

# **Ex-Proof HVAC User Manual (G1AH Series)**

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# 1 Product Specification

## 1.1 Model : G1AH-\*\*\*K-\*\*\*-\*\*\*

## 1.2 Rated Power

- G1AH-\*\*\*K-\*\*\*-35 : 3 Ph, 400 Vac, 50 Hz
- G1AH-\*\*\*K-\*\*\*-36 : 3 Ph, 400 Vac, 60 Hz
- G1AH-\*\*\*K-\*\*\*-45 : 3 Ph, 460 Vac, 50 Hz
- G1AH-\*\*\*K-\*\*\*-46 : 3 Ph, 460 Vac, 60 Hz

## 1.3 Power Consumption

- G1AH-030K : Cooling (R-407) – Max. 7 kW, Heating – Max. 7 kW
- G1AH-050K : Cooling (R-407) – Max. 11 kW, Heating – Max. 13 kW
- G1AH-070K : Cooling (R-407) – Max. 14 kW, Heating – Max. 13 kW
- G1AH-110K : Cooling (R-407) – Max. 20 kW, Heating – Max. 20 kW

## 1.4 Model Selection

G1AH – XXXK – XXX - XXX										
①	②		③		④		⑤		⑥	
MODEL	MAX COOLING CAPACITY (BTU/h)		HEATING TYPE		HEATING CAPACITY (W)		POWER SELECTION (Vac)		GAS GROUP	
G1AH	030	33,000	E	ELECTRIC HEATER	01	1,600 (030K 1,200)	35	400 / 50 Hz	B	IIB
	050	60,000	S	STEAM HEATER	02	3,200 (030K 2,400)	36	400 / 60 Hz	H	IIB + H2
	070	75,000			03	4,800 (030K 3,600)	45	460 / 50 Hz	C	IIC
	110	125,000			04	6,400 (030K 4,800)	46	460 / 60 HZ		
					05	8,000				
					06	9,600				
					07	11,200				
					08	12,800				
					09	14,400				
					00	0 or Steam				



## 2 Product Overview

### 2.1 Outline

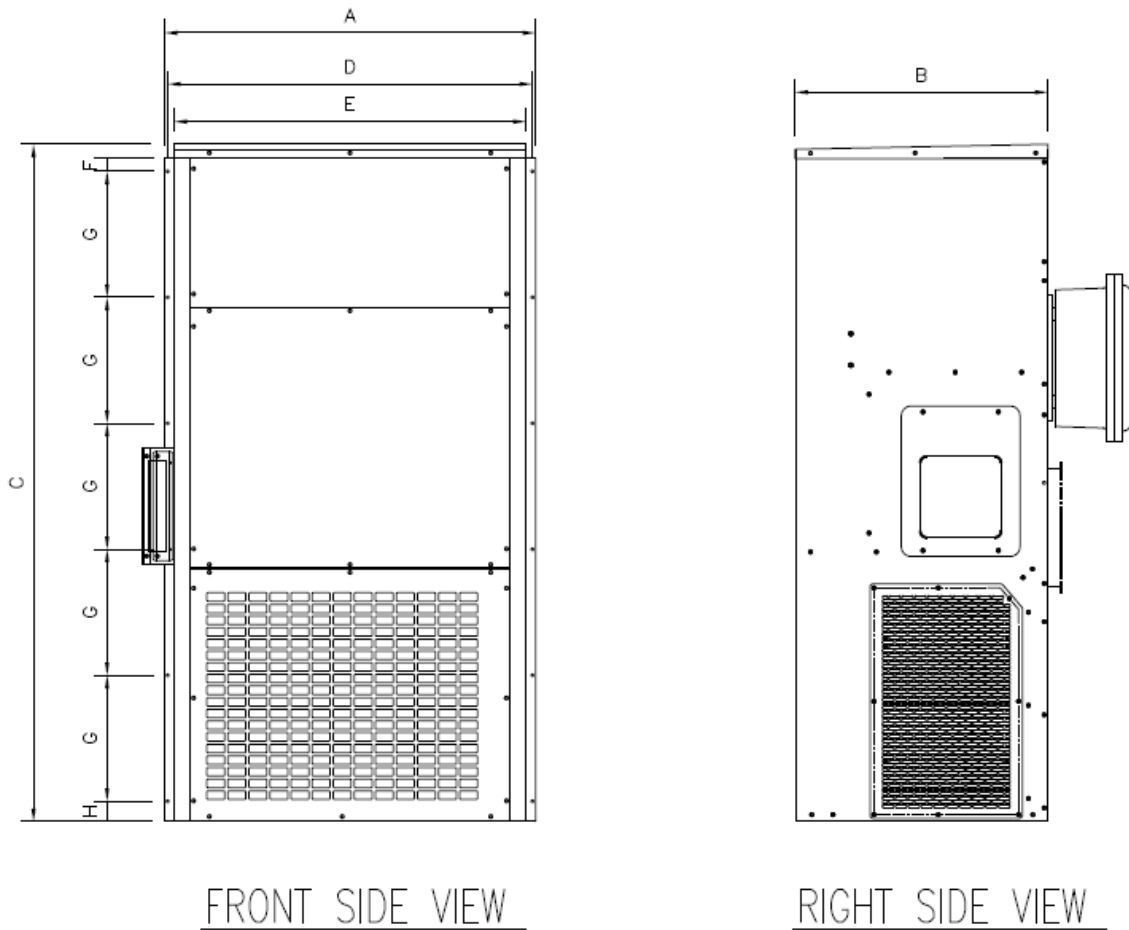
#### 2.1.1 HVAC Size & Cooling Capacity within 125,000 BTU/h

