4. A2W Monobloc Comfort with NUI as Thermostat 5. N.A. 6. A2W Monobloc RS485 7. N.A.	1	7	1. A2W
101	USER INTERFACE TYPE	This code is use to define if NUI User Interface is used and how it is used: 0. Not Used (Input Relay active/SUI) 1. NUI Installed 2. NUI used as programmer	0	2	0. Not used
102 (🔒)	NUI SOFTWARE RELEASE	This code displays the NUI Software Release	-	-	-
103 (🔒)	NUI SOFTWARE VERSION	This code displays the NUI Software Version	-	-	-
104	OUTPUT TEST	This code is use to force Output ON to test (max 10 minutes): 0. No test 1. Water pump 2. Alarm / Ambient temperature reached 3. External Heat Source / Defrost 4. Alarm + Defrost / Humidity 5. Trace Heater / Additional Water Pump 6. 3 Way valve 7. SUI Alarm 8. Blank	0	9	0. No test
105	RESET PUMP RUN-TIME	This code is use to reset the water pump timer to zero.	no	yes	no
106	EXTERNAL HEAT SOURCE / DEFROST	This code is use to select the output connected at PIN 4 on terminal strip: 1. External Heat Source 2. Defrost Output	1	2	1
107	HUMIDITY LIMIT	This code is use to define the humidity threshold limit to enable the output for the external de-humidifier system.	20	100	50%

Code Nr.	Name	DESCRIPTION	VALUE RANGE		STANDARD
			Min	Max	
108	ALARM-DEFROST OR HUMIDITY SELECTION	This code is use to select the output connected at PIN 11 on terminal strip: 1. Unit alarms and/or Defrost 2. Humidity Control	1	2	2
109	FROST DELTA SET-POINT	This code is use to set the frost delta set-point used by the Anti frost protection logic as per algorithm.	0°C	6°C	1°C
110	RESET COMPRESSOR RUN-TIME	This code is use to reset the compressor timer to zero.	No	yes	No
111 (🔒)	FLOW SWITCH STATUS	This code displayes the Flow Switch status: 0. Water not flowing 1. Water flowing	-	-	-
112	HEAT CLIMATIC CURVE NUMBER	This code is use to select the heat climatic curve number: 0. No predefined climatic curve (Installer has to draw CC) 1 - 12. Refers to NUI manuals for climatic curve details.	0	12	0
113	HEAT WATER SET-POINT	This code is use to set the fixed heating water set-point.	20°C	60°C	45°C
114	ECO HEAT TEMPERATURE REDUCTION	This code is use to set the temperature reduction value for fixed heating water set-point when the unit is in ECO mode.	1°C	20°C	5°C
115	COOL WATER SET-POINT	This code is use to set the fixed cooling water set-point.	4°C	25°C	7°C
116	ECO COOL TEMPERATURE REDUCTION	This code is use to set the temperature reduction value for fixed cooling water set-point when the unit is in ECO mode.	1°C	10°C	5°C
117	COOL CLIMATIC NUMBER	This code is use to select the cool climatic curve number: 0. No predefined climatic curve (Installer has to draw CC) 1 - 2. Refers to NUI manuals for climatic curve details	0	2	0
118	MIN OUTDOOR AIR TEMPERATURE HEATING	This code is use to select the minimum outdoor temperature of the heating climatic curve, depending on the country where the system is installed.	-20°C	+10°C	-7°C
119	MAX OUTDOOR AIR TEMPERATURE HEATING	This code is use to select the maximum outdoor temperature of the heating climatic curve.	10°C	30°C	20°C
120	MIN WATER TEMPERATURE HEATING	This code is use to select the minimum water temperature of the heating climatic curve.	20°C	60°C	40°C
121	MAX WATER TEMPERATURE HEATING	This code is use to select the maximum water temperature of the heating climatic curve.	20°C	60°C	55°C
122	MAX OUTDOOR AIR TEMPERATURE COOLING	This code is use to select the maximum outdoor temperature of the cooling climatic curve, depending on the country where the system is installed.	24°C	46°c	40°C
123	MIN OUTDOOR AIR TEMPERATURE COOLING	This code is use to select the minimum outdoor temperature of the cooling climatic curve	0°C	30°C	22°C
124	MIN WATER TEMPERATURE COOLING	This code is use to select the minimum water temperature of the cooling climatic curve.	4°C	20°C	4°C
125	MAX WATER TEMPERATURE COOLING	This code is use to select the maximum water temperature of the cooling climatic curve.	4°C	20°C	12°C
126	GMC OAT THERMISTOR	This code is use to define if GMC OAT thermistor is installed or not: 1. GMC thermistor installed 2. GMC thermistor not installed	1	2	2
127 (🔒)	TO SENSOR VALUE	This code displayes the outdoor air temperature value read by the TO sensor.	-	-	-
128 (🔒)	TE SENSOR VALUE	This code displayes the refrigerant temperature value read by the TE sensor.	-	-	-
129 (🔒)	TS SENSOR VALUE	This code displayes the suction temperature value read by the TS sensor.	-	-	-
130 (🔒)	TD SENSOR VALUE	This code displayes the discharge temperature value read by the TD sensor.	-	-	-
131 (🔒)	CDU MODE	This code displayes the actual Heat Pump operating mode: 1. Off 2. Cool 3. Heat 4. Fail 5. Defrost	-	-	-
132 (🔒)	MAX COMPRESSOR FREQUENCY	This code displayes the maximum compressor frequency calculated by GMC control board.	-	-	-
133 (🔒)	REQUESTED FREQUENCY	This code displays the requested frequency by the system control.	-	-	-

Code Nr.	Name	DESCRIPTION	VALUE RANGE		STANDARD
			Min	Max	
134 (🔒)	REAL FREQUENCY	This code displays the real compressor frequency	-	-	-
135 (🔒)	COMPRESSOR RUNTIME	This code displays the working on hours of the compressor..	-	-	-
136 (🔒)	CDU CAPACITY	This code displays the nominal heat pump capacity [kW].	-	-	-
137 (🔒)	EWT SENSOR VALUE	This code displays the Entering Water Temperature read by the EWT sensor.	-	-	-
138 (🔒)	LWT SENSOR VALUE	This code displays the Leaving Water Temperature read by the LWT sensor.	-	-	-
139 (🔒)	TR SENSOR VALUE	This code displays the refrigerant temperature value read by the TR sensor.	-	-	-
140 (🔒)	SYSTEM MODE	This code displayes the operating mode requested by the System Control: 0. Off 1. Stand by 2. Cooling 3. Heating 4. N.A. 5. N.A. 6. Rating Heating 7. Rating Cooling 8. Freeze Protection 9. Defrost 10. High Temperature Protection 11. Timeguard 12. System Fail	-	-	-
141 (🔒)	DEF MODULE	This code displays the list of the all fault codes detected by the outdoor unit. If no fault are occurring, no codes will be displayed.	-	-	-
142 (🔒)	GMC SOFTWARE VERSION	This code displays the GMC Software Version	-	-	-
143 (🔒)	GMC SOFTWARE RELEASE	This code displays the GMC Software Release	-	-	-
144 (🔒)	WATER PUMP RUNTIME	This code displays the working on hours of the water pump.	-	-	-
145 (🔒)	CURRENT WATER SET-POINT	This code displays the current water set-point defined by the system control.	-	-	-
146	DRY CONTACT OFF	This code is use to set the different OFF logics: 1. Standard OFF 2. Controlled Off Cycle (only if HP is controlled by dry contact)	1	2	1
147	ALARM / SATISFIED AIR ROOM TEMPERATURE	This code is use to select the output connected at PIN 5 on terminal strip: 1. Alarm signal 2. Signal of reached air temperature set-point	1	2	1
148	EXTERNAL HEAT SOURCE OAT LIMIT	This code is use to set the OAT threshold value under which only the external heat source will be operative as per algorithm. (Stop HP)	-20°C	65°C	-20°C
149	TEMPERATURE LIST	This code is use to set which temperature the NUI shall display in temperature zone. 1. Indoor air temperature 2. Leaving water temperature (from LWT sensor) 3. Entering water temperature (from EWT sensor) 4. Refrigerant temperature (from TR sensor) 5. Suction temperature (from TS sensor) 6. Discharge temperature (from TD sensor) 7. Refrigerant temperature (from TE sensor)	1	7	1
150	AUXILIARY OAT LIMIT	This code is use to set the OAT threshold value under which both the heat pump and the external heat source will be operative as per algorithm.	-20°C	30°C	0°C
151	AUXILIARY DELAY	This code is use to set the delay time after which, when (temperature set in code 148) < OAT < (temperature set in code 150), the external heat source will switch on . The counting of the time starts when the activation of the EHS is required as per algorithm (if (current water temperature) < (water temperature set-point – auxiliary hysteresis)	1 Min	60 Min	10 Min
152	AUXILIARY HYSTERESIS	This code is use to set the hysteresis temperature needed to activate the external heat source..	1°C	20°C	5°C
153	SANITARY HOT WATER IN OFF MODE	This code is use to define if, when system mode is off, the sanitary hot water logic can be activated: 1. Yes, SHW logic is always actives 2. No, SHW logic can be activated only in Heat or Cool mode	1	2	1

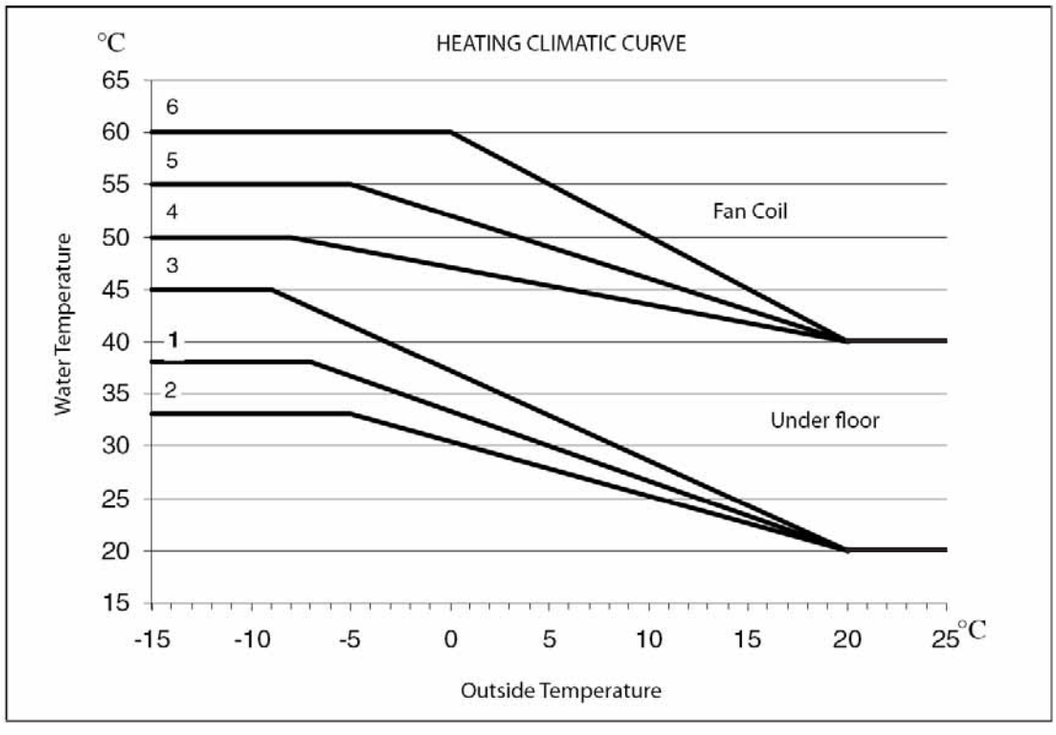
Code Nr.	Name	DESCRIPTION	VALUE RANGE		STANDARD
			Min	Max	
154	EXTERNAL HEAT SOURCE STATUS	This code is use to define the external heat source status when EHS is activated and OAT < temperature value set in Code 148: 0. Always On 1. On/Off depending by actual Room Temperature vs room temperature set-point(same hysteresis of Thermostat function). In case of NUI is not installed or room sensor unavailable, On/Off depending by water set-point (+1/-4 °C of hysteresis) 2. On/Off depending by water set-point (+1/-4 °C of hysteresis)	0	2	1
155	MAIN WATER PUMP LOGIC VS EHS STATUS	This code is use to define the water pump logic when EHS is activated and OAT < (temperature value set in Code 148): 0. Always Off 1. On/Off depending by EHS On/Off status 2. Always On	0	2	1
156	TRACE HEATER / ADDITIONAL WP LOGIC	This code is use to select the output connected at PIN 11 on terminal strip. In case an additional water pump option is active, this code is use to select its operating logic vs the SHW request (if OAT > (temperature value set in Code 148)). 0. Trace he 1. Additional water pump On/Off depending by main water pump logic. This it means that in case of SHW activation, the additional WP will be ON. 2. Additional water pump On/Off depending by main water pump logic, but always OFF when SHW is activated.	0	2	1
157	ADDITIONAL WATER PUMP LOGIC	This code is use to define the additional water pump logic, if it has been installed, when OAT < temperature value set in Code 148: 0. Always Off 1. On/Off depending by EHS On/Off status 2. Always On	0	2	2
158	DELTA AIR SET-POINT	This code is use to define the hysteresis versus the temperature room Set-Point to Off the Unit when the System Type is NUI installed and used as Thermostat (100 NUI code = 4).	0.2°C	1°C	0.3 °C
302	UNIT CONFIGURATION	This code is use to configure the unit: 0. Cooling Only 1. Heat & Cooling 2. Heating Only	0	2	1

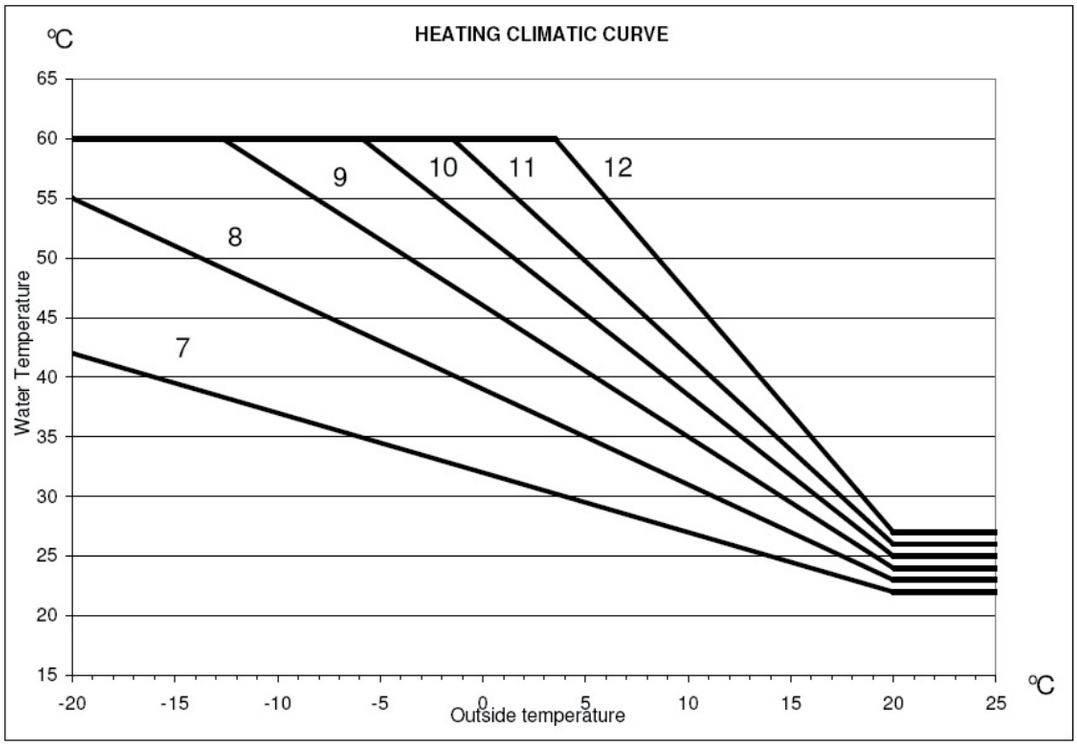
7.3.5 Climatic curves

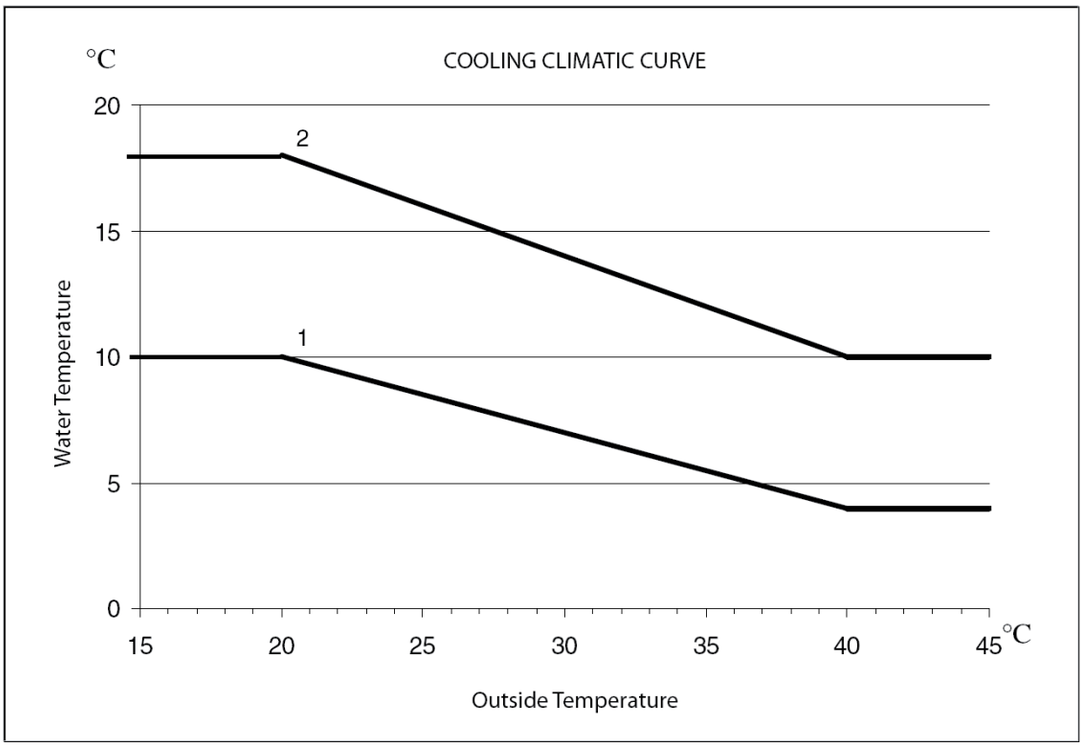
Pre-set curves

Twelve heating curves and two cooling curves are available by accessing to parameters 112 and 117 respectively of installer configuration table.

The curves are set to maintain a target indoor temperature of 20°C.

