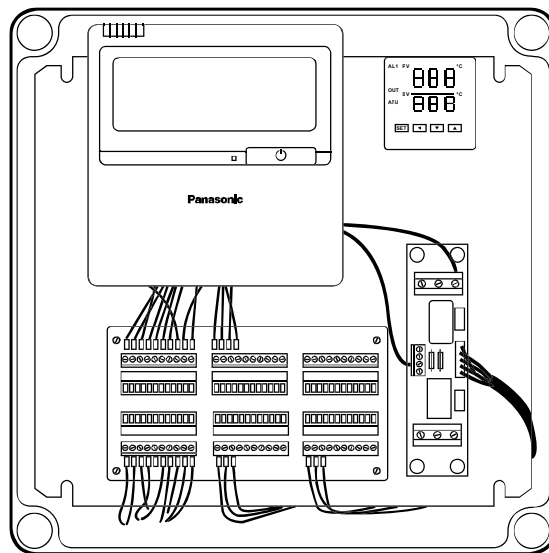


## Air Handling Unit Kit

### Installation Instructions





# **Air Handling Unit Kit**

## **Installation Instructions**

**Original Installation Instructions (English)**

**February 2016**

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# 1 General information and safety instructions

## 1.1 Introduction

This document contains the installation instructions for the Panasonic AHU Kits.

AHU Kits connect Panasonic ECOi, ECO G and PACi outdoor units to third-party air handling unit systems, using the same refrigerant circuit as the VRF system.

Application examples for Panasonic AHU Kits are hotels, offices, server rooms or all large buildings where air quality control such as humidity control and fresh air is needed.

Where information in this document does not apply to all three VRF system ranges, but only to either ECOi, ECO G or PACi systems, this will be indicated by the relevant product range logos:



The AHU Kits are supplied in three different product versions, "light", "medium" or "advanced", and can be selected based on the required functionality. The following products are covered in this documentation:

Product version	ECOi ECO G	PACi
Light	PAW-160MAH2L PAW-280MAH2L PAW-560MAH2L	PAW-280PAH2L
Medium	PAW-160MAH2M PAW-280MAH2M PAW-560MAH2M	PAW-280PAH2M
Advanced	PAW-160MAH2 PAW-280MAH2 PAW-560MAH2	PAW-280PAH2

The installation should be performed only by qualified electricians in strict accordance with the installation instructions and especially with the safety instructions given in this document.

The appliance is not to be used by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction. Children being supervised are not to play with the appliance.



### Important: Validity of this document

Due to the ongoing development and innovation of Panasonic products, this document and all the information contained herein is preliminary (as at February 2016). It may not reflect the current status of the relevant products. Preliminary or missing information will be updated and added on an ongoing basis and published at the discretion of Panasonic.

## 1.2 Structure and meaning of notices and symbols

### Safety notices

---



#### WARNING

This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

---



#### CAUTION

This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

---



#### NOTICE

This indicates a hazardous situation which, if not avoided, could result in property damage.

---

### Other notices

---



#### Important

This indicates other important information or references to other useful sources of technical data and descriptions.

---

## 1.3 Safety instructions



### WARNING

The following precautions need to be followed strictly, in order to avoid hazardous situations, which could result in death or serious injury.

---

#### **Electric shock or fire may result from inadequate or incorrect installation or wiring procedures.**

- ▶ System installation must only be performed by an experienced electrician.
- ▶ Arrange installation at the dealer where the system was purchased or use a professional installer.
- ▶ System installation must be performed in strict accordance to the installation procedures described in this document.

---

#### **Damage to the circuit breakers may result from incorrect electrical wiring, insufficient electrical circuit capacity or use with other electrical devices.**

- ▶ Always use a dedicated branch circuit for electrical wiring.
- ▶ Strictly avoid using other electrical devices within the same electrical circuit.
- ▶ Make sure the electrical circuit used has sufficient capacity.

---

#### **Overheating or fire may result if connections or attachments are not secure.**

- ▶ Use the specified cables (type and wiring diameter) for the electrical connections, and securely connect the cables.
- ▶ Run and fasten the cables securely so that external forces or pressure placed on the cables will not be transmitted to the connection terminals.

---

#### **Suffocation can result if refrigerant gas leaks and exceeds the limit density in a small room.**

- ▶ Installation of the refrigerant piping must only be performed by an experienced, qualified installer to minimize the risk of leaks.
- ▶ Install so that even if refrigerant gas leaks into the room, it will not exceed the limit density of 0.44 kg/m<sup>3</sup>, in accordance with the local regulations for facility air conditioning equipment.
- ▶ If the refrigerant gas concentration does exceed the limit density, do one of the following:
  - install an opening in a neighbouring room
  - or install ventilation equipment triggered by gas leak detection sensors
  - or install an automatic pump-down system provided by the manufacturer of the equipment

---

#### **Poisonous gas can result if refrigerant gas comes into contact with fire.**

- ▶ After installation of refrigerant pipes, perform a dry nitrogen gas sealing test to check that there are no leaks.
- ▶ Ventilate the work area if refrigerant gas leaks during installation.



- ▶ Prevent the refrigerant gas from coming into contact with a fan heater, stove, range, or other source of fire.

---

**Incorrect installation can result in falling equipment causing damage, injuries or other accidents.**

- ▶ Install in a location that is fully strong enough to support the weight of the equipment.
- ▶ Perform installation that is secure enough to withstand earthquakes, whirlwinds, storms and other strong winds.

---

**Frostbite injuries may result from coming into direct contact with the refrigerant gas.**

- ▶ When handling refrigerant gas, be careful not to touch the refrigerant gas directly.



### CAUTION

The following precautions need to be followed strictly, in order to avoid hazardous situations, which could result in minor or moderate injury.

---

**Electric shock, shock and fires may result from incomplete grounding of the equipment or failure to install an earth leakage breaker.**

- ▶ Be sure to ground equipment properly.
- ▶ Do not attach ground wires to gas pipes, water pipes, lightning arresters, or telephone ground lines.
- ▶ Always install an earth leakage breaker.

---

**Ignition of flammable gas or inflammable materials may result from installing the system in locations where flammable gas can generate, enter, build up, or leak.**

- ▶ Do not install the system in locations where flammable gas can occur in any way.
  - ▶ Do not install in locations where volatile inflammable materials are handled.
- 

## 1.4 Warranty policy

We can be held responsible for the quality and performance of the AHU Kit we supply.

However, we cannot be held responsible for the performances, operations and machine controls of your complete AHU system which incorporates our AHU Kit, nor for the components used in the refrigerant cycle of your AHU system (including, but not limited to, compressors, high-pressure switches, check valves, strainers, expansion valves, solenoid valves, 4-way valves, capillary tubes, accumulator tanks, and heat exchanger tubes), nor for any damages and defects caused in the process of installing our AHU Kit, by the system design and/or during assembly of your AHU system.

We do not publish the certificate to show conformity to the EMC and the product safety requirements applicable to your complete AHU system.

## 2 Ventilation theory and air handling units

### 2.1 Purpose of air-conditioning

The purpose of air-conditioning is to provide comfortable indoor air conditions for the room occupants and to provide energy saving potentials for the owner.

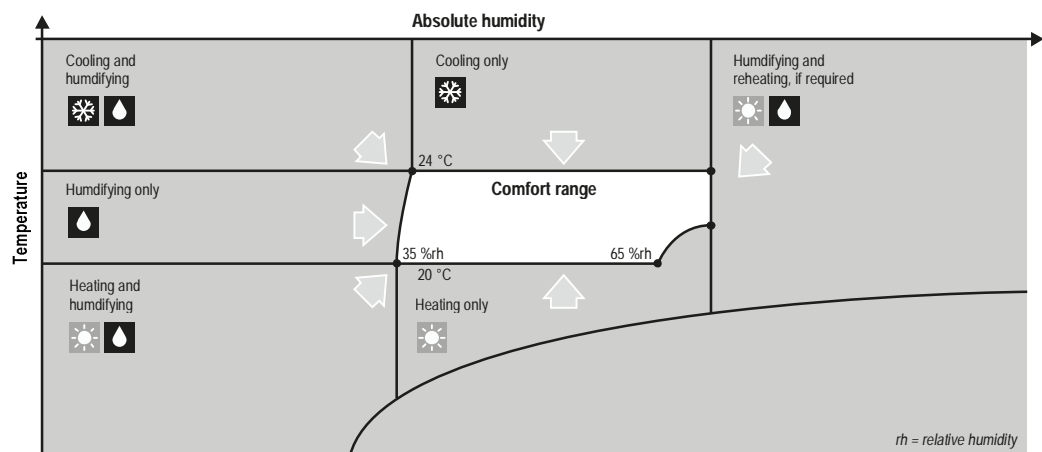
#### Comfort

If room occupants feel “comfortable” in a given room, depends mainly on the following two factors:

- air temperature
- relative air humidity

However, optimum working or living conditions do not only exist at a specific setpoint of room temperature and room humidity, but also within a certain band width of the setpoint.

