

Galactic VRF Selection Instruction for AHU

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1 Applicable Models

AHU-KIT

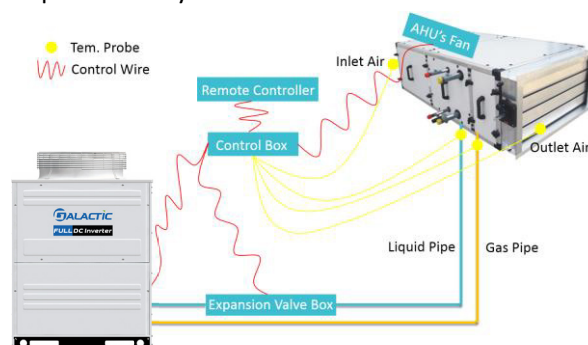
Model	GZX-2.0AEC	GZX-4.0AEC	GZX-6.0AEC	GZX-10.0AEC	GZX-20.0AEC	GZX-30.0AEC
Capacity	2HP	4HP	6HP	8-10HP	12-20HP	22-30HP
Control Box	GZX-AEC/1					
	341mm × 291mm × 127mm / H×W×D Steel Plate with White Grey Coating (Anti-corrosion)					
Expansion Valve Box	GZX-2.0AEC/2	GZX-4.0AEC/2	GZX-6.0AEC/2	GZX-10.0AEC/2	GZX-20.0AEC/2	GZX-30.0AEC/2
	200mm × 165mm × 62mm / H×W×D Equip with One Box for 2-20HP, Two Boxes for 22-30HP					
Power	220~240V 50Hz / 60Hz					

Compatible ODUs

If the control target is return air temperature, the following products will be compatible with AHU, S, G+, G, X, M, W, R, C, L and E Series. And the detail information about the combinability of these ODU will be described on **Chapter 3**.

2 System Description

AHU-KIT is specially designed to allow connection of third-party direct expansion coils included a field-supplied Air Handling Unit (AHU) to Hisense ODU. The AHU-KIT is composed of Control Box for system control, where it is included the PCB and all the electronic stuff, and Expansion Valve Box for refrigerant cycle control, where the electrical expansion valve is located. The following figure shows a simple example for the system.



Control box connect with ODU, expansion valve box, remote controller and AHU's fan. For temperature feedback, there are four temperature probes on inlet, outlet, liquid pipe and gas pipe respectively.

3 Compatible ODUs and Attention

Because AHU is a third-party product for Hisense. So the control method of different AHUs is different. According to Inlet air temperature control, outlet air temperature control and duty signal control, we can choose the compatible ODUs on following table.

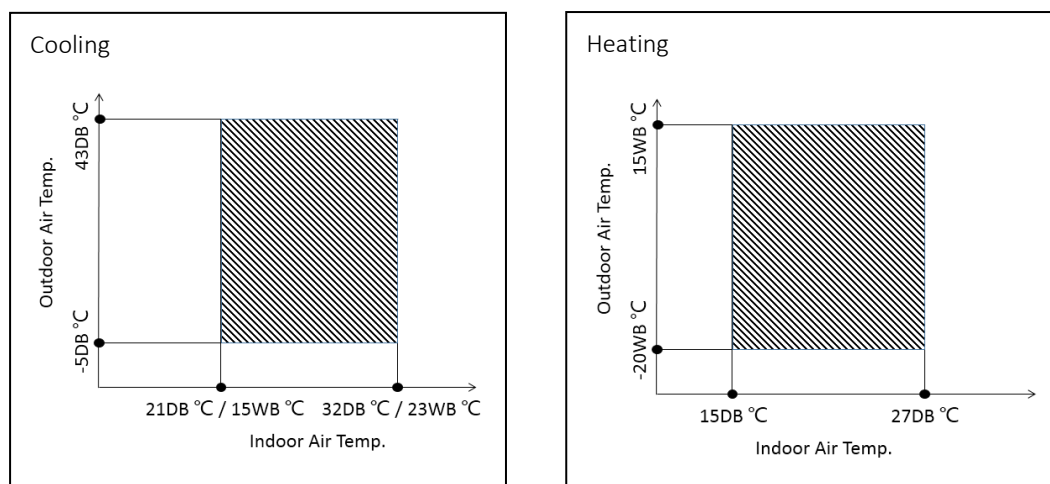
Control Type	Compatible ODU Series
Inlet air temp. control	S, G+, G, M, R, X, C, W, L, E
Outlet air temp. control	S, G+, G, M, R, X, W, C
Duty signal control	S, G+, G, M, R, X, W, C

Following principles must be accepted whether you choose any control type.

- ① If the AHU capacity is less than or equal to 6HP, this AHU will be thought as same as the standard IDU. But the ratio of IDU capacity / ODU capacity must be smaller than 110%.
- ② If the AHU capacity is more than 6HP, it is not allowed that standard IDU and AHU connect with a common system at the same time. In addition, it will best that one ODU, including combination model, connect with one AHU respectively. Or the capacity of these AHUs must be same. And the ratio of IDU capacity / ODU capacity must be smaller than 100%.

4 Operation Range

- ① Hisense heat pump air conditioner has been designed for the following temperature. Operation range is as follows:



- ② The suction air temperature is the point just before the DX-Coil. The temperature range:
 Cooling: 17°C DB ~ 35 °C DB / 23 °C WB
 Heating: 10 °C DB ~ 27 °C DB
 NOTE:
 - AHU unit in cooling mode can work in $T_{\text{outdoor air}} \geq T_{\text{suction air}}$ only.
 - AHU unit in heating mode can work in $T_{\text{outdoor air}} \leq T_{\text{suction air}}$ only.
- ③ Installation altitude is below 1000 meters.
- ④ Frequency of supply power is within $\pm 1\%$ Hz of rated frequency.

5 Heat Exchanger Design Specification

The AHU heat exchanger to be connect with Hisense VRF product must be satisfy the following requirements.