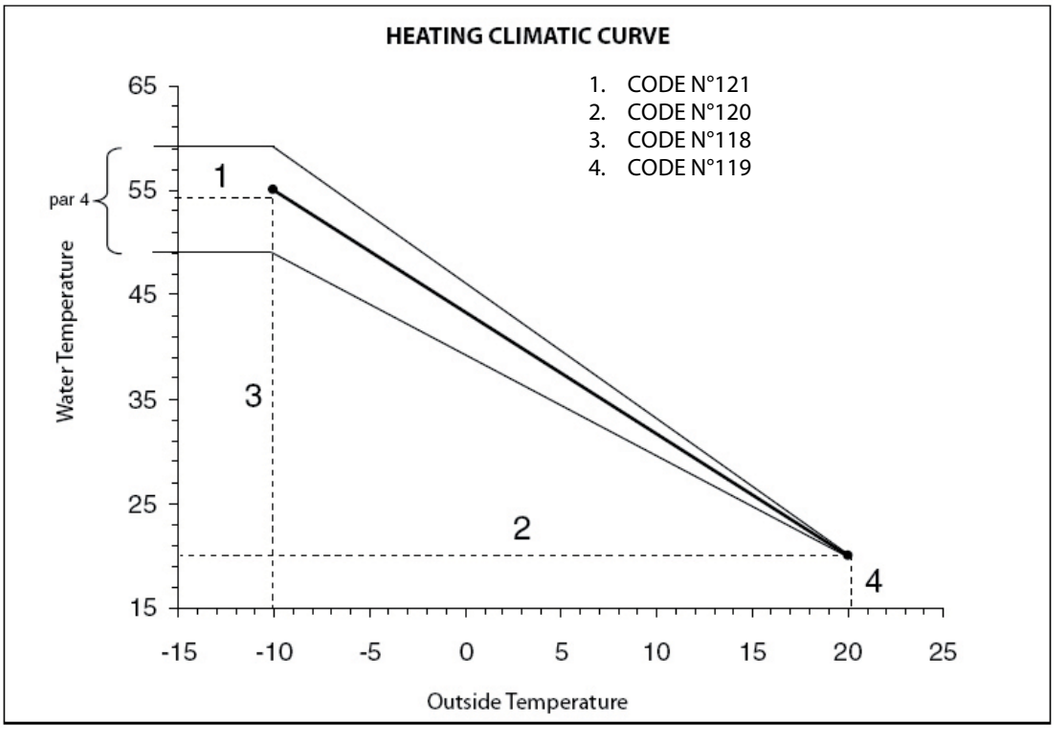


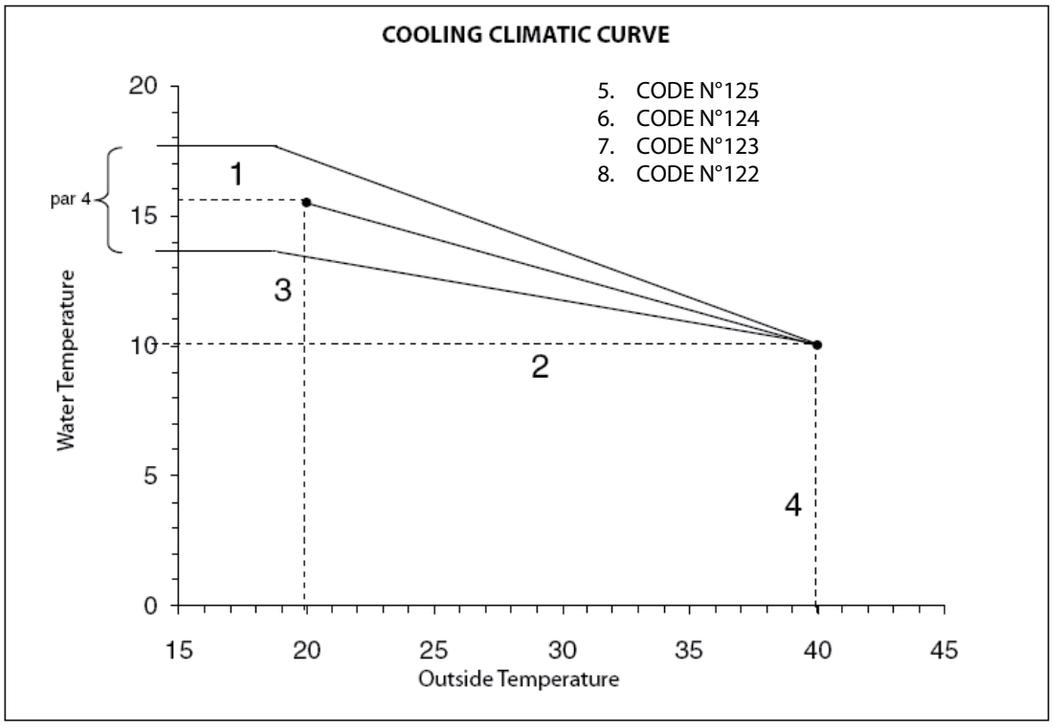




Custom curves

Parameters 112 and 117 set to 0 allows to load in the control a custom climatic curve.
Below figures show which parameter of installer configuration table need to be set to create customized heating and cooling curves.





NOTE: *In case application requires fixed water set point in necessary to set an horizontal climatic curve by setting NUI code120=121 for Heating Climatic Curve and 124=125 for Cooling Climatic Curve.*

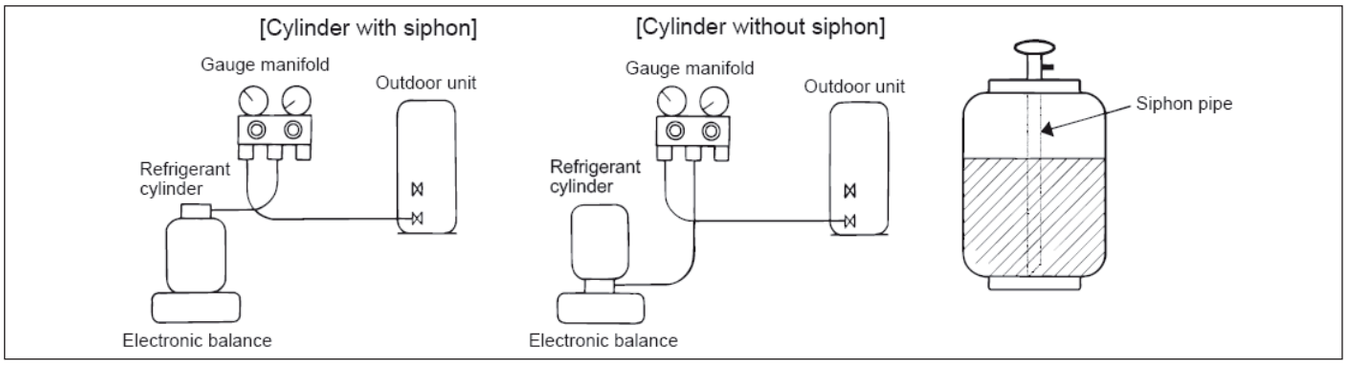
8.1 Refrigerant charge check

IMPORTANT: All maintenance operations must be performed by qualified personnel.

This check becomes necessary after any refrigerant leak or after replacement of the compressor.
The best method to correctly charge refrigerant is to completely empty the refrigerant circuit using refrigerant recovery equipment.
Then charge the exact quantity of refrigerant according to the data shown on the unit nameplate.
R-410A systems must be charged with liquid refrigerant.
Use the special recharging equipment (normally on the market) to control the refrigerant correctly.
When it is necessary to recharge refrigerant, charge the specified amount of new refrigerant according to the following steps:

1. Recover the refrigerant, and check no refrigerant remains in the equipment.
2. Connect the charge hose to packed valve service port (see the Check joint in the figure illustrated in chapter 3.4 Refrigerant schematics).
3. Connect the charge hose of the vacuum pump adapter.
4. Place the handle of the gauge manifold Low in the fully opened position, and turn on the vacuum pump's power switch. Then, evacuating the refrigerant in the cycle.
5. When the compound gauge's pointer has indicated -0.1 MPa (- 76 cmHg), place the handle Low in the fully closed position, and turn off the vacuum pump's power switch.
6. Keep the status set as it is for 1 to 2 minutes, and ensure that the compound gauge's pointer does not return.
7. Set the refrigerant cylinder to the electronic balance, connect the connecting hose to the cylinder and the connecting port of the electronic balance, and charge liquid refrigerant.

IMPORTANT:
- Never charge refrigerant exceeding the specified amount.
- If the specified amount of refrigerant cannot be charged, charge refrigerant bit by bit in COOL mode.
- Do not carry out additional charging. When additional charging is carried out if refrigerant leaks, the refrigerant composition changes in the refrigeration cycle, that is characteristics of the heat pump changes, refrigerant exceeding the specified amount is charged, and working pressure in the refrigeration cycle becomes abnormally high pressure, and may cause a rupture or personal injury.
- A cylinder with siphon enables liquid to be charged without the cylinder turned upside down.(see the figure below)

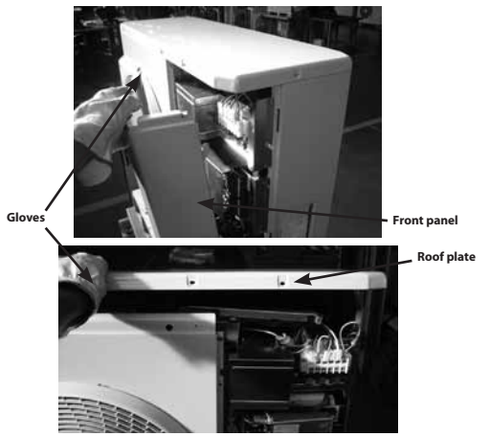
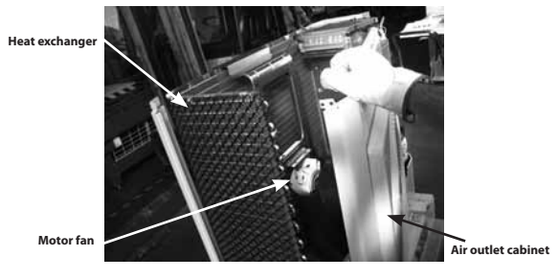


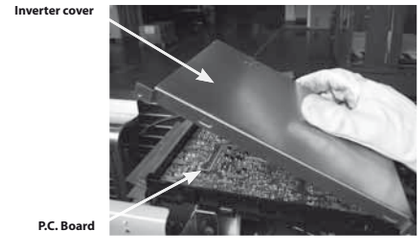
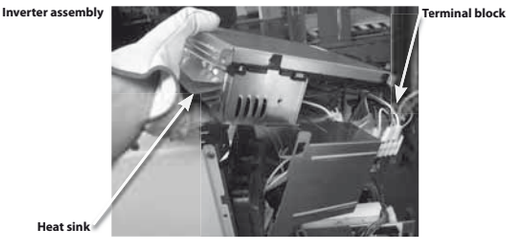
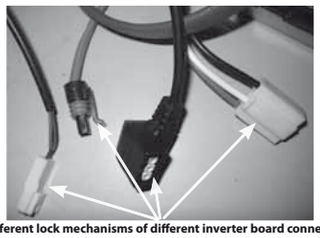
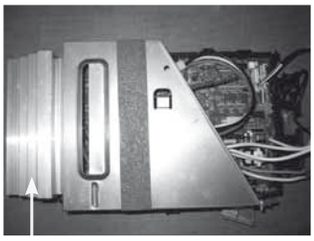
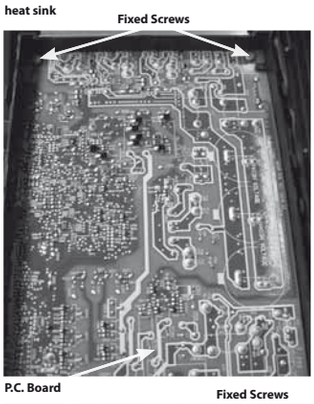
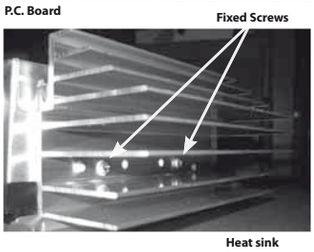
8.2 Cleaning the coil

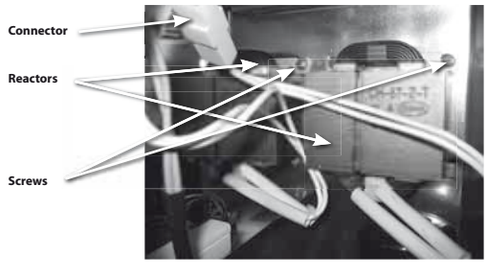
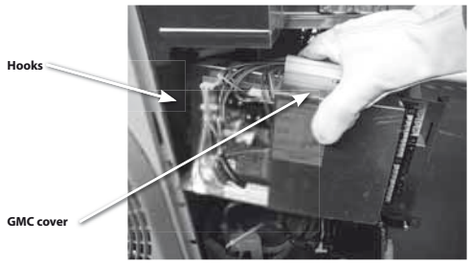
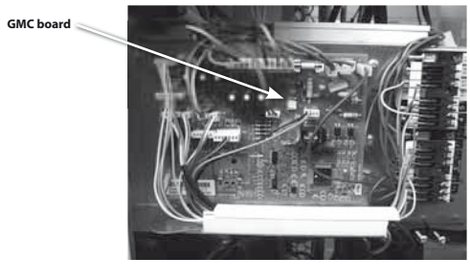
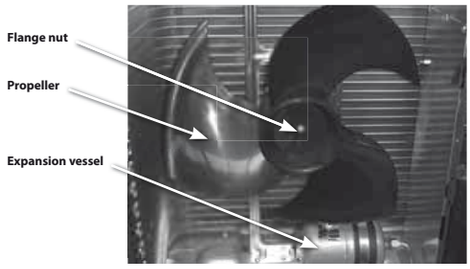
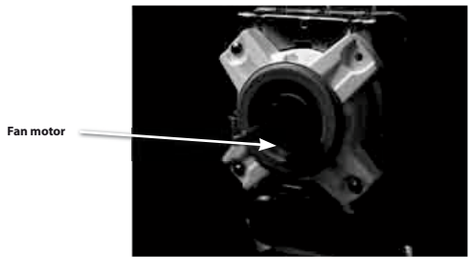
If necessary, proceed as follows for more careful cleaning of the coil:
- Switch the mains supply OFF.
- Remove unit top cover by losening the fixing screws and lifting thecover. Carefully clean the coil with a vacuum cleaner from inside to outside.

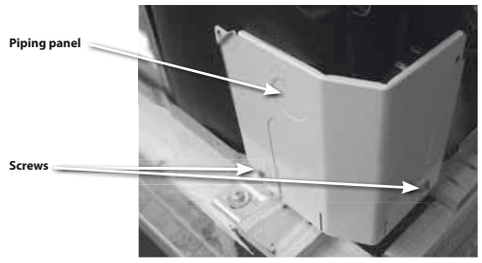
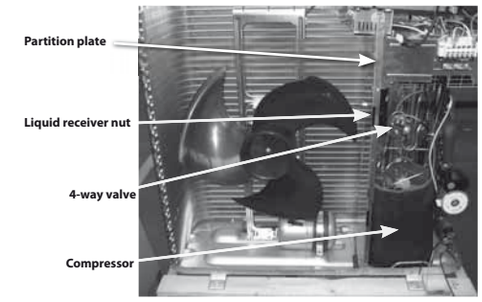
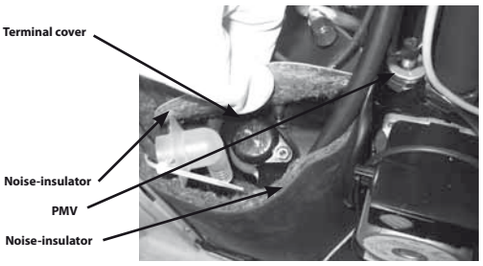
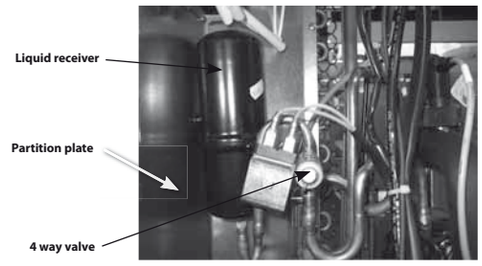
With the same vacuum cleaner, remove the dust from inside the fan compartment and the fan blades. Avoid any damage to the blades which may cause future vibrations and noise.
Replace the unit cover and tighten the screws.

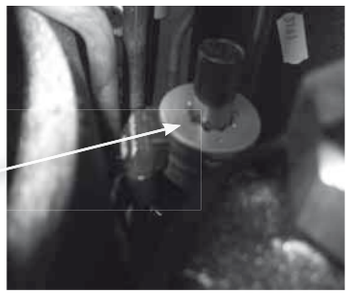
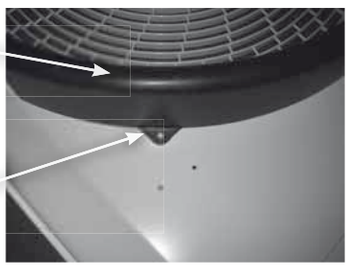
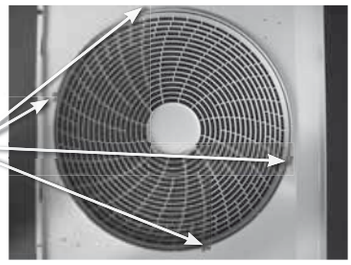
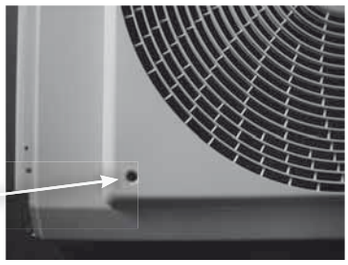
8.3 Replacement of the main parts

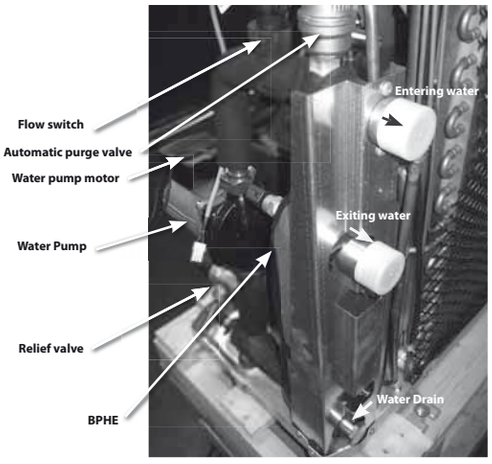
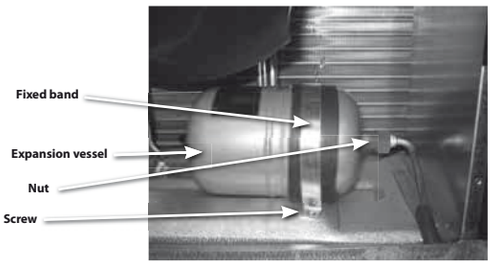
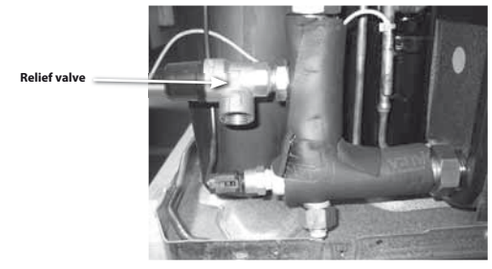
N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
		30 AWH 004, 30 AWH 006, 30 AWH 008	
(1)	**Common procedure**	• **Detachment** 1. Stop operation of the heat pump, and turn off switch of the breaker. 2. Remove the front panel (ST8P Ø9.75 • 9.5, 3 pcs.). After unscrewing the screws, remove the front panel while drawing it downward. 3. Remove the power cable from cord clamp and terminal. 4. Remove the roof plate (ST8P Ø9.75 • 9.5, 7 pcs.). • **Attachment** 5. Mount the roof plate (ST8P Ø9.75 • 9.5, 7 pcs.). 6. Connect the power cable and to terminal, and then fix them with cord clamp. REQUIREMENT Secure the power cables using a tie-wrap or rubber band to ensure they do not come into contact with the compressor, valves and discharge pipe. 7. Attach the front panel (ST8P Ø9.75 • 9.5, 3 pcs.).	
(2)	**Side cabinet**	• **Detachment** 1. Perform the work from 1 to 4 of (1). 2. Remove the screws fixing the inverter assembly and the side cabinet. (M4 Ø8 • 8, 1 pc.). 3. Remove the screws fixing the GMC assembly and the side cabinet. (ST8P Ø9.75 • 9.5, 2 pcs.). 4. Remove the screw for the side cabinet and the piping panel (Rear) (ST8P Ø9.75 • 9.5, 1 pc.). 5. Remove the screw for the side cabinet and the base plate (ST8P Ø9.75 • 9.5, 2 pcs.). 6. Remove the screws for the side cabinet and heat exchanger (ST8P Ø9.75 • 9.5, 2 pcs.). 7. Remove the screws of the side cabinet and the Brazzed plate heat exchanger assembly. (ST8P Ø9.75 • 19, 1 pcs) • **Attachment** 8. Replace the cabinet removed and attach the takenoff screws to the original positions.	
(3)	**Air-outlet cabinet**	• **Detachment** 1. Perform the work from 1 to 4 of (1). 2. Remove the screws for the air-outlet cabinet and the partition plate (ST8P Ø9.75 • 9.5, 3 pcs.). 3. Remove the screws for the air-outlet cabinet and the base plate (ST8P Ø9.75 • 9.5, 2 pcs.). 4. Remove the screws for the air-outlet cabinet and the heat exchanger (M4 Ø8 • 8, 1 pc.). • **Attachment** 5. Replace the cabinet removed and attach the taken-off screws to the original positions.	