A temperature setpoint of 22 °C and a relative humidity setpoint of 45 % with variations of  $\pm 2$  °C and  $\pm 15$  %rh respectively are typical levels used for office spaces. Also, at high temperatures, maximum limitation of absolute humidity should be provided to avoid “muggy” conditions. Typically, this limit value lies at about 10 g/kg (H<sub>2</sub>O).



#### Energy savings

Besides the advantages in terms of indoor air quality, air conditioning offers also an energy saving potential. For example, while uncontrolled ventilation through open windows leads to large amounts of heat being lost to the outside during the heating season or gained from the outside during the cooling season, air conditioning systems provide possibilities to utilize the extra “free” energy in heat recovery modules so that overall operating costs will be reduced.

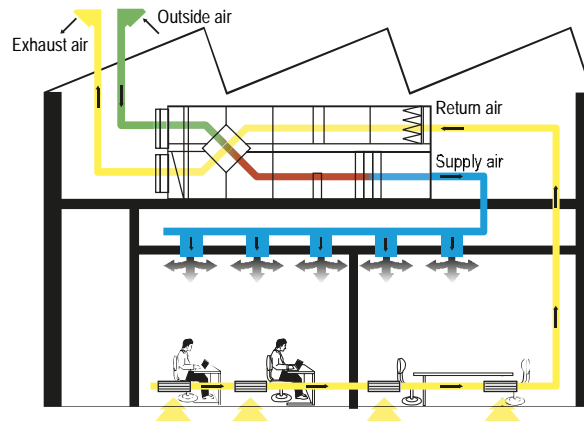
The larger the area of the comfort range, the better the energy saving opportunities.

## 2.2 Mechanical ventilation systems

### Main components of mechanical ventilation systems

The main components of a mechanical ventilation system are the following:

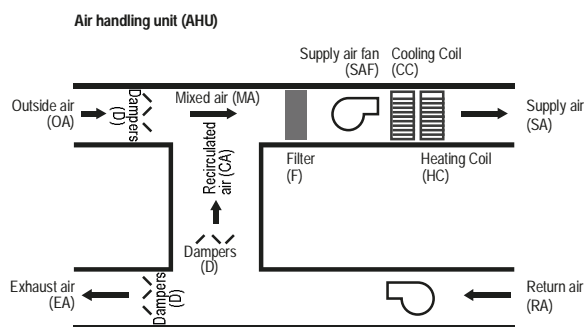
- Air handling unit (AHU)
- Air ducts
- Air distribution elements



## 2.3 Air handling units

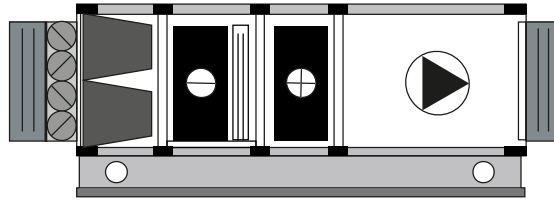
### Main components of air handling units

The main components of an air handling unit are shown in the following graphic.

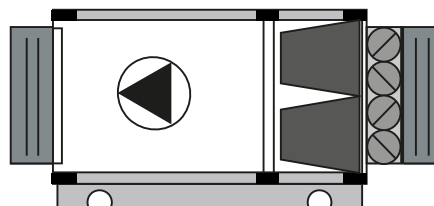


## Main types of air handling units

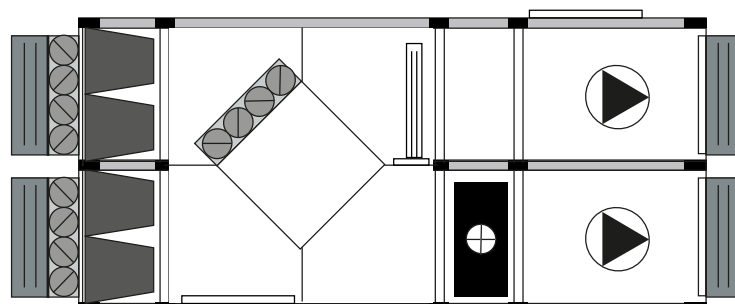
### Supply type



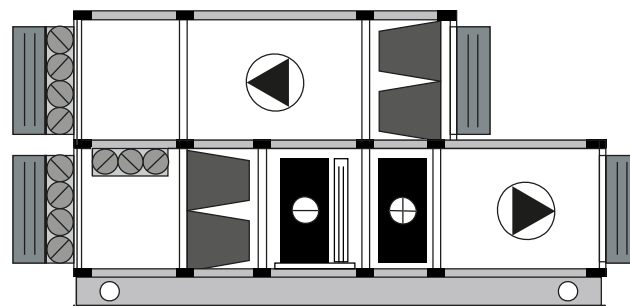
### Exhaust type



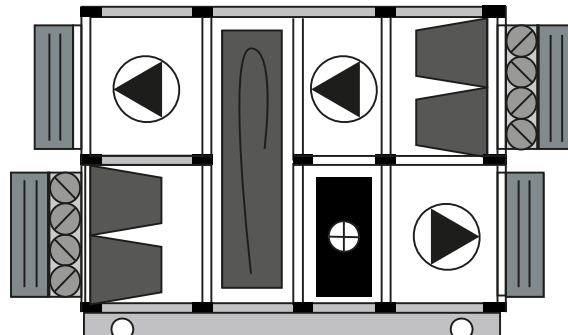
### Supply/Exhaust type with cross-flow heat exchanger



### Supply/Exhaust type with mixing chamber



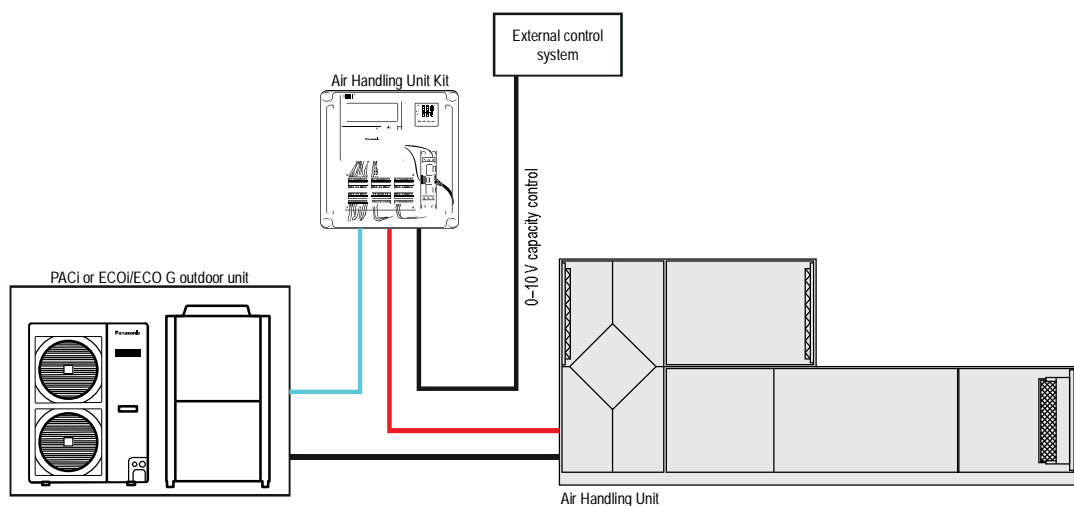
### Supply exhaust type with rotary heat exchanger



### Connecting AHU systems via the AHU Kit to ECOi/ECO G or PACi outdoor units

The following graphic shows an example for connecting a third-party air handling unit via the Panasonic AHU Kit to Panasonic ECOi/ECO G or PACi outdoor units.

#### Demand control on the outdoor unit managed by external 0–10 V signal



- 1 This schematic layout applies to the advanced and medium AHU Kit versions only, because they feature an in-built CZ-CAPBC2 interface handling the 0–10 V control. This enables two control alternatives:
  - Capacity control through external BMS via 0–10 V signal
  - Capacity control through in-built supply air or ambient temperature sensor (only available with advanced version)
- 2 As the “light” version of the AHU Kit does not include an in-built CZ-CAPBC2 interface for handling the 0–10 V control, this schematic layout does not apply to the “light” AHU Kit version.

## 3 Product description

### 3.1 General description

The Panasonic AHU Kits offer a wealth of connectivity possibilities so that they can be easily integrated into many systems.

The new AHU Kit has been developed to better meet customer demand:

- Three versions available depending on the required functionality (light, medium or advanced version)
- IP65 enclosure providing the possibility for outdoor installation
- 0–10 V demand control (included on the CZ-CAPBC2 interface)\*
- Easy control by BMS

\* Only available with all ECOi units and with PACi Elite units from 6 kW up to 25 kW.