Capacity HP	mode	Heat Exchanger Capacity (kW)			Recommended Heat Exchanger Inner volume (L)		Air Flow Rate m3/min			
		min	nom	max	min	max	Hi	Me	Lo	tolerance
2HP	cooling	4.0	5.0	5.6	0.57	1.16	14.6	11.6	8.2	±10%
	heating	4.5	5.6	7.1						
4HP	cooling	7.1	9.0	11.2	1.03	2.37	28.0	22.4	15.7	
	heating	8.0	10.0	12.5						
6HP	cooling	11.2	14.0	16.0	1.92	2.92	40.0	32.0	22.4	
	heating	12.5	16.0	18.0						
8HP	cooling	16.0	20.0	22.4	2.92	3.89	58.2	46.6	32.6	
	heating	17.9	22.4	25.0						
10HP	cooling	20.0	25.0	28.0	3.89	4.76	72.8	58.2	40.8	
	heating	22.4	28.0	31.5						
12HP	cooling	28.0	30.0	33.5	4.76	5.91	107.2	85.8	60.0	
	heating	31.5	33.5	37.5						
14HP	cooling	33.5	35.0	40.0	5.85	6.89	128.0	102.4	71.7	
	heating	37.5	40.0	45.0						
16HP	cooling	40.0	43.0	45.0	6.79	8	148.5	118.8	83.2	
	heating	45.0	47.5	50.0						
18HP	cooling	45.0	48.0	50.0	7.57	8.92	165.0	132.0	92.4	
	heating	50.0	53.0	56.0						
20HP	cooling	50.0	52.0	56.0	8.47	9.97	184.8	147.8	103.5	
	heating	56.0	60.0	63.0						
22HP	cooling	56.0	58.0	61.5	9.04	11.13	203.0	162.4	113.7	
	heating	63.0	66.0	69.0						
24HP	cooling	61.5	65.0	69.0	9.5	12.34	227.7	182.2	127.5	
	heating	69.0	75.0	77.5						
26HP	cooling	69.0	71.0	73.0	10.39	12.89	240.9	192.7	134.9	
	heating	77.5	79.0	82.5						
28HP	cooling	73.0	76.0	80.0	11.39	13.86	264.0	211.2	147.8	

	heating	82.5	86.0	90.0					
30HP	cooling	80.0	82.0	85.0	12.36	14.73	280.5	224.4	157.1
	heating	90.0	92.0	95.0					

NOTE:

Cooling and heating capacity data based on the following indoor and outdoor conditions.

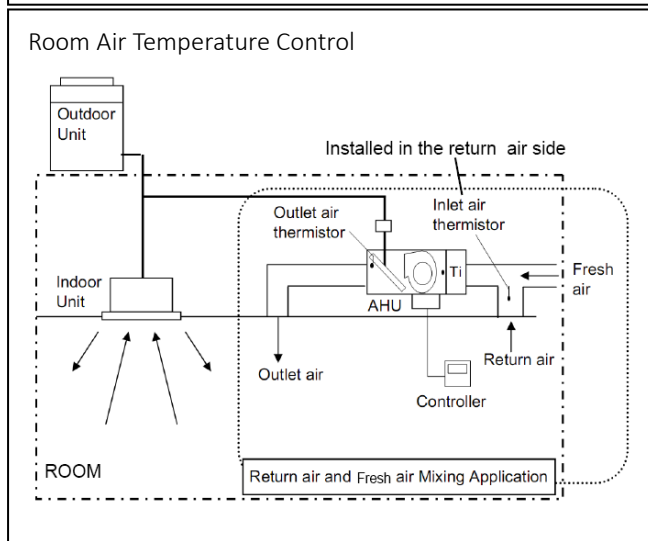
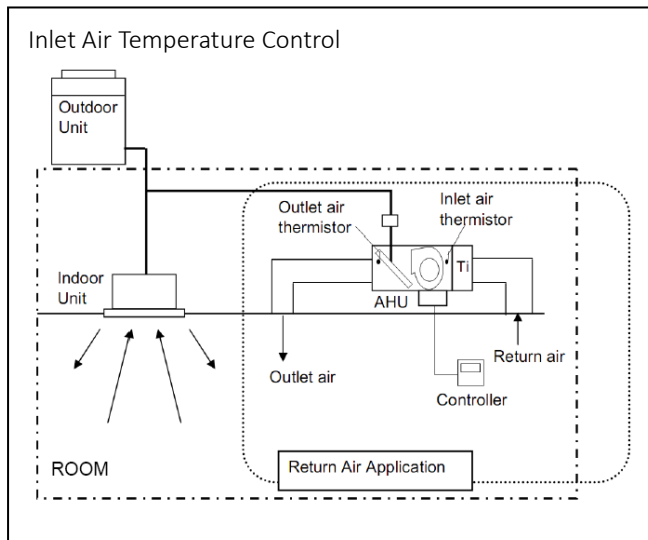
Operation Conditions		Cooling	Heating
Indoor Air Inlet Temp.	DB	27°C	20°C
	WB	19°C	-
Outdoor Air Inlet Temp.	DB	35°C	7°C
	WB	-	6°C
Pipe length : 7.5m. Pipe height: 0 m.			
<p>*Cooling:</p> <ol style="list-style-type: none"> 1.evaporation temperature:7°C 2.Superheat (SH) : 5 K 3.Pressure drop of the refrigerant flow in heat exchanger : Max. 0.15MPa. <p>*Heating:</p> <ol style="list-style-type: none"> 1.condensation temperature:47°C 2.Subcool (SC) = 15 K 3.Pressure drop of the refrigerant flow in heat exchanger : Max. 0.06MPa. 			

6 Control Model

Inlet Air (Room Air) Temperature Control

Capacity Control: For controlling the inlet air (room air) temperature, the capacity is adapted so that detection temperature of inlet air (room air) reaches the set temperature by remote controller.

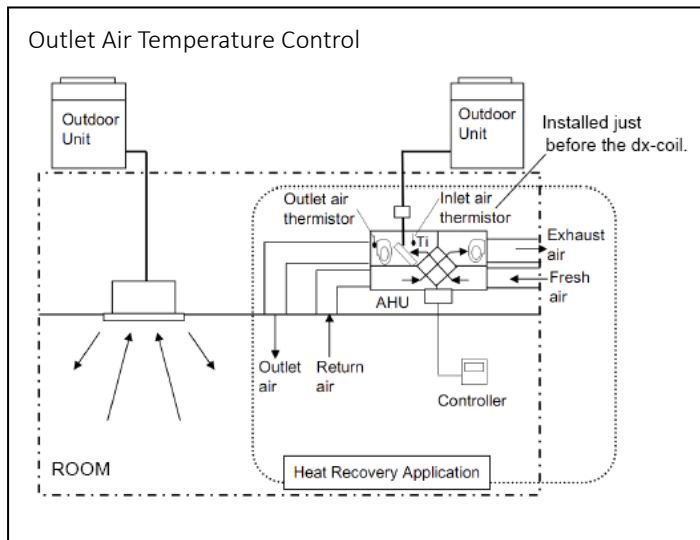
Thermostat Control: The thermostat becomes OFF if detection temperature of inlet air (room air) has reached the set temperature by remote controller.



Outlet Air Temperature Control

Capacity Control: For controlling the outlet air temperature, the capacity is adapted so that detection temperature of outlet air of AHU reaches the correction temperature of the set temperature for outlet air by remote controller.

Thermostat Control: The thermostat becomes OFF if detection temperature of outlet air and the correction temperature of the set temperature for thermostat by remote controller has no difference.



