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# AquaFREE system

## Technical Catalogue

Outdoor units:
RAS-(3~5)HVRNE
RAS-(4/5)HRNE

Indoor units:
RWM-(3~5)FSN1E
RWM-(3~5)FSN1E-(4.5/6)H(1/3)
RWM-(3~5)FSN1E-S1
RWM-(3~5)FSN1E-(4.5/6)SH(1/3)

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Specifications in this manual are subject to change without notice in order that HITACHI may bring the latest innovations to their customers.

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# Content

# Content

## Content (cont.)

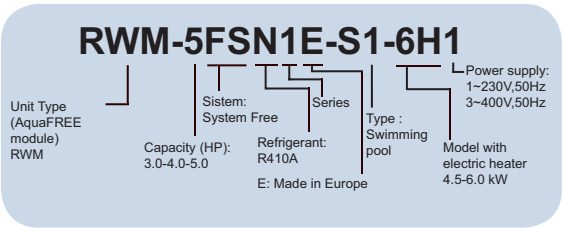
## MODELS CODIFICATION

List of AquaFREE modules, outdoor units, and accessories available in this technical catalogue

| AquaFREE MODULES | | | | | |
|---|---|---|---|---|---|
| RWM – AquaFREE (Basic Models) | | RWM – AquaFREE (Models with electric resistance) | | | |
| Unit | Indication Code | Unit | Indication Code | Unit | Indication Code |
| RWM-3FSN1E | 70900000 NEW | RWM-3FSN1E-4.5H1 | 70900005 NEW | | |
| RWM-4FSN1E | 70900001 NEW | RWM-4FSN1E-6H1 | 70900008 NEW | RWM-4FSN1E-6H3 | 70900013 NEW |
| RWM-5FSN1E | 70900002 NEW | RWM-5FSN1E-6H1 | 70900010 NEW | RWM-5FSN1E-6H3 | 70900016 NEW |
|  | |  | |  | |
| RWM | | | | | |
| ❄ ✹ 1~ | | ❄ ✹ 1~ | | ❄ ✹ 3~ | |

| AquaFREE MODULES (*) | | | | | |
|---|---|---|---|---|---|
| RWM – AquaFREE (Basic Models for swimming pool) | | RWM – AquaFREE (Models for swimming pool with electric resistance) | | | |
| Unit | Indication Code | Unit | Indication Code | Unit | Indication Code |
| RWM-3FSN1E-S1 | 70900022 NEW | RWM-3FSN1E-S1-4.5H1 | 70900027 NEW | | |
| RWM-4FSN1E-S1 | 70900023 NEW | RWM-4FSN1E-S1-6H1 | 70900030 NEW | RWM-4FSN1E-S1-6H3 | 70900032 NEW |
| RWM-5FSN1E-S1 | 70900024 NEW | RWM-5FSN1E-S1-6H1 | 70900035 NEW | RWM-5FSN1E-S1-6H3 | 70900038 NEW |
|  | |  | |  | |
| RWM | | | | | |
| ≈ ❄ ✹ 1~ | | ≈ ❄ ✹ 1~ | | ≈ ❄ ✹ 3~ | |

(*) Next launching



| OUTDOOR UNITS | | | | | |
|---|---|---|---|---|---|
| Utopia DC Inverter | | | | | |
| Unit | Indication Code | Unit | Indication Code | Unit | Indication Code |
| RAS-3HVRNE | 7E878651 | | | | |
| | | RAS-4HVRNE | 7E878652 | RAS-4HRNE | 7E875657 |
| | | RAS-5HVRNE | 7E878653 | RAS-5HRNE | 7E878658 |
|  | |  | | | |
| RAS- | | | | | |
| ❄ ☀ 1~ | | | | ❄ ☀ 3~ | |

ACCESSORIES CODE LIST

| Accessory | Name | Indication Code | Figure |
|---|---|---|---|
| DBS-26 | Drain Discharging Boss | 60299192 NEW |  |
| TT-FSN1E | Thermostatic Tank | 70900004 | To be informed later |

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# Introduction: Overview of the System

## System Description

HITACHI's AquaFREE system is a Heat pump Heating system for winter, and a partial cooling system for summer. The system consists of an Inverter Heat Pump outdoor unit and a hydraulic module indoor unit. The heat pump absorbs or sends heat to the outside, and transfers it to the water circuit by means of the AquaFREE module.

The AquaFREE air-conditioning system incorporates a set of technical benefits that make it one of the most attractive on the market. Right from the selection of the ideal type of equipment in each case, up to its maintenance, and through installation, start up and operation, AquaFREE always provides the best solution for every user, and greatly simplifies and eases the user's selection process.

AquaFREE systems provide great comfort, high reliability, rigorous design, low electrical consumption, and a small installation space.

The AquaFREE system is made up of the following units:

H(V)RNE outdoor units with the following capacity:

- RAS-(3~5)HVRNE
- RAS-(4/5)HRNE

AquaFREE modules with or without support resistance:

- RWM-(3~5)FSN1E
- RWM-(3~5)FSN1E-H(1/3)

AquaFREE modules for pool water heating applications, with or without support resistance

- RWM-(3~5)FSN1E-S1
- RWM-(3~5)FSN1E-SH(1/3)

## Main features of the system.

- Types of Applications:
  Radiant floor, radiators, hybrid radiators + radiant floor systems, and pool heating applications.
- Large variety of AquaFREE modules with or without support resistance.
- Flexible installation, outdoor unit may be placed at a distance of up to 30m.

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# 1. Benefits of AquaFREE

1

This chapter describes the features and benefits of the new AquaFREE modules, which, thanks to the flexibility and modularity of its system will provide you with the complete solution for your air conditioning requirements.

## Content

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# 1. Benefits of AquaFREE

☛Selection Benefits:

## 1.1. Benefits from the selection point of view



The AquaFREE system provides a series of technical benefits that make it more attractive to the user. These benefits are described in detail below:

### 1.1.1. Environment friendly

- **Uses R410A refrigerant**

  Hitachi AquaFREE units are environment friendly since they use R410A refrigerant.

  R410 is totally ecological since it does not contain any substances that are harmful to the ozone layer, ODP=0.

- **Highly efficient**

  Hitachi AquaFREE units are very efficient and allow important energy savings compared to conventional systems; these energy savings also mean that less CO2, which causes the greenhouse effect, is produced.

Selection Benefits:

AquaFREE

Outdoor unit

Indoor unit without electric heater

Indoor units with electric heater

### 1.1.2. Selection Range

#### ◆ Range of Outdoor units

The range of the H(V)RNE outdoor unit series allows to select 3~5HP units, for single as well as three phase combinations.

The H(V)RNE units are very efficient and silent. The combination of the scroll compressor and the inverter type continuous control allow a high level of efficiency as well as important noise reduction as compared to conventional units.

| Outdoor Units | | | Capacity (HP) | | |
|---|---|---|---|---|---|
| | | | 3 | 4 | 5 |
| UTOPIA DC-INVERTER | H(V)RNE |  | ● | | |
| | |  | | ● | ● |

#### ◆ AquaFREE module

The range of AquaFREE modules allows to choose between a wide range of possibilities depending on the application chosen

Single phase and three phase units, with or without electric heater as shown in the following table:

| Modules | | | | Capacity (HP) | | |
|---|---|---|---|---|---|---|
| | | | | 3 | 4 | 5 |
| AquaFREE MODULE | AquaFREE Basic (1~) | RWM-FSN1E |  | ● | ● | ● |
| | AquaFREE Electric heater (1~) | RWM-FSN1E-H1 |  | ● | ● | ● |
| | AquaFREE Electric heater (3~) | RWM-FSN1E-H3 |  | | ● | ● |
| | AquaFREE Basic Pool (1~) | RWM-FSN1E-S1 |  | ● | ● | ● |
| | AquaFREE Electric heater Pool (1~) | RWM-FSN1E-SH1 |  | ● | ● | ● |
| | AquaFREE Electric heater Pool (3~) | RWM-FSN1E-SH3 |  | | ● | ● |

◆ **Main Features:**

AquaFREE units have minimal dimensions and low noise level.

### 1.1.3. Options and accessories

The AquaFREE system have a series of options and accessories to improve the installation and make it more flexible depending on the required needs.



◆ **Electric Heater**

They are support resistances that are used to increase the temperature of the water under very extreme outdoor conditions, such as low temperatures. They can be single or three phase.

The adjustment of these resistances depends on the needs of each installation.

The electric heater can operate independently of the compressor.

Flexibility: Depending on the need of each installation, either of two operation modes can be selected by means of a simple “jumper”

◆ **Pool Module**

It includes an additional exchanger in order to use the AquaFREE system to heat the water of the pool. This exchanger can also include the support resistances module, single as well as three phase.

◆ **Thermostatic Tank**

It’s a hydraulic device that allows to automatically adjust the temperature of the water in order to work with different water temperatures.

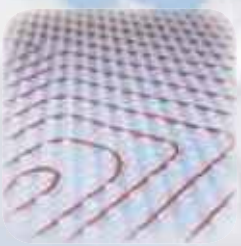
It’s very useful for mixed radiators and radiant floor circuits

◆ **Room Thermostat**

The Remote thermostat’s features are as follows:

- Radio thermostat, wireless.
- Innovative and ergonomic design.
- Easy to handle, displayed on a large screen.
- Different working modes depending on room occupancy.
- Different programs for run, stop and timer operation.
- A very useful holidays mode.

Selection Benefits:



### 1.1.4. Adaptable to the customer's needs

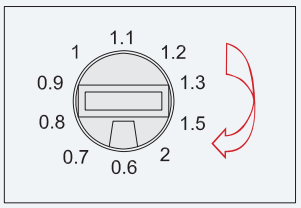
◆ **Selecting the most adequate system**

Depending on his needs, the user can choose between different systems:

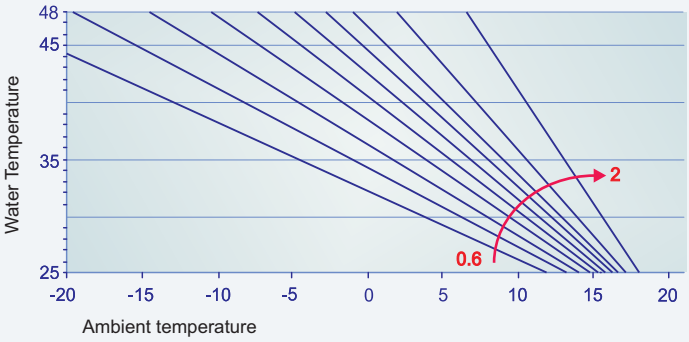
- Systems for radiant floor
- Systems for radiators
- Mixed systems, radiators + radiant floor
- Systems to heat the water of a pool.