#### Features and benefits

Depending on the AHU Kit version, the devices offer the following features and benefits:

Features and benefits	Version		
	Light	Medium	Advanced
Connectable with P-LINK system.	X	X	X
Fan control signal from the PCB can be used for controlling the air volume of an external fan (High/Mid/Low and LL for Th-OFF) (Need to change the fan control circuit wiring at field.)	X	X	X
Defrost operation signal, Thermo-ON/OFF states output	X	X	X
Drain pump control (Drain-pump and the float switch to be field-supplied)	X	X	X
Basic humidifier control output (Humidifier to be field-supplied)	X	X	X
Alarm and operation output	X	X	X
The system is controlled by the air intake (or room return air) temperature in the same way as a standard indoor unit. Selectable modes: Automatic / Cooling / Heating / Fan / Dry (equivalent to Cooling).	X	X	X
Easy integration into BMS or AHU control systems using demand control: 40 to 115 % (5 % steps) of nominal current by 0–10 V input signal	–	X	X
Temperature set point adjustment by external control system using 0–10 V or 0–140 Ohm signal	–	X	X
Room supply air temperature can be controlled by the additional thermostat, its supply air temperature sensor and the 0–10 V input signal for enhanced comfort and efficiency	–	–	X
Target temperature setting based on ambient temperature with CZ-CAPBC2 interface using 0–10 V signal	–	–	X

## 3.2 Scope of supply

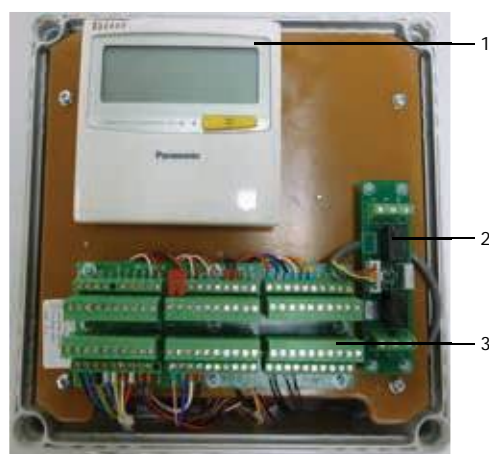
The scope of supply of the AHU Kits depends on the product version (light, medium or advanced) and on the relevant VRF system range. The following table shows an overview of the different scopes of supply.

Scope of supply	Version					
	Light		Medium		Advanced	
	ECO  ECO G	PAC 	ECO  ECO G	PAC 	ECO  ECO G	PAC 
	PAW-160MAH2L PAW-280MAH2L PAW-560MAH2L	PAW-280PAH2L	PAW-160MAH2M PAW-280MAH2M PAW-560MAH2M	PAW-280PAH2M	PAW-160MAH2 PAW-280MAH2 PAW-560MAH2	PAW-280PAH2
IP65 case	X	X	X	X	X	X
Control unit including transformer	X	X	X	X	X	X
Relays	X	X	X	X	X	X
Terminal boards	X	X	X	X	X	X
Remote controller (CZ-RTC2 / CZ-RTC4*)	X	X	X	X	X	X
PCB for T10 connection (PAW-T10)	X	X	–	–	X	X
Expansion valve	X	–	X	–	X	–
PCBs for the expansion and RAP / SVK valves	X	–	X	–	X	–
Refrigerant temperature sensors	E1 + E3	X	X	–	X	–
	E1 + E2	–	X	X	–	X
Air intake and air outlet temperature sensors	TA	X	X	X	X	X
	BL	X	X	–	X	–
CZ-CAPBC2 interface for 0-10 V control (ACC-SP1A)	–	–	X	X	X	X
Thermostat (TR-16 / TR-17*) including an additional temperature sensor to be used either for room supply air or ambient air temperature	–	–	–	–	X	X

\* Depending on AHU Kit generation.

The heat exchanger, fan and fan motor must be field-supplied.

### Exterior view of AHU Kits and some of their components



#### Light version: PAW-280PAH2L\*

- 1 Remote controller (CZ-RTC2 / CZ-RTC4)
- 2 External signal control PCB (PAW-T10)
- 3 Terminal board with 6 connectors

\* Shown as an example and with transparent front cover removed.

#### PACi accessories



Thermistor x2  
(Refrigerant: E1, E2)



Thermistor  
(Air: TA)



**Medium version: PAW-280PAH2M\***

- 1 Remote controller (CZ-RTC2 / CZ-RTC4)
- 2 Terminal board with 6 connectors
- 3 CZ-CAPBC2 interface (on rear side)

\* Shown as an example and with transparent front cover removed.

**PACi accessories**



Thermistor x2  
(Refrigerant: E1, E2)



Thermistor  
(Air: TA)



**Advanced version: PAW-560MAH2\***

- 1 Remote controller (CZ-RTC2 / CZ-RTC4)
- 2 Thermostat (TR-16/TR-17)
- 3 External signal control PCB (PAW-T10)
- 4 Terminal board with 6 connectors
- 5 CZ-CAPBC2 interface (on rear side)

\* AHU Kit shown with transparent front cover removed.

**ECOi / ECO G accessories**



Thermistor x2  
(Refrigerant: E1, E3)



Thermistor x2  
(Air: TA, BL)



Expansion  
valve

**Control functions provided as standard by integral components**

**CZ-RTC2 / CZ-RTC4 Timer remote controller**

- Operation-ON/OFF
- Mode selection
- Temperature setting
- Parameter settings

**TR-16 / TR-17 Additional Thermostat (advanced version only)**

- Target temperature setting based on ambient temperature with proportional integral logic\*
- Demand control based on room supply air temperature to enhance comfort and efficiency\*

\* Only one of these two options can be chosen at a time.



**CZ-CAPBC2 Mini seri-para I/O unit (medium and advanced versions only)**

- Easy integration in external AHU control systems and BMS
- Demand control: 40 to 115 % (5 % steps) of nominal current by 0–10 V input signal<sup>1</sup>
  - » Medium version: Terminal M2-2; M2-3. Advanced version: Terminal M2-1; M2-2.
- Target temperature setting by 0–10 V or 0–140 Ω input signal<sup>1</sup>
  - » Medium and advanced versions: Terminal M2-3; M2-4.
- Suction air temperature (TA sensor) output by 4–20 mA signal
  - » Medium version: Terminal PT9; PT10. Advanced version: Terminal M2-1; M2-2.
- Mode select and/or ON/OFF control<sup>2</sup>
  - » Medium and advanced versions: Terminal DI1; DI2; DI3; COM.
- Fan operation control<sup>2</sup>
  - » Medium and advanced versions: Terminal DI1; DI2; DI3; COM.
- Operation status output/ Alarm output
  - » Medium and advanced versions: Terminal COM; DO1 / COM; DO2.
- Thermostat ON/OFF control<sup>2</sup>
  - » Medium and advanced versions: Terminal DI1; DI2; DI3; COM.

1 Demand control by external BMS cannot be combined with the demand control or target temperature setting accomplished by the thermostat. However, if simultaneous demand control and target temperature setting is needed, this can only be achieved by using a second (optional) CZ-CAPBC2 interface.

2 Mode select and/or ON/OFF control cannot be combined with fan operation control nor Thermostat ON/OFF control. However if simultaneous control of 2 options is needed, this can be achieved by using a second (optional) CZ-CAPBC2 interface. All 3 options cannot be used at the same time.

**PAW-T10 PCB to connect to T10 connector (light and advanced versions only)**

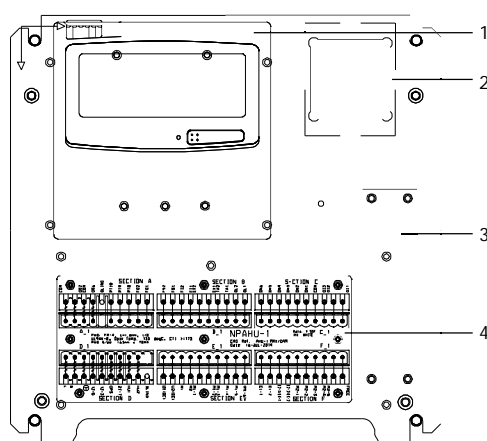
- Dry contact PCB for easy control of the unit
- Operation ON/OFF input signal
  - » PAW-T10 terminal I(1); I(2).
- Remote control prohibition
  - » PAW-T10 terminal I(3); I(4).
- Operation ON status output signal, maximum 230 V / 5 A (NO/NC)
  - » PAW-T10 terminal NC O(5); NO O(6); Potential for both O(7).
- Alarm status output signal, maximum 230 V / 5 A (NO/NC)
  - » PAW-T10 terminal NC O(8); NO O(9); Potential for both O(10).