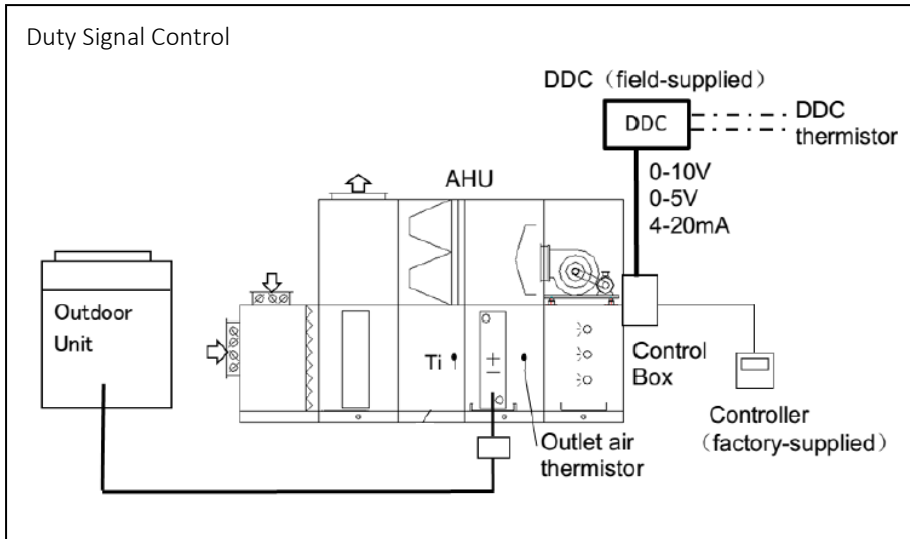
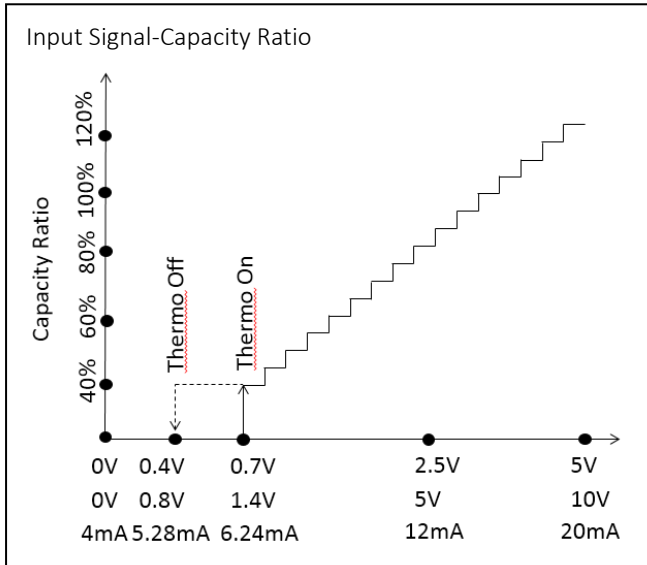
For above two control modes, the correction about the set temperature will be described on Chapter 7.

Duty Signal Control

Capacity Control: The capacity of outdoor unit is fixed by an external duty signal, which can be a free-voltage signal (0~10V or 0~5V) or a current signal (4~20 mA). The duty signal is generated by a field-supplied DDC and supplied to the AHU Connection Kit. The capacity of outdoor unit depends on the signal strength.

Thermostat Control: for system controlled by a duty signal it is possible to force thermo-off by the duty signal itself. When the duty signal becomes lower than 8% of the full range of the signal, the system will be turned to thermo-off condition. When the duty signal becomes higher than 14% of the full range, the system will be turned to thermo-on condition.

Duty Input	0-5V	<0.4V	$\geq 0.7V$	0.7V	1.0V	1.2V	1.5V	1.8V	2.0V	2.3V
	0-10V	<0.8V	$\geq 1.4V$	1.4V	2.0V	2.4V	3.0V	3.6V	4.0V	4.6V
	4-20mA	<5.28mA	$\geq 6.24mA$	6.24 mA	7.20 mA	7.84 mA	8.80 mA	9.76 mA	10.40 mA	11.36 mA
Capacity(% of Normal)		Thermo-Off	Thermo-On	40%	45%	50%	55%	60%	65%	70%
Duty Input	0-5V	2.6V	2.8V	3.1V	3.3V	3.6V	3.9V	4.1V	4.4V	4.7V
	0-10V	5.2V	5.6V	6.2V	6.6V	7.2V	7.8V	8.2V	8.8V	9.4V
	4-20mA	12.32mA	12.96mA	13.92 mA	14.56 mA	15.52 mA	16.48 mA	17.12 mA	18.08 mA	19.04 mA
Capacity(% of Normal)		75%	80%	85%	90%	95%	100%	105%	110%	120%



7 Switch Settings

Capacity Code Setting

Capacity/ HP	2	4	6	8	10
Code(DSW3)					
Capacity/ HP	12	14	16	18	20
Code(DSW3)					
Capacity/ HP	22	24	26	28	30
Code(DSW3)					

Control Mode Setting

Control Mode	Optional Setting	ODU to AHU Setting
Inlet/Room Air Temperature Control	E1→00(Factory Setting)	
Outlet Temperature Control	E1→01	F2→1(C Series) $\overline{F1}$ →2(Other series)
Duty Signal Control	E1→02 E4→00(0-10V) E4→01(0-5V) E4→02(4-20mA / It is invalid that multi ODUs connect with one AHU.)	F2→1(C Series) $\overline{F1}$ →2(Other series)

Correction Temperature Setting

When the capacity control of outlet air temperature control is chosen, maybe we will set the correction temperature due to temperature drift.

Items	Code	Function
bb(Cooling Mode)	00(Factory Setting)	$T_{\text{setting}}-6^{\circ}\text{C}$
	01	$T_{\text{setting}}-4^{\circ}\text{C}$
	02	$T_{\text{setting}}-2^{\circ}\text{C}$
b1(Heating Mode)	00	$T_{\text{setting}}+4^{\circ}\text{C}$
	01	T_{setting}
	02	$T_{\text{setting}}+2^{\circ}\text{C}$