◆ **Easy temperature selection**

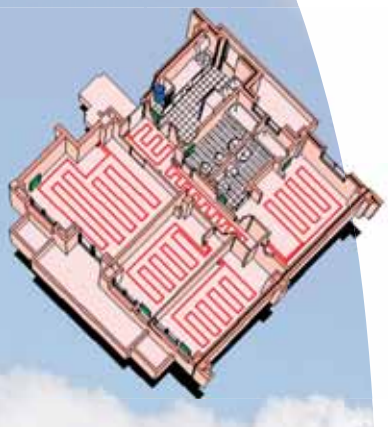
The water temperature can be adjusted by means of a 10 position rotary switch. These 10 different position allow to optimize the installation depending on the needs of each installation. The set temperature can be up to 48ºC.




The working temperature range for each of these 10 positions is shown in the following graph:



☛Installation benefits:



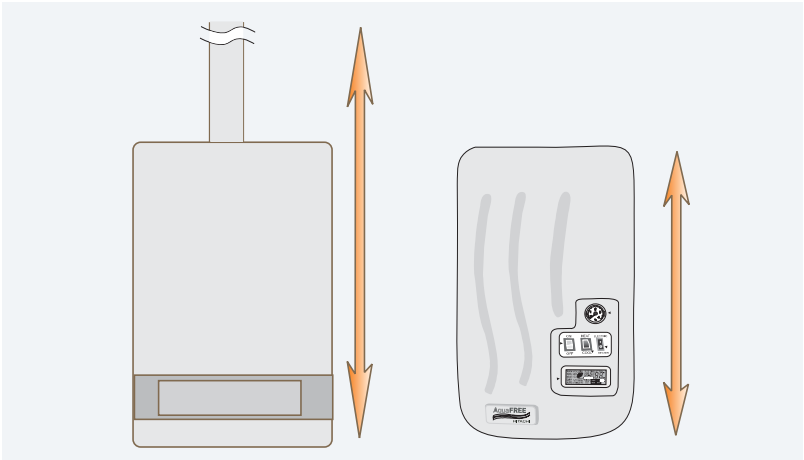
## 1.2. Benefits from the point of view of the Installation

As far as installation is concerned, AquaFREE systems provide the following benefits:



### 1.2.1. Compact Size

The AquaFREE module requires less installation space than a conventional boiler.



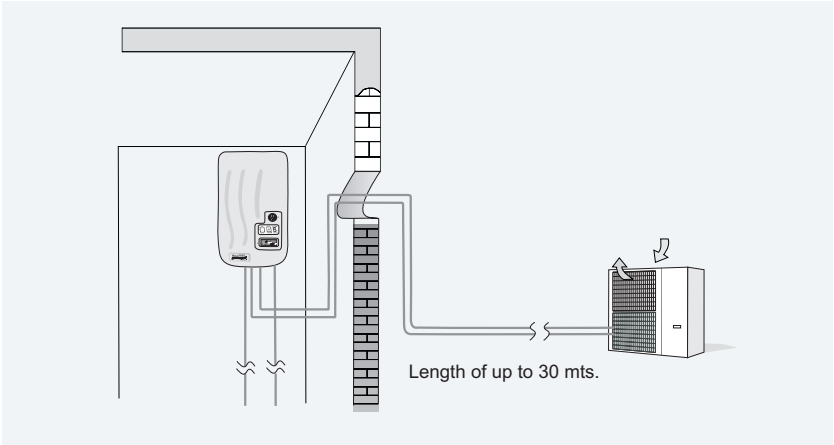
### 1.2.2. Long piping length

- **Water piping**

  The AquaFREE system is prepared for long lengths of hydraulic piping with a pressure loss of up to 0,5 bar.

- **Gas piping**

  Available in lengths of up to 30 meters, with a distance that allows to make the installation flexible depending on each user's needs.



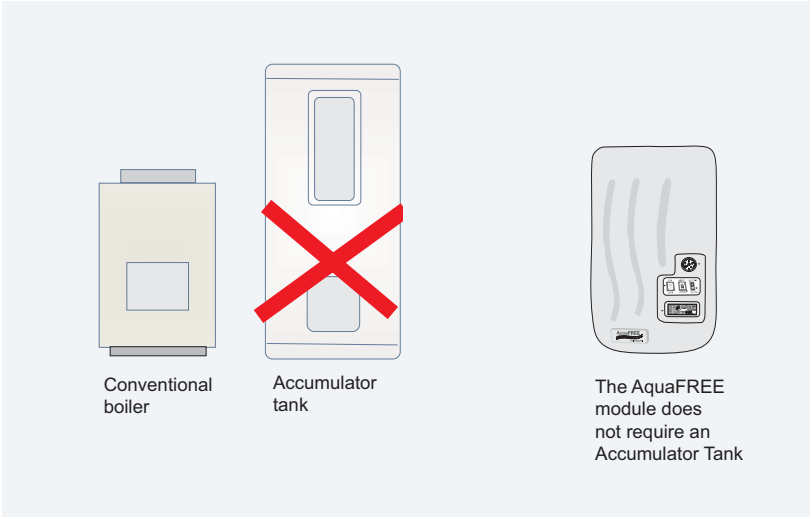
☛Installation benefits:

### 1.2.3. Easy installation and maintenance

The use of electricity as the energy source instead of fossil fuels implies a series of benefits from the installation as well as the ulterior maintenance point of view.

The benefits are the following:

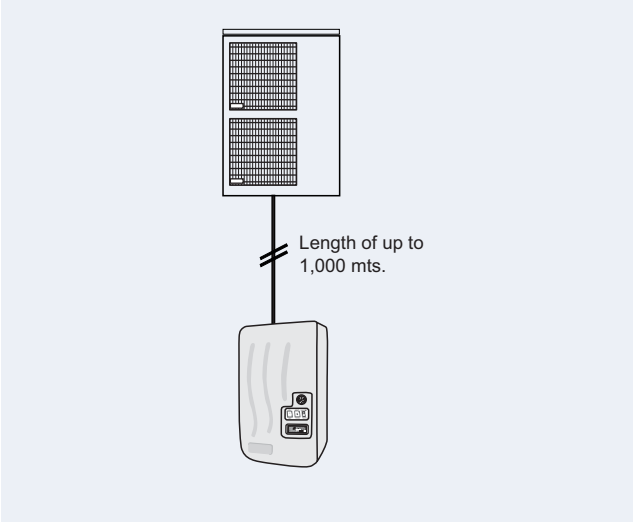
- High efficiency
- Compact installation
- No accumulation tanks required for the energy source



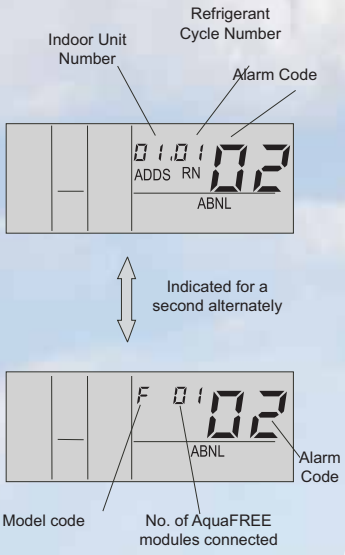

### 1.2.4. Easy and flexible communication installation

◆ **No polarity**

The units of the system interconnect by means of the bus called H-Link, which consists of two non polar wires and allows for distances of up to 1000 meters.



☛ Startup Benefits:


Example of Alarm 02 detection

## 1.3. Benefits from the startup point of view

As far as start up is concerned, AquaFREE systems provide the following benefits:

### 1.3.1. Easy start up

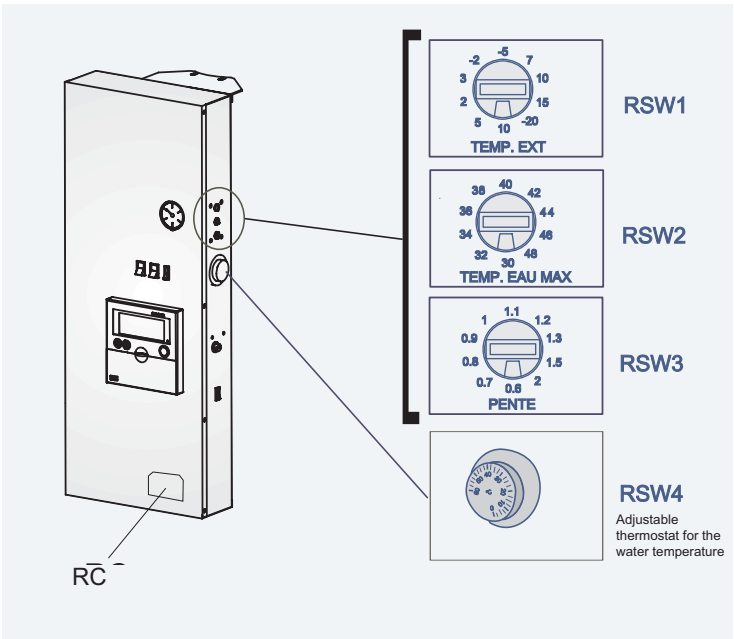
- **Selection switches**

  Start up is performed by means of an intuitive system to select the different parameters that make up the AquaFREE module.

- **Commissioning**

  This selection is performed by means of rotary switches that configure the different basic parameters of the module: Set water temperatures, and adjustment of the Electric heater's working range.

  There are different startup and temperature adjustment conditions to adjust the support electric resistances. Each installation can be customized depending on the needs.




- **Alarm system**

  Rigorous alarms detection system. The AquaFREE systems provide a wide range of alarms detection which impacts directly on the setup and ulterior maintenance of the installation, allowing to control all the key points of the unit by means of the PC-P1HE.

  All the control parameters of all the key point of the systems cans be viewed with a simple check mode : inverter compressor frequency reading, thermistor temperature reading, etc.

  The PC-P1HE is very useful for ulterior maintenance of the system and the units.

### 1.3.2. Service checking tool

The liquid crystal display on the front part of the module will display an alarm code so that a diagnostic of the installation can be performed rapidly

☛Functionality Benefits:

Highly Efficient DC Scroll Compressor

# 1.4. Benefits from the point of view of functionality

## 1.4.1. Designed for maximum comfort.

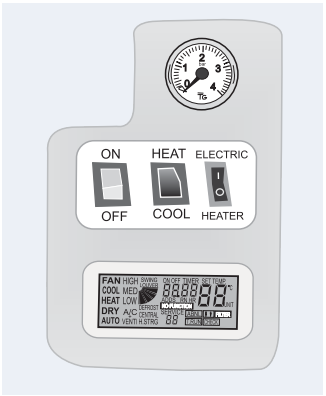
Hitachi's AquaFREE technology materializes into very functional machines, that are designed to provide maximum comfort to its users.