**PAW-OCT, DC12 V outlet, OPTION terminal**

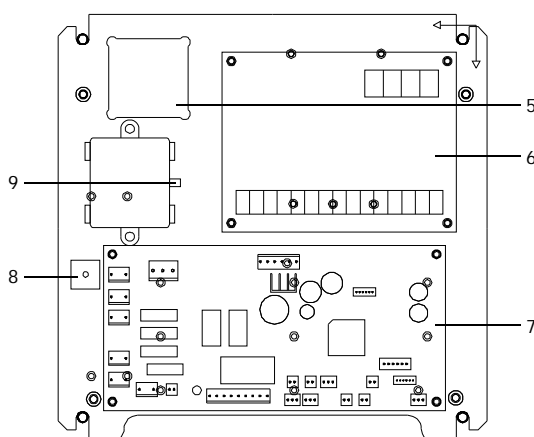
- Output signal for Cooling/Heating/Fan status
  - » Terminal ON4; ON5; ON6; Potential ON1.
- Output signal for Defrost operation indication
  - » Terminal ON2; Potential ON1.
- Output signal for Thermostat-ON status
  - » Terminal ON3; Potential ON1.

**Additional contacts available**

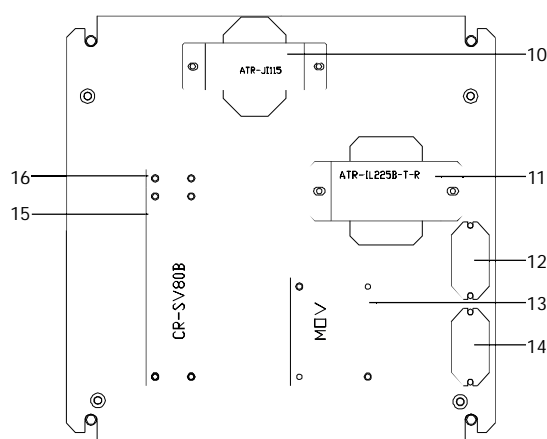
- External humidifier control (ON/OFF) 230 V AC 3 A
  - » Terminal HU1; HU2.
- External fan control (ON/OFF) 12 V DC
  - » Terminal FD1; FD2.
- External filter status signal potential free
  - » Terminal FI1; FI2.
- External float switch signal potential free
  - » Terminal FS1; FS2.
- External leakage detection sensor or TH. OFF contact potential free (possible usage for external blow out temperature control)
  - » Terminal EX1; EX2

**Mounting boards****Upper mounting board – front side**

- 1 Remote controller (CZ-RTC2 / CZ-RTC4)
- 2 Thermostat (TR-16 / TR-17)<sup>1</sup>
- 3 External signal control PCB (PAW-T10)<sup>1</sup>
- 4 Terminal board with 6 connectors (labelled Section A to Section F) each with 20 contacts<sup>2</sup>

**Upper mounting board – rear side**

- 5 Pocket for thermostat
- 6 CZ-CAPBC2 interface for 0-10 V control (PCB name: ACC-SP1A)<sup>1</sup>
- 7 Main control board (PCB name: CR-UXXP71B-P)
- 8 Terminal for upper mounting board
- 9 EMC filter<sup>1</sup>



### Lower mounting board

- 10 Auxiliary transformer<sup>1</sup>
- 11 Transformer
- 12 Relay
- 13 Single motorized valve PCB<sup>1</sup>
- 14 Relay
- 15 Single RAP valve control PCB<sup>3</sup>
- 16 Double RAP valve control PCB<sup>3</sup>

- 1 Not available in all versions.
- 2 For details see "5.4 Terminal block layout".
- 3 Depending on the model used, the single RAP valve control PCB (15) or double RAP valve control PCB (16) is mounted in this position.

### 3.3 System lineup



#### System lineup – ECOi systems

Capacity		Outdoor unit combination			AHU Kit combination		
HP	kW						
5	16	all ECOi outdoor units			PAW-160MAH2(L/M) <sup>1</sup>	–	–
10	28	all ECOi 2-pipe outdoor units			PAW-280MAH2(L/M) <sup>2</sup>	–	–
20	56	U-20ME1E81	–	–	PAW-560MAH2(L/M) <sup>3</sup>	–	–
30	84	U-16ME1E81	U-14ME1E81	–	PAW-560MAH2(L/M) <sup>4</sup>	PAW-280MAH2(L/M)	–
40	112	U-20ME1E81	U-20ME1E81	–	PAW-560MAH2(L/M) <sup>4</sup>	PAW-560MAH2(L/M)	–
50	140	U-18ME1E81	U-16ME1E81	U-16ME1E81	PAW-560MAH2(L/M) <sup>4</sup>	PAW-560MAH2(L/M)	PAW-280MAH2(L/M)
60	168	U-20ME1E81	U-20ME1E81	U-20ME1E81	PAW-560MAH2(L/M) <sup>4</sup>	PAW-560MAH2(L/M)	PAW-560MAH2(L/M)

1 PAW-160MAH2(L/M):

- PAW-160MAH2(L/M) can be installed in combination with all ECOi 2-pipe and 3-pipe outdoor units like any other standard indoor unit.
- Mixed installation with standard indoor units is possible. However, in this case one additional RAP valve (CZ-P160RVK2) must be installed in the unit connection pipe, unless the unit is exclusively used in cooling only operation.

2 PAW-280MAH2(L/M):

- PAW-280MAH2(L/M) can be installed in combination with all ECOi 2-pipe outdoor units like any other standard indoor unit.
- Mixed installation with standard indoor units is possible. However, in this case two additional RAP valves (2 x CZ-P160RVK2) must be installed in the unit connection pipe, unless the unit is exclusively used in cooling only operation.
- Connection to ECOi 3-way systems is not allowed.

3 PAW-560MAH2(L/M):

- Mixed installation with standard indoor units is not allowed.
- Connection to ECOi 3-way systems is not allowed.

4 In case of a multiple AHU Kit combination within one refrigerant system, those kits must share the same AHU housing including fan, and they have to be "group-wired" and operate as a single group. In this case you have to disconnect the included remote controllers and CZ-CAPBC2 boards (ACC-SP1A PCB) except for one each. It is irrelevant which one is retained, there is no preference. The external connections need to be done only on the unit with the connected CZ-CAPBC2 board.

**Note:** In this particular case it is even possible to combine a single advanced or medium version with one or two light versions, and still have full functions of the advanced or medium version respectively.

**ECO G System lineup – ECO G systems**

Capacity		Outdoor unit	AHU Kit
HP	kW		
5	16	all ECO G outdoor units	PAW-160MAH2(L/M) <sup>1</sup>
10	28	all ECO G outdoor units	PAW-280MAH2(L/M) <sup>2</sup>
20	56	U-20GE2E5 or U-25GE2E5 or U-30GE2E5	PAW-560MAH2(L/M) <sup>3</sup>

- PAW-160MAH2(L/M):
  - PAW-160MAH2(L/M) can be installed in combination with all ECO G outdoor units like any other standard indoor unit.
  - Mixed installation with standard indoor units is possible. However, in this case one additional RAP valve (CZ-P160RVK2) must be installed in the unit connection pipe, unless the unit is exclusively used in cooling only operation or in a 3-way system with heat recovery box.
- PAW-280MAH2(L/M):
  - PAW-280MAH2(L/M) can be installed in combination with all ECO G outdoor units like any other standard indoor unit.
  - Mixed installation with standard indoor units is possible. However, in this case two additional RAP valves (2 x CZ-P160RVK2) must be installed in the unit connection pipe, unless the unit is exclusively used in cooling only operation or in a 3-way system with heat recovery box.
- PAW-560MAH2(L/M):
  - Mixed Installation with standard indoor units is possible. However, in this case further restrictions will apply. For details, please contact your local Panasonic service partner.
  - Connection to ECO G 3-way systems is not allowed.

**PACi System lineup – PACi systems**

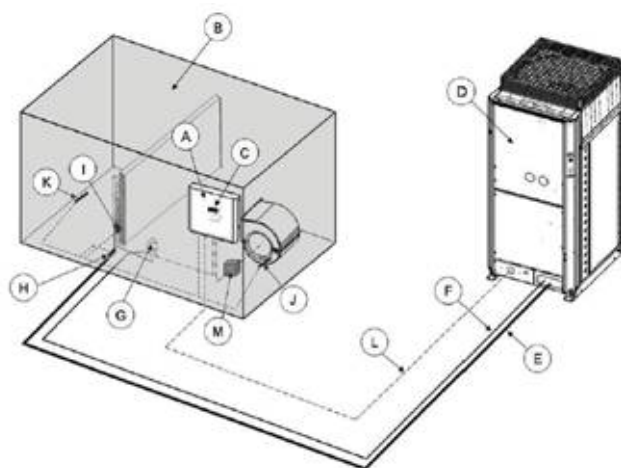
Capacity (kW)	Outdoor unit <sup>1</sup>				AHU Kit
	PACi Standard		PACi Elite		
	Single-phase units	Three-phase units	Single-phase units	Three-phase units	
5.0	–	–	U-50PE1E5	–	PAW-280PAH2(L/M) <sup>2</sup>
6.0	U-60PEY1E5	–	U-60PE1E5A	–	
7.1	U-71PEY1E5	–	U-71PE1E5A	U-71PE1E8A	
10.0	U-100PEY1E5	U-100PEY1E8	U-100PE1E5A	U-100PE1E8A	
12.5	U-125PEY1E5	U-125PEY1E8	U-125PE1E5A	U-125PE1E8A	
14.0	–	U-140PEY1E8	U-140PE1E5A	U-140PE1E8A	
20.0	–	–	–	U-200PE1E8	
25.0	–	–	–	U-250PE1E8	

- With PACi systems, only 1-to-1 installations are allowed (1 x PACi outdoor unit + 1 x PAW-280PAH2(L/M)). Combinations with more than 1 outdoor unit or more than 1 AHU Kit are not possible.
- Mixed installation with standard indoor units is not allowed.