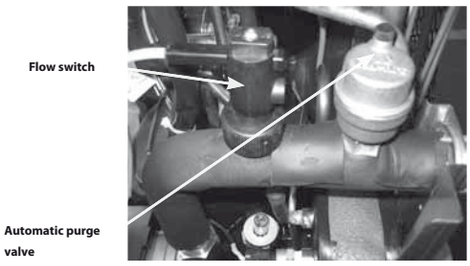
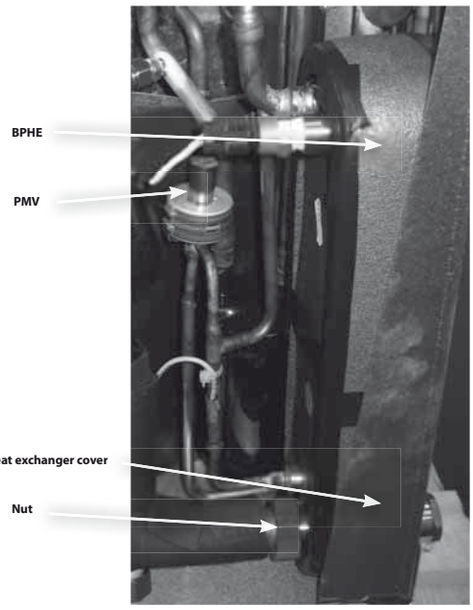
N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(4)	**Inverter assembly**	1. Perform the works from 1 to 4 of (1) and (2) . **WARNING** For 1 minute after the power is turned off, do not disassemble the inverter to prevent an electric shock. Perform discharging by connecting the discharging resistance or plug of soldering iron to + , – terminals of the C10 too 13 electrolytic capacitor (760µF) of P.C. board. Never use a screwdriver or similar device to discharge the electrolytic capacitor components as a electric shock may occur. Under system fault condition, the electrolytic capacitor components may not have discharged. Ensure these are discharged before proceeding. 2. Remove the inverter cover to gain access to inspect the P.C.Board 3. Take off screws (ST8P Ø9.75 • 9.5, 1 pcs.) fixing the main body and the inverter box. 4. Remove various lead wires from the holder at upper part of the inverter box and wiring holder at right side of the terminal block. 5. Remove the lead wire from the bundled part at left side of the terminal block. 6. Pull the inverter box upward. 7. Disconnect connectors of various lead wires. **REQUIREMENT** As each connector has a lock mechanism, avoid to remove the connector by holding the lead wire, but by holding the connector.	   Different lock mechanisms of different inverter board connectors
(5)	**Control P.C. board assembly**	• Disconnect lead wires and connectors connected from the control P.C. board assembly to other parts 1. Lead wires Connection with the power terminal block: 3 wires (Black, White, Orange) Earth wire: 1 wire (Black) 2. Connectors Connection with compressor: Remove 3P connector. Connection with reactor: Remove the relay connectors from P08, P11 and P31,P30.CN500: TE sensor (2P)CN501: TD sensor (3P) CN502: TO sensor (2P) CN503: TS sensor (3P) CN300: Outdoor fan (3P) CN500: Case thermo. (2P) CN701: 4-way valve (3P) CN700: PMV (Pulse Motor Valve) **REQUIREMENT** As each connector has a lock mechanism, avoid to remove the connector by holding the lead wire, but by holding the connector. 3. Cut off tie lap which fixes various lead wires to the inverter assembly. 4. Take off the screws fixing the P.C. board and the base. 5. Take off 2 screws fixing the heat sink and main control board assembly side, and replace the board with a new one. Caution: When mounting a new board, check that the board is correctly set in the groove of the base holder of P.C. board base. Attach the P.C. board so that the heat sink comes securely contact with the metal sheet. • Mount the inverter assembly. **Caution**: Mount the inverter assembly to the partition plate so that hooks of the heat sink cover do not come near the partition plate but also near the fan side. • Attach the removed connectors at the P.C. board and attach the taken-off screws to the original positions.	Control P.C. board assembly   

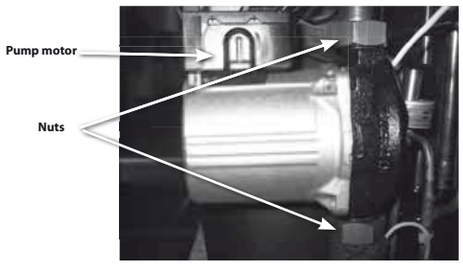
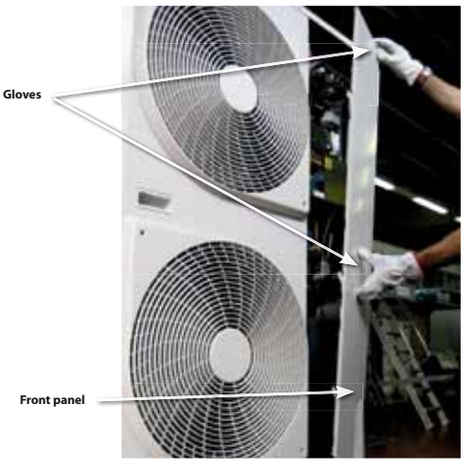
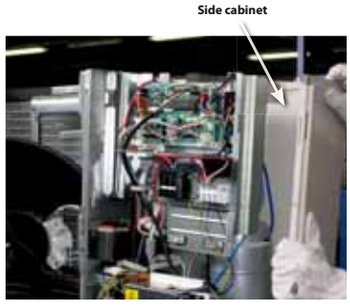
N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(6)	**Reactors**	1. Perform the works from 1 to 4 of (1) and (2). 2. Remove the inverter assembly item (4). 3. Remove the reactors' connectors. 4. Take off the screws (ST8P Ø9.75 • 9.5, 2 pcs) fixing the reactor to the partition plate. 5. Pull the reactor upward and detach it from the partition plate. 6. Replace the fail reactor with a new one.	
(7)	**GMC Board assembly**	1. Perform the works from 1 to 4 of (1). 2. Take off the screws (ST1T Ø4 x 10L, 2 pcs) fixing the GMC cover and remove it gain access to inspect the board. 3. Disconnect lead wires and connectors connected from the GMC board assembly to other parts. J6A Water Enter Exchanger Sensor J6B TR Sensor J6C Water Exit Exchanger Sensor J22 Outdoor Air Sensor J18 Mode (Heat/Cool) J5 Remote Control J20 Eco / Antifreeze Switch J8 Communications Receive J16 ON/OFF and Power limitation Switch J20 Sanitary Water Dry contact J4 Water Exchanger and 3 way valve J7 Water pump Speed – Defrost and TFC status – EHS and Dehumidifier J11 Alarm status and Defrost signal REQUIREMENT As each connector has a lock mechanism, avoid to remove the connector by holding the lead wire, but by holding the connector. 4. Pull the GMC assembly upward and detach it from the partition plate. The GMC board is attach to the partition plate by two hooks. 5. Remove 4 hooking claws of GMC board base and pull the GMC board upward. 6. Replace the fail GMC board with a new one. Caution: When mounting a new board, check that the board is correctly set in the groove of the base holder of GMC board base. 7. Attach the removed connectors at the GMC board and attach the taken-off screws to the original positions.	 
(8)	**Fan motor**	1. Perform the works from 1 to 4 of (1) and (3). 2. Take off the flange nut fixing the fan motor and the propeller. Lose the flange nut by turning clockwise. (To tighten the flange nut, turn counter-clockwise.) 3. Remove the propeller fan. 4. Disconnect the connector for fan motor from the inverter. 5. Take off the fixing screws (ST8P Ø10 x 25, 4 pcs.) holding by hands so that the fan motor does not fall. 6. Replace the fail fan motor with a new one. Caution: Be sure that the propeller fan does not come to contact with the fan motor lead.	 

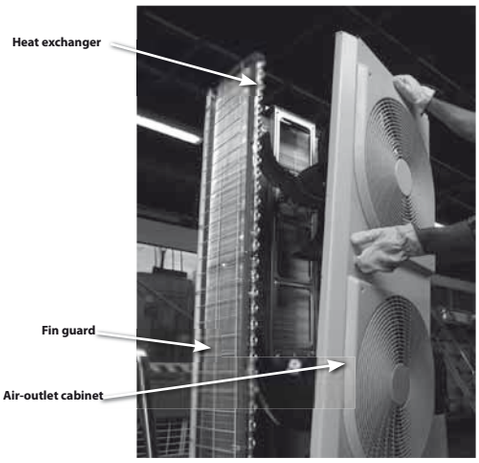
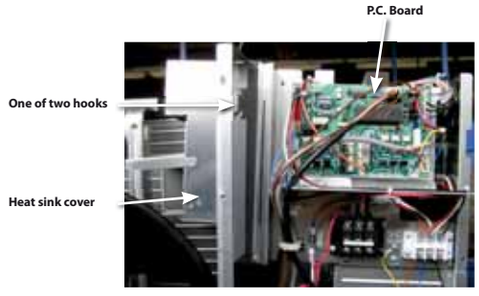
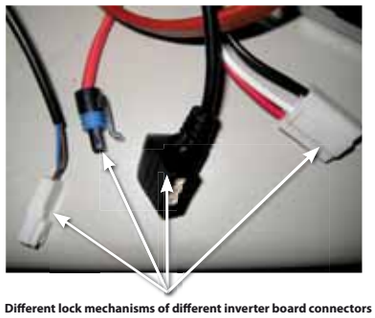
N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(9)	**Compressor**	Perform the works from 1 to 4 of (1) and (2), (3), (4), (6), (7). 1. Discharge refrigerant gas. 2. Remove the piping panel, take off the fixing screws. (ST8P Ø9.75 • 9.5, 2 pcs.) 3. Remove the partition plate, take off screws from the base plate (ST8P Ø9.75 • 9.5, 1 pcs.) and from the heat exchanger (ST8P Ø9.75 • 9.5, 3 pcs.). Remove also the nut fixing the liquid receiver and the partition plate. 4. Remove the noise-insulator. 5. Remove the terminal covers of the compressor, and disconnect lead wires of the compressor and the compressor thermo assembly from the terminal. 6. Remove pipes connected to the compressor with a burner. **CAUTION** Ensure flames of burner do not damage 4-way valve or PMV. (If doing so, a malfunction may be caused.) 7. Take off the fixing screws of the bottom plate and heat exchanger. (ST8P Ø9.75 • 9.5, 2 pcs.) 8. Pull upward the refrigerating cycle. 9. Take off nut fixing the compressor to the bottom place. **CAUTION** When reconnecting the lead wires to the compressor terminals after replacement of the compressor, be sure to caulk the Faston terminal without loosening. 10. Draw out the compressor toward you	  
(10)	**Liquid receiver**	1. Perform the works from 1 to 4 of (1) and (2), (3), (4), (6), (7). 2. Discharge refrigerant gas. 3. Remove the nut fixing the liquid receiver and the partition plate. 4. Remove the partition plate, take off screws from the base plate (ST8P Ø9.75 • 9.5, 1 pcs.) and from the heat exchanger (ST8P Ø9.75 • 9.5, 3 pcs.). 5. Remove pipes connected to the liquid receiver with a burner. **CAUTION** Ensure flames of burner do not damage other components. (If doing so, a malfunction may be caused.)	

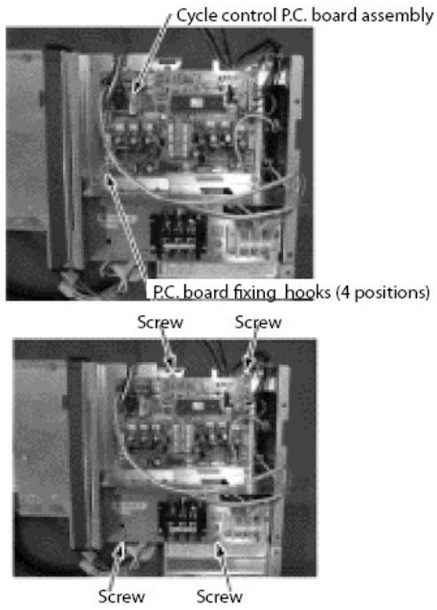
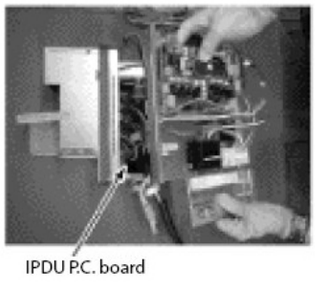
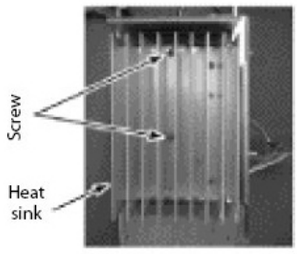
N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(11)	Pulse modulating valve (PMV) coil	• **Detachment** 1. Perform the works from 1 to 4 of (1) and (3). 2. Hold outside of the coil by hands and turn it while lifting upward. 3. The fixing hooks come off the fixing concavities and then the coil can be removed from PMV body. • **Attachment** 4. Match the positioning extrusion of the coil surely to the concave part of PMV body, and then fix it.	
(12)	Fan guard	• **Detachment** 1. Perform works from 1 to 4 of (1) and (3). 2. Remove the front cabinet, and put it down so that fan guard side directs downward. Caution: Perform works on a corrugated cardboard, cloth, etc. to prevent flaw on the product. 3. Remove the screws fixing the bell-mouth (ST8P Ø8.2 • 6.5, 2 pcs). 4. Remove the bell-mouth. 5. Remove the screws fixing the fan guard (ST8P Ø8.2 • 6.5, 2 pcs). 6. Remove hanging hook of the fan guard by pushing with a minus screwdriver. • **Attachment** 7. Fix the hanging hooks by pushing with hands. REQUIREMENT	  

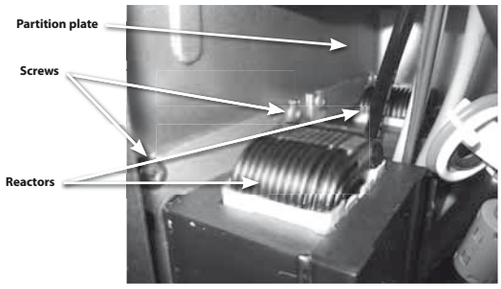
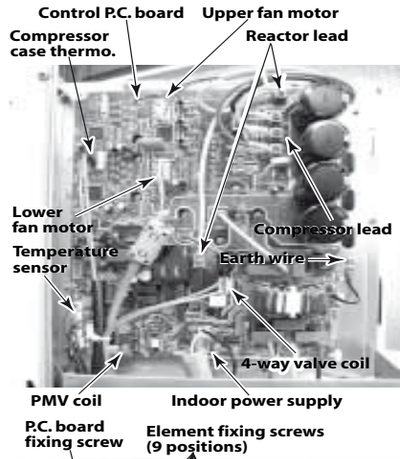
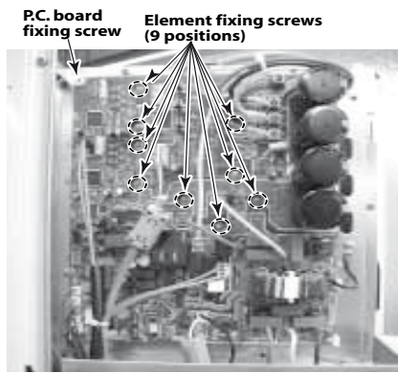
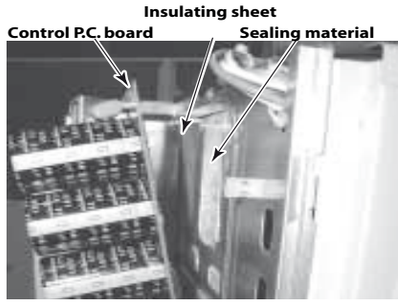
N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
	Water circuit	CAUTION: To replace a water circuit part, first close the water supply source valve and the valve of water pipe connected to the unit.	
(13)	Expansion vessel (Only H versions)	1. Perform works from 1 to 4 of (1) and (3). 2. Remove the fixed band of the expansion vessel. (ST8P Ø9.75 • 9.5, 2 pcs.) 3. Remove the expansion vessel connection (flare nut). 4. Replace the packing to new one when installing the expansion vessel. IMPORTANT: After the expansion vessel replacement repair, open the water supply source valve and water piping valve to pass water through the hydro unit, and check that the expansion vessel connection has no water leakage.	
(14)	**Relief valve**	1. Perform works from 1 to 4 of (1) and (2). 2. Remove the piping panel. 3. Remove the relief valve. CAUTION: The relief valve connection uses an O ring for water seal. Be careful not to scratch the O ring; otherwise, water leakage may occur. IMPORTANT: After the relief valve replacement repair, open the water supply source valve and water piping valve to pass water through the hydro unit, and check that the relief valve connection has no water leakage.	

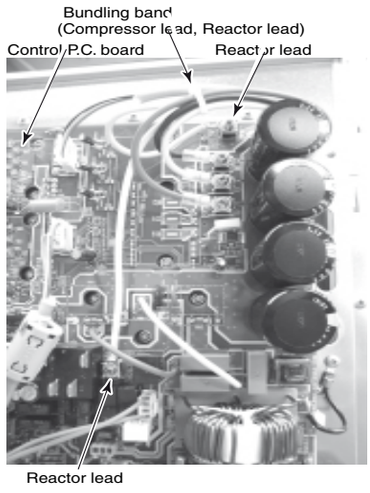
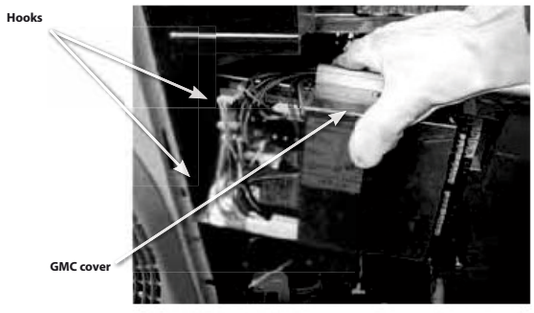
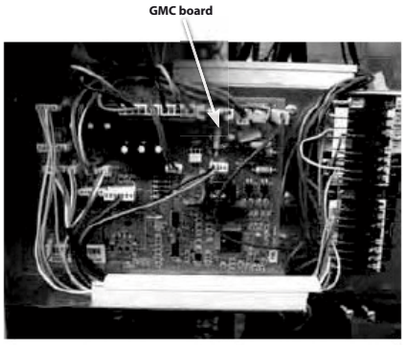
N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(15)	**Automatic purge valve**	1. Perform works from 1 to 4 of (1) and (2). 2. Remove the automatic purge valve. IMPORTANT After the automatic purge valve replacement repair, open the water supply source valve and water piping valve to pass water through the hydro unit, and check that the air vent valve connection has no water leakage.	
(16)	**Flow switch**	1. Perform works from 1 to 4 of (1) and (2). 2. Remove the relative connector 3. Remove the flow switch. CAUTION: The flow switch connection uses an O ring for water seal. Be careful not to scratch the O ring; otherwise, water leakage may occur. Place a flow sensor parallel to the water heat exchanger inlet pipe so that the wire is place on the right side from the front view.	
(17)	**Water heat exchanger (BPHE)**	1. Perform works from 1 to 4 of (1) and (2). 2. Disconnect all the power source cable and cylinder connection cable. 3. Discharge refrigerant gas. 4. Take off the nut connecting the heat exchanger to the water circuit 5. Remove refrigerant pipes connected to the compressor with a burner. CAUTION Ensure flames of burner do not damage PMV. (If doing so, a malfunction may be caused.) 6. Take off the nuts fixing the water heat exchanger to the heat exchanger cover. 7. Take off the screws fixing the heat exchanger cover to the base plate (ST8P Ø9.75 • 9.5, 2 pcs.) and the inlet water pipe (ST8P Ø9.75 • 9.5, 2 pcs.). IMPORTANT: After the water heat exchanger replacement repair, open the water supply source valve and water piping source valve to pass water through the hydro unit, and check that the connection has no water leakage. After connecting the refrigerant pipe, check that the connection has no refrigerant leakage.	
(18)	**TWI sensor TR sensor TWO sensor**	1. Perform works from 1 to 4 of (1) and (2). 2. Take the sensors out.	