An example of this are the new technologies used in the AquaFREE Series air conditioning systems

One of these new technologies is the control of the system by means of a simple 10 position rotary switch located on one of the sides of the electrical box which allows to customize the set temperature of the water depending on each installation.

## 1.4.2. Easy to use.

Very easy for the users to use, the complete operation of the unit can be controlled with only three buttons.




## 1.4.3. High efficiency system.

- **Increase of the system's capacity**

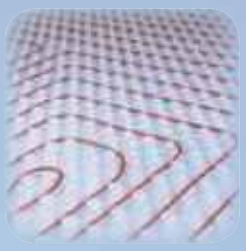
  AquaFREE systems are highly efficient, which is due to the following technical features:

  - A more efficient heat exchanger.
  - Gas injection circuit

- **Reduced power consumption**

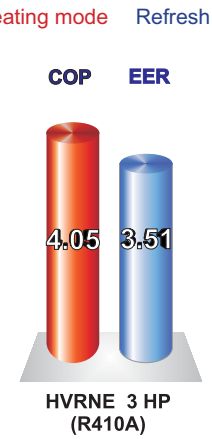
  - Highly Efficient DC Scroll Compressor Use of neodymium magnets in the rotor of the compressor motor.
  - Use of the new inverter control.

☛Functionality Benefits:



◆ **High-level COP and EER.**

As an example of this high level, the capacity operation power (COP) and the energy efficiency ratio (EER) for the RAS-3HVRNE unit are shown.



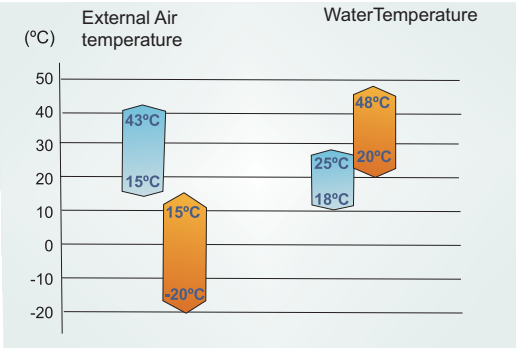



### 1.4.4. Wide range of temperatures.

◆ **RANGE**

The use of the inverter systems along with the AquaFREE module implies a wide range of temperatures

– Temperature range for operation in radiant floor and radiators




Cooling operation (DW)
Heating operation (WB)

***NOTE:***
*DW : Dry Bulb*
*WB : Wet Bulb*

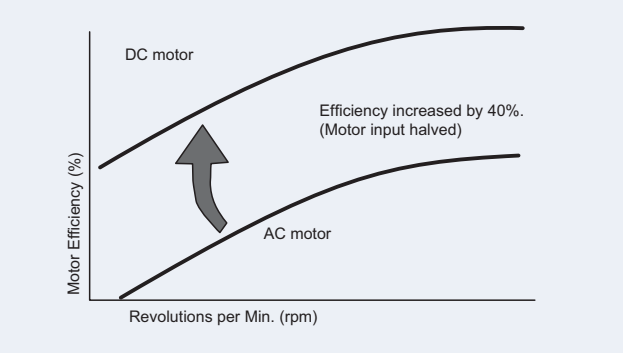
☛Functionality Benefits:

### 1.4.5. Noise reduction

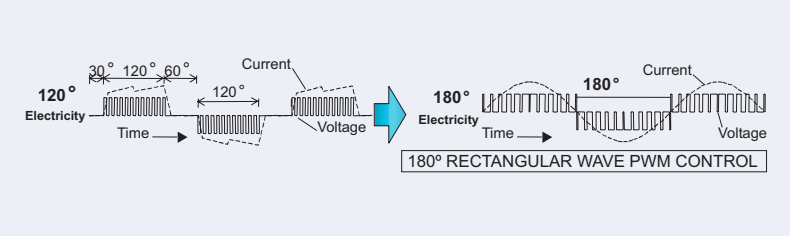
HITACHI AquaFREE systems have been designed to reduce noise to a minimum.

The AquaFREE module has been desigend rigorously to reduce the installation's noise to 28 dB (A). Because HITACHI has used all of the technology it disposes of for developing its products, AquaFREE is one of the most silent systems on the market.

- The compressor's features are as follows:
  - Scroll type
  - The use of neodymium magnets improves the performance at low frequencies.
  - 2 parts rotor reduces electromagnetic noise.
- The fan's features are as follows:
  - Uses DC motors




  - Control by means of PWM (pulse width modulation). This control system allows to control and adjust the fan's startup and stop rate.




By combining these elements the system's electromagnetic noises have been reduced.

☛ Service Benefits:

# 1.5. Benefits from the point of view of maintenance



## 1.5.1. High reliability

◆ **Minimizes maintenance**

Faithful to Hitachi's usual philosophy, HITACHI AquaFREE units have been designed to guarantee great reliability and robustness in order to reduce maintenance operations to a minimum.

## 1.5.2. Designed for easy maintenance

◆ **Easy accessibility**

All AquaFREE systems' components are easily accessible. You can access all of the unit's components to perform appropriate operations through a simple cover. The entire system is designed for maintenance operations to be easy and simple.

◆ **29 alarm codes for easy maintenance**

These units use up to 29 very precise alarm codes in order to rapidly locate any problem that might occur.

These alarms are grouped by elements that belong to the system in order to facilitate maintenance work and optimize the installer's job

## 1.5.3. Main features of the elements that make up the AquaFREE module

◆ **Monotubular Heat Exchanger**

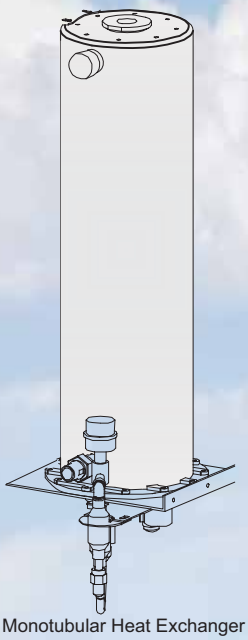
The monotubular exchanger has developed a very efficient exchanger system with a system of external fins and an internal system by slotted tube

It allows easy disassembly for cleaning and maintenance work.

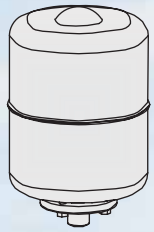
It has a polyamide cover to avoid risks of corrosion.

◆ **Expansion Tank**

Stainless steel sanitary type expansion tank



Monotubular Heat Exchanger



Expansion Tank

☛Main features
of the H(V)RNE units:

# 1.6. Main features of the H(V)RNE outdoor units

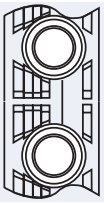
The RAS-H(V)RNE outdoor units are characterized by their silence and their efficiency; they were designed with very high technology.

## 1.6.1. High efficiency cooling circuit

For the refrigerant cycle, HITACHI has developed a new and more efficient heat exchanger.

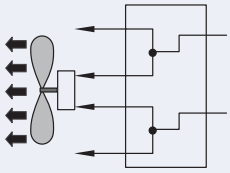
◆ **New aluminum fins for the heat exchanger**

The new smaller flow resistance heat exchanger using new aluminium fins reduces resistance airflow and pressure loss in pipes.



Air flow resistance decreased by 20%.

The optimised slit shape minimises noise by reducing air intake resistance.



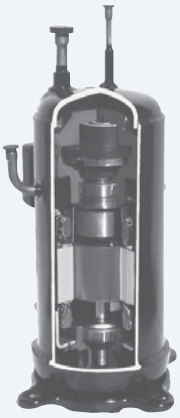
Pressure drop in heat exchanger pipe has been decreased.

◆ **Bigger heat exchanger**

The new bigger heat exchanger increases efficiency. A lower flow resistance provides more silent operation.

## 1.6.2. Highly efficient scroll compressor

◆ **Hitachi's exclusive Scroll Compressor**



◆ **The strong points of the new Hitachi high pressure scroll compressor**

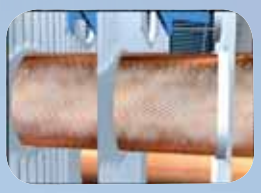
– Improvement of the compressor shaft's rotation system, which has two bearings located on the ends of the shaft which allow for greater system reliability.

– New scroll coil which permits to optimize the overlap between the two scrolls, thus greatly reducing intake loss by leakage.

– Oil return circuit design largely reduces heat loss.

– Improved lubrication system to provide accurate oiling for the compressor.

☛Main features
of the H(V)RNE units:



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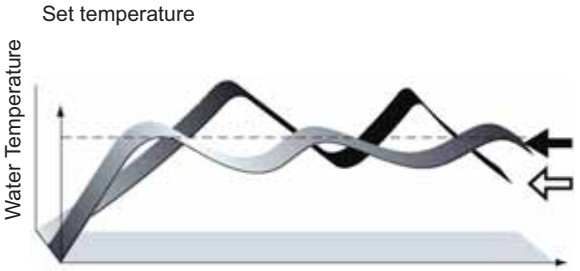
### ◆ Compressor control by means of an inverter regulation

Control by inverter provides a very fine control of the compressor which allows to rapidly attain the set temperature and maintain a stable operation which saves energy and reduces the noise level. This operation is possible because the compressor operators continuously and autoregulates itself according to the system's needs. In this way, the energetic waste of the conventional systems when stopping and starting up when the set temperature is reached is not allowed.

At the same time, possible compressor breakage is eliminated since many startups and stops are avoided.

Concept of Operation (in Heating Mode)




DC INVERTER

Machine with constant speed

HITACHI
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# 2. General data

This chapter contains a rapid description of the main data of AquaFREE modules and their complementary RAS-H(V)RNE outdoor units of Hitachi's DC Inverter series.