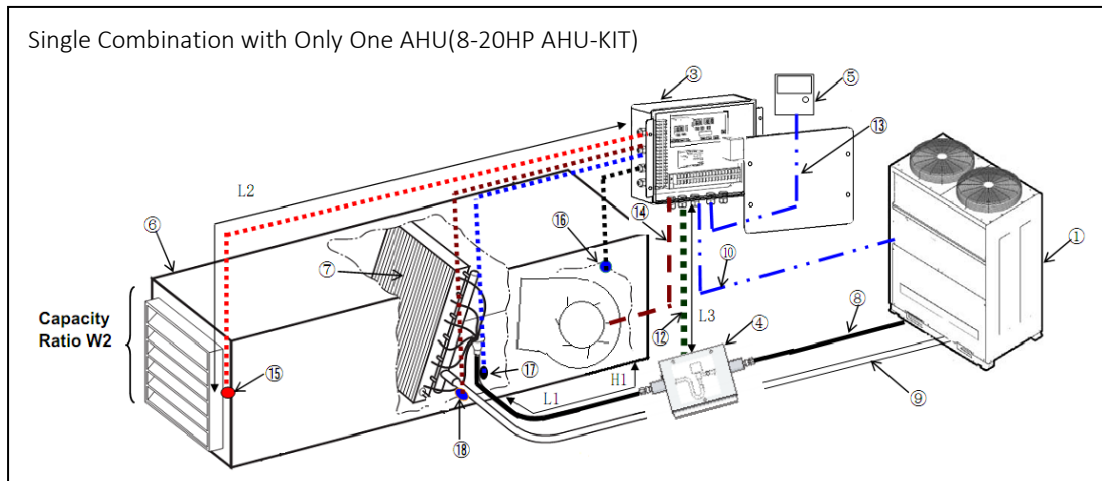
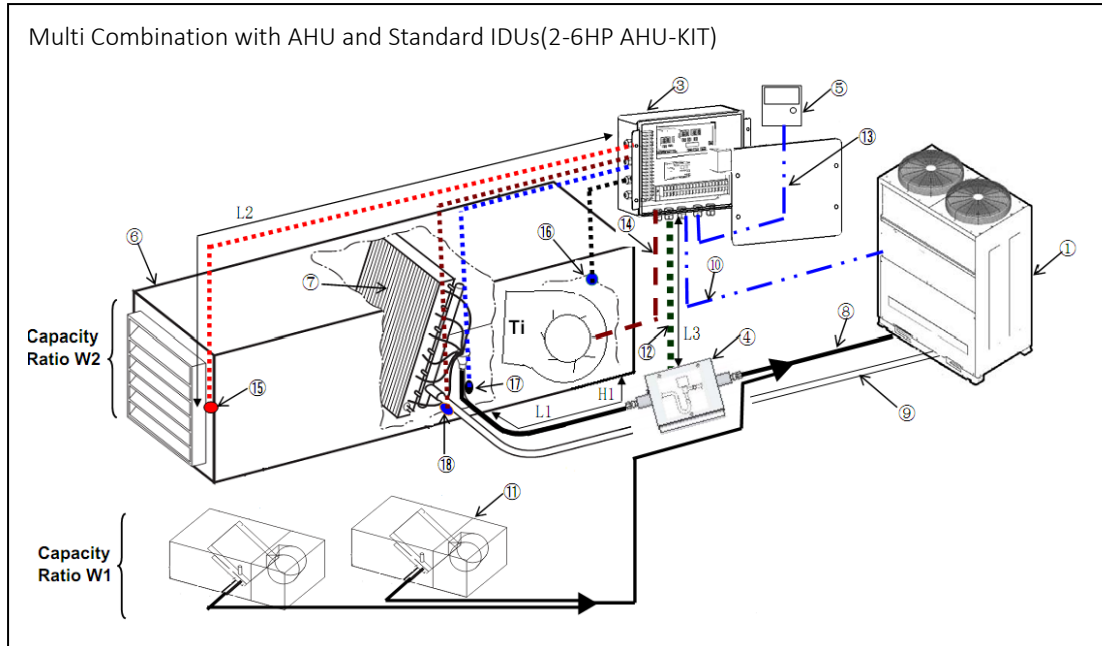
When the thermostat control of outlet air temperature control is chosen, maybe we will set the correction temperature due to temperature drift.

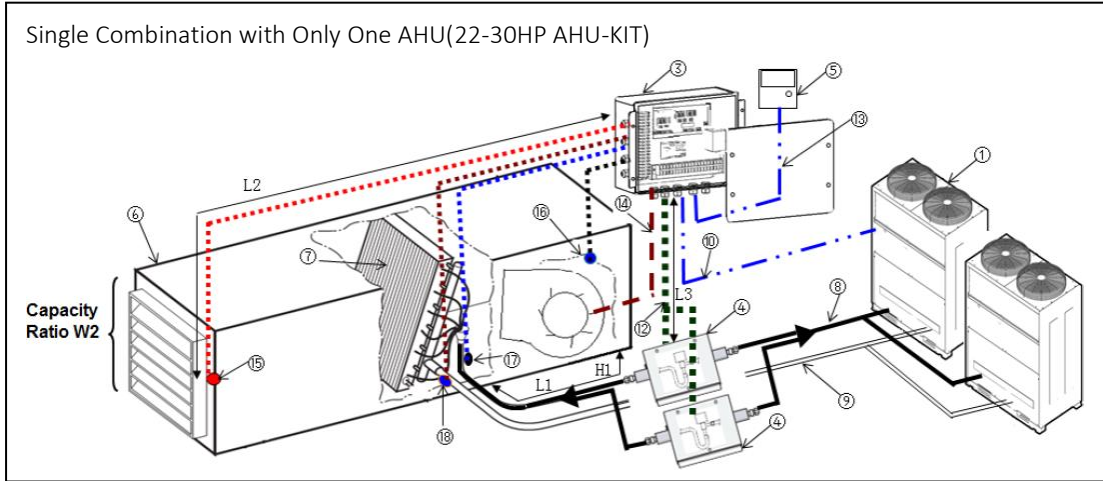
Items	Code	Function
+bb+CF(Cooling Mode)	00(Factory Setting)	T_{setting}
	01	$T_{\text{setting}}+2^{\circ}\text{C}$
	02	$T_{\text{setting}}+5^{\circ}\text{C}$
+b1-CF(Heating Mode)	00	T_{setting}
	01	$T_{\text{setting}}-2^{\circ}\text{C}$
	02	$T_{\text{setting}}-5^{\circ}\text{C}$

8 Limitation and Part and Selection

Parameter Table

Limitation





Item	Description	Item	Description	Item	Description
1	Outdoor Unit	2	AHU-KIT	3	Control Box
4	Expansion Valve Box	5	Remote Controller	6	AHU
7	Heat Exchanger	8	Liquid Pipe	9	Gas Pipe
10	ODU-IDU Communication	11	Standard IDU	12	Control Wires
13	Remote Controller Communication	14	Control Wires for AHU	15	Outlet Air Thermistor
16	Inlet Air Thermistor	17	Liquid Pipe Thermistor	18	Gas Pipe Thermistor

L1 : the distance between the heat exchanger of AHU and the Expansion Valve for the piping length. Keep the distance no more than 5m.

H1 : the height difference between the heat exchanger of AHU and the Expansion Valve . Keep the difference no more than 2m.

L2: the Length of thermistor for Outlet air/Inlet air/Liquid Pipe/Gas Pipe. The length is no more than 10m.

L3: the Length of control wires for electrical expansion valve. The length is no more than 0m.

Ti: the suction air temperature just before the dx-coil. The temperature range:

Cooling: 7 °C (DB) to 35 °C(DB)/ 23°C(WB)

Heating: 10 °C (DB) to 27°C(DB)

W2 : the total AHU capacity with AHU KIT to outdoor unit capacity.

W1 : the total standard indoor unit capacity to outdoor unit capacity.