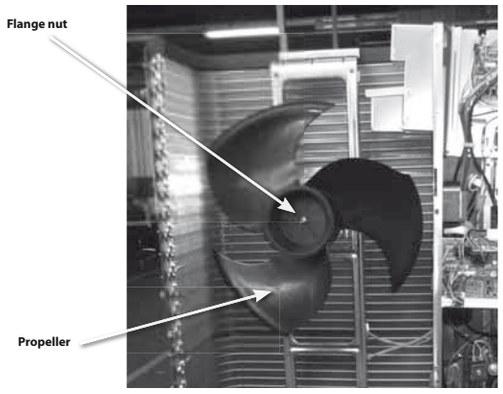
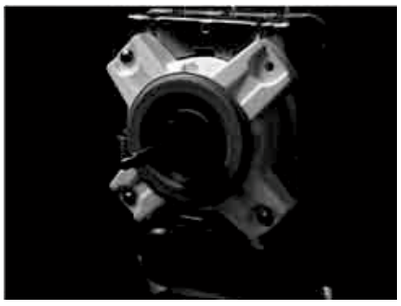
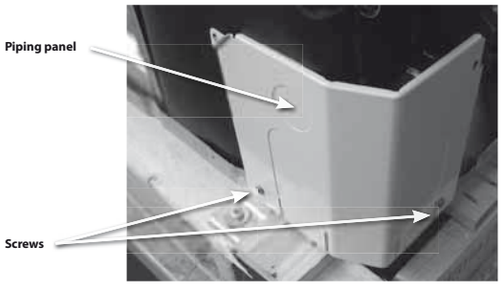
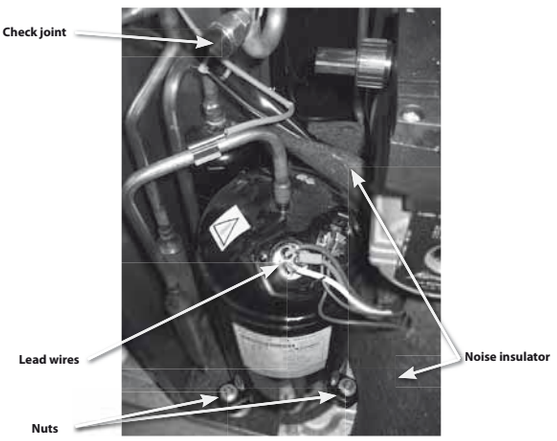
N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(19)	**Pump (Only H versions)**	1. Perform works from 1 to 4 of (1) and (2). 2. Remove the relative connectors 3. Remove the 2 nuts of the heater connection and the lower side of the pump. 4. Remove the pump pulling it out. **CAUTION:** The pump connection uses a liquid packing for water seal. When replacing the pump, use a packing which was slathered with the liquid gasket. **IMPORTANT:** After the pump replacement repair, open the water supply source valve and water piping valve to pass water through the hydro unit, and check that the pump connection has no water leakage.	
		30 AWH 012, 30 AWH 015	
(1)	**Common procedure**	**• Detachment** 1. Stop operation of the heat pump, and turn off switch of the breaker. 2. Remove the front panel (ST8P Ø9.75 • 9.5, 3 pcs.). After unscrewing the screws, remove the front panel while drawing it downward. 3. Remove the power cable from cord clamp and terminal. 4. Remove the roof plate (ST8P Ø9.75 • 9.5, 7 pcs.). **• Attachment** 8. Mount the roof plate (ST8P Ø9.75 • 9.5, 7 pcs.). 9. Connect the power cable and to terminal, and then fix them with cord clamp. REQUIREMENT Secure the power cables using a tie-wrap or rubber band to ensure they do not come into contact with the compressor, valves and discharge pipe. 10. Attach the front panel (ST8P Ø9.75 • 9.5, 3 pcs.).	 
(2)	**Side cabinet**	**• Detachment** 1. Perform the work from 1 to 4 of (1). 2. Remove the screws fixing the inverter assembly and the side cabinet. (M4 Ø8 • 8, 1 pc. and ST8P Ø9.75 • 9.5, 1 pc.). 3. Remove the screws fixing the GMC assembly and the side cabinet. (ST8P Ø9.75 • 9.5, 2 pcs.). 4. Remove the screw for the side cabinet and the piping panel (Rear) (ST8P Ø9.75 • 9.5, 1 pc.). 5. Remove the screw for the side cabinet and the base plate (ST8P Ø9.75 • 9.5, 2 pcs.). 6. Remove the screws for the side cabinet and the fin guard (ST8P Ø9.75 • 9.5, 4 pcs.). 7. Remove the screws of the side cabinet and the Brazzed plate heat exchanger assembly. (ST8P Ø9.75 • 19, 1 pcs.). **• Attachment** 8. Replace the cabinet removed and attach the taken-off screws to the original positions.	

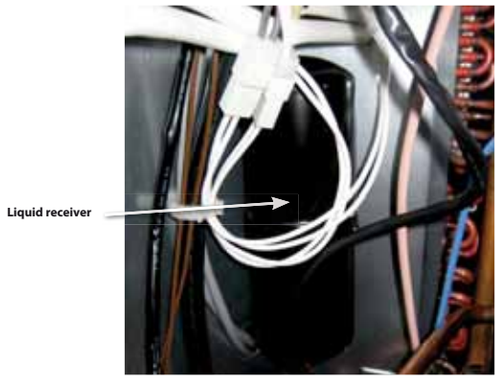
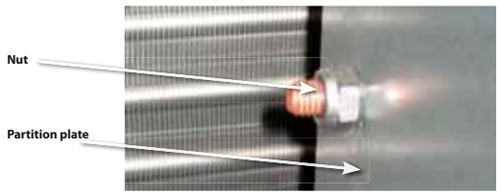
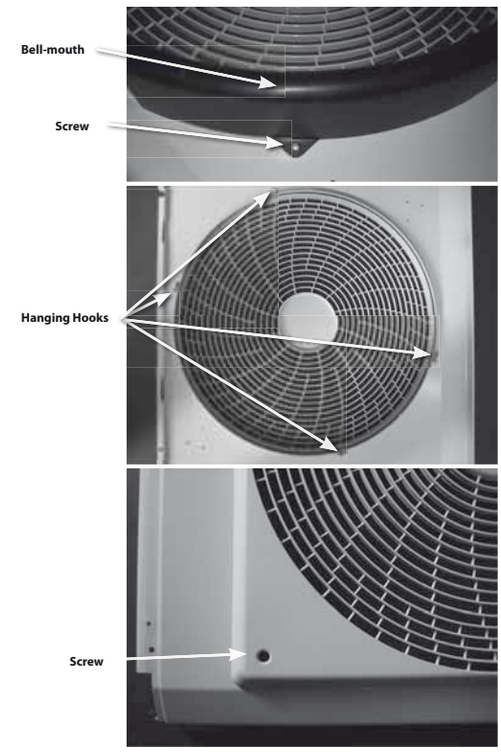
N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(3)	Air-outlet cabinet	• **Detachment** 1. Perform the work from 1 to 4 of (1). 2. Remove the screws for the air-outlet cabinet and the partition plate (ST8P Ø9.75 • 9.5, 4 pcs.). 3. Remove the screws for the air-outlet cabinet and the base plate (ST8P Ø9.75 • 9.5, 2 pcs.). 4. Remove the screws for the air-outlet cabinet and the fin guard (ST8P Ø9.75 • 9.5, 4 pcs.). 5. Remove the screw for the air-outlet cabinet and the heat exchanger (M4 Ø8 • 8, 1 pc.). • **Attachment** 6. Replace the cabinet removed and attach the taken-off screws to the original positions.	
(4)	Inverter assembly (012)	1. Perform the works from 1 to 4 of (1) and (3) . **WARNING** For 1 minute after the power is turned off, do not disassemble the inverter to prevent an electric shock. Perform discharging by connecting the discharging resistance or plug of soldering iron to + , – terminals of the C10 too 13 electrolytic capacitor (760µF) of P.C. board. Never use a screwdriver or similar device to discharge the electrolytic capacitor components as a electric shock may occur. Under system fault condition, the electrolytic capacitor components may not have discharged. Ensure these are discharged before proceeding. 2. Remove connectors which are connected from the cycle P.C. board to the other parts. 3. Lead wires Connection with the power terminal block: 3 wires (Black, White, Orange) Earth wire: 1 wire (Black) 4. Connectors Connection with compressor: Remove 3P connector. Connection with reactor: Remove the relay connectors from P08, P09 and P12, P13. CN600: TD sensor (3P) CN601: TO sensor (2P) CN604: TE sensor (2P) CN605: TS sensor (3P) CN301: Upper outdoor fan (3P) CN300: Detection of upper outdoor fan (5P) CN302: Lower outdoor fan (3P) CN303: Detection of lower outdoor fan (5P) CN500: Case thermo. (2P) CN700: 4-way valve (3P) CN702: PMV (Pulse Motor Valve) (6P) **REQUIREMENT** As each connector has a lock mechanism, avoid to remove the connector by holding the lead wire, but by holding the connector. 5. Cut off tie lap which fixes various lead wires to the inverter assembly. 6. Lift up the hook (upper left) with the partition plate upward just removing.	  Different lock mechanisms of different inverter board connectors

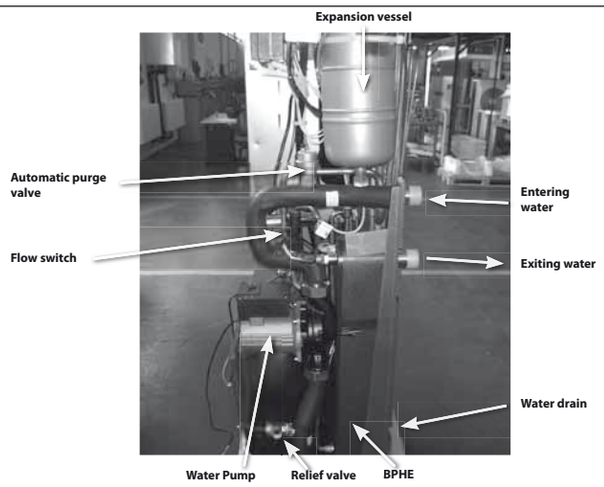
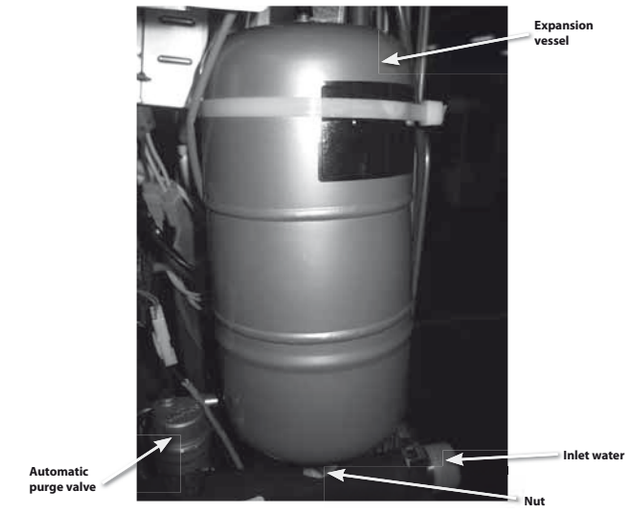
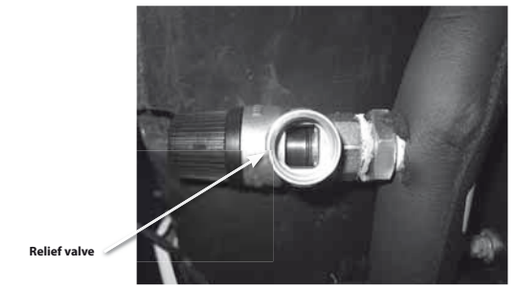
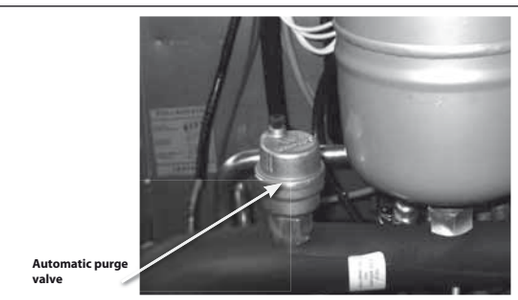
N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(5)	Cycle PC board (012)	1. Perform the works from 1 to 4 of (1) ,(3) and (4). 2. Remove connectors and lead wires: Connector CN800: Connection with IPDU P.C. board (5P) CN01: Connection with IPDU P.C. board (5P) CN02: Indoor/Outdoor connection terminal block (3P) CN03: Connection with IPDU P.C. board (3P) CN04: Connection with IPDU P.C. board (2P). **REQUIREMENT** As each connector has a lock mechanism, avoid to remove the connector by holding the lead wire, but by holding the connector. 3. Remove the supporting hooks at 4 corners to remove the cycle P.C. board. 4. Mount a new cycle P.C. board. 5. Lift up the hook (upper left) with the partition plate upward just removing.	
(6)	IPDU P.C. board (012)	1. Perform the works from 1 to 4 of (1) ,(3), (4), and (5). 2. Remove the screws of the inverter assembly to separate the inverter assembly (M4 • 8, 4 pcs). 3. Remove the connectors and the lead wires which are connected from IPDU P.C. board to the other parts. Connector CN04: Connection with cycle P.C. board (3P) CN05: Connection with cycle P.C. board (2P) CN06: Connection with cycle P.C. board (5P) CN13: Connection with cycle P.C. board (5P) CN600: Heat sink sensor (2P) Lead wire CN01: Connection with power terminal block (Red) CN02: Connection with power terminal block (White) CN03: Connection with inverter box (Black) CN09: Connection with compressor (Red) CN10: Connection with compressor (White) CN11: Connection with compressor (Black) Rectifier diode + : Red lead wire – : White lead wire ATTENTION: The rectifier diode has polarity, so be careful to + and –. If + and – are mistaken, a trouble is caused. ~ : Orange lead wire (Top) ~ : Brown lead wire (Bottom) REQUIREMENT As each connector has a lock mechanism, avoid to remove the connector by holding the lead wire, but by holding the connector. 4. Remove the heat sink cover (M4 • 8, 2pcs). 5. Remove the two screws which fix the heat sink and IGBT and also take off support hooks of the P.C. board (5 positions) to remove IPDU P.C. board. 6. Mount a new IPDU P.C. board.	  

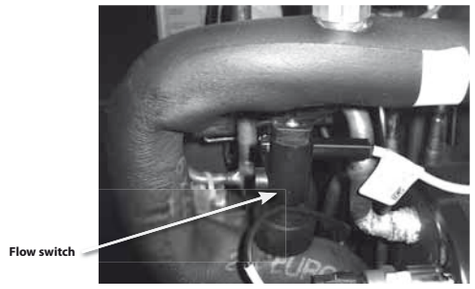
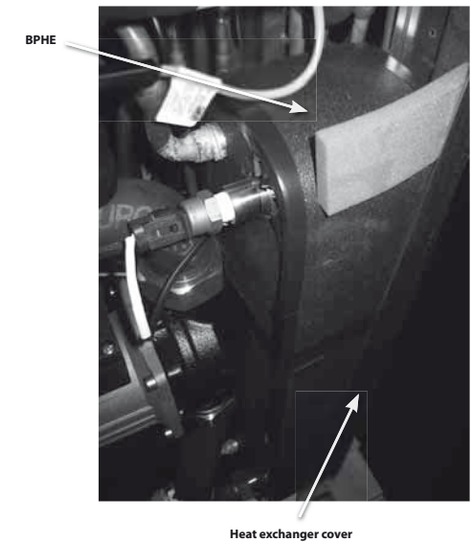
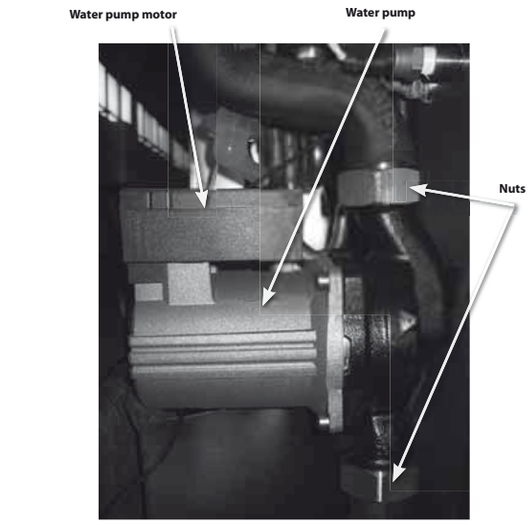
N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(7)	**Reactors (012)**	1. Perform the works from 1 to 4 of (1) and (2). 2. Remove the inverter assembly item (4). 3. Remove the reactors' connectors. 4. Take off the screws (ST8P Ø9.75 • 9.5, 2 pcs) fixing the reactor to the partition plate. 5. Pull the reactor upward and detach it from the partition plate. 6. Replace the fail reactor with a new one.	
(8)	**Control P.C. Board (015)**	1. Perform the works from 1 to 4 of (1) and (2). **WARNING** Never disassemble the inverter for 1 minute after power supply has been turned off because an electric shock may be caused. 2. Remove the connectors connected to the control P.C. board. (Indoor power supply, Temperature sensor, PMV coil, 4-way valve coil, Compressor case thermo, Fan motor) • Unlock the lock of the housing part and then remove the connectors. 3. Remove the lead wires connected to the control P.C board. Compressor lead U: CN200 Red V: CN201 White W: CN202 Black Reactor cord CN05 White CN06 White 4. Remove the earth wire from the control P.C. board. (Trust B tight screw Ø4 × 6, 1 pc.) 5. Remove the fixing screws of the control P.C. board. (Screw with collar for fixing element Ø3 × 16, 9 pcs. Pan S tight screw for fixing board Ø3 × 20, 1 pc.) 6. Remove the control P.C. board. (Supporter: 5 positions) **NOTE :** Be careful to take out because there is sealing material for the heat sink. 7. Replace the control P.C. board with a new one. **NOTE :** • Be sure not to confuse for Compressor lead V (CN201 White), Reactor lead CN05 and CN06. • Be sure not to come-off of the insulating sheet. **Attention:** The inverter board is fixed at the side cabinet by a steel braket. When replace the P.C. Board remember to detach it from the defective board and to screw it at the new one.	   

N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(9)	**Reactor (015)**	1. Perform the works from 1 to 4 of (1) and (2). 2. Remove the reactor lead connected to the control P.C. board. CN05 White, CN06 White 3. Cut the bundling band which bundled the compressor lead and fan motor lead. 4. Remove the reactor. (Trust B tight screw, Ø4 × 6, 2 pcs.) 5. Replace the reactor with a new one. **NOTE :** Be sure to bundle the removed bundling band with the bundling band on the market. Be careful so that the fan motor lead does not come to contact with the reactor body.	
(10)	**GMC Board assembly**	1. Perform the works from 1 to 4 of (1). 2. Take off the screws (ST1T Ø4 x 10L, 2 pcs) fixing the GMC cover and remove it gain access to inspect the board. 3. Disconnect lead wires and connectors connected from the GMC board assembly to other parts. J6A Water Enter Exchanger Sensor J6B TR Sensor J6C Water Exit Exchanger Sensor J22 Outdoor Air Sensor J18 Mode (Heat/Cool) J5 Remote Control J20 Eco / Antifreeze Switch J8 Communications Receive J16 ON/OFF and Power limitation Switch J20 Sanitary Water Dry contact J4 Water Exchanger and 3 way valve J7 Water pump Speed – Defrost and TFC status – EHS and Dehumidifier J11 Alarm status and Defrost signal **REQUIREMENT** As each connector has a lock mechanism, avoid to remove the connector by holding the lead wire, but by holding the connector. 4. Pull the GMC assembly upward and detach it from the partition plate. The GMC board is attach to the partition plate by two hooks. 5. Remove 4 hooking claws of GMC board base and pull the GMC board upward. 6. Replace the fail GMC board with a new one. **Caution:** When mounting a new board, check that the board is correctly set in the groove of the base holder of GMC board base. 7. Attach the removed connectors at the GMC board and attach the taken-off screws to the original positions.	 