## Content

# 2.1. AquaFREE modules

## 2.1.1. RWM – AquaFREE (Basic Models)

| RWM model | | | RWM-3FSN1E | RWM-4FSN1E | RWM-5FSN1E |
|---|---|---|---|---|---|
| Electrical Power Supply | | | 1~230V. 50Hz | | |
| Capacities | Cooling for radiant floor (Min/Nom/Max) Conditions: (35ºC ext / 19ºC water) | kW | 3.90/7.10/8.00 | 4.90/10.00/11.20 | 6.70/12.50/14.00 |
| | Energy efficiency rate (EER) | - | 3.51 | 3.22 | 3.54 |
| | Heating for radiant floor (Min/Nom/Max) Conditions: (7ºC ext / 35ºC water) | kW | 4.00/8.00/10.00 | 5.70/11.20/14.60 | 7.00/14.00/16.70 |
| | Coefficient of performance (COP) | - | 4.05 | 3.46 | 3.47 |
| Pump Input power | | W | 93 | 93 | 132 |
| Sound Pressure Level | | dB(A) | 27 | 28 | 28 |
| Outer Dimensions | Height | mm | 900 | | |
| | Width | mm | 526 | | |
| | Depth | mm | 372 | | |
| Net weight | | Kg | 38 | 39 | 40 |
| Refrigerant | | - | R410A | | |
| Refrigerant Piping Connection | | - | Connection with nuts | | |
| Connections size | Liquid Piping | mm (inches) | Ø9.53 (3/8”) | | |
| | Gas pipe | mm (inches) | Ø15.88 (5/8”) | | |
| Water Pipe Connection | | - | Connection with nuts | | |
| Connections size | Circuit | mm (inches) | Ø25.4 (1”) | | |
| | Supply | mm (inches) | Ø19.05 (3/4”) | | |
| Water Working pressure (Nom) | | mAq | 3.5 | 2.5 | 2.3 |
| Expansion vessel volume | | l | 5 | | |
| Maximum current power consumption | | A | 0.5 | 0.5 | 0.6 |
| Packaging dimensions | | $m^3$ | 0.2 | | |
| Colour | | - | Aluminium Grey | | |
| Remote Control SW | | - | CTA- IMH RF A | | |

OD: Outer Diameter

## *NOTE:*

1. The nominal cooling and heating capacity is the combined capacity of HITACHI’s AquaFree system, and it based with the following standards:
   - Cooling capacity EN 12055
   - Heating capacity reverse cycle units EN 255

| Operation conditions | | Cooling | Heating |
|---|---|---|---|
| Water Temperature | Inlet. | 23,0 °C | 35.0 °C |
| | Outlet | 18,0 °C | 30.0 °C |
| Outdoor Air Inlet Temperature | DB | 35,0 °C | 7,0 °C |
| | WB | - | 6,0 °C |

Piping Length: 7.5 meters
Piping lift: 0 meters
DB: dry bulbWB: wet bulb

2. The Sound Pressure Level is based on following conditions:
   - 1 meter from the unit’s front surface.
   - Voltage of the power source is 230V.

   The above data was measured in an anaechoic chamber so that reflected sound should be taken into consideration when installing the unit.

## 2.1.2. RWM – AquaFREE (Models with electric resistance)

| RWM model | | | | RWM-3FSN1E-4.5H1 | RWM-4FSN1E-6H1 | RWM-5FSN1E-6H1 | RWM-4FSN1E-6H3 | RWM-5FSN1E-6H3 |
|---|---|---|---|---|---|---|---|---|
| Electrical Power Supply | | | | 1~230V, 50 Hz | | | 3~400V, 50 Hz | |
| Capacities | Cooling for radiant floor (Min/Nom/Max) Conditions: (35ºC ext / 19ºC water) | | kW | 3.90/7.10/8.00 | 4.90/10.00/11.20 | 6.70/12.50/14.00 | 4.90/10.00/11.20 | 6.70/12.50/14.00 |
| | Energy efficiency rate (EER) | | - | 3.51 | 3.22 | 3.54 | 3.22 | 3.54 |
| | Heating for radiant floor (Min/Nom/Max) Conditions: (7ºC ext / 35ºC water) | | kW | 4.00/8.00/11.50 | 5.70/11.20/14.60 | 7.00/14.00/16.70 | 5.70/11.20/14.60 | 7.00/14.00/16.70 |
| | Coefficient of performance (COP) | | - | 4.05 | 3.46 | 3.47 | 3.46 | 3.47 |
| Auxiliary resistance 4.50kW (min/med/max) | | at 230V | kW | 1.50/3.00/4.50 | - | - | - | - |
| | | at 400V | kW | - | - | - | - | - |
| Auxiliary resistance 6.00kW (min/med/max) | | at 230V | kW | - | 2.00/4.00/6.00 | 2.00/4.00/6.00 | - | - |
| | | at 400V | kW | - | - | - | 2.00/4.00/6.00 | 2.00/4.00/6.00 |
| Pump input power | | | W | 93 | 93 | 132 | 93 | 132 |
| Sound Pressure Level | | | dB(A) | 27 | 28 | 28 | 28 | 28 |
| Outer Dimensions | Height | | mm | 900 | | | | |
| | Width | | mm | 526 | | | | |
| | Depth | | mm | 372 | | | | |
| Net weight | | | Kg | 42 | 44 | 45 | 44 | 45 |
| Refrigerant | | | - | R410A | | | | |
| Refrigerant Piping Connection | | | - | Connection with nuts | | | | |
| Connections size | Liquid Piping | | mm (inches) | Ø9.53 (3/8") | | | | |
| | Gas pipe | | mm (inches) | Ø15.88 (5/8") | | | | |
| Water Pipe Connection | | | - | Connection with nuts | | | | |
| Connections size | Circuit | | mm (inches) | Ø25.4 (1") | | | | |
| | Supply | | mm (inches) | Ø19.05 (3/4") | | | | |
| Water Working pressure (Nom) | | | mAq | 3.5 | 2.5 | 2.3 | 2.5 | 2.3 |
| Expansion vessel volume | | | l | 5 | | | | |
| Maximum current power consumption | | | A | 20.1 | 26.5 | 26.6 | 26.5 | 26.6 |
| Packaging dimensions | | | $m^3$ | 0.2 | | | | |
| Colour | | | - | Aluminium Grey | | | | |
| Remote Control SW | | | - | CTA- IMH RF A | | | | |

OD: Outer Diameter

*NOTE:*

1. The nominal cooling and heating capacity is the combined capacity of HITACHI's AquaFree system, and it based with the following standards:
   - Cooling capacity EN 12055
   - Heating capacity reverse cycle units EN 255

| Operation conditions | | Cooling | Heating |
|---|---|---|---|
| Water Temperature | Inlet. | 23,0 °C | 35.0 °C |
| | Outlet | 18,0 °C | 30.0 °C |
| Outdoor Air Inlet Temperature | DB | 35,0 °C | 7,0 °C |
| | WB | - | 6,0 °C |

Piping Length: 7.5 meters
Piping lift: 0 meters
DB: dry bulbWB: wet bulb

2. The Sound Pressure Level is based on following conditions:
   - 1 meter from the unit's front surface.
   - Voltage of the power source is 230V.

   The above data was measured in an anaechoic chamber so that reflected sound should be taken into consideration when installing the unit.

## 2.1.3. RWM – AquaFREE (Basic Models for swimming pools)

| RWM model | | | | RWM-3FSN1E-S1 | RWM-4FSN1E-S1 | RWM-5FSN1E-S1 |
|---|---|---|---|---|---|---|
| Electrical Power Supply | | | | 1~230V, 50Hz | | |
| Capacities | Cooling for radiant floor (Min/Nom/Max) Conditions: (35ºC ext / 19ºC water) | | kW | 3.90/7.10/8.00 | 4.90/10.00/11.20 | 6.70/12.50/14.00 |
| | Energy efficiency rate (EER) | | - | 3.51 | 3.22 | 3.54 |
| | Heating for radiant floor (Min/Nom/Max) Conditions: (7ºC ext / 35ºC water) | | kW | 4.00/8.00/11.50 | 5.70/11.20/14.60 | 7.00/14.00/16.70 |
| | Coefficient of performance (COP) | | - | 4.05 | 3.46 | 3.47 |
| Pump input power | | | W | 93 | 93 | 132 |
| Sound Pressure Level | | | dB(A) | 27 | 28 | 28 |
| Outer Dimensions | Height | | mm | 900 | | |
| | Width | | mm | 526 | | |
| | Depth | | mm | 372 | | |
| Net weight | | | Kg | 38 | 39 | 40 |
| Refrigerant | | | - | R410A | | |
| Refrigerant Piping Connection | | | - | Connection with nuts | | |
| Connections size | Liquid Piping | | mm (inches) | Ø9.53 (3/8") | | |
| | Gas pipe | | mm (inches) | Ø15.88 (5/8") | | |
| Water Pipe Connection | | | - | Connection with nuts | | |
| Connections size | Circuit | | mm (inches) | Ø25.4 (1") | | |
| | Supply | | mm (inches) | Ø19.05 (3/4") | | |
| Water Working pressure (Nom) | | | mAq | 3.5 | 2.5 | 2.3 |
| Expansion vessel volume | | | l | 5 | | |
| Maximum current power consumption | | | A | 0.5 | 0.5 | 0.6 |
| Packaging dimensions | | | $m^3$ | 0.2 | | |
| Colour | | | - | Aluminium Grey | | |
| Remote Control SW | | | - | CTA- IMH RF A | | |

OD: Outer Diameter

### *NOTE:*

1. The nominal cooling and heating capacity is the combined capacity of HITACHI's AquaFree system, and it based with the following standards:
   - Cooling capacity EN 12055
   - Heating capacity reverse cycle units EN 255

| Operation conditions | | Cooling | Heating |
|---|---|---|---|
| Water Temperature | Inlet. | 23,0 °C | 35.0 °C |
| | Outlet | 18,0 °C | 30.0 °C |
| Outdoor Air Inlet Temperature | DB | 35,0 °C | 7,0 °C |
| | WB | - | 6,0 °C |

Piping Length: 7.5 meters
Piping lift: 0 meters
DB: dry bulbWB: wet bulb

2. The Sound Pressure Level is based on following conditions:
   - 1 meter from the unit's front surface.
   - Voltage of the power source is 230V.

   The above data was measured in an anaechoic chamber so that reflected sound should be taken into consideration when installing the unit.