### 3.4 System Overview

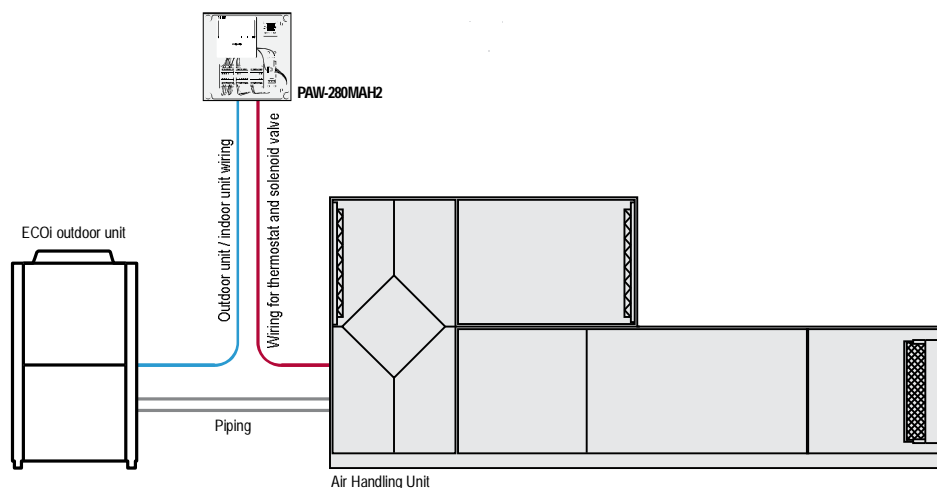
#### **ECO*i*** System Overview – ECOi systems

##### Single-connection system

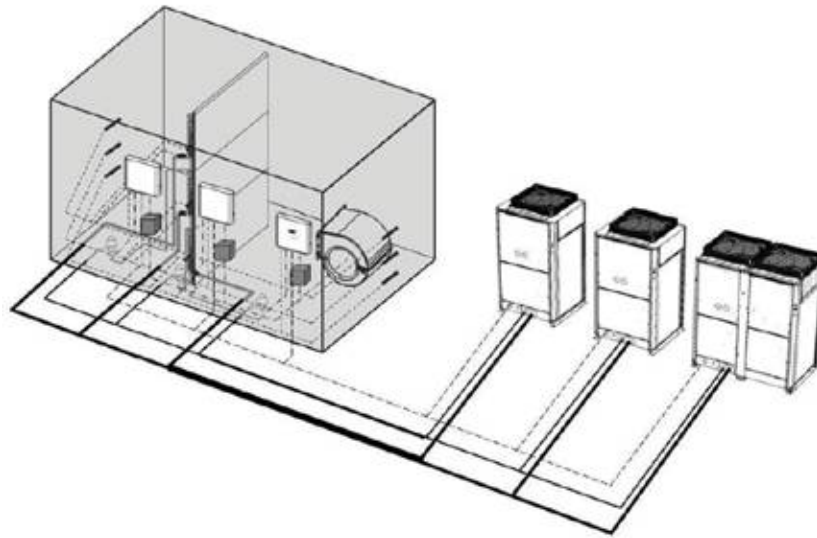


- |   |   |   |  |
|---|---|---|--|
| A | AHU Kit enclosure (complete)                        | H | Thermistor for liquid pipe                               |
| B | AHU system (field supplied)                         | I | Thermistor for gas pipe                                  |
| C | Remote controller (integrated in AHU Kit enclosure) | J | Thermistor for suction air                               |
| D | Outdoor unit  | K | Thermistor for discharge air                             |
| E | Liquid piping (field supplied)                      | L | Inter-unit wiring  |
| F | Gas piping (field supplied)                         | M | Magnetic relay for operating the blower (field supplied) |
| G | Electronic expansion valve                          |   |  |

##### System example for ECOi single-connection system



## Multi-connection system



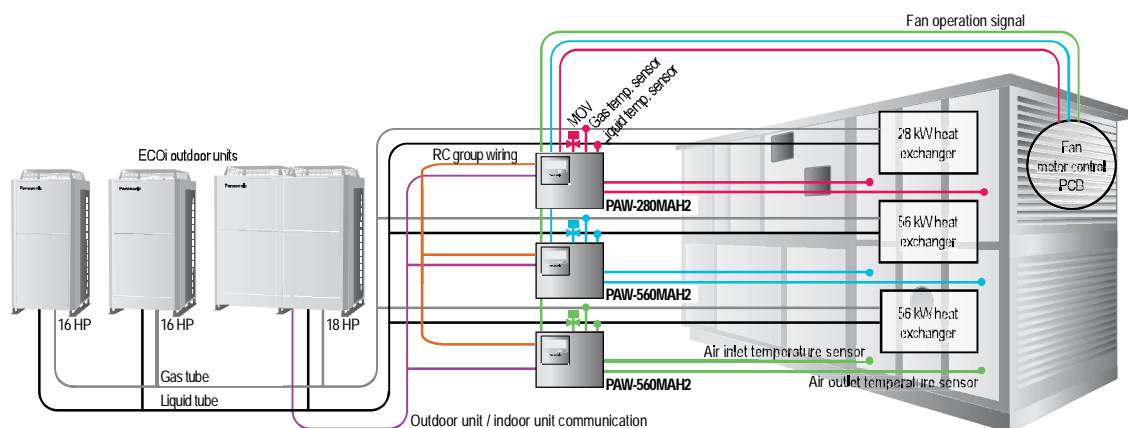
### Note:

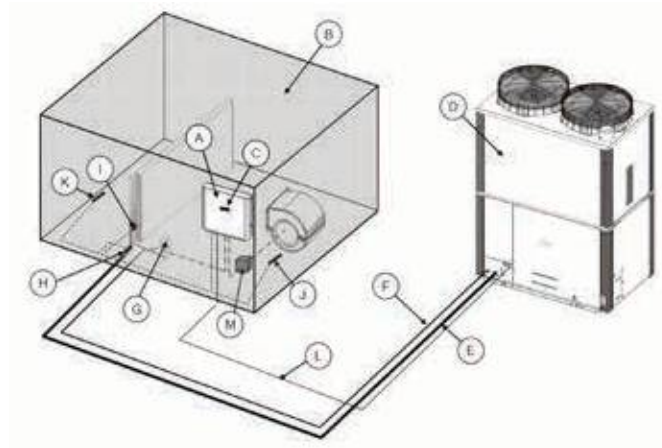
The following restrictions apply only if PAW-560MAH2(L) is used alone or in combination with other AHU Kits. For all other AHU Kits and AHU Kit combinations without PAW-560MAH2(L) no such restrictions apply.

- 1 All AHU heat exchangers belonging to the same refrigerant circuit have to be installed in the same chassis equipped with one single fan motor.
- 2 One AHU Kit and correspondingly one magnetic relay is required for each heat exchanger. All AHU Kits have to be wired to the fan motor.
- 3 All AHU Kits shall be connected and controlled by group control wiring of remote controller.
- 4 In case of a multiple AHU Kit combination within one refrigerant system, those kits must share the same AHU housing including fan, and they have to be "group-wired" and operate as a single group. In this case you have to disconnect the included remote controllers and CZ-CAPBC2 boards (ACC-SP1A PCB) except for one each. It is irrelevant which one is retained, there is no preference. The external connections need to be done only on the unit with the connected CZ-CAPBC2 board.

**Note:** In this particular case it is even possible to combine a single advanced or medium version with one or two light versions, and still have full functions of the advanced or medium version respectively.