N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(11)	**Fan motor**	1 Perform the works from 1 to 4 of (1) and (3). 2. Take off the flange nut fixing the fan motor and the propeller. Lose the flange nut by turning clockwise. (To tighten the flange nut, turn counter-clockwise.) 3. Remove the propeller fan. 4. Disconnect the connector for fan motor from the inverter. 5. Take off the fixing screws (4 pcs.) holding by hands so that the fan motor does not fall. 6. Replace the fail fan motor with a new one. Caution: The same propeller fan and the fan motor are used at upper and lower sides. Be sure that the propeller fan does not come to contact with the fan motor lead.	 
(12)	**Compressor**	Perform the works from 1 to 4 of (1) and (2), (3), (4), (7), (8). 1. Discharge refrigerant gas. 2. Remove the piping panel, take off the fixing screws. (ST8P Ø9.75 • 9.5, 2 pcs.) 3. Remove the partition plate, take off screws from the base plate (ST8P Ø9.75 • 9.5, 1 pcs.) and from the heat exchanger (ST8P Ø9.75 • 9.5, 3 pcs.). Remove also the nut fixing the liquid receiver and the partition plate. 4. Remove the noise-insulator. 5. Remove the terminal covers of the compressor, and disconnect lead wires of the compressor and the compressor thermo assembly from the terminal. 6. Remove pipes connected to the compressor with a burner. **CAUTION** Ensure flames of burner do not damage 4-way valve or PMV. (If doing so, a malfunction may be caused.) 7. Take off the fixing screws of the bottom plate and heat exchanger. (ST8P Ø9.75 • 9.5, 2 pcs.) 8. Pull upward the refrigerating cycle. 9. Take off nut fixing the compressor to the bottom place. **CAUTION** When reconnecting the lead wires to the compressor terminals after replacement of the compressor, be sure to caulk the Faston terminal without loosening. 10. Draw out the compressor toward you	  

N°	Exchange parts name	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(13)	**Liquid receiver**	1. Perform the works from 1 to 4 of (1) and (2), (3), (4), (5), (8). 2. Discharge refrigerant gas. 3. Remove the nut fixing the liquid receiver and the partition plate. 4. Remove the partition plate, take off screws from the base plate (ST8P Ø9.75 • 9.5, 1 pcs.) and from the heat exchanger (ST8P Ø9.75 • 9.5, 3 pcs.). 5. Remove pipes connected to the liquid receiver with a burner. **CAUTION** Ensure flames of burner do not damage other components. (If doing so, a malfunction may be caused.)	 
	Pulse modulating valve (PMV) coil	• Detachment 1. Perform the works from 1 to 4 of (1) and (2). 2. Hold outside of the coil by hands and turn it while lifting upward. 3. The fixing hooks come off the fixing concavities and then the coil can be removed from PMV body. • Attachment 4. Match the positioning extrusion of the coil surely to the concave part of PMV body, and then fix it.	
(14)	**Fan guard**	• Detachment 1. Perform works from 1 to 4 of (1) and (3). 2. Remove the front cabinet, and put it down so that fan guard side directs downward. Caution: Perform works on a corrugated cardboard, cloth, etc. to prevent flaw on the product. 3. Remove the screws fixing the bell-mouth (ST8P Ø8.2 • 6.5, 2 pcs). 4. Remove the bell-mouth. 5. Remove the screws fixing the fan guard (ST8P Ø8.2 • 6.5, 2 pcs). 6. Remove hanging hook of the fan guard by pushing with a minus screwdriver. • Attachment 7. Fix the hanging hooks by pushing with hands. REQUIREMENT Check that all the hanging hooks are fixed to the specified positions. 8. After attachment, fix it with screws (ST8P Ø8.2 • 6.5, 2 pcs). 9. Mount the bell-mouth coupling on metal lip of air-outlet cabinet. 10. After attachment, fix it with screws (ST8P Ø8.2 • 6.5, 2 pcs).	

N°	Remarks	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(15)	**Water circuit**	**CAUTION**: To replace a water circuit part, first close the water supply source valve and the valve of water pipe connected to the unit.	
(16)	**Expansion vessel (Only H versions)**	1. Perform works from 1 to 4 of (1), (2). 2. Remove the expansion vessel connection (flare nut). 3. Replace the packing to new one when installing the expansion vessel. **IMPORTANT**: After the expansion vessel replacement repair, open the water supply source valve and water piping valve to pass water through the hydro unit, and check that the expansion vessel connection has no water leakage.	
(17)	**Relief valve**	1. Perform works from 1 to 4 of (1). 2. Remove the piping panel 3. Remove the relief valve. **CAUTION:** The relief valve connection uses an O ring for water seal. Be careful not to scratch the O ring; otherwise, water leakage may occur. **IMPORTANT**: After the relief valve replacement repair, open the water supply source valve and water piping valve to pass water through the hydro unit, and check that the relief valve connection has no water leakage.	
(18)	**Automatic purge valve**	1. Perform works from 1 to 4 of (1) and (2). 2. Remove the automatic purge valve. **IMPORTANT** After the automatic purge valve replacement repair, open the water supply source valve and water piping valve to pass water through the hydro unit, and check that the air vent valve connection has no water leakage.	

N°	Remarks	Work procedure (IMPORTANT: Ensure gloves are worn at all times to avoid risk of injury)	Remarks
(19)	**Flow switch**	1. Perform works from 1 to 4 of (1) and (2). 2. Remove the relative connector 3. Remove the flow switch. CAUTION: The flow switch connection uses an O ring for water seal. Be careful not to scratch the O ring; otherwise, water leakage may occur. Place a flow sensor parallel to the water heat exchanger inlet pipe so that the wire is place on the right side from the front view.	
(20)	**Water heat exchanger (BPHE)**	1. Perform works from 1 to 4 of (1) and (2). 2. Disconnect all the power source cable, unit connection cable, and cylinder connection cable. 3. Discharge refrigerant gas. 4. Take off the nut connecting the heat exchanger to the water circuit 5. Remove refrigerant pipes connected to the compressor with a burner. CAUTION Ensure flames of burner do not damage PMV. (If doing so, a malfunction may be caused.) 6. Take off the nuts fixing the water heat exchanger to the heat exchanger cover. 7. Take off the screws fixing the heat exchanger cover to the base plate (ST8P Ø9.75 • 9.5, 2 pcs.) and the inlet water pipe (ST8P Ø9.75 • 9.5, 2 pcs.). IMPORTANT: After the water heat exchanger replacement repair, open the water supply source valve and water piping source valve to pass water through the hydro unit, and check that the connection has no water leakage. After connecting the refrigerant pipe, check that the connection has no refrigerant leakage.	
(21)	**TWI sensor TWO sensor**	1. Perform works from 1 to 4 of (1) and (2). 2. Take the sensors out.	
(22)	**Pump (Only H versions)**	1. Perform works from 1 to 4 of (1) and (2). 2. Remove the relative connectors 3. Remove the 2 nuts of the heater connection and the lower side of the pump. 4. Remove the pump pulling it out. CAUTION: The pump connection uses a liquid packing for water seal. When replacing the pump, use a packing which was slathered with the liquid gasket. IMPORTANT: After the pump replacement repair, open the water supply source valve and water piping valve to pass water through the hydro unit, and check that the pump connection has no water leakage.	

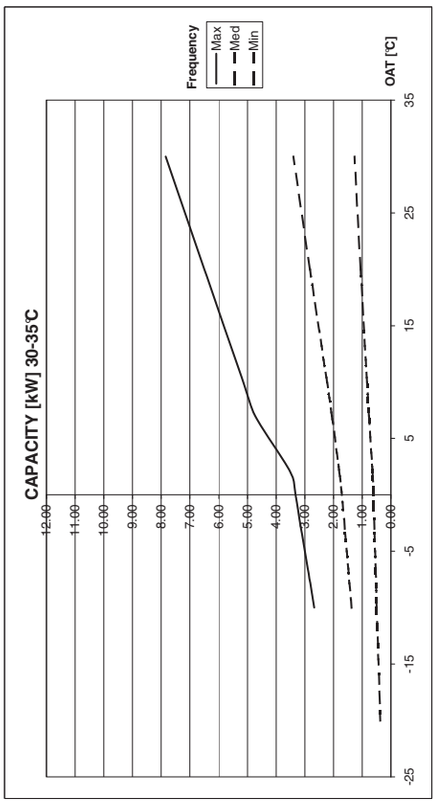
8.4 Periodic Inspection Items

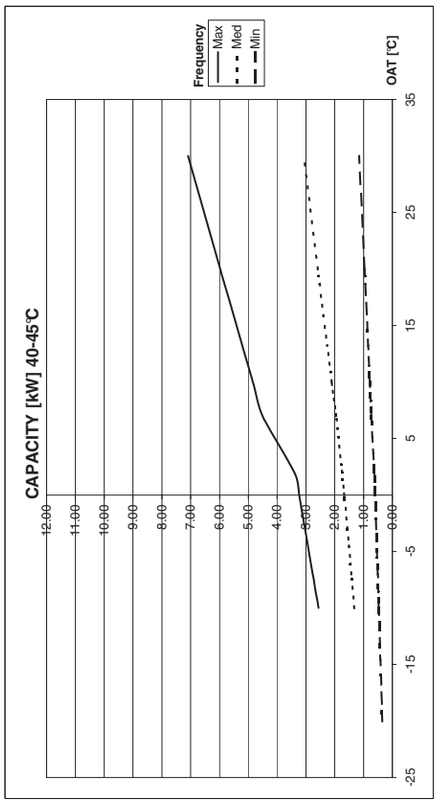
Unit	Frequency	Periodic inspection details
Insulation measurement (Power source circuit/ Compressor)	Annually	Insulation measurement with a mega tester
Operation check	Annually	Hot water supply/ Heating/ Cooling operation check with remote controller.
Refrigerant leakage/ Water leakage inspection.	Annually	Visual inspection and check with a leak tester: No leakage must be found.
Water heat exchanger inspection (Internal dirt and clogging)	Annually	Checking for water dirtiness in a closed cycle, Cleaning.
Inlet / Outlet water temperature measurement	Annually	Temperature measurement: Temperature measurement during an operation.
Circulation pump inspection	Annually	No leakage or abnormal noise must be found (Replacement every 10 years: Charged).
Automatic air purge valve inspection	Annually	Water leakage, Air vent.
Expansion vessel	Annually	Visual check for charge pressure abnormality, water leakage, or corrosion.
Heater assembly	Annually	Check for appearance damage, deformation, or loose terminal.
Flow switch	Annually	Operation check while running
Safety valve	Annually	Water leakage, Appearance check, Drainage check.
Power source measurement (No-load voltage/ Rated operation)	Annually	Electronic voltage measurement: 230V ±23V
Operation frequency (Unit operation check)	Annually	Frequency check by rated operation
Air heat exchanger inspection (Dirt and clogging)	Annually	Visual inspection, Clear clogging
Fan inspection (Scratch, damage)	Annually	Check for scratches or damages to the fan or abnormal motor sound
Cycle parts (Compressor, 4-way valve, Pulse motor valve)	Annually	Operation check by trial run
Inverter control board, GMC board, Terminal block	Annually	Check for loose connector and connecting terminal

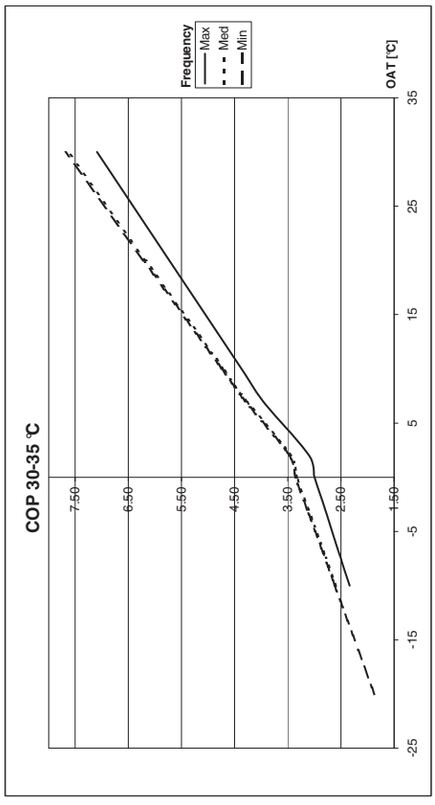
For the spare parts refer to specific document.