G1AH-030K-\*\*\*-\*\* : W)910 x H)1900 x D)700, 33,000 BTU/h

G1AH-050K-\*\*\*-\*\* : W)1180 x H)2150 x D)850, 60,000 BTU/h

G1AH-070K-\*\*\*-\*\* : W)1180 x H)2150 x D)850, 75,000 BTU/h

G1AH-110K-\*\*\*-\*\* : W)1180 x H)2350 x D)1050, 125,000 BTU/h



HVAC OUTLINE SIZE TABLE

ITEM	HVAC MODEL	A	B	C	D	E	F	G	H
1	G1AH-030K	910	700	1900	890	850	40	350	60
2	G1AH-050K, G1AH-070K	1180	850	2150	1160	1120	40	400	60
3	G1AH-110K	1180	1050	2350	1160	1120	40	400	60

Figure 2.1 HVAC OUTLINE SIZE DWG

**2.1.2 HVAC type: Electrical Heater type, number of heaters, Heating Capacity**

G1AH-030K-E\*\*-\*\*: GH-012, 0 to 4 heaters, Maximum 4,800 W

G1AH-050K-E\*\*-\*\*: GH-016, 0 to 6 heaters, Maximum 9,600 W

G1AH-070K-E\*\*-\*\*: GH-016, 0 to 6 heaters, Maximum 9,600 W

G1AH-110K-E\*\*-\*\*: GH-016, 0 to 9 heaters, Maximum 14,400 W

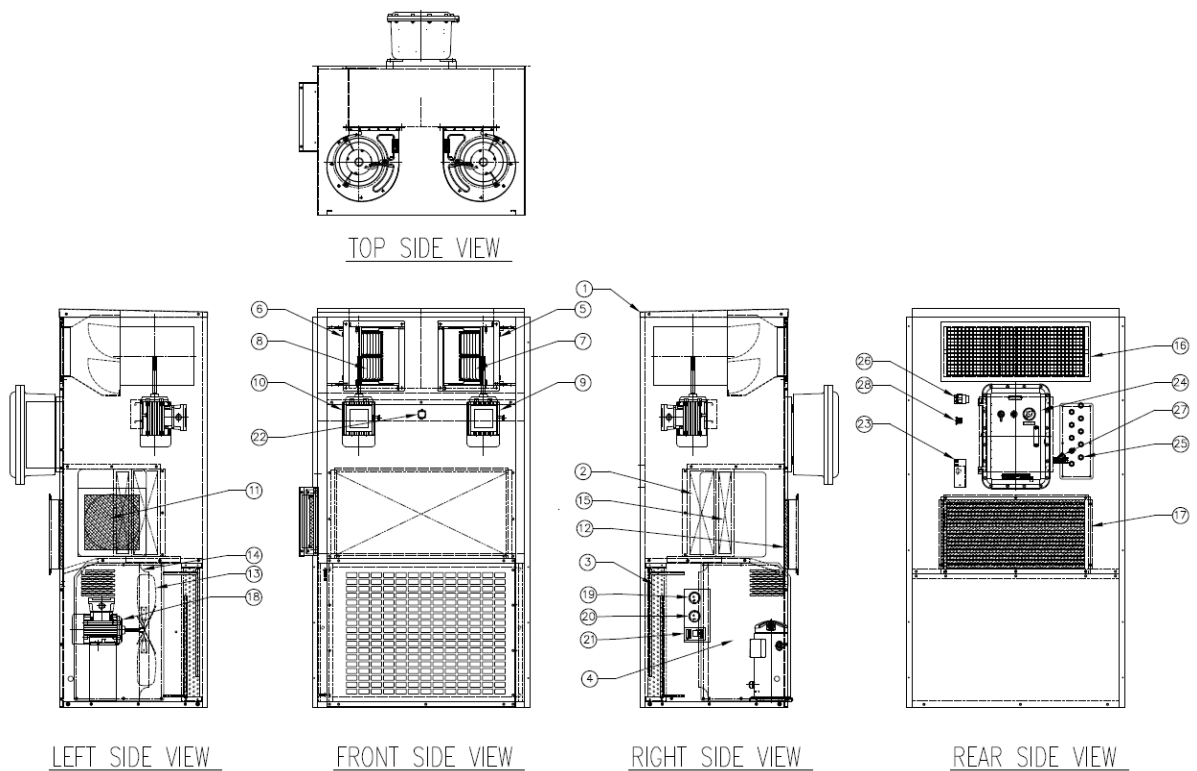
**2.1.3 HVAC Structure Material : SGCC (G.I. steel) or 304SS or 316SS**