For Multi combination with AHU and standard indoor unit

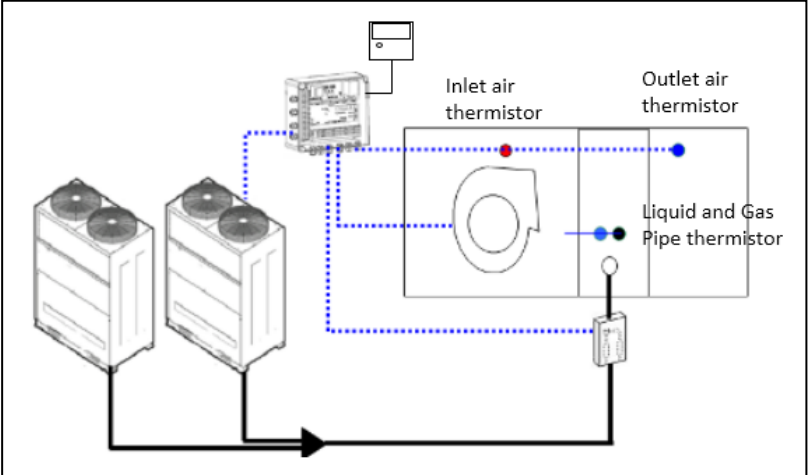
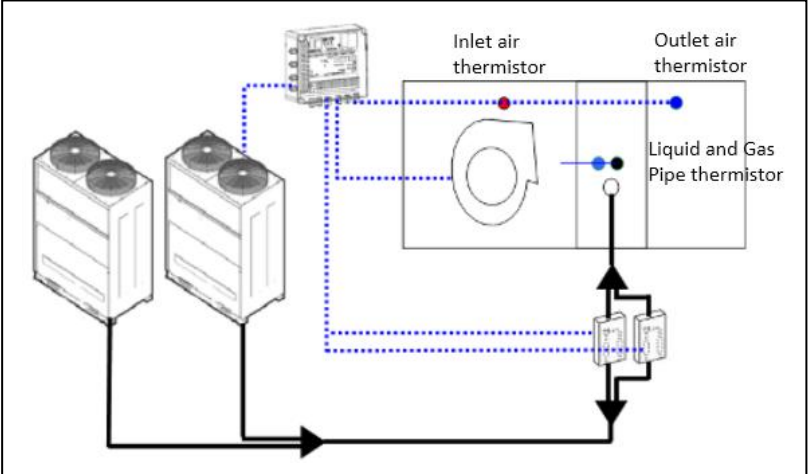
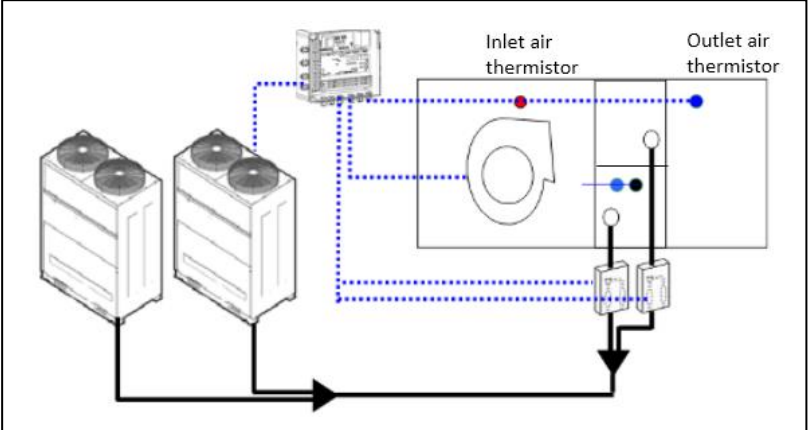
W2: no more than 30% ; W1+W2:no more than 110%

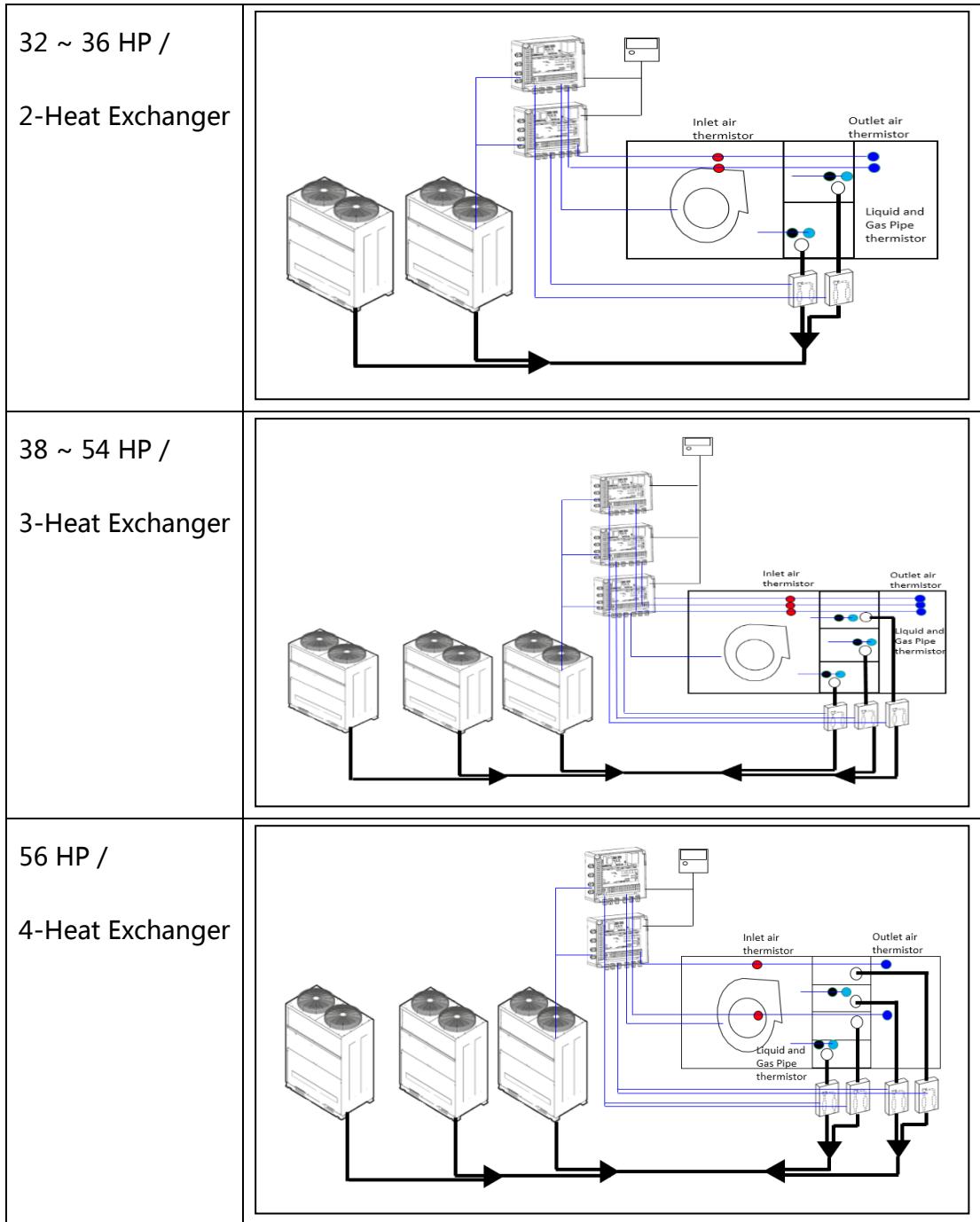
For Single combination with only AHU:

W2:no more than 100%

9 Connection Schemes and Example

Connection Schemes

AHU Capacity	Scheme
2 ~ 20 HP	
22 ~ 30 HP / 1 Heat Exchanger	
22 ~ 30 HP / 2-Heat Exchanger	



NOTE: For multi heat exchangers in a AHU, every heat exchanger capacity is same.