## 2.1.4. RWM – AquaFREE (Models for swimming pools and with electric resistance)

| RWM model | | | | RWM-3FSN1E-S1-4.5H1 | RWM-4FSN1E-S1-6H1 | RWM-5FSN1E-S1-6H1 | RWM-4FSN1E-S1-6H3 | RWM-5FSN1E-S1-6H3 |
|---|---|---|---|---|---|---|---|---|
| Electrical Power Supply | | | | 1~230V, 50 Hz | | | 3~400V, 50 Hz | |
| Capacities | Cooling for radiant floor (Min/Nom/Max) Conditions: (35ºC ext / 19ºC water) | | kW | 3.90/7.10/8.00 | 4.90/10.00/11.20 | 6.70/12.50/14.00 | 4.90/10.00/11.20 | 6.70/12.50/14.00 |
| | Energy efficiency rate (EER) | | - | 3.51 | 3.22 | 3.54 | 3.22 | 3.54 |
| | Heating for radiant floor (Min/Nom/Max) Conditions: (7ºC ext / 35ºC water) | | kW | 4.00/8.00/11.50 | 5.70/11.20/14.60 | 7.00/14.00/16.70 | 5.70/11.20/14.60 | 7.00/14.00/16.70 |
| | Coefficient of performance (COP) | | - | 4.05 | 3.46 | 3.47 | 3.46 | 3.47 |
| Auxiliary resistance 4.50kW (min/med/max) | | at 230V | kW | 1.50/3.00/4.50 | - | - | - | - |
| | | at 400V | kW | - | - | - | - | - |
| Auxiliary resistance 6.00kW (min/med/max) | | at 230V | kW | - | 2.00/4.00/6.00 | 2.00/4.00/6.00 | - | - |
| | | at 400V | kW | - | - | - | 2.00/4.00/6.00 | 2.00/4.00/6.00 |
| Pump input power | | | W | 93 | 93 | 132 | 93 | 132 |
| Sound Pressure Level | | | dB(A) | 27 | 28 | 28 | 28 | 28 |
| Outer Dimensions | Height | | mm | 900 | | | | |
| | Width | | mm | 526 | | | | |
| | Depth | | mm | 372 | | | | |
| Net weight | | | Kg | 42 | 44 | 45 | 44 | 45 |
| Refrigerant | | | - | R410A | | | | |
| Refrigerant Piping Connection | | | - | Connection with nuts | | | | |
| Connections size | Liquid Piping | | mm (inches) | Ø9.53 (3/8") | | | | |
| | Gas pipe | | mm (inches) | Ø15.88 (5/8") | | | | |
| Water Pipe Connection | | | - | Connection with nuts | | | | |
| Connections size | Circuit | | mm (inches) | Ø25.4 (1") | | | | |
| | Supply | | mm (inches) | Ø19.05 (3/4") | | | | |
| Water Working pressure (Nom) | | | mAq | 3.5 | 2.5 | 2.3 | 2.5 | 2.3 |
| Expansion vessel volume | | | l | 5 | | | | |
| Maximum current power consumption | | | A | 20.1 | 26.5 | 26.5 | 9.2 | 9.2 |
| Packaging dimensions | | | $m^3$ | 0.2 | | | | |
| Colour | | | - | Aluminium Grey | | | | |
| Remote Control SW | | | - | CTA- IMH RF A | | | | |

OD: Outer Diameter

*NOTE:*

1. The nominal cooling and heating capacity is the combined capacity of HITACHI's AquaFree system, and it based with the following standards:
   - Cooling capacity EN 12055
   - Heating capacity reverse cycle units EN 255

| Operation conditions | | Cooling | Heating |
|---|---|---|---|
| Water Temperature | Inlet. | 23,0 °C | 35.0 °C |
| | Outlet | 18,0 °C | 30.0 °C |
| Outdoor Air Inlet Temperature | DB | 35,0 °C | 7,0 °C |
| | WB | - | 6,0 °C |

Piping Length: 7.5 meters
Piping lift: 0 meters
DB: dry bulbWB: wet bulb

2. The Sound Pressure Level is based on following conditions:
   - 1 meter from the unit's front surface.
   - Voltage of the power source is 230V.

   The above data was measured in an anaechoic chamber so that reflected sound should be taken into consideration when installing the unit.

# 2.2. Outdoor Units

## 2.2.1. RAS – DC Inverter

| RAS Model | | | RAS-3HVRNE | RAS-4HVRNE | RAS-5HVRNE | RAS-4HRNE | RAS-5HRNE |
|---|---|---|---|---|---|---|---|
| Electrical power supply | | | 1~230V, 50Hz | | | 3~400V, 50Hz | |
| Colour (Munsell Code) | | - | Natural Grey (1.0Y8.5/0.5) | | | | |
| Sound pressure level (night mode) | | dB(A) | 43 / (39) | 45 / (41) | 47 / (43) | 45 / (41) | 47 / (43) |
| Sound power level | | dB(A) | 64 | 66 | 69 | 66 | 69 |
| Outer Dimensions | Height | mm | 800 | 1240 | 1240 | 1240 | 1240 |
| | Width | mm | 850 | 950 | 950 | 950 | 950 |
| | Depth | mm | 315 | 315 | 315 | 315 | 315 |
| Net weight | | Kg | 60 | 95 | 97 | 100 | 102 |
| Refrigerant | | - | R410A | | | | |
| Flow control | | - | Micro processor Controlled Expansion Valve | | | | |
| Type compressor | | - | Hermetic (Rotary) | Hermetic (Scroll) | Hermetic (Scroll) | Hermetic (Scroll) | Hermetic (Scroll) |
| | Q´ty | - | 1 | 1 | 1 | 1 | 1 |
| | Power | kW | 0.98 | 1.38 | 1.38 | 2.2 | 3.0 |
| Heat exchanger | | | Multi-Pass Cross-Finned Tube | | | | |
| Condenser Fan (Type) | | - | Propeller Fan | | | | |
| | Q´ty | - | 1 | 2 | 2 | 2 | 2 |
| | Air Flow Rate | m³/min | 45 | 80 | 90 | 80 | 90 |
| | Power | W | 50 | 30 + 50 | 50 + 70 | 30 + 50 | 50 +70 |
| Refrigeration Piping | | - | Connection with nuts | | | | |
| Connections size | Liquid Piping | mm (inches) | Ø9.53 (3/8") | Ø9.53 (3/8") | Ø9.53 (3/8") | Ø9.53 (3/8") | Ø9.53 (3/8") |
| | Gas pipe | mm (inches) | Ø15.88 (5/8") | Ø15.88 (5/8") | Ø15.88 (5/8") | Ø15.88 (5/8") | Ø15.88 (5/8") |
| Refrigerant charge | | Kg | 2.4 | 3.6 | 3.6 | 3.6 | 3.6 |
| Maximum current power consumption | | A | 25 | 32 | 32 | 11 | 15 |
| Packing Measurement | | m³ | 0.34 | 0.55 | 0.55 | 0.55 | 0.55 |

OD: Outer Diameter

*NOTE:*

1. The nominal cooling and heating capacity is the combined capacity of HITACHI's AquaFree system, and it based with the following standards:
   - Cooling capacity EN 12055
   - Heating capacity reverse cycle units EN 255

| Operation conditions | | Cooling | Heating |
|---|---|---|---|
| Water Temperature | Inlet. | 23,0 °C | 35.0 °C |
| | Outlet | 18,0 °C | 30.0 °C |
| Outdoor Air Inlet Temperature | DB | 35,0 °C | 7,0 °C |
| | WB | - | 6,0 °C |

Piping Length: 7.5 meters
Piping lift: 0 meters
DB: dry bulbWB: wet bulb

2. The Sound Pressure Level is based on following conditions:
   - 1 meter from the unit's front surface.
   - Voltage of the power source is 230V.

   The above data was measured in an anaechoic chamber so that reflected sound should be taken into consideration when installing the unit.

# 2.3. Main Component Data for AquaFREE modules

The main components described are the following:

- ◈ AquaFREE modules: (Water-Free)
- Heat exchanger
- Water Pump
- Auxiliary resistance



## 2.3.1. RWM – AquaFREE (Basic Models)

| RWM model | | | | RWM-3FSN1E | RWM-4FSN1E | RWM-5FSN1E |
|---|---|---|---|---|---|---|
| Heat exchanger | Heat exchanger type | | - | "Shell and Tube" | | |
| | Piping | Material | - | Copper tube / Plastic (PP) | | |
| | | Rated exchanged capacity | kW | 12 | 12 | 15 |
| | | Gas pipe | Ø mm | 15.88 | 15.88 | 15.88 |
| | | Liquid pipe | Ø mm | 9.53 | 9.53 | 9.53 |
| | | Water inlet | Ø mm | 25.40 | 25.40 | 25.40 |
| | | Water outlet | Ø mm | 25.40 | 25.40 | 25.40 |
| | Maximum operating refrigerant pressure | | MPa | 4.15 | 4.15 | 4.15 |
| | Maximum operating water pressure | | MPa | 0.35 | 0.35 | 0.35 |
| | Cylinder diameter | | Ø mm | 158 | 158 | 158 |
| Water pump | Type | | - | RS6 | RS6 | RS7 |
| | Electrical power supply | | - | 1~230V, 50 Hz | | |
| Expansion vessel | Type | | - | Membrane surge tank | | |
| | Material | | - | Steel | | |
| | Volume | | l | 5 | | |

## 2.3.2. RWM – AquaFREE (Models with electric resistance)

| RWM model | | | | RWM-3 FSN1E-4.5H1 | RWM-4 FSN1E-6H1 | RWM-5 FSN1E-6H1 | RWM-4 FSN1E-6H3 | RWM-5 FSN1E-6H3 |
|---|---|---|---|---|---|---|---|---|
| **Heat exchanger** | Heat exchanger type | | - | "Shell and Tube" | | | | |
| | Piping | Material | - | Copper tube / Plastic (PP) | | | | |
| | | Rated exchanged capacity | kW | 12 | 12 | 15 | 12 | 15 |
| | | Gas pipe | Ø mm | 15.88 | 15.88 | 15.88 | 15.88 | 15.88 |
| | | Liquid pipe | Ø mm | 9.53 | 9.53 | 9.53 | 9.53 | 9.53 |
| | | Water inlet | Ø mm | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 |
| | | Water outlet | Ø mm | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 |
| | Maximum operating refrigerant pressure | | MPa | 4.15 | 4.15 | 4.15 | 4.15 | 4.15 |
| | Maximum operating water pressure | | MPa | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 |
| | Cilinder diameter | | Ø mm | 158 | 158 | 158 | 158 | 158 |
| Water Pump | Type | | - | RS7 | RS7 | RS7 | RS7 | RS7 |
| | Electrical power supply | | - | 1~230V. 50 Hz | | | | |
| Expansion vessel | Type (manufactured / model) | | - | Membrane surge tank | | | | |
| | Material | | - | Steel | | | | |
| | Volume | | l | 5 | | | | |
| Electric heater | Type | | - | Electrical resistance | Electrical resistance | Electrical resistance | Electrical resistance | Electrical resistance |
| | Capacity | | kW | 4.50 | 6.00 | 6.00 | 6.00 | 6.00 |