## System example for ECOi multi-connection system (140 kW capacity)



**ECO G** System Overview – ECO G systemsSingle-connection<sup>1</sup> or multiple-connection<sup>2</sup> systems

- |   |   |   |  |
|---|---|---|--|
| A | AHU Kit enclosure (complete)                        | H | Thermistor for liquid pipe (E1)                          |
| B | AHU system (field supplied)                         | I | Thermistor for gas pipe (E3)                             |
| C | Remote controller (integrated in AHU Kit enclosure) | J | Thermistor for suction air (TA)                          |
| D | Outdoor unit  | K | Thermistor for discharge air (BL)                        |
| E | Liquid piping (field supplied)                      | L | Inter-unit wiring  |
| F | Gas piping (field supplied)                         | M | Magnetic relay for operating the blower (field supplied) |
| G | Electronic expansion valve                          |   |  |

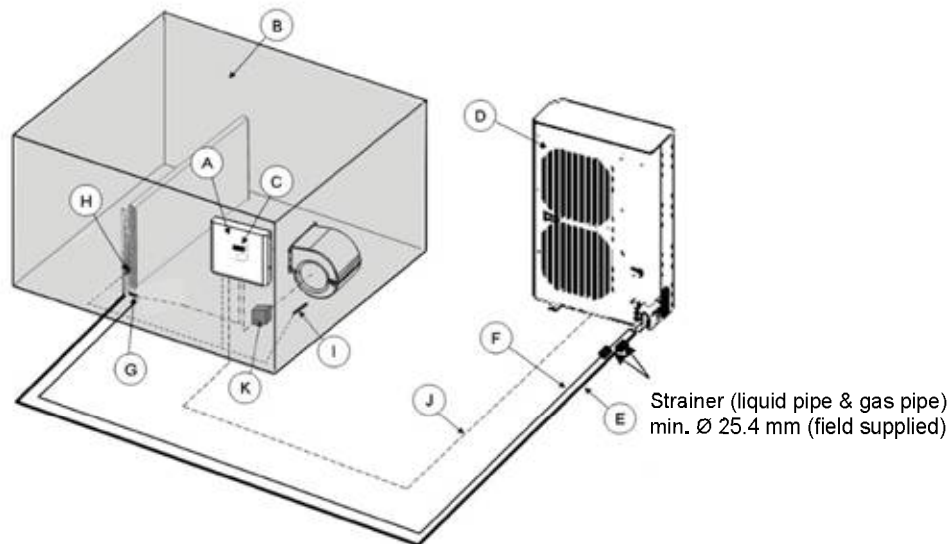
1 Single-connection system shown here as an example.

2 Multi-connection systems are possible in combination with PAW-160MAH2(L/M) or PAW-280MAH2(L/M). In case of multi-connections with PAW-560MAH2(L/M) further restrictions will apply. For details, please contact your local Panasonic service partner.



**PACi** System Overview – PACi systems

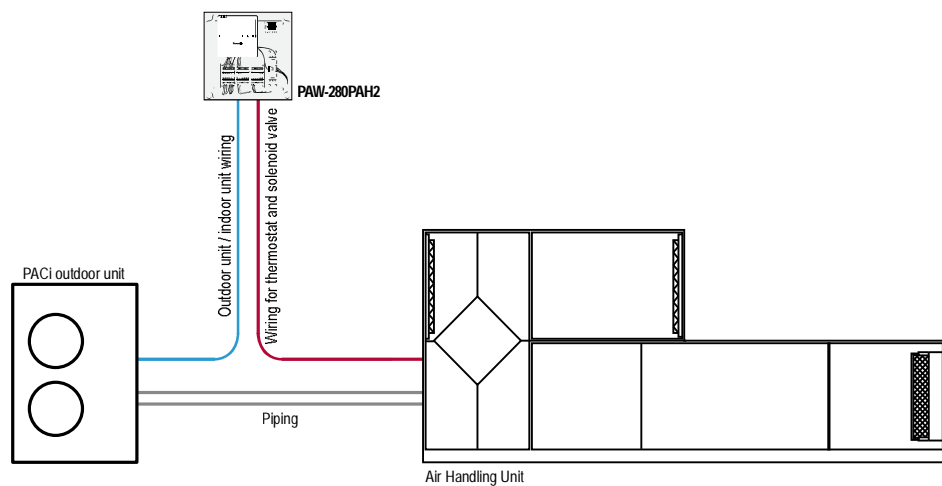
Single-connection<sup>1</sup> system only



- |   |   |   |  |
|---|---|---|--|
| A | AHU Kit enclosure (complete)                        | H | Thermistor for heat exchanger pipe middle (E2)           |
| B | AHU system (field supplied)                         | I | Thermistor for suction air (TA)                          |
| C | Remote controller (integrated in AHU Kit enclosure) | J | Inter-unit wiring  |
| D | Outdoor unit  | K | Magnetic relay for operating the blower (field supplied) |
| E | Liquid piping (field supplied)                      |   |  |
| F | Gas piping (field supplied)                         |   |  |
| G | Thermistor for liquid pipe (E1)                     |   |  |

<sup>1</sup> With all PACi outdoor units only 1-to-1 installations are allowed.

**System example for PACi single-connection system**

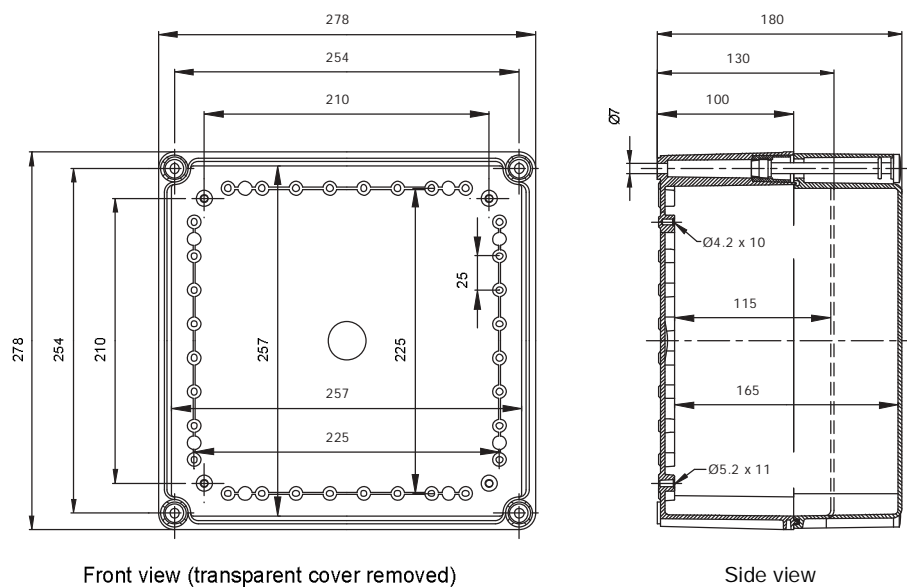


### 3.5 Technical data

#### Technical data – AHU Kit

All AHU Kit models			
Power source	V / ph / Hz	220 ... 240 / 1 / 50	
Rated current consumption	A	0.1	
Rated power consumption (max.)	W	18.0	
Dimensions (enclosure)	H x W x D	mm	278 x 278 x 180
Net weight	Advanced / Medium	kg	4.25
	Light		3.98
Protection class			IP65
Thermostat (Fitted on advanced versions only: PAW-160/280/560MAH2 and PAW-250PAH2)			
Dimensions	W x H x D	mm	48 x 48 x 90 (approximately)
Required void space		mm	85 mm (approximately)
Mounting cut-out	W x H	mm	44 x 44 (DIN 1/16)
Display height		mm	10 (approximately)
Temperature range	measuring / indicating	°C	-50 ... +580 / -50 ... +580
Temperature increments	measuring / indicating	°C	0.1 / 1
Sampling period		sec	< 3
Output signal	factory setting / alternative setting	V	0 ... 10 / 2 ... 10
Input signal			Pt100, 2-/3-wire
Control voltage	V / ph / Hz	85 ... 265 / 1 / 50/60	
Ambient temperature (max.)	°C	45	
Ambient air humidity (max. in hostile environments)	% RH	85	
Quiescent current consumption	W	< 3	

#### Dimensions – AHU Kit





## Important

Apart from the technical data and limitations given in the following tables, the technical data and limitations of the relevant outdoor units, local wiring and piping design regulations and approved best practices need to be observed in installation procedures.