**2.1.4 Protection Degree of Equipment.**

Air Inlet – IP21, Air Outlet – IP11, Compressor Junction Box – IP54

**2.2 Equipment**

**2.2.1 HVAC Configuration**



**Figure 2.2 HVAC Assembly DWG**

## 3 Cautions

If you open HVAC for installation, operation, maintenance of internal equipment and circuit, HVAC power should be turned off. When HVAC is open, don't supply power to HVAC.

- Do not change the equipment. Unauthorized changes affect the explosion properties.
- The prescriptions and regulations as well as the electrical data described in the type examination certificate must be obeyed.
- The prescriptions and regulations as well as the electrical data described in EU-(or EC) type examination certificate for individual parts must be obeyed.
- Besides the instruction for electrical installation in non-hazardous area per the applicable national or international standards, especially the standards of EN 60079-14 "Electrical installations in hazardous locations" and/or equivalent national standard must be obeyed.
- Installation and Maintenance are only allowed to be done by personnel who has a person competency in explosion safety.
- If HVAC be installed at hazardous area, you should note explosion protection requirement
- Secure enough space for maintenance of HVAC.
- For field connection by user, only suitably Ex certified cable gland and sealing fitting must be used.
- Condensate water of HVAC should be drained to outside.

## 4 Transportation and Installation

### 4.1 Transportation

When you carry the equipment, equipment should be carried carefully to protect the part, installed inside and outside.

If the equipment was laid on its side during transport, equipment should be stand straight for 24 hours before operating the equipment.

Keep the HVAC dry and free from direct sunlight. Storage temp range is -20 to 70°C

### 4.2 Installation

#### 4.2.1 General

Be aware of explosion requirements, if equipment is installed in hazardous area, Before installation, check stability of wall and floor.

The equipment should be installed vertically and float at least 50 mm from ground.

The equipment can be used without duct system. But duct size should not interfere airflow. If you install the duct outdoor, duct should be insulated more than 20 mm for efficiency.

To prevent from rain permeation, cover the gap between equipment and wall on connection area with silicon.

For field connections by user, only suitably certified Ex d cable gland and/or sealing fitting and/or blanking element must be used.

Internal ground is connected on ground terminal of inside. External ground should be connected to external ground. Ground wire size should be larger than 5.0 mm<sup>2</sup> for external, and equal or larger than cross sectional area of phase conductor (1.5 to 4.0 mm<sup>2</sup>) for internal. For connection of the grounding conductor a cable lug shall be used. The conductor shall be mounted so that it secured against loosening and twisting.

After installation and equipment commissioning test, for sealing fitting, fill compound to cable inlet before operating equipment.