## 2.3.3. RWM – AquaFREE (Basic Models for swimming pools)

| RWM model | | | | RWM-3FSN1E-S1 | RWM-4FSN1E-S1 | RWM-5FSN1E-S1 |
|---|---|---|---|---|---|---|
| Heat exchanger | Heat Exchanger Type | | - | | | |
| | Piping | Material | - | | | |
| | | Outer Diameter | Ø mm | | | |
| | | Inlet gas (SAE) | Ø mm | | | |
| | | Inlet liquid (SAE) | Ø mm | | | |
| | | Water Inlet | Ø mm | | | |
| | | Water Outlet | Ø mm | | | |
| | Maximum Operation Pressure | | MPa | | | |
| | Cilinder diameter | | m | | | |
| Water Pump | Type (Manufactured / model) | | - | | | |
| | Electrical power supply | | - | | | |
| | Head pressure (Min/Max) | | mAq | | | |
| | Water flow (Min/Max) | | m³/h | | | |
| Expansion vessel | Type (Manufactured / model) | | - | | | |
| | Material | | - | | | |

To be informed later

## 2.3.4. RWM – AquaFREE (Models for swimming pools and with electric resistance)

| RWM model | | | | RWM-3 FSN1E-S1-4.5H1 | RWM-4 FSN1E-S1-6H1 | RWM-5 FSN1E-S1-6H1 | RWM-4 FSN1E-S1-6H3 | RWM-5 FSN1E-S1-6H3 |
|---|---|---|---|---|---|---|---|---|
| **Heat exchanger** | Heat Exchanger Type | | - | | | | | |
| | Piping | Material | - | | | | | |
| | | Outer Diameter | Ø mm | | | | | |
| | | Inlet gas (SAE) | Ø mm | | | | | |
| | | Inlet liquid (SAE) | Ø mm | | | | | |
| | | Water Inlet | Ø mm | | | | | |
| | | Water Outlet | Ø mm | | | | | |
| | Maximum Operation Pressure | | MPa | | | | | |
| | Cilinder diameter | | m | | | | | |
| Water Pump | Type (Manufactured / model) | | - | | | | | |
| | Electrical power supply | | - | | | | | |
| | Head pressure (Min/Max) | | mAq | | | | | |
| | Water flow (Min/Max) | | m³/h | | | | | |
| Expansion vessel | Type (Manufactured / model) | | - | | | | | |
| | Material | | - | | | | | |

To be informed later

## 2.4. Main Component data for Outdoor Units

The main components described are the following:

- ◈ Outdoor Units: (DC-Inverter)
- Heat exchanger
- Fan Unit
- Compressor



### 2.4.1. RAS – DC Inverter

| RAS Model | | | | RAS-3 HVRNE | RAS-4 HVRNE | RAS-5 HVRNE | RAS-4 HRNE | RAS-5 HRNE |
|---|---|---|---|---|---|---|---|---|
| Heat exchanger | Heat Exchanger Type | | - | Multi-Pass Cross-Finned Tube | | | | |
| | Piping | Material | - | Copper Tube | | | | |
| | | Outer Diameter | Ø mm | 7 | 7 | 7 | 7 | 7 |
| | | Rows | - | 2 | 2 | 2 | 2 | 2 |
| | | Number of Tubes/Coil | qty | 76 | 116 | 116 | 116 | 116 |
| | Fins | Material | - | Aluminium | | | | |
| | | Pitch | mm | 1,9 | 1,9 | 1,9 | 1,9 | 1,9 |
| | Maximum Operation Pressure | | MPa | 4,15 | 4,15 | 4,15 | 4,15 | 4,15 |
| | Total Face Area | | m² | 0,64 | 1,00 | 1,00 | 1,00 | 1,00 |
| | Number of Coils/Unit | | - | 1 | 1 | 1 | 1 | 1 |
| Fan Unit | Fan | Type | - | Propeller Fan | | | | |
| | | Number/Unit | qty | 1 | 1 | 1 | 1 | 1 |
| | | Outer Diameter | mm | 465 | 465 | 465 | 465 | 465 |
| | | Revolutions | rpm | 678 | 678 | 678 | 678 | 678 |
| | | Nominal Air Flow/Fan | m3/min | 45 | 80 | 90 | 80 | 90 |
| | Motor | Type | - | Drip-Proof Type Enclosure | | | | |
| | | Starting method | - | Permanent Condenser | | | | |
| | | Horsepower | W | 50 | 30 + 50 | 50 + 70 | 30 + 50 | 50 + 70 |
| | | Q´ty | qty | 1 | 1 | 1 | 1 | 1 |
| | | Insulation Class | - | E | E | E | E | E |
| Compressor | Model | | - | 2YC45BXD | E305AHD-27D4 | E405AHD-36D2 | E305AHD-27D4 | E405HD-36D4 |
| | Air Tight Pressure | Discharge | MPa | 4,15 | 4,15 | 4,15 | 4,15 | 4,15 |
| | | Suction | MPa | 2,21 | 2,21 | 2,21 | 2,21 | 2,21 |
| | Motor Type | Starting method | - | Inverter-Driven | | | | |
| | | Poles | qty | 4 | 4 | 4 | 4 | 4 |
| | | Insulation Class | - | E | E | E | E | E |
| | Oil | Type | - | FVC50K | FVC68D | FVC68D | FVC68D | FVC68D |
| | | Q´ty | l | 0,75 | 1,2 | 0,5 | 1,2 | 1,2 |
| | Refrigerant Charge | | Kg | 2,4 | 3,6 | 3,6 | 3,6 | 3,6 |

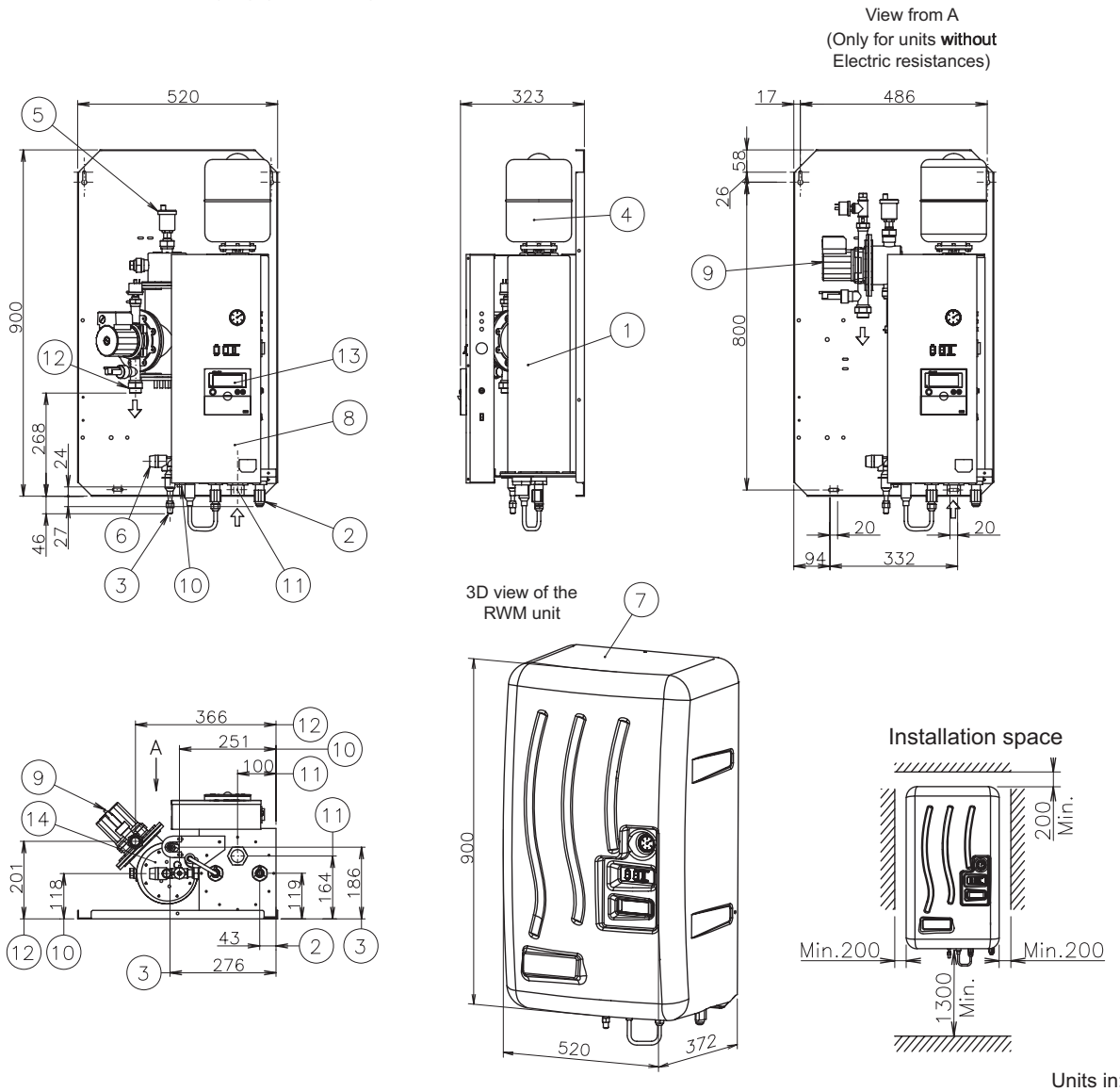
# 3. Dimensional data

This chapter contains dimensional and minimum space required specifications to install AquaFREE and the complementary RAS-H(V)RNE outdoor units of Hitachi's DC Inverter series.