## Technical data and limitations – ECOi and ECO G systems

HP			5	10	20
Model			PAW-160MAH2(L/M)	PAW-280MAH2(L/M)	PAW-560MAH2(L/M)
Nominal cooling capacity		kW	14.0	28.0	56.0
Nominal heating capacity		kW	16.0	31.5	63.0
Air volume flow (Cooling)	Min	m³/h	1,140	3,500	7,000
	Max	m³/h	2,600	5,000	10,000
AHU DX coil heat exchanger volume	Min	dm³	1.7	2.8	5.6
	Max	dm³	2.8	5.4	10.7
Bypass factor			0.9 (recommended)	0.9 (recommended)	0.9 (recommended)
Piping length	Min / Max	m	10 / 100	10 / 100	10 / 100
Max. branch pipe length		m	12	12	12
Max. branch pipe length difference after first branch		m	10	10	10
Elevation difference (in/out)	Max	m	10	10	10
Piping connections	Liquid pipe	Inch (mm)	3/8 (9.52)	3/8 (9.52)	5/8 (15.88)
	Gas pipe	Inch (mm)	5/8 (15.88)	7/8 (22.22)	1 1/8 (28.58)
Intake temperature of AHU Kit	Cooling (Min / Max)	°C	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)
	Heating (Min / Max)	°C	16 / 30 °C DB	16 / 30 °C DB	16 / 30 °C DB
Ambient temperature (outdoor unit)	Cooling (Min / Max)	°C	-10 / 43 °C DB	-10 / 43 °C DB	-10 / 43 °C DB
	Heating (Min / Max)	°C	-20 / 15 °C WB	-20 / 15 °C WB	-20 / 15 °C WB

HP			30 <sup>1</sup>	40 <sup>1</sup>	50 <sup>1</sup>	60 <sup>1</sup>
Model			PAW-280MAH2(L/M) + PAW-560MAH2(L/M)	PAW-560MAH2(L/M) + PAW-560MAH2(L/M)	PAW-560MAH2(L/M) + PAW-560MAH2(L/M) + PAW-280MAH2(L/M)	PAW-560MAH2(L/M) + PAW-560MAH2(L/M) + PAW-560MAH2(L/M)
Nominal cooling capacity		kW	84.0	112.0	140.0	168.0
Nominal heating capacity		kW	95.0	127.0	155.0	189.0
Air volume flow (Cooling)	Min	m³/h	10,500	14,000	17,500	21,000
	Max	m³/h	15,000	20,000	25,000	30,000
AHU DX coil heat exchanger volume	Min	dm³	8.4	11.2	14.0	32.1
	Max	dm³	16.1	21.4	26.8	16.8
Bypass factor			0.9 (recommended)	0.9 (recommended)	0.9 (recommended)	0.9 (recommended)
Piping length	Min / Max	m	10 / 100	10 / 100	10 / 100	10 / 100
Max. branch pipe length		m	12	12	12	12
Max. branch pipe length difference after first branch		m	10	10	10	10
Elevation difference (in/out)	Max	m	10	10	10	10
Piping connections	Liquid pipe	Inch (mm)	3/4 (19.05)	3/4 (19.05)	3/4 (19.05)	3/4 (19.05)
	Gas pipe	Inch (mm)	1 1/4 (31.75)	1 1/2 (38.15)	1 1/2 (38.15)	1 1/2 (38.15)
Intake temperature of AHU Kit	Cooling (Min / Max)	°C	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)
	Heating (Min / Max)	°C	16 / 30 °C DB	16 / 30 °C DB	16 / 30 °C DB	16 / 30 °C DB
Ambient temperature (outdoor unit)	Cooling (Min / Max)	°C	-10 / 43 °C DB	-10 / 43 °C DB	-10 / 43 °C DB	-10 / 43 °C DB
	Heating (Min / Max)	°C	-20 / 15 °C WB	-20 / 15 °C WB	-20 / 15 °C WB	-20 / 15 °C WB

1 Not applicable for ECO G systems.



## Technical data and limitations – PACi systems

AHU Kit			PAW-280PAH2(L/M)			
Outdoor unit	PACi Standard	1-phase	U-60PEY1E5	U-71PEY1E5	U-100PEY1E5	U-125PEY1E5
Nominal cooling capacity		kW	6.0	7.1	10.0	12.5
Nominal heating capacity		kW	7.0	8.0	11.2	14.0
Air volume flow (Cooling)	Min (factory)	m³/h	540	540	840	1,140
	Max (factory)	m³/h	960	960	1,980	2,100
Air volume flow (Cool.), subject to restrictions¹	Max	m³/h	1,450	1,600	2,400	2,500
AHU DX coil heat exchanger volume	Min (factory)	dm³	1.3	1.3	1.5	1.5
	Max (factory)	dm³	1.4	1.4	1.9	1.9
AHU DX coil heat exchanger volume, subject to restrictions²	Max	dm³	1.8	2.0	2.8	2.75
	Additional ref. charge	kg/dm³	0.9	0.9	0.9	0.9
	Max. additional refrigerant charge	kg	0.36	0.54	0.81	0.76
	Max. pipe length	m	40	35	30	30
Heat exchanger front area	Min	m²	–	–	0.43	0.43
	Max	m²	–	–	0.51	0.51
Piping length	Min / Max	m	3 / 40	3 / 35	5 / 30	5 / 30
Precharged length	Max	m	20	20	15	15
Additional refrigerant charge		g/m	40	40	50	50
Piping connections	Liquid pipe	Inch (mm)	3/8" (9,52)	3/8" (9,52)	3/8" (9,52)	3/8" (9,52)
	Gas pipe	Inch (mm)	5/8" (15,88)	5/8" (15,88)	5/8" (15,88)	5/8" (15,88)
Intake temperature of AHU Kit¹	Cooling (Min / Max)	°C	18 / 32 °C DB	18 / 32 °C DB	18 / 32 °C DB	18 / 32 °C DB
			(13 / 23 °C WB)	(13 / 23 °C WB)	(13 / 23 °C WB)	(13 / 23 °C WB)
	Heating (Min / Max)	°C	16 / 30 °C DB	16 / 30 °C DB	16 / 30 °C DB	16 / 30 °C DB
Ambient temperature (outdoor unit)	Cooling (Min / Max)	°C	-10 / 43 °C DB	-10 / 43 °C DB	-10 / 43 °C DB	-10 / 43 °C DB
	Heating (Min / Max)	°C	-20 / 15 °C WB	-20 / 15 °C WB	-20 / 15 °C WB	-20 / 15 °C WB

AHU Kit			PAW-280PAH2(L/M)		
Outdoor unit	PACi Standard	3-phase	U-100PEY1E8	U-125PEY1E8	U-140PEY1E8
Nominal cooling capacity		kW	10.0	12.5	14.0
Nominal heating capacity		kW	11.2	14.0	16.0
Air volume flow (Cooling)	Min (factory)	m³/h	840	1,140	1,140
	Max (factory)	m³/h	1,980	2,100	2,160
Air volume flow (Cool.), subject to restrictions¹	Max	m³/h	2,400	2,500	2,600
AHU DX coil heat exchanger volume	Min (factory)	dm³	1.5	1.5	1.5
	Max (factory)	dm³	1.9	1.9	1.9
AHU DX coil heat exchanger volume, subject to restrictions²	Max	dm³	2.8	2.75	2.8
	Additional ref. charge	kg/dm³	0.9	0.9	0.9
	Max. additional refrigerant charge	kg	0.81	0.76	0.81
	Max. pipe length	m	30	30	30
Heat exchanger front area	Min	m²	0.43	0.43	0.43
	Max	m²	0.51	0.51	0.51
Piping length	Min / Max	m	5 / 30	5 / 30	5 / 30
Precharged length	Max	m	15	15	15
Additional refrigerant charge		g/m	50	50	50
Piping connections	Liquid pipe	Inch (mm)	3/8" (9,52)	3/8" (9,52)	3/8" (9,52)
	Gas pipe	Inch (mm)	5/8" (15,88)	5/8" (15,88)	5/8" (15,88)
Intake temperature of AHU Kit¹	Cooling (Min / Max)	°C	18 / 32 °C DB	18 / 32 °C DB	18 / 32 °C DB
			(13 / 23 °C WB)	(13 / 23 °C WB)	(13 / 23 °C WB)
	Heating (Min / Max)	°C	16 / 30 °C DB	16 / 30 °C DB	16 / 30 °C DB
Ambient temperature (outdoor unit)	Cooling (Min / Max)	°C	-10 / 43 °C DB	-10 / 43 °C DB	-10 / 43 °C DB
	Heating (Min / Max)	°C	-20 / 15 °C WB	-20 / 15 °C WB	-20 / 15 °C WB

To be continued on next page.