Examples

Following examples include G, R, W, L

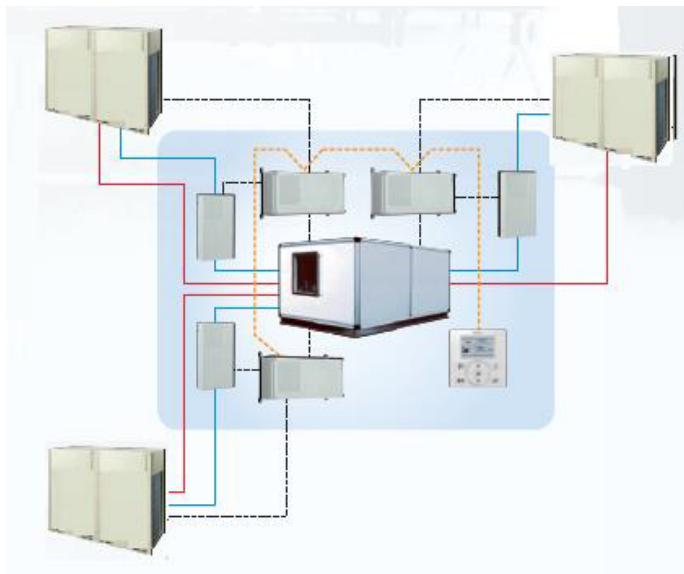
10 Multi ODUs by One AHU

Multi Hisense VRF ODUs can connect with one AHU for cooling and heating.

In Turkey market, there are some projects need big AHU, which capacity is bigger than 112 HP (S series). In this case, multi VRF ODU may used to connect with one big AHU.

Design principle:

- ① If any one VRF ODU system is still working in heating, AHU fan must run, min half air volume.
- ② In this connection, select VRF ODU with same capacity, also each section connected of AHU heat exchanger must be same capacity.
- ③ AHU side control the air comfortable situation to avoid the cold air in heating mode.



11 FAQ

Question 1: Could AHU be connected to control system by AHU kit?

Answer 1: Yes, It can be connected to central system, include all central controllers and Hi-dom system.

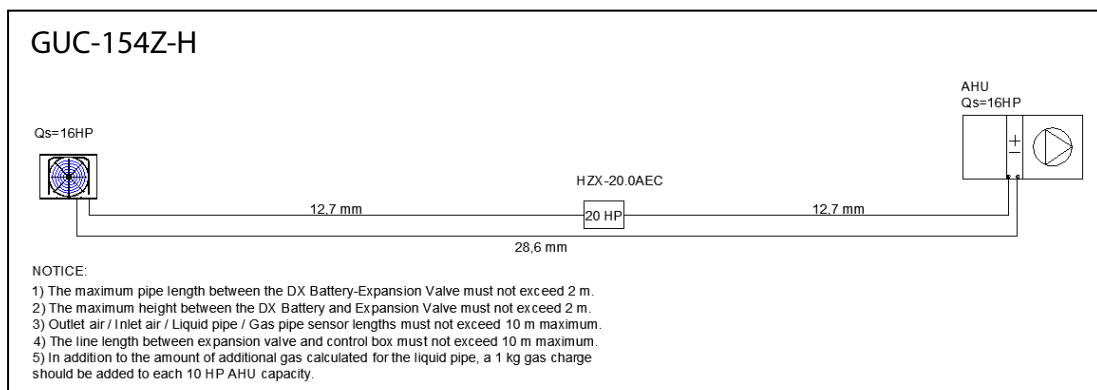
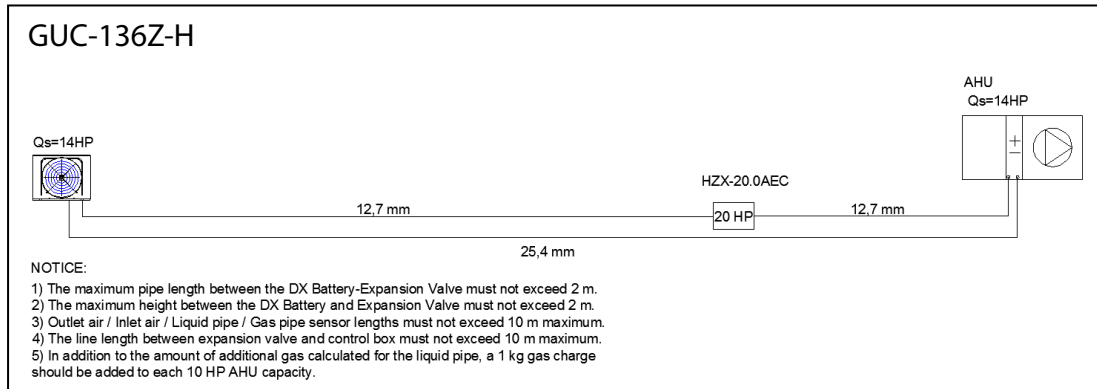
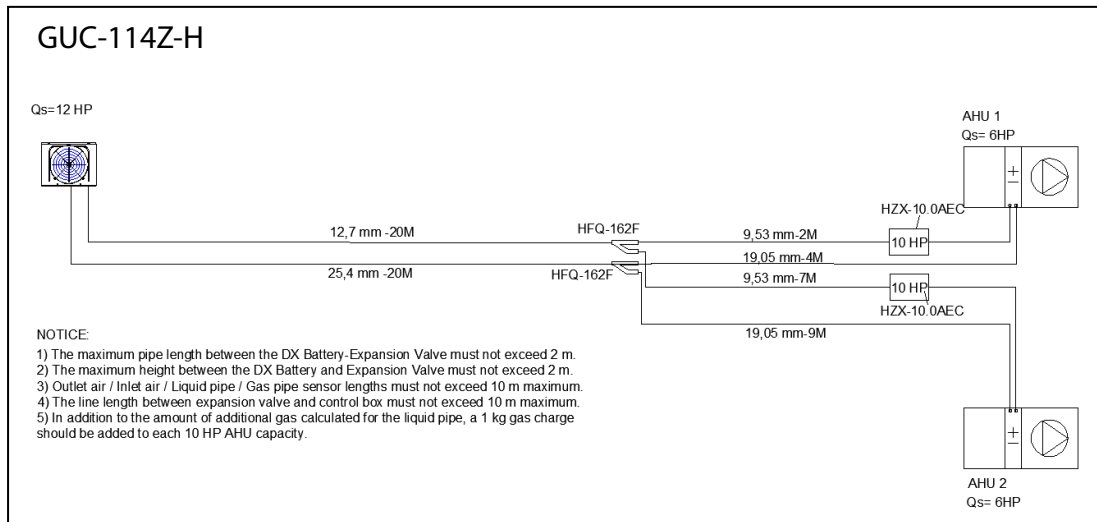
Question 2: We can use AC motor to realize 3 steps fan speed normally, could we use DC motor to realize 3 steps fan speed?