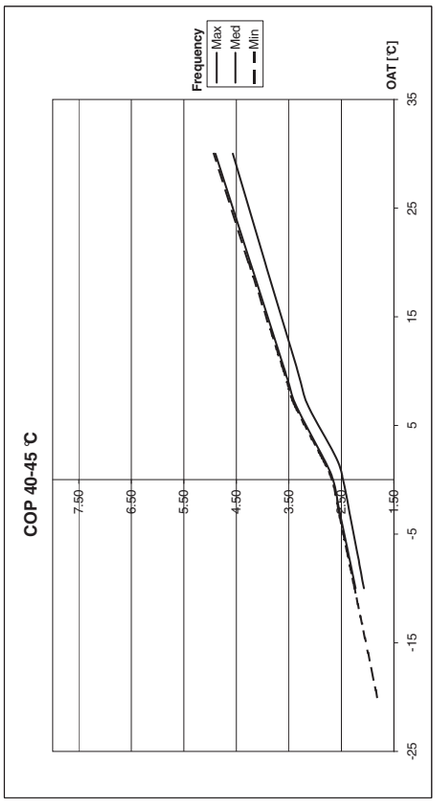
10 Extended rating

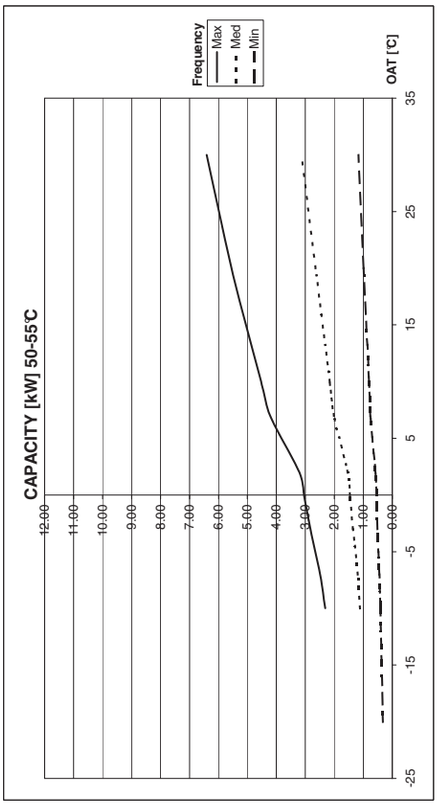
Size 004 Heating

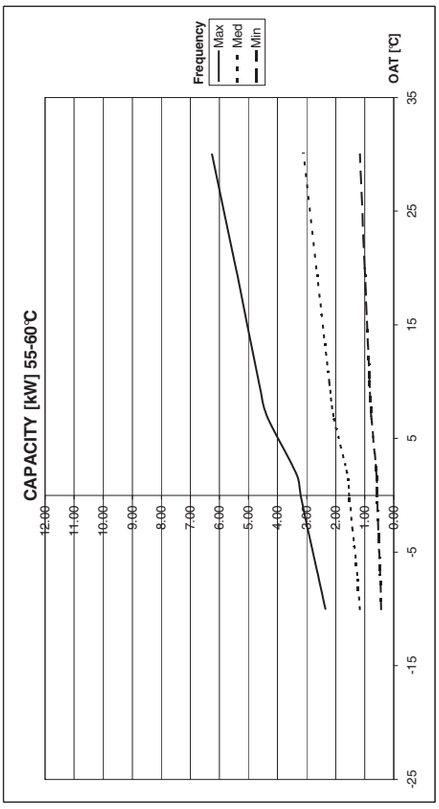


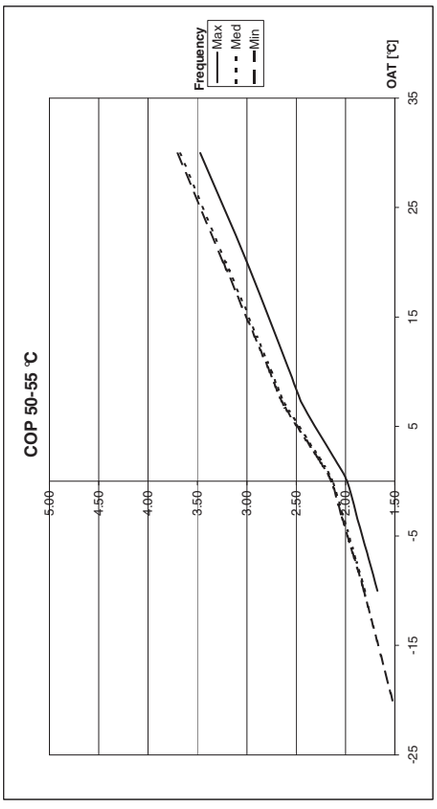


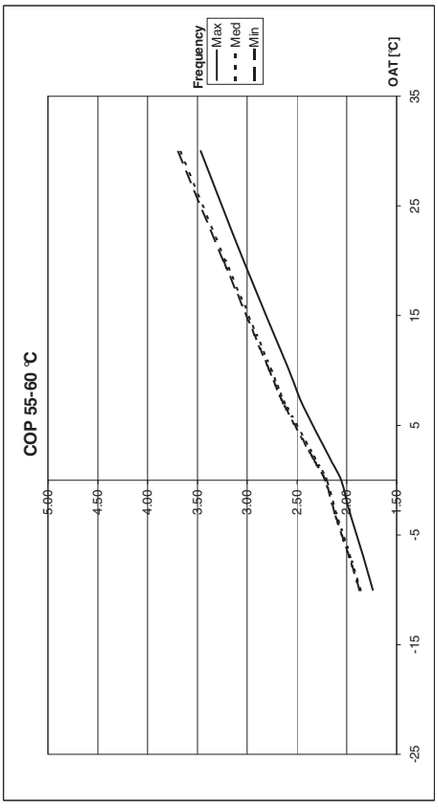




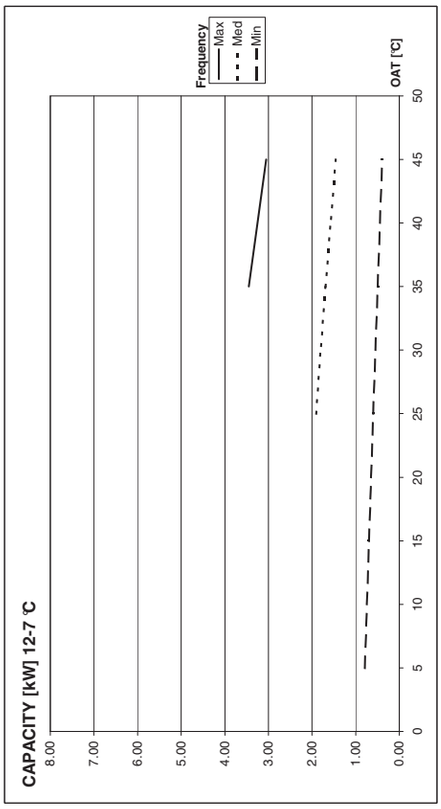


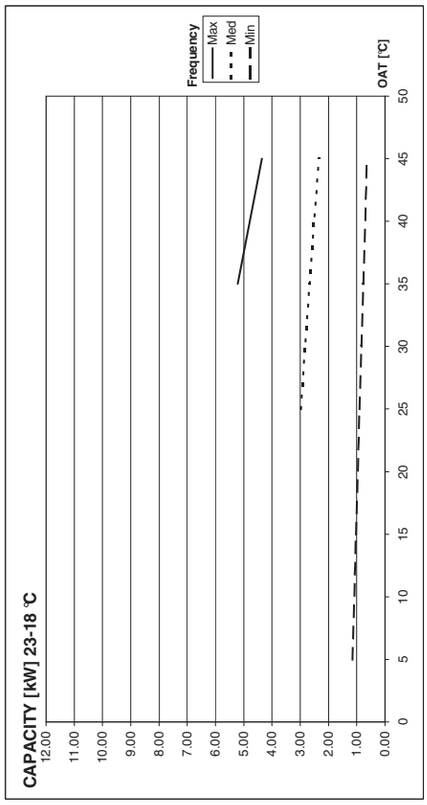


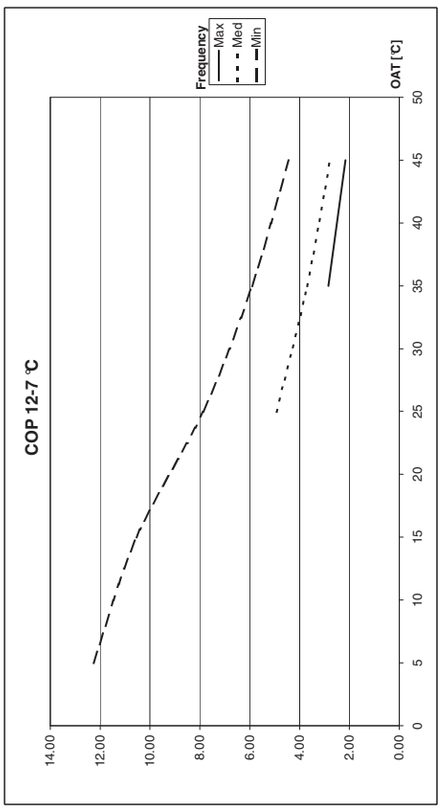


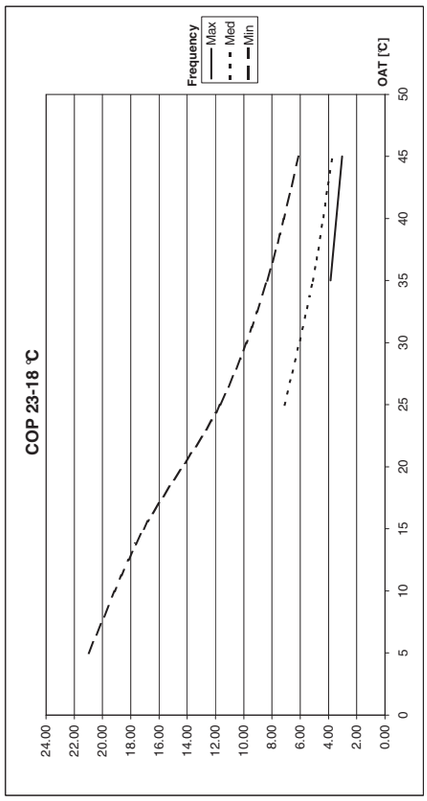


Size 004 Cooling

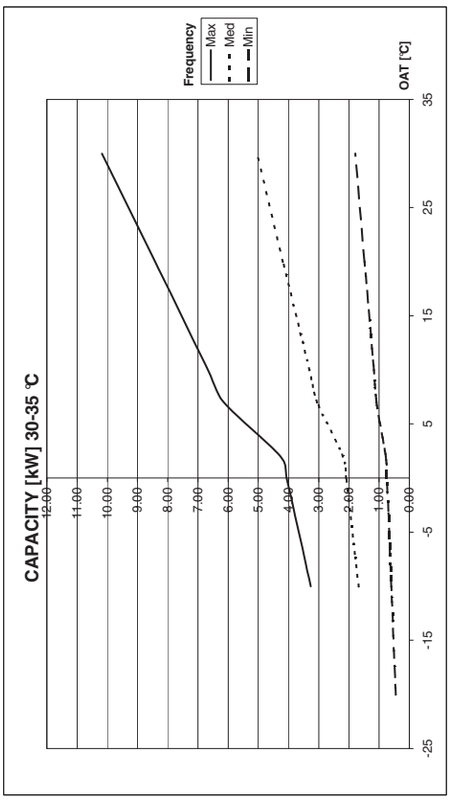


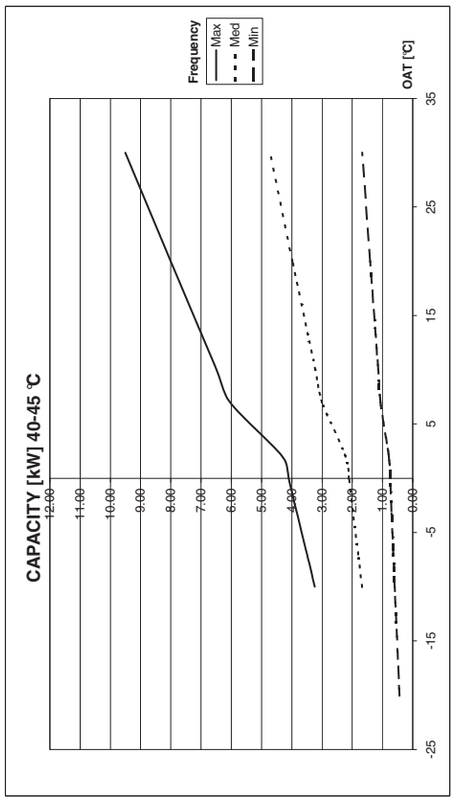


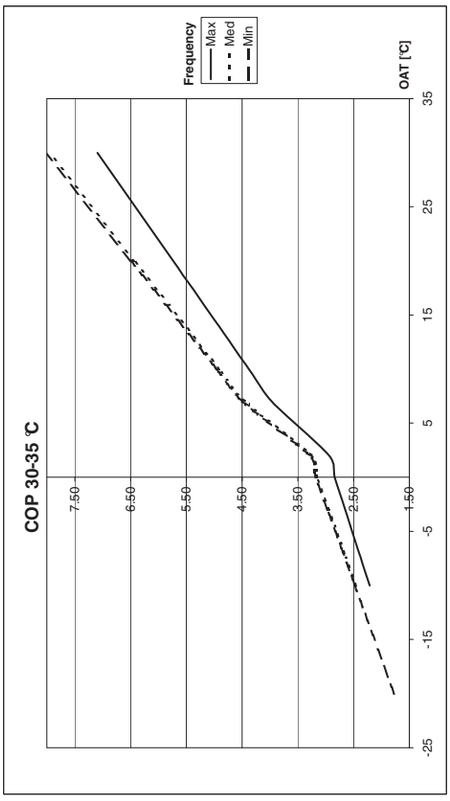


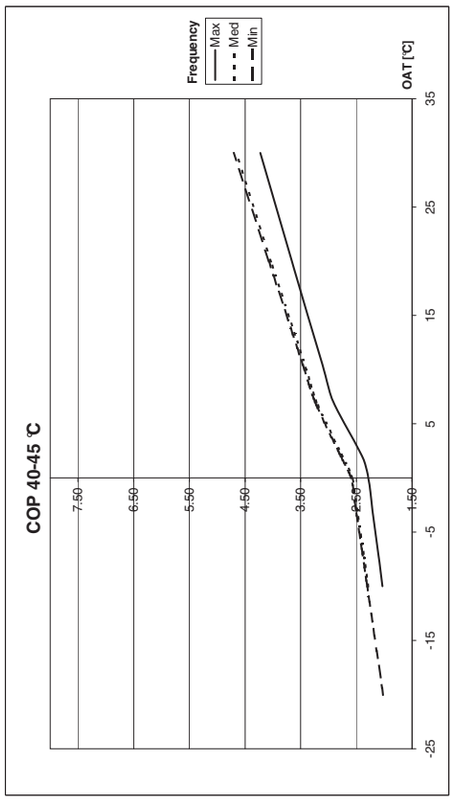


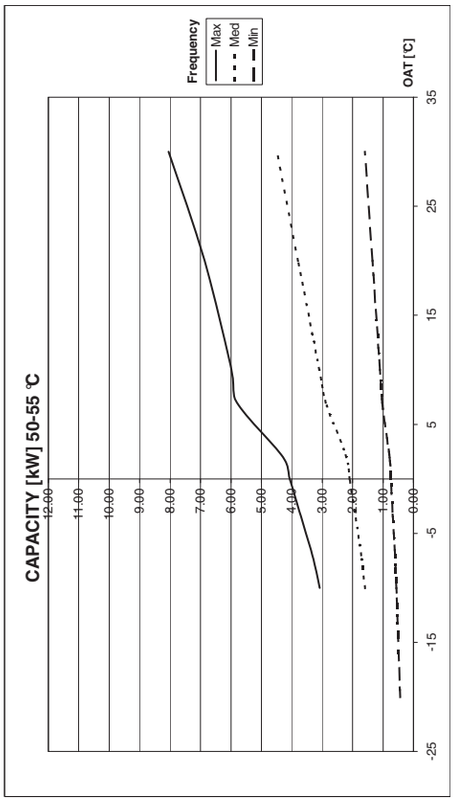
Size 006 Heating

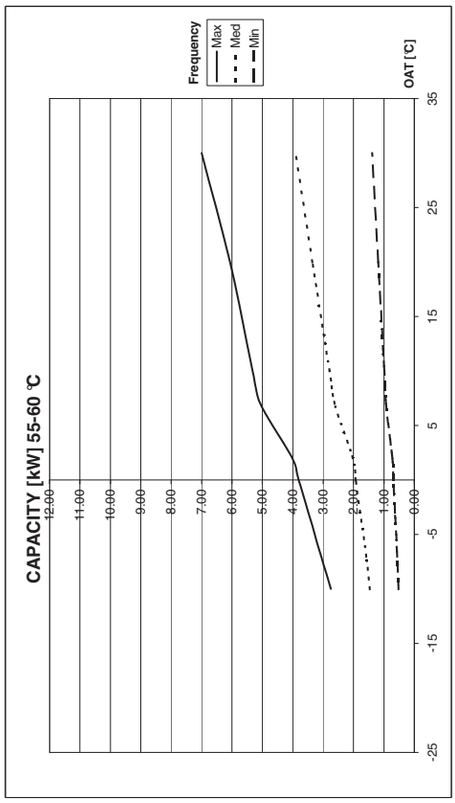


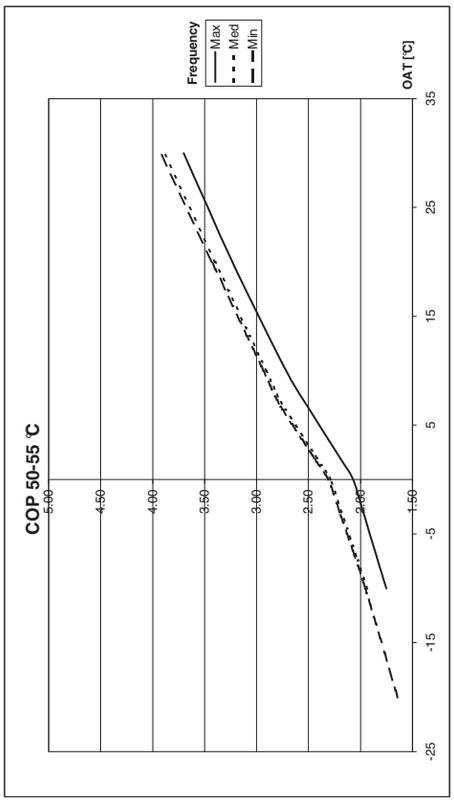


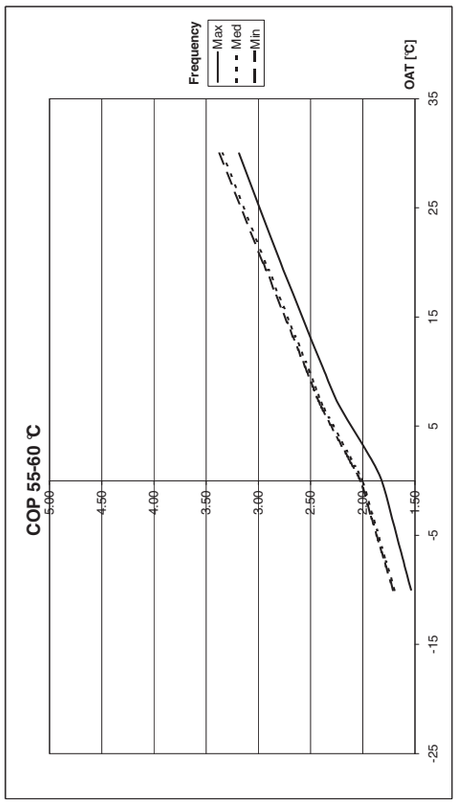




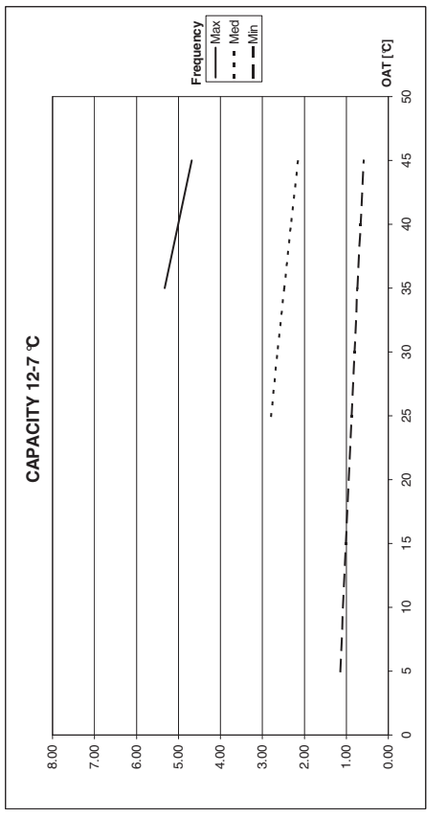


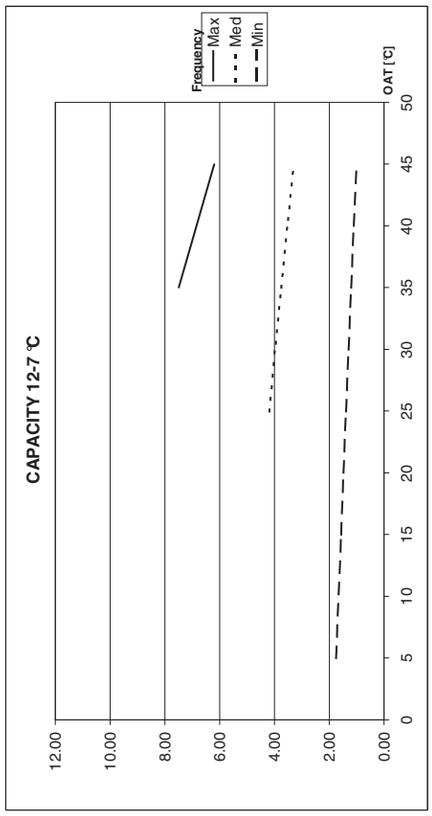


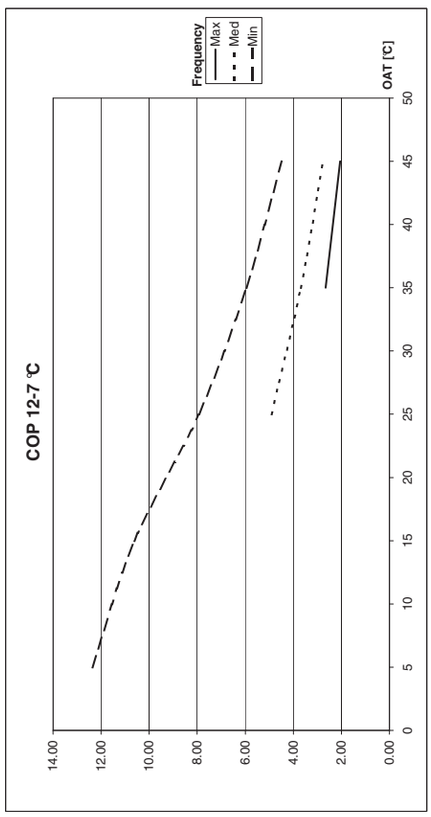


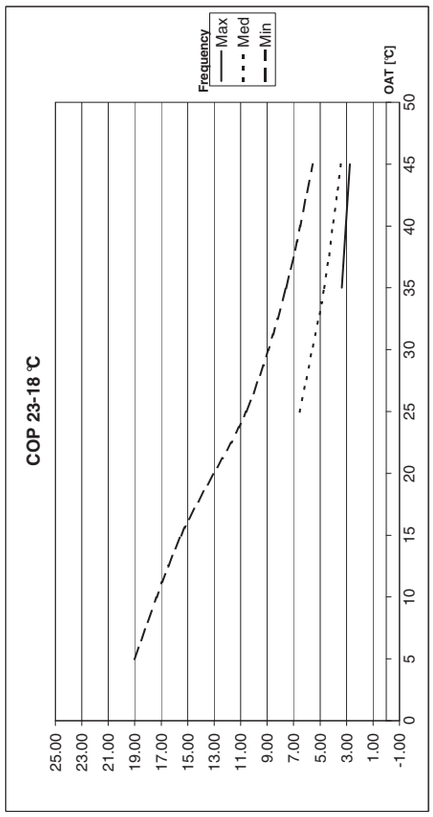


Size 006 Cooling

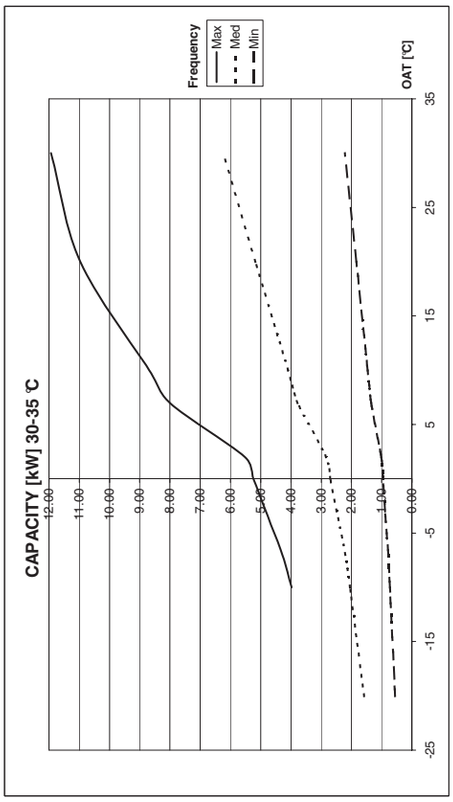


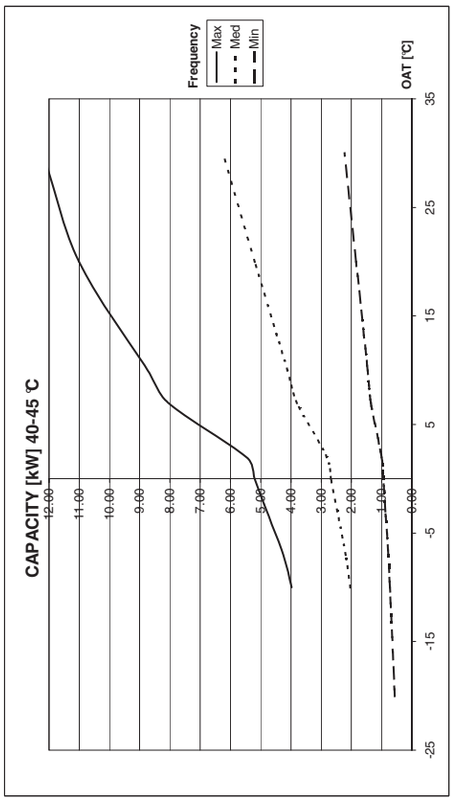


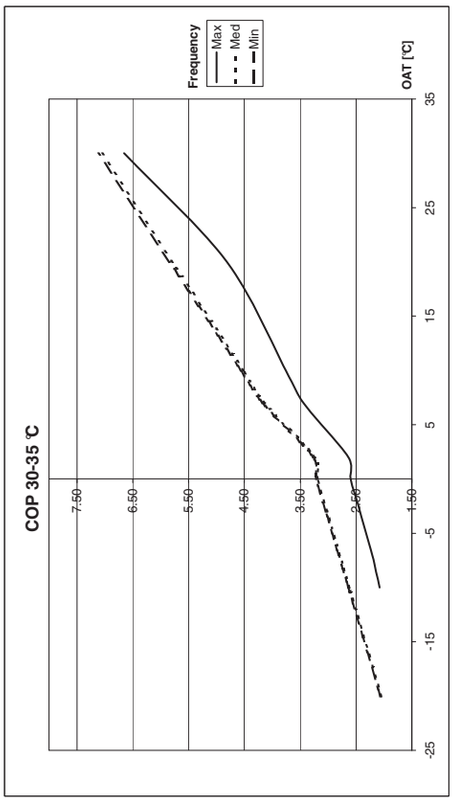


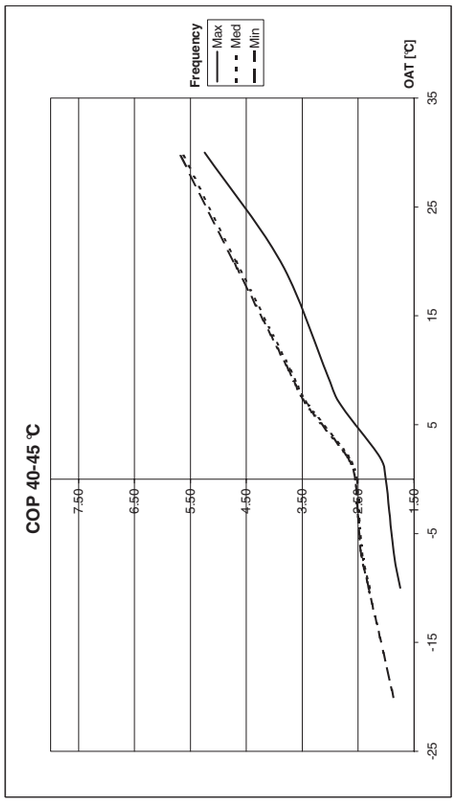


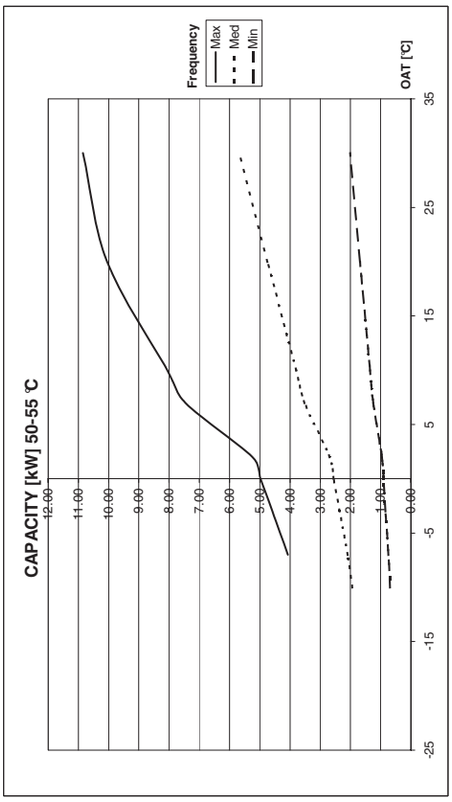
Size 008 Heating

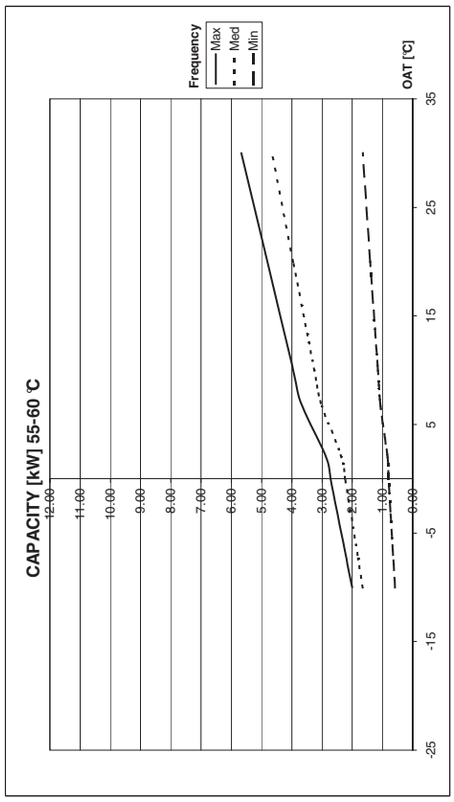


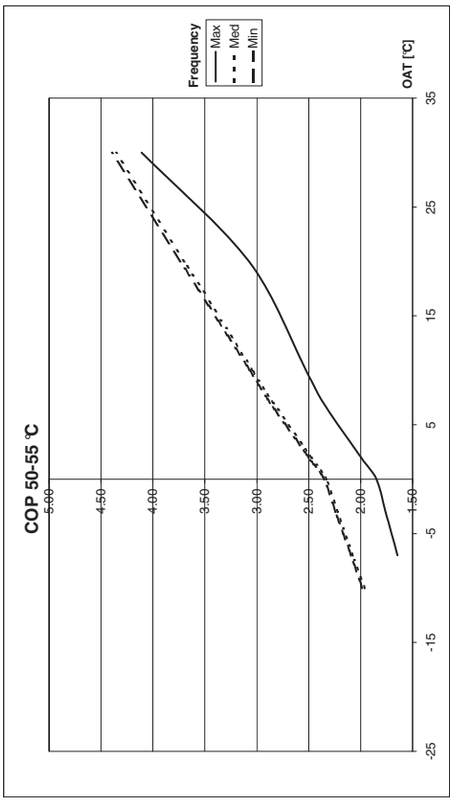


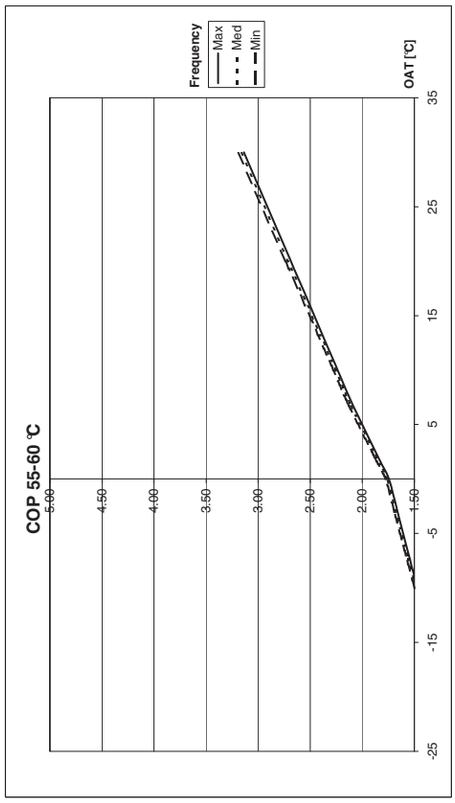




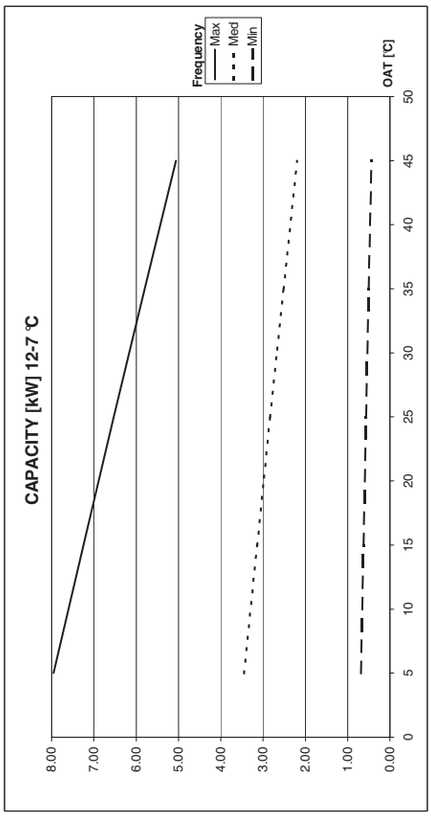


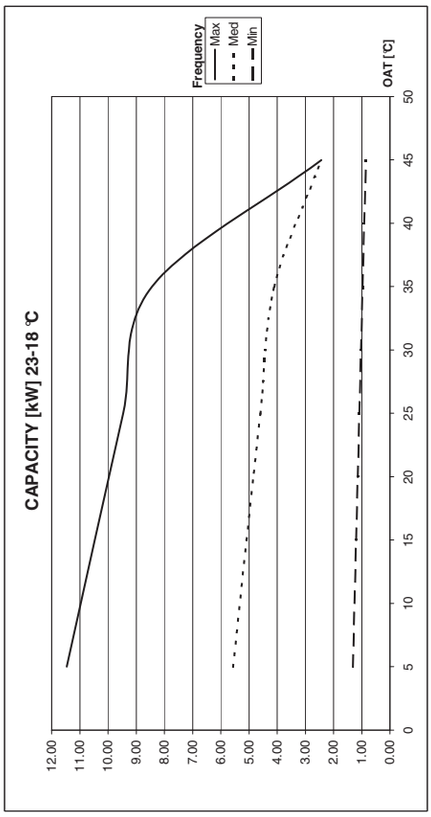


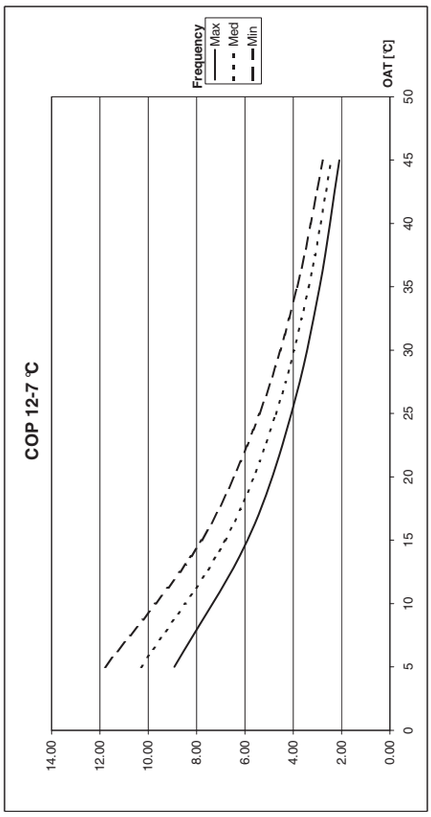


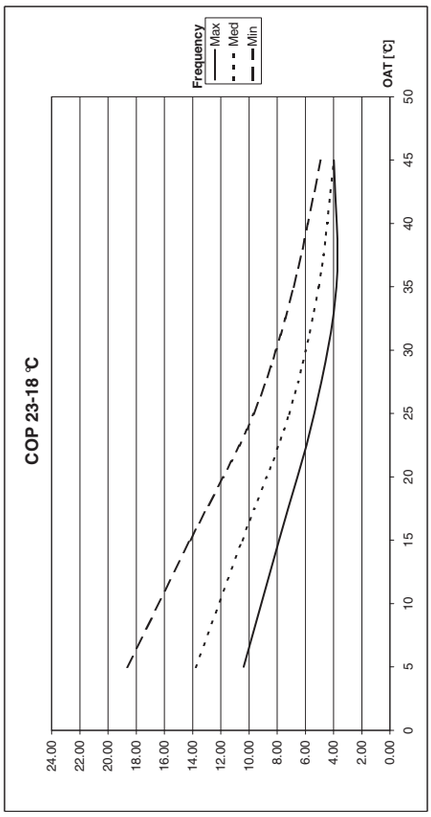


Size 008 Cooling

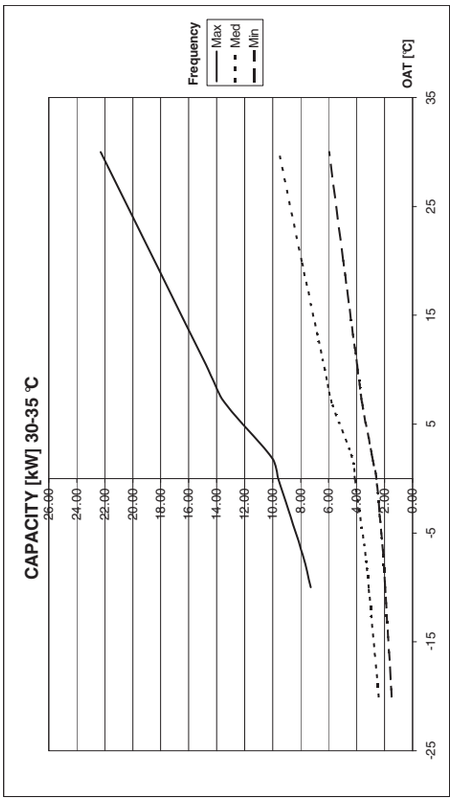


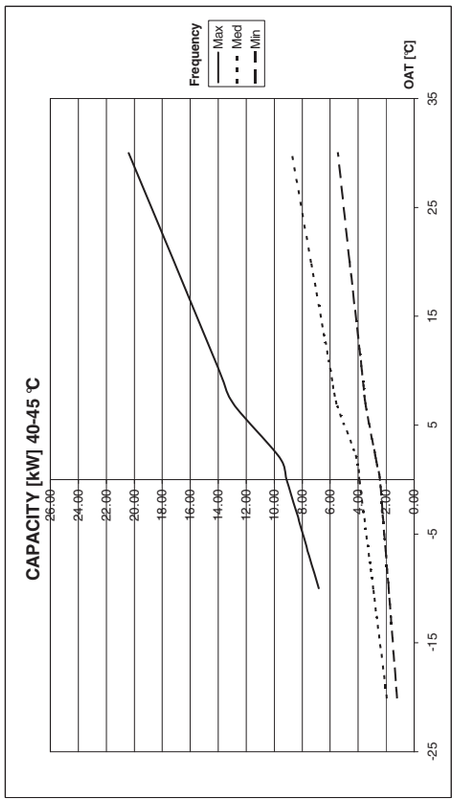


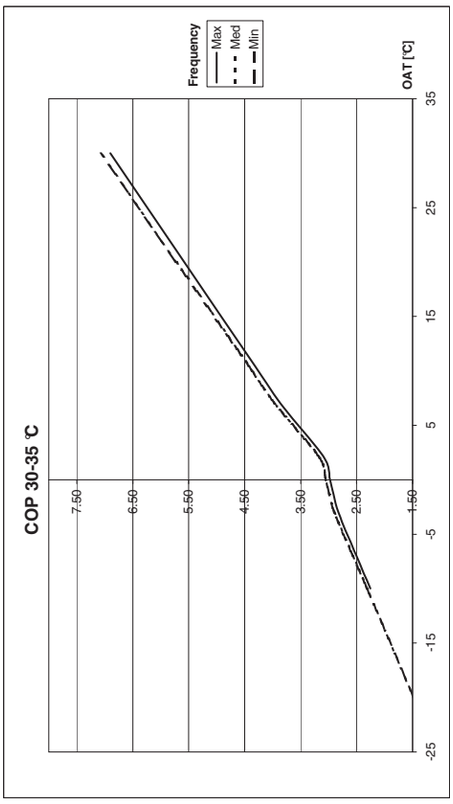


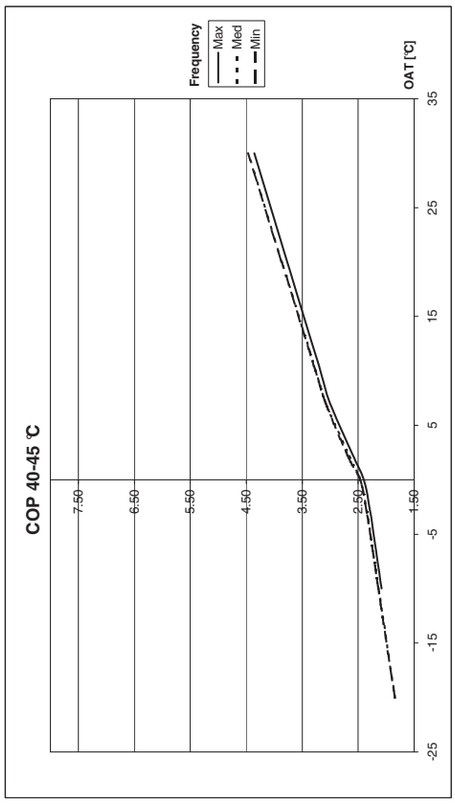


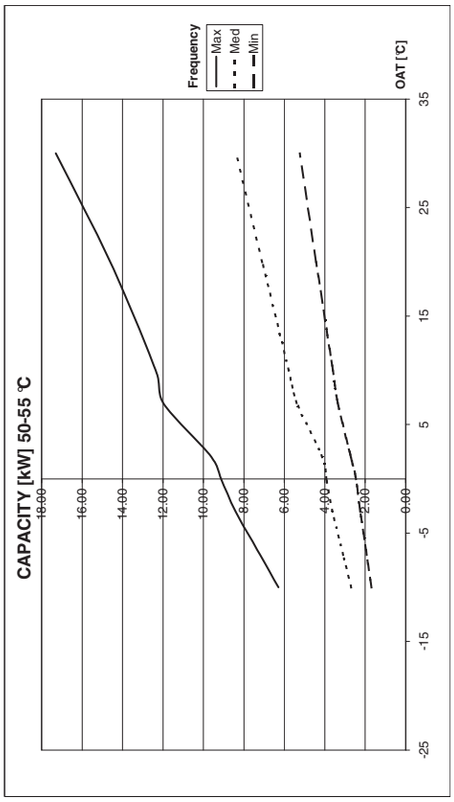
Size 012 Heating

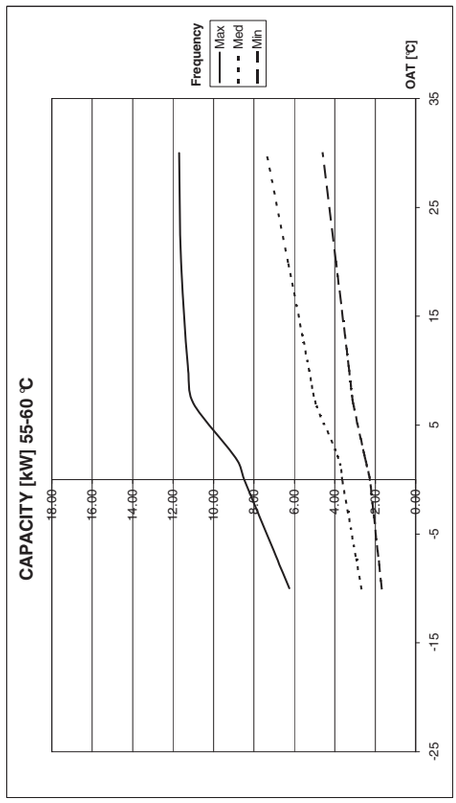


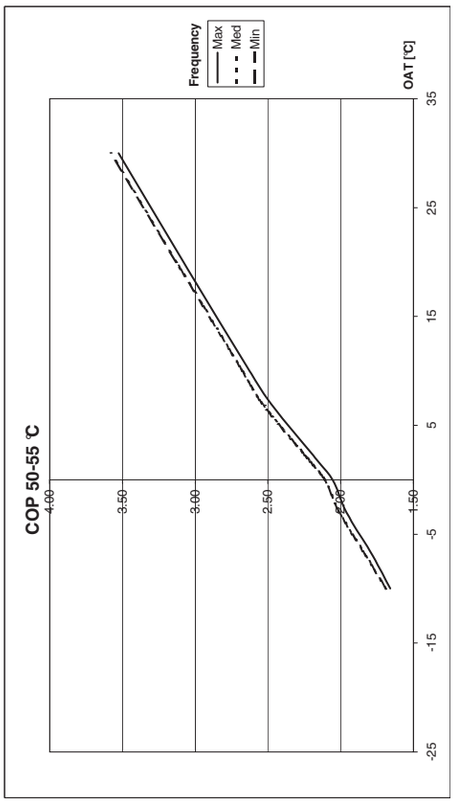


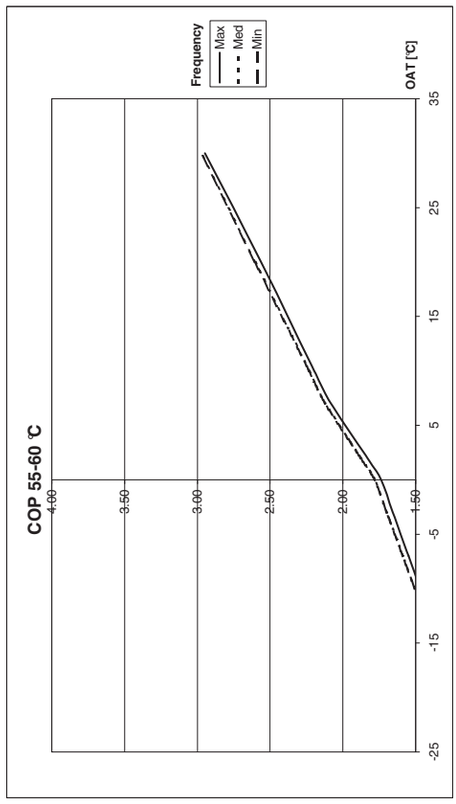




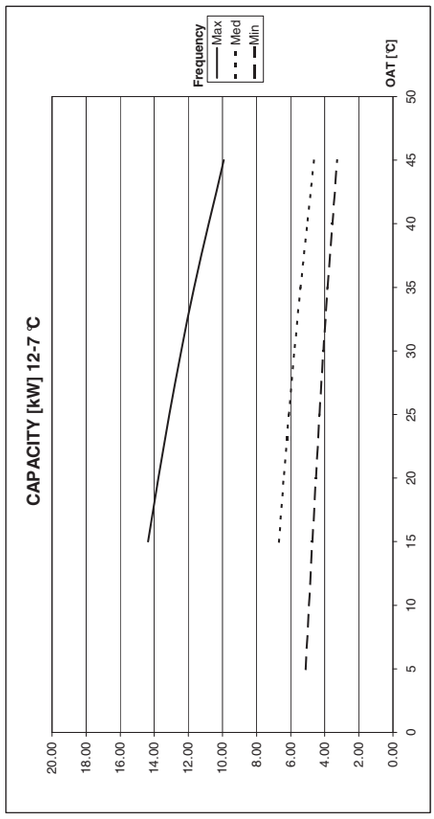


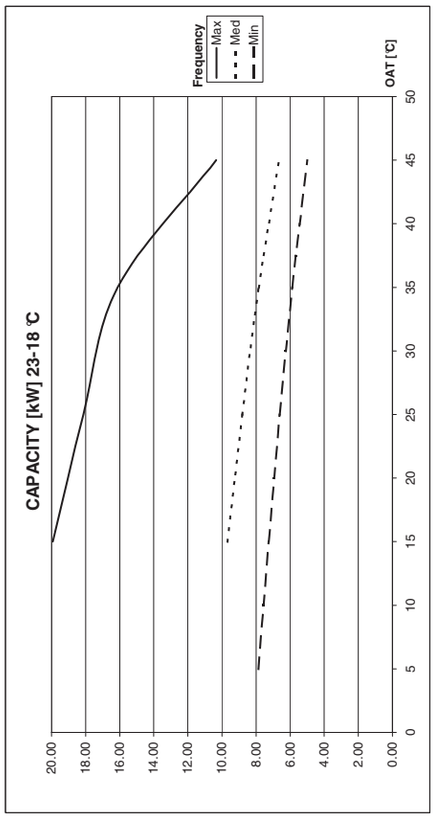


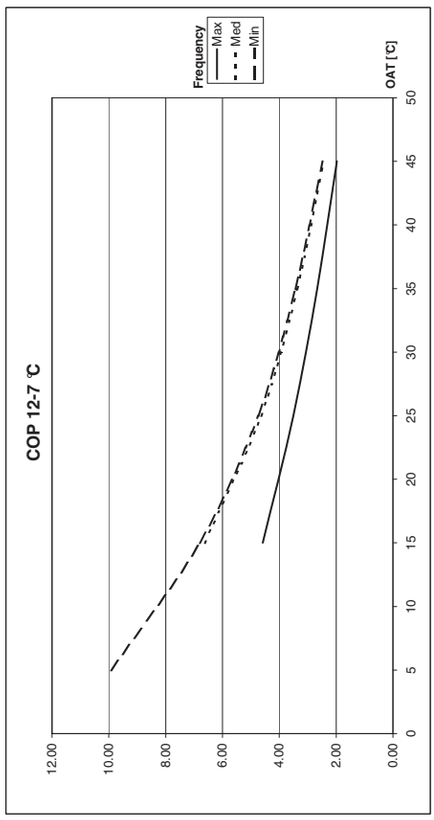


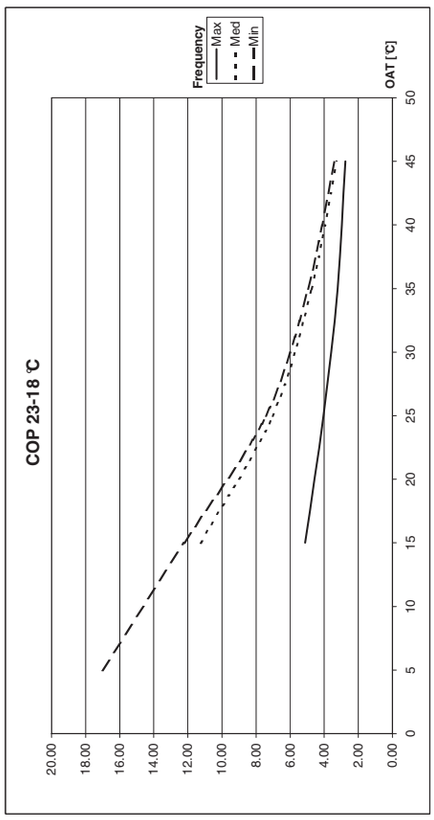


Size 012 Cooling

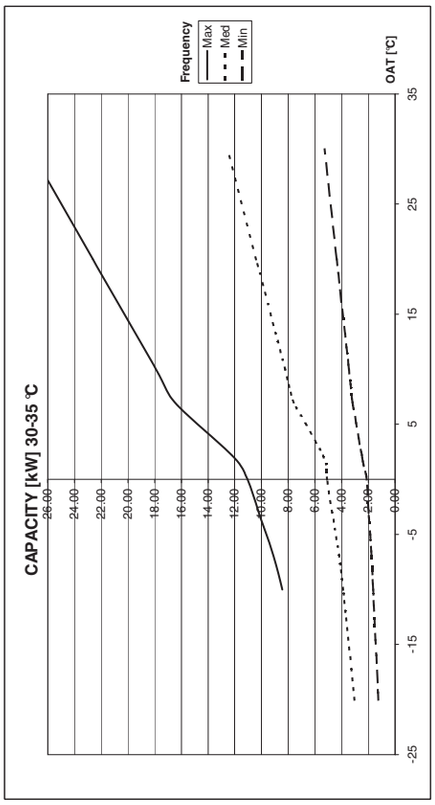


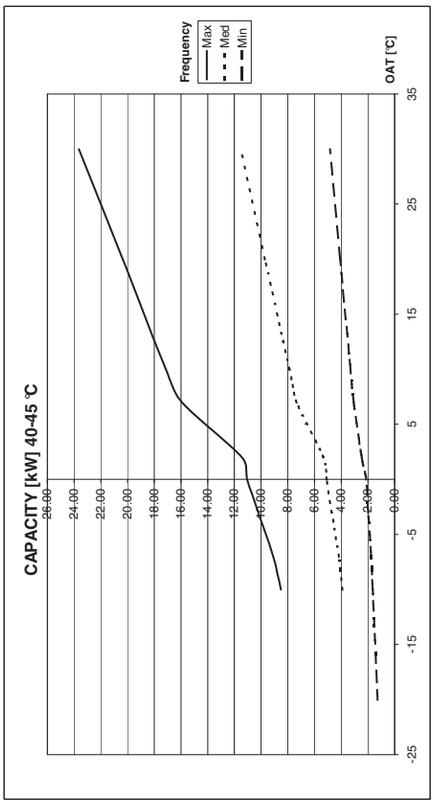


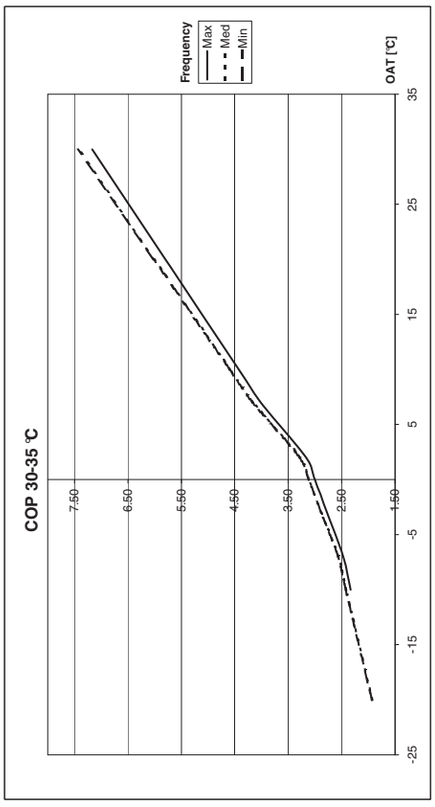


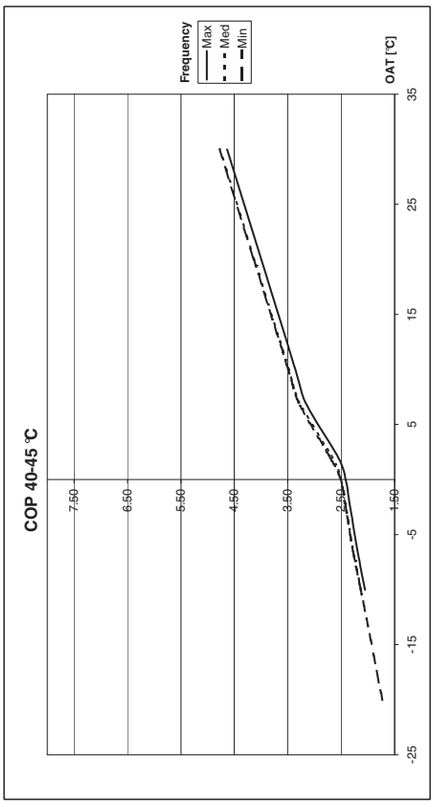


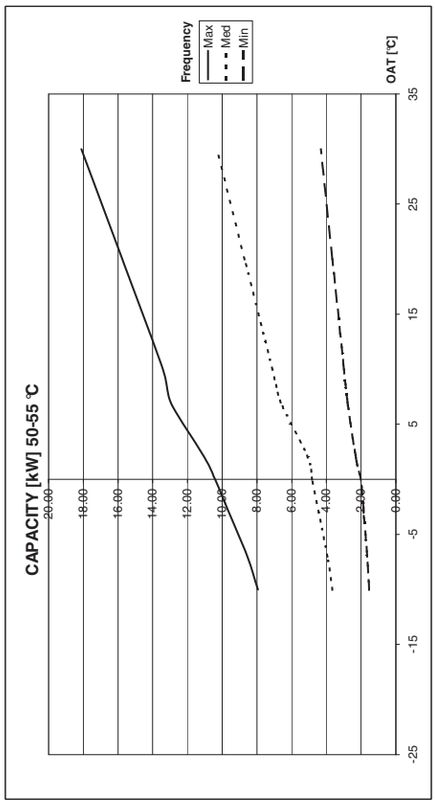
Size 015 Heating

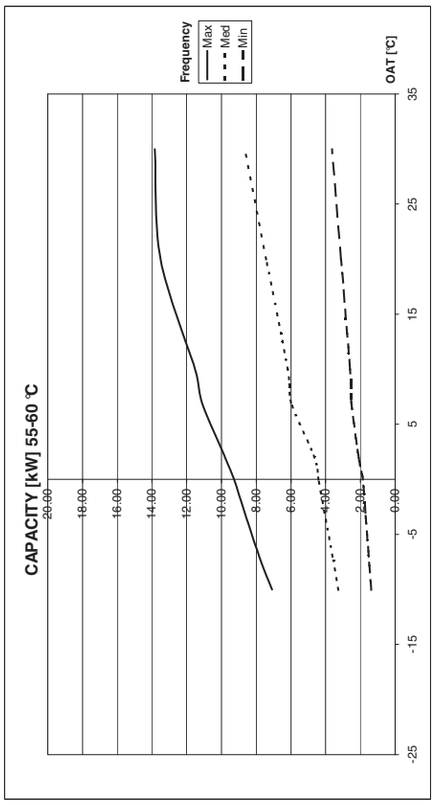


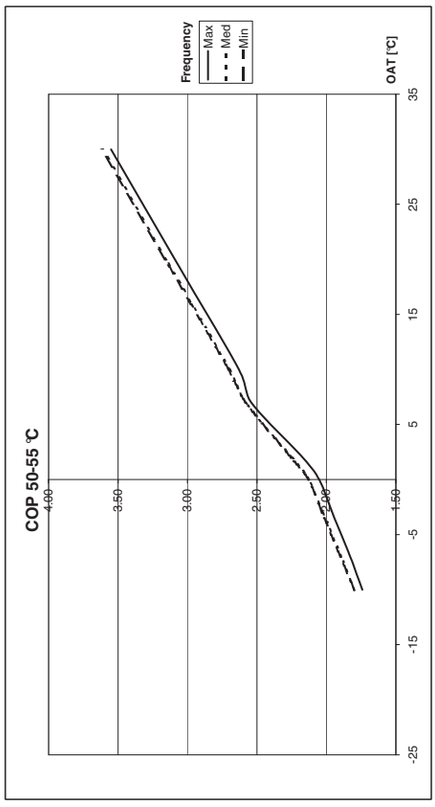


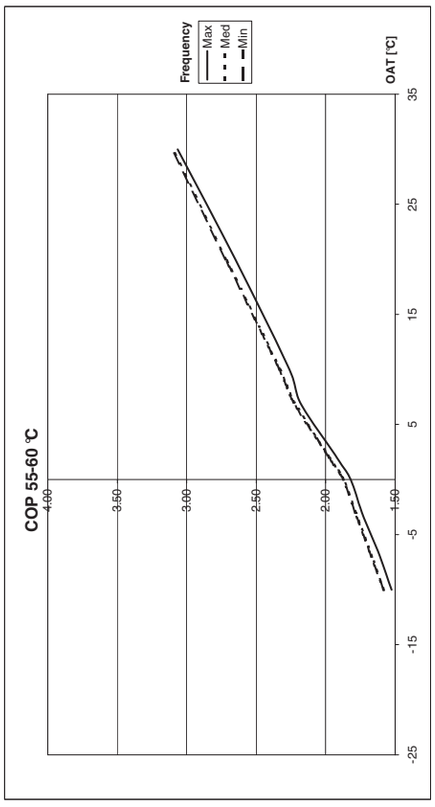




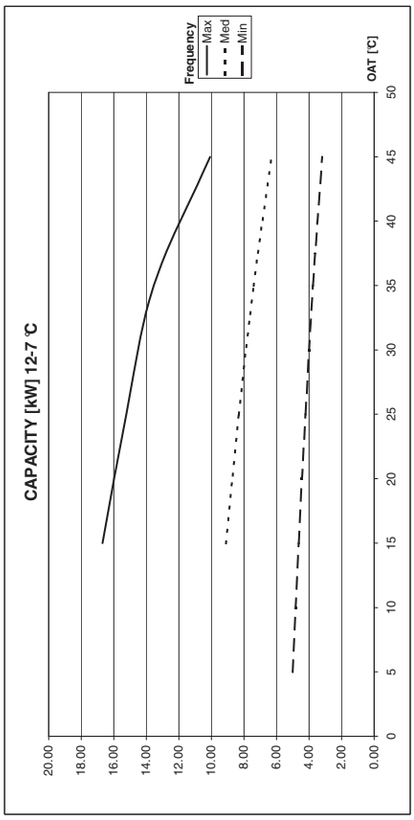


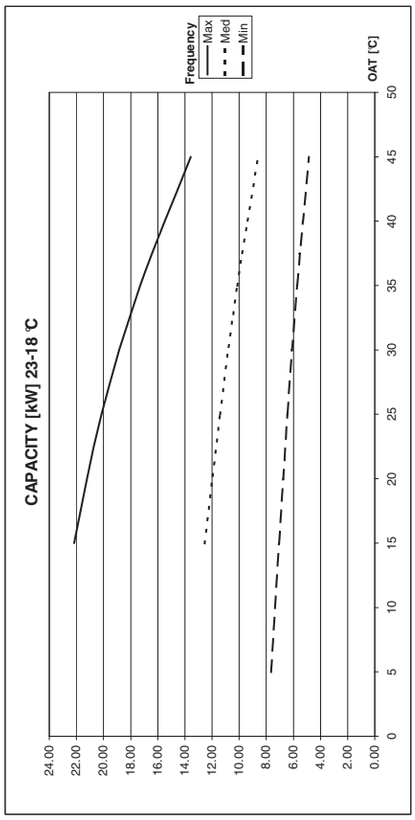


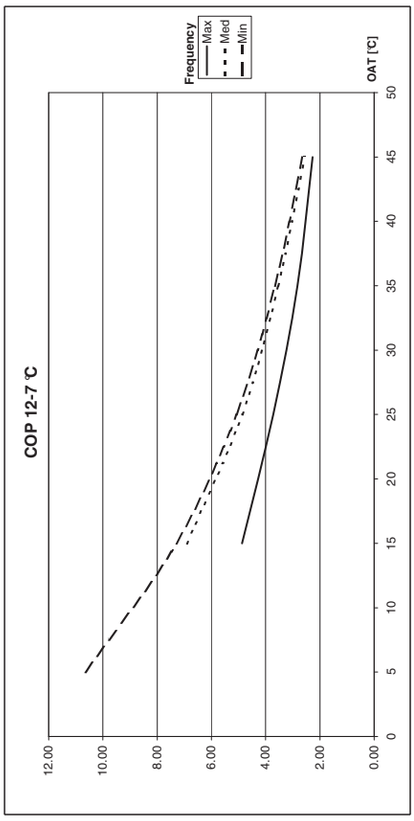


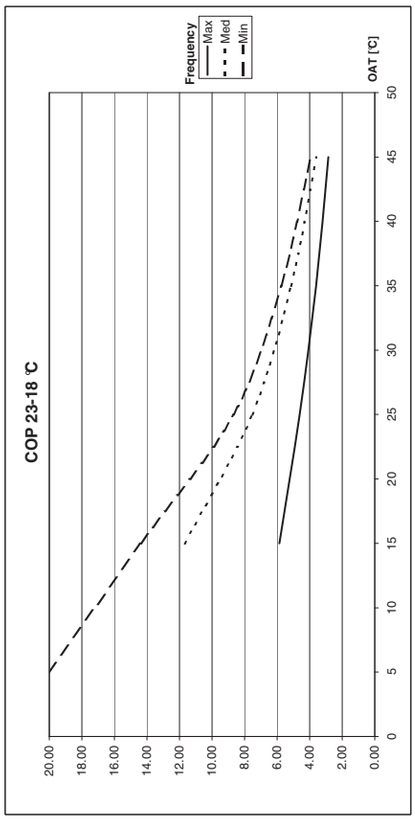


Size 015 Cooling









11.1 Additional information

Questions Customers Ask

As more and more consumers become environmentally conscious, you'll see greater opportunities to sell the R-410A units. Yet, as with any new technology, your customers are likely to have questions and concerns. Prepare yourself with answers to the following questions and prepare to profit from being the most knowledgeable home comfort professional in the market.

What types of refrigerants are there?