**Technical data and limitations – PACi systems (cont.)**

AHU Kit			PAW-280PAH2(L/M)					
Outdoor unit	PACi Elite	1-phase	U-50PE1E5	U-60PE1E5A	U-71PE1E5A	U-100PE1E5A	U-125PE1E5A	U-140PE1E5A
Nominal cooling capacity		kW	5.0	6.0	7.1	10.0	12.5	14.0
Nominal heating capacity		kW	5.6	7.0	8.0	11.2	14.0	16.0
Air volume flow (Cooling)	Min (factory)	m³/h	480	540	720	840	1,140	1,140
	Max (factory)	m³/h	780	960	1,500	1,980	2,100	2,160
Air volume flow (Cool.), subject to restrictions¹	Max	m³/h	1,080	1,600	1,800	2,400	2,600	2,700
AHU DX coil heat exchanger volume	Min (factory)	dm³	–	–	–	1.7	1.7	1.7
	Max (factory)	dm³	1.3	1.4	1.8	2.1	2.1	2.1
AHU DX coil heat exchanger volume, subject to restrictions²	Max	dm³	1.5	1.8	2.2	3.0	3.0	3.0
	Additional ref. charge	kg/dm³	0.9	0.9	0.9	0.9	0.9	0.9
	Max. additional refrigerant charge	kg	0.18	0.36	0.36	0.81	0.81	0.81
	Max. pipe length	m	30	40	40	30	30	30
	Max. ambient temp. for pump down	°C	n/a	35	35	25	25	25
Heat exchanger front area	Min	m²	–	–	–	0.43	0.43	0.43
	Max	m²	–	–	–	0.51	0.51	0.51
Piping length	Min / Max	m	3 / 30	5 / 40	5 / 40	5 / 30	5 / 30	5 / 30
Precharged length	Max	m	20	20	20	20	20	20
Additional refrigerant charge		g/m	20	50	50	50	50	50
Piping connections	Liquid pipe	Inch (mm)	1/4" (6,35)	3/8" (9,52)	3/8" (9,52)	3/8" (9,52)	3/8" (9,52)	3/8" (9,52)
	Gas pipe	Inch (mm)	1/2" (12,7)	5/8" (15,88)	5/8" (15,88)	5/8" (15,88)	5/8" (15,88)	5/8" (15,88)
Intake temperature of AHU Kit¹	Cooling (Min / Max)	°C	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)
	Heating (Min / Max)	°C	16 / 30 °C DB	16 / 30 °C DB	16 / 30 °C DB	16 / 30 °C DB	16 / 30 °C DB	16 / 30 °C DB
Ambient temperature (outdoor unit)	Cooling (Min / Max)	°C	-10 / 43 °C DB	-10 / 43 °C DB	-10 / 43 °C DB	-10 / 43 °C DB	-10 / 43 °C DB	-10 / 43 °C DB
	Heating (Min / Max)	°C	-20 / 15 °C WB	-20 / 15 °C WB	-20 / 15 °C WB	-20 / 15 °C WB	-20 / 15 °C WB	-20 / 15 °C WB

AHU Kit			PAW-280PAH2(L/M)			
Outdoor unit	PACi Elite	3-phase	U-71PE1E8A	U-100PE1E8A	U-125PE1E8A	U-140PE1E8A
Nominal cooling capacity		kW	7.1	10.0	12.5	14.0
Nominal heating capacity		kW	8.0	11.2	14.0	16.0
Air volume flow (Cooling)	Min (factory)	m³/h	720	840	1,140	1,140
	Max (factory)	m³/h	1,500	1,980	2,100	2,160
Air volume flow (Cool.), subject to restrictions¹	Max	m³/h	1,800	2,400	2,600	2,700
AHU DX coil heat exchanger volume	Min (factory)	dm³	–	1.7	1.7	1.7
	Max (factory)	dm³	1.8	2.1	2.1	2.1
AHU DX coil heat exchanger volume, subject to restrictions²	Max	dm³	2.2	3.0	3.0	3.0
	Additional ref. charge	kg/dm³	0.9	0.9	0.9	0.9
	Max. additional refrigerant charge	kg	0.36	0.81	0.81	0.81
	Max. pipe length	m	40	30	30	30
	Max. ambient temp. for pump down	°C	35	25	25	25
Heat exchanger front area	Min	m²	–	0.43	0.43	0.43
	Max	m²	–	0.51	0.51	0.51
Piping length	Min / Max	m	5 / 40	5 / 30	5 / 30	5 / 30
Precharged length	Max	m	20	20	20	20
Additional refrigerant charge		g/m	50	50	50	50
Piping connections	Liquid pipe	Inch (mm)	3/8" (9,52)	3/8" (9,52)	3/8" (9,52)	3/8" (9,52)
	Gas pipe	Inch (mm)	5/8" (15,88)	5/8" (15,88)	5/8" (15,88)	5/8" (15,88)
Intake temperature of AHU Kit¹	Cooling (Min / Max)	°C	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)
	Heating (Min / Max)	°C	16 / 30 °C DB	16 / 30 °C DB	16 / 30 °C DB	16 / 30 °C DB
Ambient temperature (outdoor unit)	Cooling (Min / Max)	°C	-10 / 43 °C DB	-10 / 43 °C DB	-10 / 43 °C DB	-10 / 43 °C DB
	Heating (Min / Max)	°C	-20 / 15 °C WB	-20 / 15 °C WB	-20 / 15 °C WB	-20 / 15 °C WB

To be continued on next page.

## Technical data and limitations – PACi systems (cont.)

AHU Kit			PAW-280PAH2(L/M)	
Outdoor unit	PACi Elite	3-phase	U-200PE1E8	U-250PE1E8
Nominal cooling capacity		kW	20.0	25.0
Nominal heating capacity		kW	22.4	28.0
Air volume flow (Cooling)	Min (factory)	m³/h	1,680	2,280
	Max (factory)	m³/h	3,960	4,440
Air volume flow (Cool.), subject to restrictions¹	Max	m³/h	4,300	5,400
AHU DX coil heat exchanger volume	Min (factory)	dm³	2.3	2.7
	Max (factory)	dm³	4.3	4.3
AHU DX coil heat exchanger volume, subject to restrictions²	Max	dm³	5.7	7.1
	Additional ref. charge	kg/dm³	0.9	0.9
	Max. additional refrigerant charge	kg	1.25	2.51
	Max. pipe length	m	n/a	n/a
	Max. ambient temp. for pump down	°C	n/a	n/a
Heat exchanger front area	Min	m²	0.54	0.66
	Max	m²	1.0	1.0
Piping length	Min / Max	m	5 / 70	5 / 70
Precharged length	Max	m	30	30
Additional refrigerant charge		g/m	40	80
Piping connections	Liquid pipe	Inch (mm)	3/8" (9,52)	1/2" (12,7)
	Gas pipe	Inch (mm)	1" (25,4)	1" (25,4)
Intake temperature of AHU Kit¹	Cooling (Min / Max)	°C	18 / 32 °C DB (13 / 23 °C WB)	18 / 32 °C DB (13 / 23 °C WB)
	Heating (Min / Max)	°C	16 / 30 °C DB	16 / 30 °C DB
Ambient temperature (outdoor unit)	Cooling (Min / Max)	°C	-15 / 43 °C DB	-15 / 43 °C DB
	Heating (Min / Max)	°C	-20 / 15 °C WB	-20 / 15 °C WB

- 1 This (higher) maximum allowed air volume is subject to a restriction of the "Intake temperature of AHU Kit" to 30 °C DB (instead of 32 °C DB). Without this restriction, only the (lower) factory-set maximum air volume is allowed.
- 2 This (higher) maximum AHU DX coil heat exchanger volume is subject to the following restrictions:
  - an additional refrigerant charge on top of the additional refrigerant charge, which needed, when pipe length exceeds the maximum allowed with standard shipment charge (see calculation example below)
  - AND a reduced maximum pipe length
  - AND an ambient air temperature limit above which no pump down must be performed

## Calculation example for total additional refrigerant charge

Unit: U-60PE1E5

Pipe length: 40 meter

AHU DX coil (supplied by AHU manufacturer): 1,7 dm³

Refrigerant charge at shipment fitted for pipe length within 30 m

Pipes additional refrigerant charge: 0,05 kg/m

AHU DX coil additional refrigerant charge: 0,9 kg/dm³

Refrigerant charge at shipment fitted for AHU DX coil volume within 1,4 dm³

Total additional refrigerant charge calculation

$$((1.7 \text{ dm}^3 - 1.4 \text{ dm}^3) \times 0.9 \text{ kg/dm}^3) + (10 \text{ m} \times 0.05 \text{ kg/m}) = 0.27 \text{ kg} + 0.50 \text{ kg} = 0.77 \text{ kg}$$

## Calculation example for number of passes in the heat exchanger

The minimum number of passes in the AHU heat exchanger is restricted. The limit is calculated by the formula:

Minimum number of passes

$$= \text{Number of steps} \times \text{Distance between tube sheets} \times \text{Number of rows} \times 1.5 \times 10^{-4}$$

The calculated value must then be rounded up to the next integer number.

## Example

Number of steps: 12

Distance between tube sheets: 1,000 mm

Number of row: 3

Minimum number of passes =  $12 \times 3 \times 1.5 \times 10^{-4} = 5.4$

This value must be rounded up to 6.

This means that the minimum number of passes is 6 passes.



## NOTICE

### **Nuisance tripping of high-pressure switch**

The outdoor unit is equipped with a high-pressure switch, which stops the operation of the air-conditioning unit for protection when the set high-pressure limit is exceeded. Nuisance tripping of the high-pressure switch may occur in heating mode if the heat exchanger pipe thermistor (E2) is not properly positioned or if the limit is not properly set.

- Position the heat exchanger pipe thermistor (E2) correctly and set the limit properly in accordance with the instructions given in this document.
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