## Content

# 3.1. AquaFREE modules

◈ RWM-3~5FSN1E-(S1)-(4.5/6H1/3)




Units in: mm

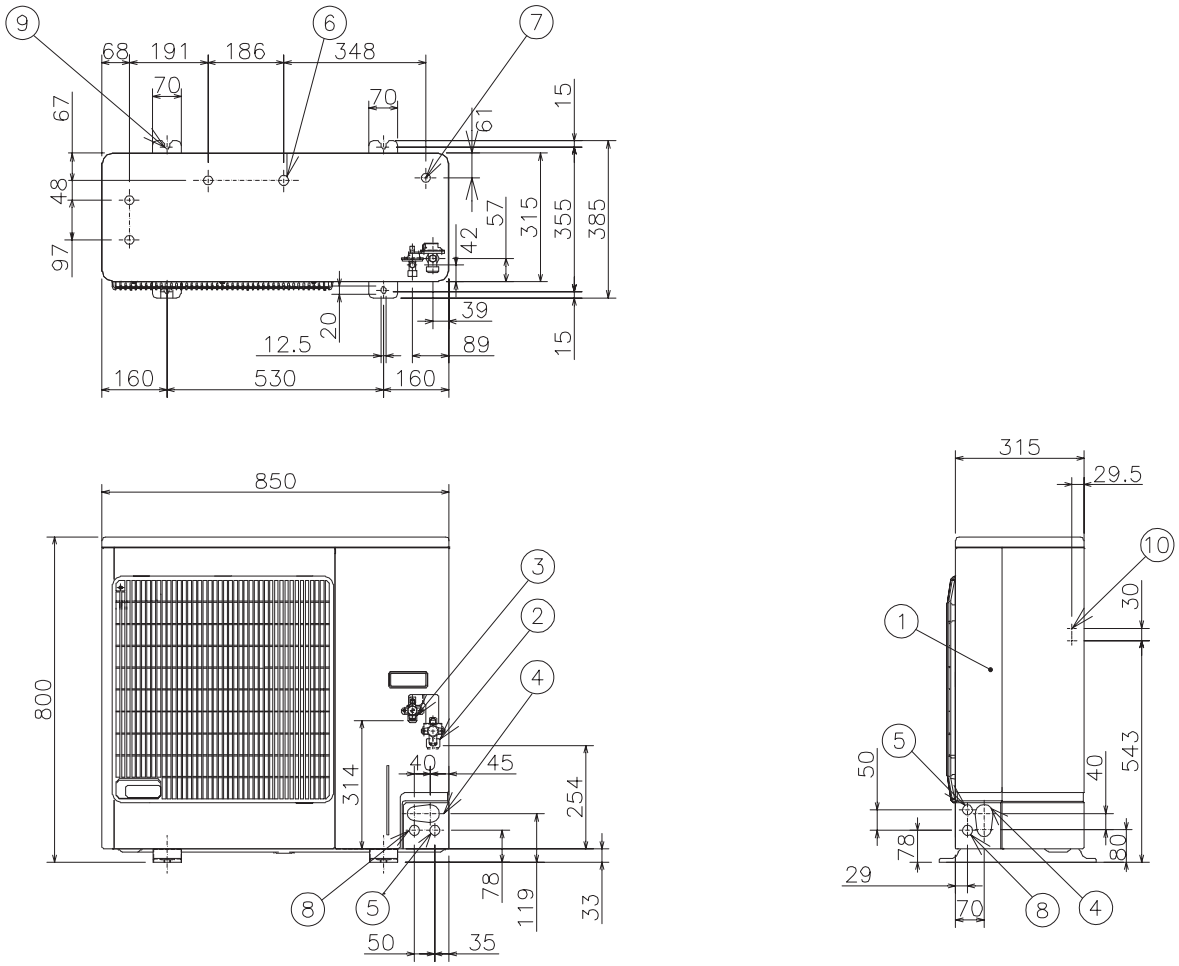
| No. | Description | Remarks |
|---|---|---|
| 1 | Heat exchanger | |
| 2 | Refrigerant Gas Line | Flare nut connection Ø15.88 (5/8”) |
| 3 | Refrigerant Liquid Line | Flare nut connection Ø9.53 (3/8”) |
| 4 | Expansion tank | |
| 5 | Automatic drain | |
| 6 | Safety valve | |
| 7 | Front cover | |
| 8 | Electrical Control Box | |
| 9 | Water Pump | |
| 10 | Electric resistance | Ø19.05 (3/4”) |
| 11 | Water connection | Tamaño de las conexiones del circuito de agua del suelo radiante Ø25.4 (1”) |
| 12 | Water inlet from the RWM from the radiating floor | |
| 13 | Water outlet from the RWM to the radiating floor circuit | |
| 14 | Electric Heater | Only models (4.5/6H1/3) |

Drawing number: XEKS1053

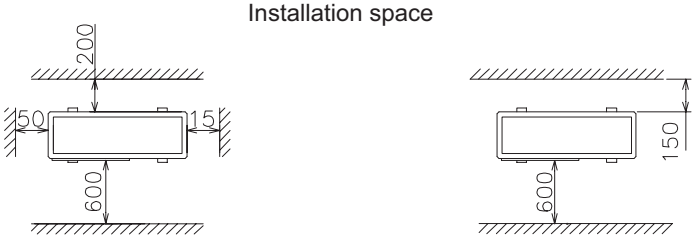
## 3.2. Outdoor Units: RAS-DC Inverter



◈ RAS-3HVRNE




Installation space



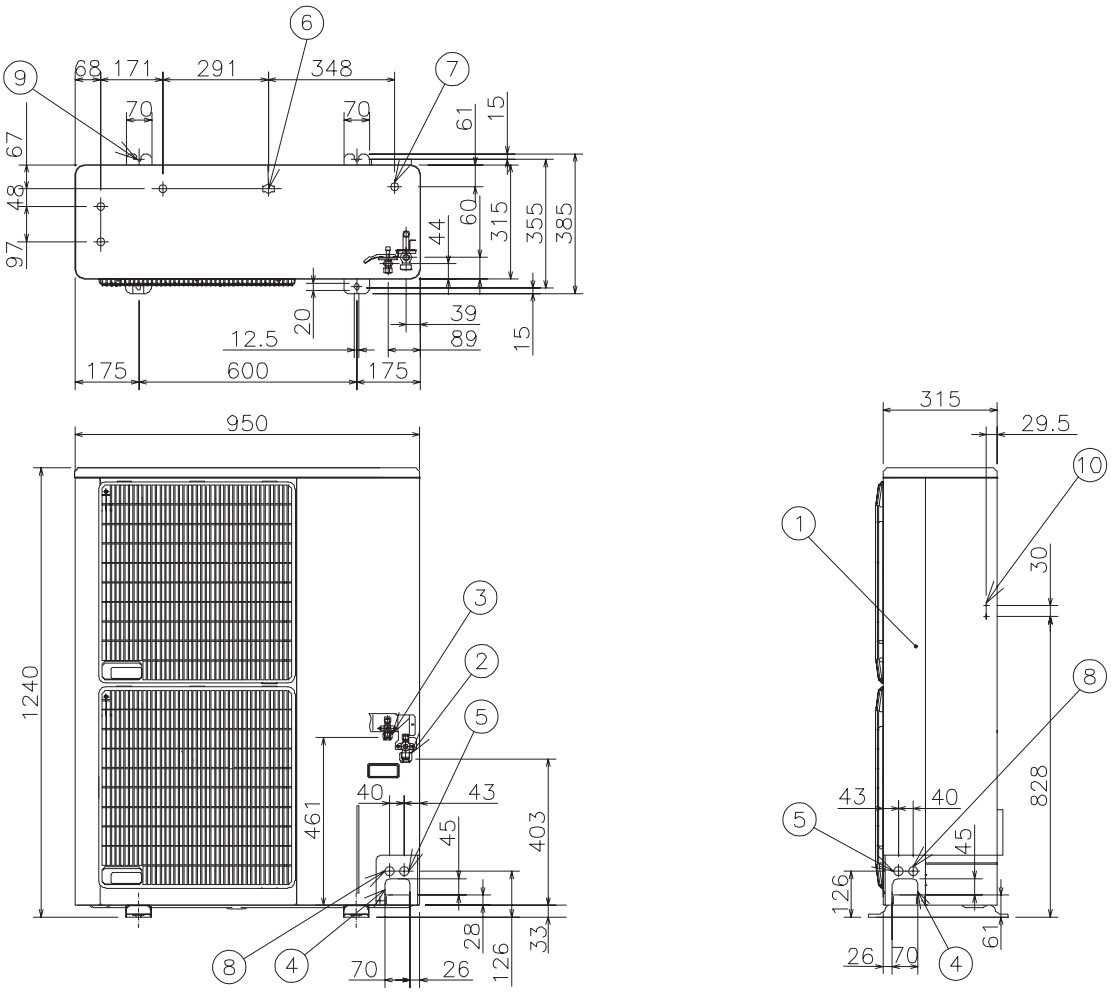

Units in: mm

| No. | Description | Remarks |
|---|---|---|
| 1 | Service cover | |
| 2 | Refrigerant Gas Line | Flare nut: Ø15.88 |
| 3 | Refrigerant Liquid Line | Flare nut: Ø9.53 |
| 4 | Holes for Refrigerant piping | Knockout hole |
| 5 | Holes for Control Line Wiring | Ø26.5 Knockout hole |
| 6 | Drain holes | Ø26 |
| 7 | Drain holes | 4-Ø24 |
| 8 | Holes for Power Source Wiring | Ø26.5 Knockout hole |
| 9 | Holes for fixing machine to floor | 2–U Cut Holes |
| 10 | Holes for fixing machine to wall | M5 self-tapping screws |

*NOTE:*
*Even if there are no walls in front of or behind the unit, a minimum space of 600mm is required in front of the unit, and 200mm behind it.*
*If there are walls around the unit, then vent holes must be made through the wall.*
*When there are obstacles above the unit, the four surrounding sides must be kept open.*

Drawing number XEKS0831

◈ RAS-4/5H(V)RNE




Installation space


Units in: mm

| No. | Description | Remarks |
|---|---|---|
| 1 | Service cover | |
| 2 | Refrigerant Gas Line | Flare nut: Ø15.88 |
| 3 | Refrigerant Liquid Line | Flare nut: Ø9.53 |
| 4 | Holes for Refrigerant piping | Knockout hole |
| 5 | Holes for Control Line Wiring | Ø26.5 Knockout hole |
| 6 | Drain holes | Ø26 |
| 7 | Drain holes | 4-Ø24 |
| 8 | Holes for Power Source Wiring | Ø26.5 Knockout hole |
| 9 | Holes for fixing machine to floor | 2–U Cut Holes |
| 10 | Holes for fixing machine to wall | M5 self-tapping screws |

*NOTE:*
*Even if there are no walls in front of or behind the unit, a minimum space of 600mm is required in front of the unit, and 300mm behind it.*
*If there are walls around the unit, then vent holes must be made through the wall.*
*When there are obstacles above the unit, the four surrounding sides must be kept open.*

Drawing number XEKS0831

HITACHI
Inspire the Next

# 4.Capacities and information for selecting unit

This chapter is a guide for selecting the unit best suited to your needs and shows performance details for each unit.

## Content

# 4.1. Choosing your AquaFREE system

The following steps are an example of how to choose the system units and indicates the way to decide on the model best suited to your own specific needs:

We recommend that you choose the AquaFREE system according to the heating load.

### 4.1.1. How to use the data in this chapter

Define the installation requirements: load, operating temperature and special installation needs. Then select the most suitable units. Decide on where to put the outdoor unit to allow easy maintenance and service.