Answer 2: Yes, there was a project in South Korea, which adopt DC motor to realize 3 steps fan speed. Actually, AHUkit just supply 3 kinds of fan speed signal, no mater AC motor or DC motor.

Question 3: If there are many AHUs in one system, how can we chose ODUs?

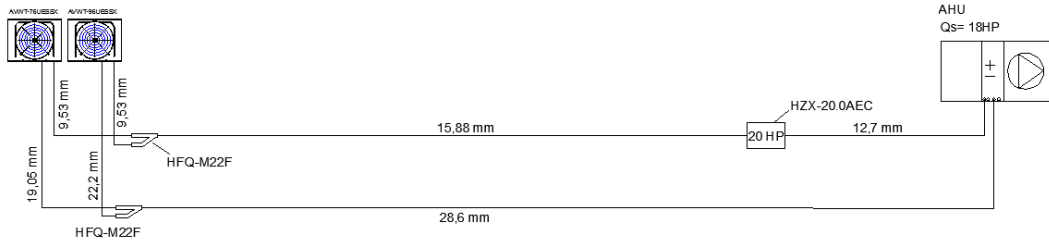
Answer 3: if each AHU capacity is no more than 6HP, we can treat these AHUs as normal indoor units. If there is AHU more than 8HP, all AHUs capacity should be same in this system.

Appendix



GUC-172Z-H

Qs=18HP

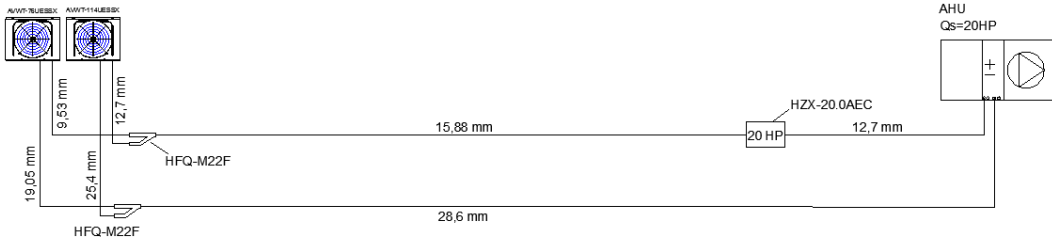


NOTICE:

- 1) The maximum pipe length between the DX Battery-Expansion Valve must not exceed 2 m.
- 2) The maximum height between the DX Battery and Expansion Valve must not exceed 2 m.
- 3) Outlet air / Inlet air / Liquid pipe / Gas pipe sensor lengths must not exceed 10 m maximum.
- 4) The line length between expansion valve and control box must not exceed 10 m maximum.
- 5) In addition to the amount of additional gas calculated for the liquid pipe, a 1 kg gas charge should be added to each 10 HP AHU capacity.

GUC-190Z-H

Qs=20HP

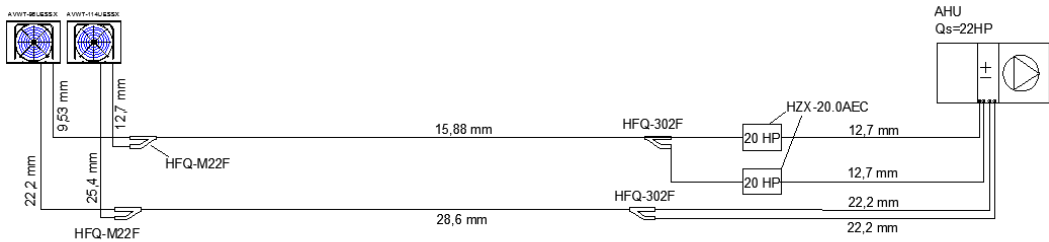


NOTICE:

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- 2) The maximum height between the DX Battery and Expansion Valve must not exceed 2 m.
- 3) Outlet air / Inlet air / Liquid pipe / Gas pipe sensor lengths must not exceed 10 m maximum.
- 4) The line length between expansion valve and control box must not exceed 10 m maximum.
- 5) In addition to the amount of additional gas calculated for the liquid pipe, a 1 kg gas charge should be added to each 10 HP AHU capacity.

GUC-210Z-H

Qs=22HP

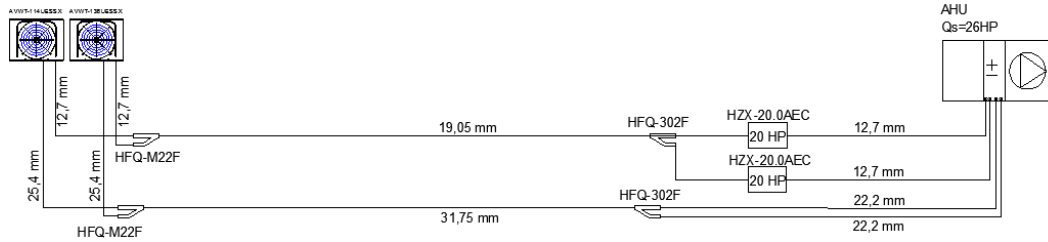


NOTICE:

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- 2) The maximum height between the DX Battery and Expansion Valve must not exceed 2 m.
- 3) Outlet air / Inlet air / Liquid pipe / Gas pipe sensor lengths must not exceed 10 m maximum.
- 4) The line length between expansion valve and control box must not exceed 10 m maximum.
- 5) In addition to the amount of additional gas calculated for the liquid pipe, a 1 kg gas charge should be added to each 10 HP AHU capacity.

GUC-250Z-H

Qs=26HP

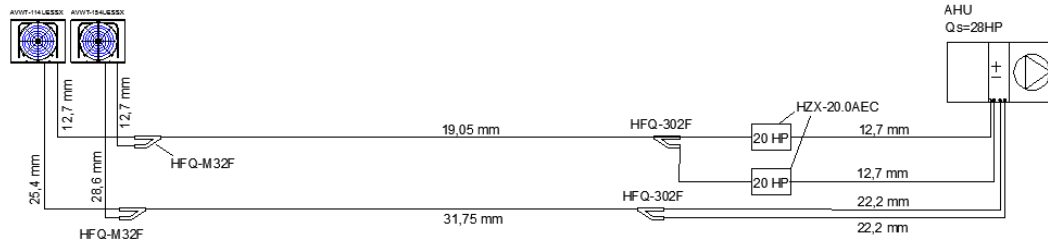


NOTICE:

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- 2) The maximum height between the DX Battery and Expansion Valve must not exceed 2 m.
- 3) Outlet air / Inlet air / Liquid pipe / Gas pipe sensor lengths must not exceed 10 m maximum.
- 4) The line length between expansion valve and control box must not exceed 10 m maximum.
- 5) In addition to the amount of additional gas calculated for the liquid pipe, a 1 kg gas charge should be added to each 10 HP AHU capacity.