**4.2.2 Mounting**

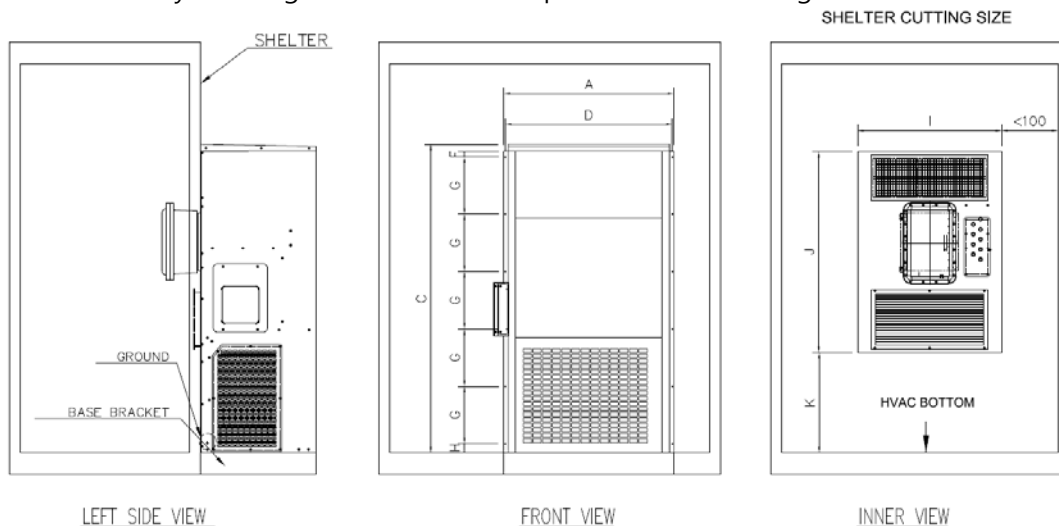
The HVAC should be installed outside of the shelter and cut one side so that it can suck and discharge the inside air. Refer to the table below for the model of the shelter cutting size and position. At the time of the shelter cutting, cut at least 100 mm away from the side wall.

For HVAC maintenance, a space of at least 500 mm should be secured.

After installing the HVAC on the outside of the shelter, fix it on the outside of the shelter with a 6mm bolt in the fixing hole on the left side of the HVAC.

The outside air should be sucked in the safety zone. For this purpose, it is generally necessary to install a stack so that the explosion area is more than 1 m away.

The Stack connects the user to the left or right outside suction of the HVAC. If it is not an explosion-proof area or it is not necessary to maintain the positive pressure in the room, block the outside air by blocking the external intake port without installing the stack.



HVAC OUTLINE & INSTALL SIZE TABLE (ALL DIM IN MIN)

ITEM	HVAC MODEL	A	B	C	D	E	F	G	H	I	J	K
1	G1AH-030K	910	700	1900	890	850	40	350	60	800	350	600
2	G1AH-050K, G1AH-070K	1180	850	2150	1160	1120	40	400	60	1000	1400	700
3	G1AH-110K	1180	1050	2350	1160	1120	40	400	60	1000	1550	750

**Figure 4.1 HVAC mounting DWG**



### 4.2.3 Wiring (User connection)

- **Power Connection, Entry ① or ②**

(1" NPT Cable gland or sealing fitting, II 2 G Ex db IIC)

R	: MCCB-R
S	: MCCB-S
T	: MCCB-T

- **Common Alarm Connection, Entry ③ or ④**

(1/2" NPT Cable gland or sealing fitting, II 2 G Ex db IIC)

Common	: R5
NO	: R6
NC	: R7

- **Steam Sol Valve Connection, Entry ⑥**

(1/2" NPT Cable gland or sealing fitting, II 2 G Ex db IIC)