There are several refrigerants in use today. Each has a different chemical formula. These refrigerants flow through your air conditioning system to provide cooling for your home. Because of differences in their chemical make-up, each of these refrigerants acts just a little differently.

There are three major groups of refrigerants being used: chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs).CFCs and HCFCs contain chlorine. HFCs do not.

Why does it matter if refrigerants contain chlorine?

Scientific studies have shown that when refrigerants containing chlorine are released into the atmosphere, the chlorine molecules can react with stratospheric ozone. When this happens, it depletes the ozone layer and increases human exposure to ultraviolet (UV) radiation. Refrigerants that do not contain chlorine do not deplete the ozone layer.

While other studies indicate that HCFCs may be less damaging to the ozone layer than CFCs (such as those once used in aerosol products), the presence of chlorine still makes HCFCs less favorable for the environment than HFCs, which do not contain any chlorine.

What exactly is an earth-friendly refrigeran

An earth-friendly refrigerant does not depl the ozone because it does not contain chlorin

Why has R-410A been chosen as an alternative refrigerant?

While many chemical compounds exist as possibilities, R-410A provides the best comb nation of properties for a refrigerant: 1) it is non-ozone depleting; 2) its thermodynamic properties make it an energy-efficient choice and 3) it has excellent safety ratings.

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Just how safe is R-410A?

While R-410A is just as safe as R-22 for you, your family and your pets, it is even safer for the earth. Of course, any refrigerant is perfectly safe as long as it remains in a closed system, such as your air conditioner. Even so, the responsible choice is to use a refrigerant that will not harm the atmosphere if it accidentally leaks out of the system.

How does an R-410A air conditioner compare to my existing system ?

When you compare an R-22 unit with an R-410A unit of the same efficiency rating and capacity, you won't notice any difference in terms of comfort or energy savings. And, because our R-410A units are built to the same rigorous reliability standards, maintenance will also be similar to a new R-22 unit.

Why should I consider an air conditioner with R-410A now?

Although you will experience the same comfort, energy efficiency and reliability, you will also be doing your part to protect the environment.

You will be complying with upcoming government regulations, no matter what changes may be made to their schedule.

In the long run, you may also reap some substantial cost savings. As the government mandates the phase-out of R-22 and it becomes less available, there may be higher costs associated with servicing and recharging R-22 systems.

Can I use R-410A to convert my existing air conditioning system?