GUC-268Z-H

Qs=28HP

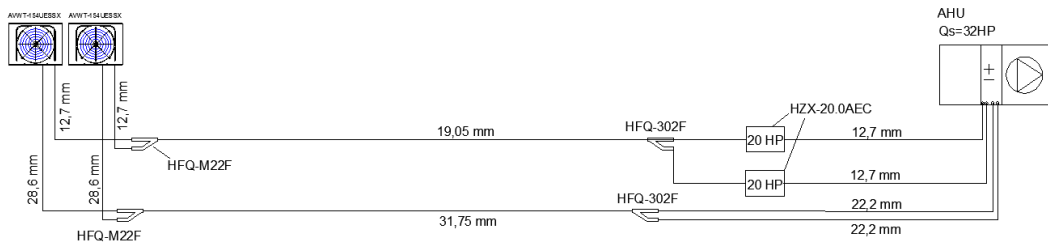


NOTICE:

- 1) The maximum pipe length between the DX Battery-Expansion Valve must not exceed 2 m.
- 2) The maximum height between the DX Battery and Expansion Valve must not exceed 2 m.
- 3) Outlet air / Inlet air / Liquid pipe / Gas pipe sensor lengths must not exceed 10 m maximum.
- 4) The line length between expansion valve and control box must not exceed 10 m maximum.
- 5) In addition to the amount of additional gas calculated for the liquid pipe, a 1 kg gas charge should be added to each 10 HP AHU capacity.

GUC-307Z-H

Qs=32HP

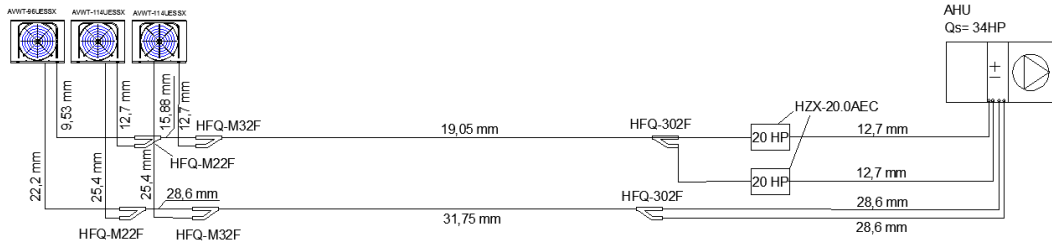


NOTICE:

- 1) The maximum pipe length between the DX Battery-Expansion Valve must not exceed 2 m.
- 2) The maximum height between the DX Battery and Expansion Valve must not exceed 2 m.
- 3) Outlet air / Inlet air / Liquid pipe / Gas pipe sensor lengths must not exceed 10 m maximum.
- 4) The line length between expansion valve and control box must not exceed 10 m maximum.
- 5) In addition to the amount of additional gas calculated for the liquid pipe, a 1 kg gas charge should be added to each 10 HP AHU capacity.

GUC-324Z-H

Qs=34HP

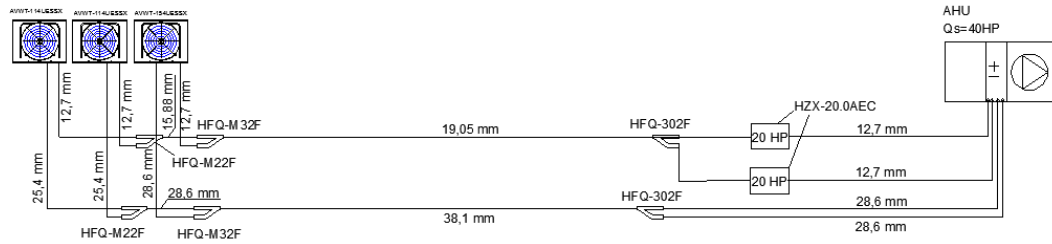


NOTICE:

- 1) The maximum pipe length between the DX Battery-Expansion Valve must not exceed 2 m.
- 2) The maximum height between the DX Battery and Expansion Valve must not exceed 2 m.
- 3) Outlet air / Inlet air / Liquid pipe / Gas pipe sensor lengths must not exceed 10 m maximum.
- 4) The line length between expansion valve and control box must not exceed 10 m maximum.
- 5) In addition to the amount of additional gas calculated for the liquid pipe, a 1 kg gas charge should be added to each 10 HP AHU capacity.

GUC-386Z-H

Qs=40HP

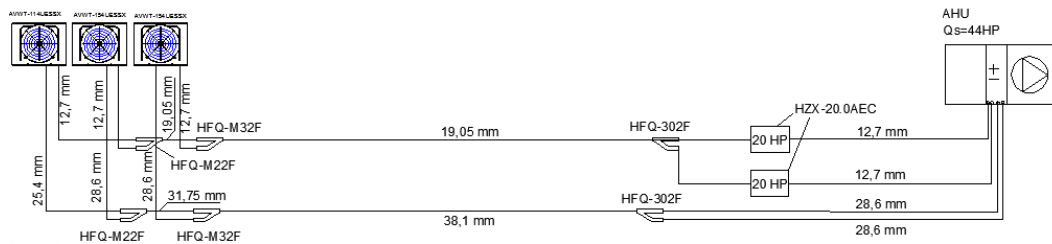


NOTICE:

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- 2) The maximum height between the DX Battery and Expansion Valve must not exceed 2 m.
- 3) Outlet air / Inlet air / Liquid pipe / Gas pipe sensor lengths must not exceed 10 m maximum.
- 4) The line length between expansion valve and control box must not exceed 10 m maximum.
- 5) In addition to the amount of additional gas calculated for the liquid pipe, a 1 kg gas charge should be added to each 10 HP AHU capacity.

GUC-420Z-H

Qs=44HP



NOTICE:

- 1) The maximum pipe length between the DX Battery-Expansion Valve must not exceed 2 m.
- 2) The maximum height between the DX Battery and Expansion Valve must not exceed 2 m.
- 3) Outlet air / Inlet air / Liquid pipe / Gas pipe sensor lengths must not exceed 10 m maximum.
- 4) The line length between expansion valve and control box must not exceed 10 m maximum.
- 5) In addition to the amount of additional gas calculated for the liquid pipe, a 1 kg gas charge should be added to each 10 HP AHU capacity.

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