24V+	: Q4
0V	: OV2

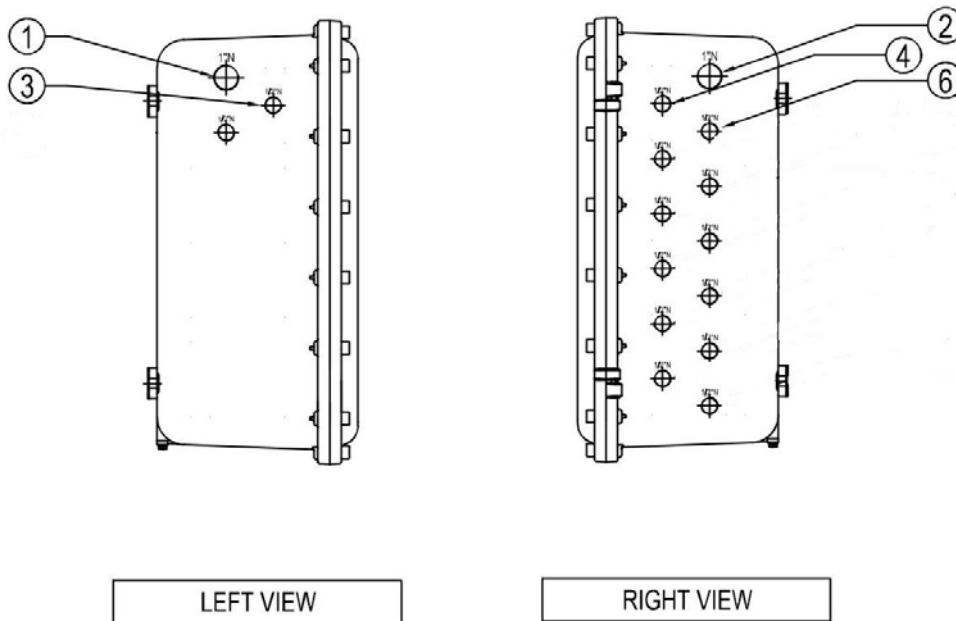


Figure 4.2 Cable entries location and type & size

## 5 Operation

### 5.1 General

Heating, Ventilating and Air Conditioning systems (HVAC) type G1AH-030K, G1AH-050K, G1AH-070K and G1AH-110K provide heating or cooling air in the shelter of explosive gas atmosphere of Zone 1 per IEC/EN 60079-10.

Ventilating operates by sucking indoor air from Inside suction and sucking outdoor air from outside suction, and discharging air to Inside Discharge area.

Heating is a function to increase the room temperature by using Electric Heater or Steam.

Model using electric heater is G1AH-\*\*\*K-E\*\* model.

Capacity can be selected according to room volume.

Maximum capacity is as follows.

G1AH-030K model can install up to four G1AH-012 (1,200 W) heaters (4,800 W).

G1AH-050K and G1AH-070K models can install G1AH-016 (1,600 W) heaters up to 6 (9,600 W).

G1AH-110K models can install G1AH-016 (1,600 W) heaters up to 9 (14,400 W).

Steam Heater model is G1AH-\*\*\*K-S00 model.

G1AH-030K model is using SC-2R8S steam heater coil and G1AH-050K, G1AH-070K and G1AH-110K models are using SC-2R11S steam heater coils. Maximum steam pressure, 0.5 MPa (159 °C) is allowed.

Air-Conditioning is a function to lower the room temperature by a cooling cycle using a compressor.

HVAC G1AH series is an integral model of indoor unit outdoor unit and it is filled with refrigerant (R-407c or R-134a).

HVAC G1AH series is an indoor unit outdoor unit model. Since the product is shipped with the refrigerant filled in the product, no preparation work is required.

G1AH-030K model uses the ZR34K, the G1AH-050K model uses the ZR61K, the G1AH-070K model uses the ZR81K, and the G1AH-110K model uses the ZR125K compressor.

### 5.2 Ventilating

Ventilating can keep the positive pressure in the room by sucking the outside air and supplying to the room.

Outside air should be taken from non-hazardous area. For this, it is generally recommended to install a stack which has an intake more than at least 1 m away from explosive gas atmosphere. The stack is user connection.

The stack is user connection. The stack can be connected to the left side (A) or right side (b) in figure 5.1. If it is not an explosive gas atmosphere of Zone 1 or it is not necessary to maintain the positive pressure in the room, block the outside air by blocking the external intake port without installing the stack.

There are two fans for ventilation. When power is applied, only one fan selected in the fan selector switch is operated and the other is standby.

The fan selector switch has three options: A / Auto / B. If Auto is selected, the fan is operated alternately every 12 hours.

If there is a problem on operating fan like low volume of supplying air which is monitored by the differential pressure switch or malfunction of a fan motor, automatically current operating fan is stopped and the fan on standby starts operating with alarm output.