No. The chemical properties of R-410A require some mechanical differences in your air conditioning system. This means replacing your outdoor unit, at minimum. While your indoor coil and interconnecting tubing may remain unchanged, we encourage replacement of these components to ensure the maximum efficiency and reliability of a properly-matched system.

What if my new R-410A air conditioner is accidentally charged with R-22?

Clear, distinct labeling makes this unlikely. Should it occur, however, the R-22 can be recovered and the system recharged with R-410A with no damage.

Does an R-410A system need any special care?

Regular maintenance and service procedures are the same as for an R-22 unit. We encourage you to call us, though, because not everyone has the proper qualification, training and equipment to work with R-410A units.

11.1 Additional information

Installation/Servicing Tools

Changes in the product and components

In the case of an air conditioner using R410A, in order to prevent any other refrigerant from being charged accidentally, service port diameter of the outdoor unit control valve (3 way valve) has been changed. (1/2 UNF 20 threads per inch)

- In order to increase the pressure resisting strength of the refrigerant piping flare processing diameter and size of opposite side of flare nuts has been changed. (for copper pipes with nominal dimensions 1/2 and 5/8)

New tools for R410A

New tools for R410A	Applicable to R22 model		Changes
Gauge manifold	X		As pressure is high, it is impossible to measure by means of conventional gauge. In order to prevent any other refrigerant from being charged, each port diameter is changed.
Charge hose			In order to increase pressure resisting strength, hose materials and port size are changed (to 1/2 UNF 20 threads per inch). When purchasing a charge hose, be sure to check the port size.
Electronic balance for refrigerant charging	O		As pressure is high and gasification speed is fast, it is difficult to read the indicated value by means of charging cylinder, as air bubbles occur.
Torque wrench (nominal diam. 1/2, 5/8)	X		The size of opposite sides of flare nuts have been increased. Incidentally, a common wrench is used for nominal diameters 1/4 and 3/8.
Flare tool (clutch type)	O		By increasing the clamp bar's receiving hole, strength of spring in the tool has been improved.
Gauge for projection adjustment	-	-	Used when flare is made with using conventional flare tool.
Vacuum pump adapter	O		Connected to the conventional vacuum pump. It is necessary to use an adapter to prevent vacuum pump oil from flowing back to the charge hose. The charge hose connecting part has two ports-one for conventional refrigerant (7/16 UNF 20 threads per inch) and one for R410A. If the vacuum pump oil (mineral) mixes with R410A a sludge may occur and damage the equipment.
Gas leakage detector	X		Exclusive for HFC refrigerant.

- Incidentally, the "refrigerant cylinder" comes with the refrigerant designation (R410A) and protector coating in the U,S.'s ARI specified rose color (ARI color code: PMS 507).
- Also, the "charge port and packing for refrigerant cylinder" require 1/2 UNF 20 threads per inch corresponding to the charge hose's port size.

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