### HVAC AIR DIRECTION

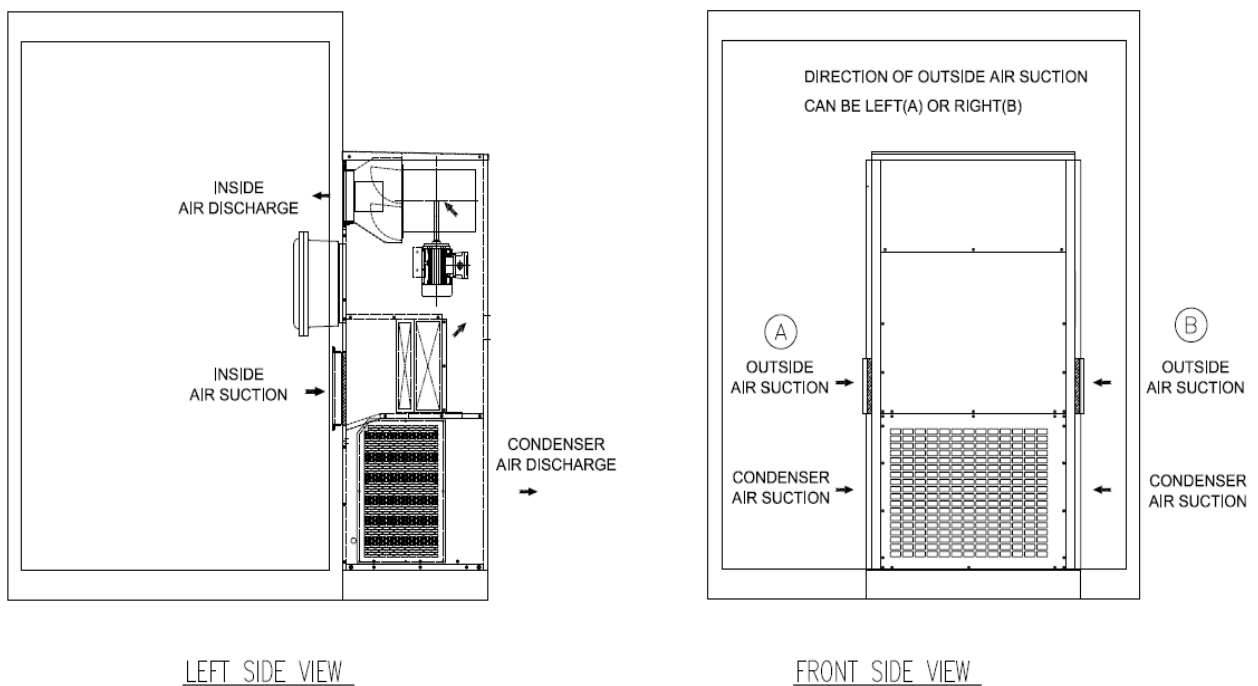
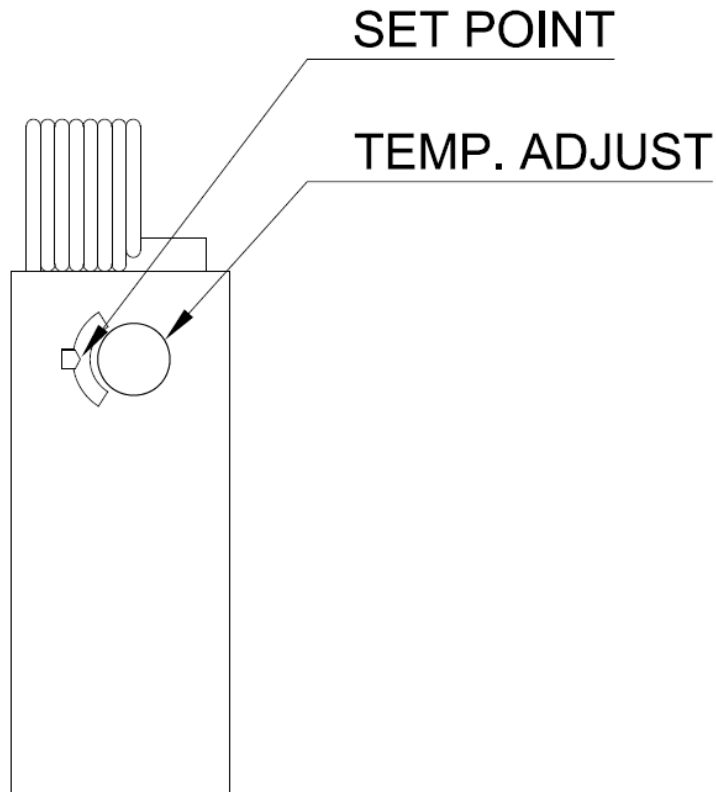


Figure 5.1 HVAC Air Direction

### 5.3 Temperature Setup

Use the Temperature controller to set the temperature for heating and cooling. The settable temperature is -1 to 40 °C.



**Figure 5.2 Thermostat**

- 1) Turn the dial to set the desired temperature.
- 2) Cooling is executed when the temperature of the thermostat is higher than the setting value and stops when the temperature becomes lower than 1.5 °C.
- 3) When the temperature is lower than the set temperature by 1.5 °C, the heater starts operation and heating operation starts.
- 4) Operation is stopped when the set temperature is rises by heating operation.

## 5.4 Cooling (Air-Conditioning) Operation

HVAC G1AH series is an integral model of indoor unit and outdoor unit and cooling circuit including a compressor and parts for cooling like evaporator coil and condenser coil, etc. is filled with refrigerant (R-407c or R-134a).

The indoor unit is located in the upper part of the HVAC and consists of Main Blower A, the Main Blower B, the Evaporator Coil and TEV.

The outdoor unit is located at the bottom part of the HVAC and consists of Compressor, Check Valve, Condenser Coil, Filter Drier, LP Gauge, HP Gauge, LP Switch, HP Switch and Low Pressure Filter.

Cooling is executed when the temperature of the thermostat is higher than the setting value and stops when the temperature becomes lower than 1.5 °C.

Default setting value is 23 °C and can be changed by the user.

- **Cooling cycle**

- 1) When the cooling signal is generated in the thermostat, the compressor compresses the refrigerant to make high temperature and high pressure liquid and send it to the condenser coil.
- 2) The condenser fan blows the condenser coil, which is heated by the high temperature refrigerant supply. The temperature of the heat exchanged refrigerant in the condenser coil is lowered.
- 3) The liquid refrigerant of high temperature and high pressure is vaporized by lowering the pressure through TEV, and the low temperature low pressure gas refrigerant is supplied to the evaporator coil.
- 4) The evaporator coil cooled by the low temperature refrigerant becomes very low temperature.
- 5) The main blower passes the suction air in the inside suction part and the outside suction part to the low temperature evaporator coil.
- 6) Air temperature passing through the evaporator coil is lowered and refrigerant temperature is increased.
- 7) The lowered temperature air discharged into the room to lower the room temperature.
- 8) The refrigerant whose temperature has risen through the heat exchange is recycled to the compressor and the cycle is repeated.

To protect the compressor, it operates after 3 minutes from the initial power-on.

To protect the compressor, it operates after 3 minutes from restarting after stopping.

Compressor downstream refrigerant pressure is set at 29 bar for the HP switch and 2 bar for the compressor front end two LP switch. The compressor stopped by safety devices automatically when it exceeds 29 bar or falls below 2 bar.

## 5.5 Heating Operation

Heating of HVAC G1AH series uses electric heater or steam coil.

Heating is allowed at an ambient temperature of **-20 °C to +40 °C**.

The electric heater setting temperature can be set up to 40 °C.

Heating is executed when the temperature of the thermostat is lower than the setting value and stops when the temperature becomes higher than 1.5 °C.

Default setting value is 23 °C and can be changed by the user.

- **Electric heater**

When a heating signal is generated from the thermostat, the electric heater is supplied with power and becomes hot.

The main blower sucks indoor and outdoor air and discharges hot air through the heat exchanger with electric heater.

- **Steam heater (Maximum pressure of steam : 0.5 MPa)**

When a heating signal is generated by the thermostat, a signal is generated to supply the steam. The user opens the solenoid valve according to the signal and supplies steam to the steam heater coils and becomes hot.

The main blower sucks in indoor and outdoor air and discharges the hot air to the room through heat exchange with the steam heater coils.

## 5.6 Protective Device

- 1) If the compressor discharge pressure rise more than standard (29 bar) during operating HVAC, pressure switch will receive signal and stop the compressor and send alarm signal.
- 2) If the compressor intake pressure is lower than standard (2 bar) during operating HVAC, pressure switch receive signal and stop the compressor and send alarm signal.
- 3) Main blower and condenser motor is equipped with a thermal protector for overheat protection. Thermal Protector Open/Close Temperature 130 + 5 °C.
- 4) If an alarm occurs on the switch measuring the differential pressure across the fan, stop the active blower fan and activate the standby blower fan. If both blower fans stop, HVAC stops the electric heaters and the compressor to prevent overheating (Interlocking) and send alarm signal to the user.
- 5) If steam heater is used, the user shall ensure closing the steam line by the solenoid valve or manual valve when alarm signal occurs (user scope).

## 6 Maintenance, repair and malfunction

- 1) Regarding maintenance, repair and malfunction, inquire to manufacturer when the operator is not able to handle (Contact point is written on external name plate).
- 2) Clean the filters which were placed on the upper side of the Inside Return Air and Fresh Air Suction.
- 3) When air flow alarms, check inside return filter and fresh air filter.  
If it's not the problem of filter, ask manufacturer.
- 4) When refrigerants' pressure high alarms because pressure of HP gauge indicates higher than 38 bar, remove the cause and push the Pressure Switch Reset. And then you may turn on the power of the HVAC.
- 5) When refrigerants' pressure high alarms because pressure of LP gauge indicates lower than 2 bar, turn on the power of the HVAC only after you remove the cause.

### 6.1 How to charge refrigerant

- 1) Check the Surroundings. When you are sure non-explosive condition, start to charge refrigerant.
- 2) Prepare Refrigerant(R-407c or R-134a), Manifold for charging refrigerant, and Electronic scale.
- 3) Connect manifold with HVAC, and then open low-pressure valve to remove remaining refrigerant in HVAC.
- 4) Close the low-pressure valve of manifold after removing remaining refrigerant.
- 5) Locate upside down refrigerant cylinder on electronic scale and connect manifold with service port. Then, make scale set to zero.
- 6) For flushing, make leakage of refrigerant for about 3 seconds by loosening high-pressure part of HVAC and opening high-pressure valve of manifold.
- 7) Open the high-pressure valve, charge the refrigerant (2.7 kg) and then, close the valve.
- 8) After turning on the air-conditioner of HVAC, open the low-pressure valve, and then charge refrigerant more 0.3 kg (totally 3.0 kg).
- 9) Uninstall manifold from HVAC.

## 7 NAME PLATE

- 1) Size : 110 x 90
- 2) Material : SUS304, 1.0 mm

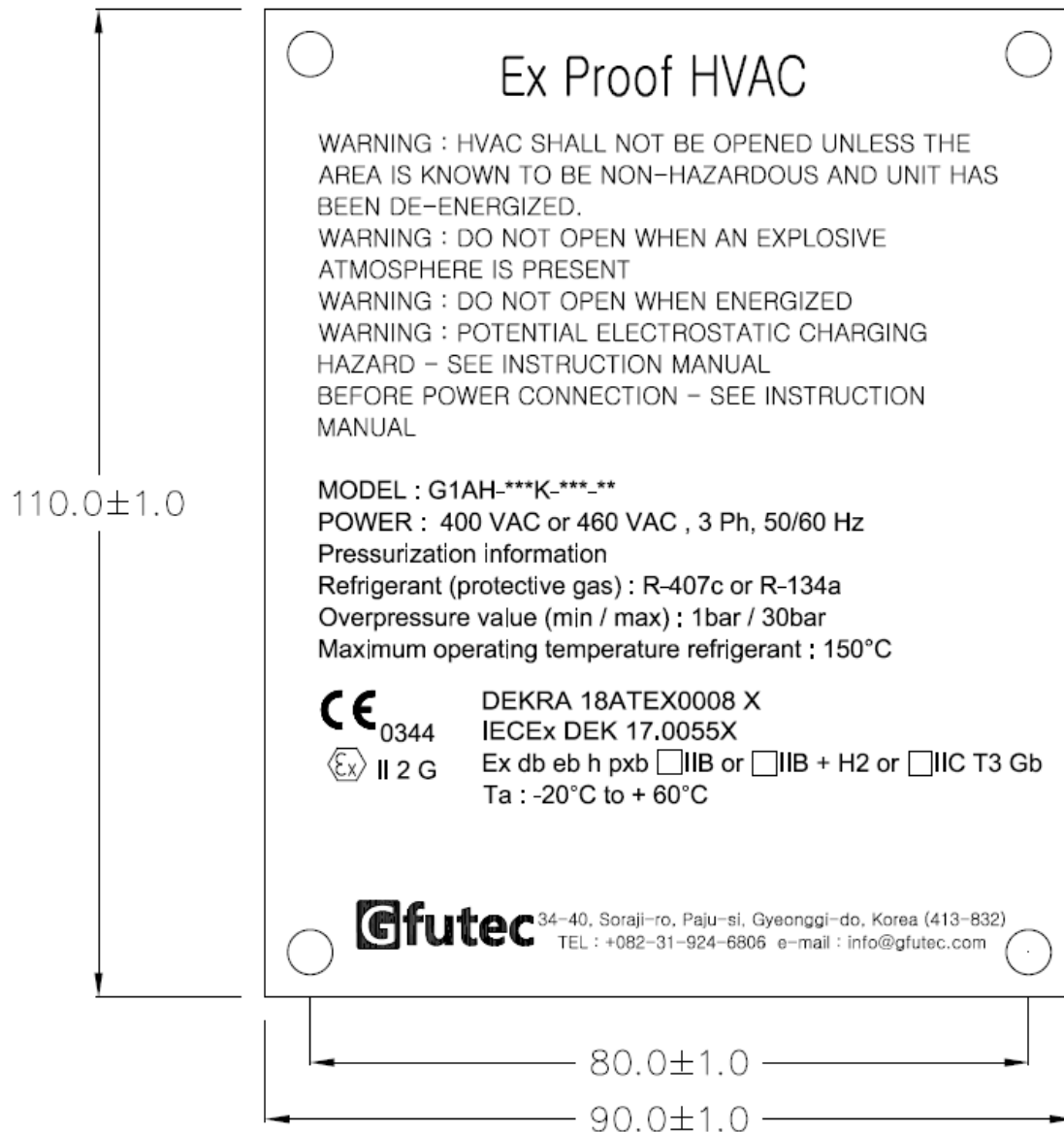


Figure 8.1 Name Plate