Use the following information to calculate the most suitable units:

- Relevant sections of Chapter 4:
  - Unit capacities: Section 4.2
  - Correction factors for piping lenght: Section 4.6
  - Data related to noise: Section 4.7

- In addition, use the following information from the technical catalogue:
  - General data: Chapter 2
  - Length of water piping: Section 7.4.2
  - Electrical “water rule” wiring: Section 9.3.2

### 4.1.2. Example of choosing units by heating load

We suggest the following method to determine the characteristics of the system units:

**System requirements**

**Step 1:**

Heating load:

| | |
|---|---|
| Wet-bulb temperature of the incoming air: | -5 ºC |
| Temperature of the water outlet: | 35 ºC |
| Temperature of the water inlet: | 30 ºC |
| Thermal load: | 8.00 kW |
| Type of installation: | Radiant Floorr |

*NOTE:*

The calculation methods for thermal loads in the building should comply with the regulations applicable in each country.

| Installation restrictions: | |
|---|---|
| Power source: | 230 V, 1~, 50 Hz |
| AquaFREE module lower than the outdoor unit: | 15 m |
| Total equivalent distance between the AquaFREE module and the outdoor unit: | 20 m |

| Type of AquaFREE module: |
|---|
| AquaFREE RWM modules needed |

☛ **Step 2:**

**Select the units**

Select the units to make up the AquaFREE system according to the thermal load needed.

The system chosen should have a load capacity greater than the thermal load required by the installation.

Use sections 4.2 and 4.3 to calculate your choice

- Unit chosen:

  The total heating load is **8.00 kW**, and the choice of system depends on the table of capacities (section 4.2) for radiant floor (35/30ºC)

☛ **Table 1:**

**Heating capacity data:**

| AquaFREE UNITS | Radiant floor | |
|---|---|---|
| | Outdoor air inlet temperature WB (ºC) | Water outlet/inlet temperature (35/30ºC) |
| | | Max. CAP |
| RWM-4FSN1E | -6 | 8,80 |
| | -5 | 9,00 |
| | -3 | 9,00 |

Apply a correction factor according to the length and height of the piping (section 4.7) and the heating capacity given in Table 1:

*Heating capacity of the system =*
*heating capacity x correction factor for tubing length =*
*9.00 x 0.99* = **8.91 kW**

*NOTE:*
The defrosting factor is included in Table 1.

The AquaFREE system most suitable for your requirements is:

| Unit chosen | RAS-4HVRNE/RWM-4FSN1E |
|---|---|

4

☛ **Step 3:**

**Choose units with electrical resistance (heating load)**

| | |
|---|---|
| Wet-bulb temperature of the incoming air: | -11 ºC |
| Temperature of the water outlet: | 35 ºC |
| Temperature of the water inlet: | 30 ºC |
| Thermal load: | 10.00 kW |
| Type of installation: | Radiant floor |

| Installation restrictions: | |
|---|---|
| Power source: | 230 V, 1~, 50 Hz |
| AquaFREE module lower than the outdoor unit: | 15 m |
| Total equivalent distance between the AquaFREE module and the outdoor unit: | 20 m |
| Total heating load: | 10.00 kW |

The total heating load is **10.00 kW**, and the choice of system depends on the table of capacities (section 4.2) for radiant floor (35/30ºC)

☛ **Table 2:**

**Heating capacity data**

| | Radiant Floor | |
|---|---|---|
| AquaFREE units | Outdoor air inlet temperature WB (ºC) | Water outlet/inlet temperature (35/30ºC) |
| | | Max. CAP |
| RWM-4FSN1E | -9 | 8,30 |
| | -11 | 8,00 |
| | -13 | 7,60 |

- As can be seen, the *Total heating load* > *Capacity of the unit*. These conditions require the use of additional electrical elements.
- The capacity of the electrical elements required can be checked in Chapter 2 (General Data).
- Select the available unit from the table in Chapter 2 (General Data) with the electrical element corresponding to model **RWM-4FSN1E-6H1,** with a total power of **(8 x 0.99) + 6 kW** of electrical resistance.

*NOTE:*

We advise using support heaters rather than overburdening the selected unit.

| | |
|---|---|
| Unit with selected electrical element. | RWM-4FSN1E-6H1 |

☛ **Step 4:**

**Choice of units for installations with radiators or mixed installations (radiators + radiant floor)**

- In the case of installations with radiators, use the same process as the radiant floor method.
  Choose the values in the table of water outlet/inlet temperature (45/40ºC)

- For mixed installations, use the graphs corresponding to the radiator installations.

Cooling load:

### 4.1.3. Capacities available for cooling load

- The AquaFREE systems are limited cooling systems, not air conditioning. However, the temperature of a room can be reduced with water temperatures of between 19 and 21 ºC.

- The parameter which determines which temperature can be chosen is humidity. For areas with a high humidity, 21 ºC is recommended, while in the case of dry areas up to 19 ºC is possible.

## 4.2 Capacity in heating mode

The following tables show the heating capacity corresponding to a particular outdoor temperature, and with a water outlet/inlet temperature of 35/30 ºC and 45/40 ºC.

Temperatures of between 35/30 ºC are recommended for radiant floor.

Temperatures of between 45/40 ºC are recommended for low-intensity radiators.

| AquaFREE UNITS | Outdoor air inlet temperature WB (ºC) | Water outlet/inlet temperature (35/30ºC) Max. CAP Radiant floor | Water outlet/inlet temperature (45/40 ºC) Max. CAP Radiators |
|---|---|---|---|
| RWM-3FSN1E | -20 | - | - |
| | -17 | - | - |
| | -15 | 4,50 | 3,80 |
| | -13 | 4,90 | 4,20 |
| | -11 | 5,30 | 4,60 |
| | -9 | 5,70 | 5,00 |
| | -7 | 6,00 | 5,30 |
| | -6 | 6,20 | 5,60 |
| | -5 | 6,40 | 5,80 |
| | -3 | 6,50 | 6,10 |
| | -2 | 6,80 | 6,40 |
| | 0 | 7,40 | 7,00 |
| | 2 | 8,10 | 7,80 |
| | 4 | 9,00 | 8,80 |
| | 5 | 10,00 | 9,80 |
| | 6 | 10,90 | 10,80 |
| | 8 | 11,60 | 11,50 |
| | 10 | 12,20 | 12,20 |
| | 13 | 13,20 | 13,30 |
| | 14 | 13,50 | 13,70 |
| RWM-4FSN1E | -20 | 6,20 | 6,00 |
| | -17 | 6,80 | 6,60 |
| | -15 | 7,20 | 7,10 |
| | -13 | 7,60 | 7,50 |
| | -11 | 8,00 | 7,90 |
| | -9 | 8,30 | 8,40 |
| | -7 | 8,60 | 8,70 |
| | -6 | 8,80 | 8,90 |
| | -5 | 9,00 | 9,00 |
| | -3 | 9,00 | 8,90 |
| | -2 | 9,20 | 9,10 |
| | 0 | 9,70 | 9,70 |
| | 2 | 10,50 | 10,40 |
| | 4 | 11,60 | 11,50 |
| | 5 | 12,70 | 12,60 |
| | 6 | 13,90 | 13,70 |
| | 8 | 14,50 | 14,30 |
| | 10 | 15,20 | 15,00 |
| | 13 | 16,20 | 15,90 |
| | 14 | 16,50 | 16,20 |

| AquaFREE UNITS | Outdoor air inlet temperature WB (ºC) | Water outlet/inlet temperature (35/30ºC) Max. CAP Radiant floor | Water outlet/inlet temperature (45/40 ºC) Max. CAP Radiators |
|---|---|---|---|
| RWM-5FSN1E | -20 | 9,50 | 8,00 |
| | -17 | 10,10 | 8,60 |
| | -15 | 10,50 | 9,00 |
| | -13 | 10,90 | 9,50 |
| | -11 | 11,30 | 9,90 |
| | -9 | 11,80 | 10,30 |
| | -7 | 12,00 | 10,60 |
| | -6 | 12,10 | 10,70 |
| | -5 | 12,20 | 10,90 |
| | -3 | 11,80 | 10,70 |
| | -2 | 11,90 | 10,80 |
| | 0 | 12,30 | 11,30 |
| | 2 | 13,10 | 12,10 |
| | 4 | 14,20 | 13,30 |
| | 5 | 15,40 | 14,50 |
| | 6 | 16,70 | 15,70 |
| | 8 | 17,30 | 16,30 |
| | 10 | 17,80 | 17,00 |
| | 13 | 18,70 | 17,90 |
| | 14 | 18,90 | 18,20 |

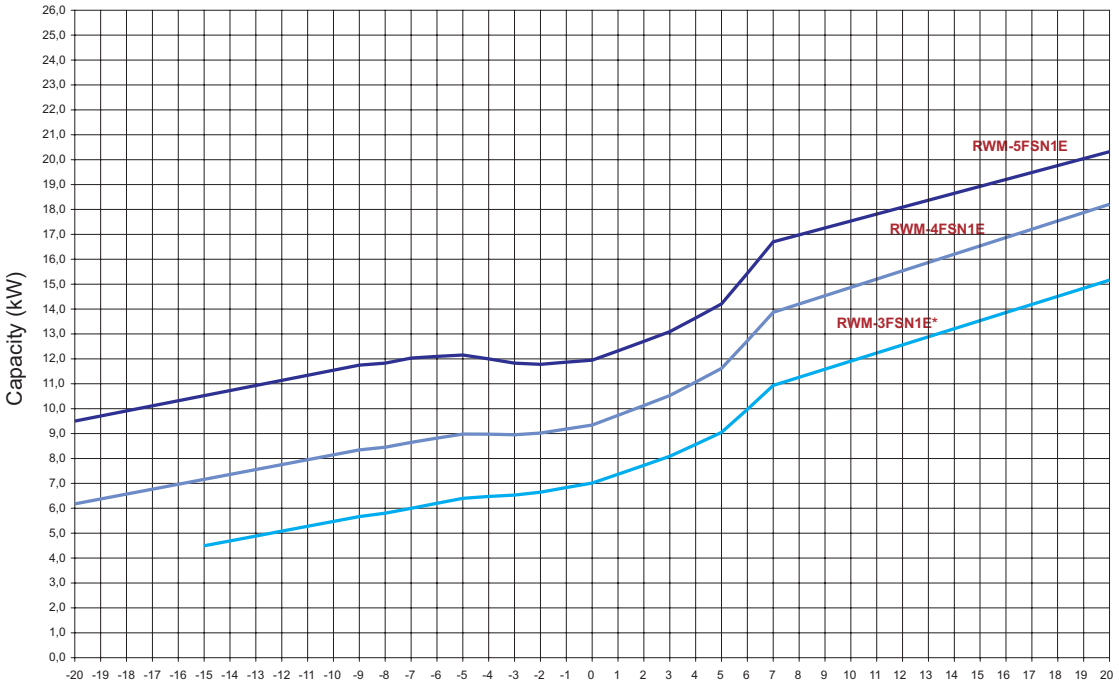


*NOTES*:

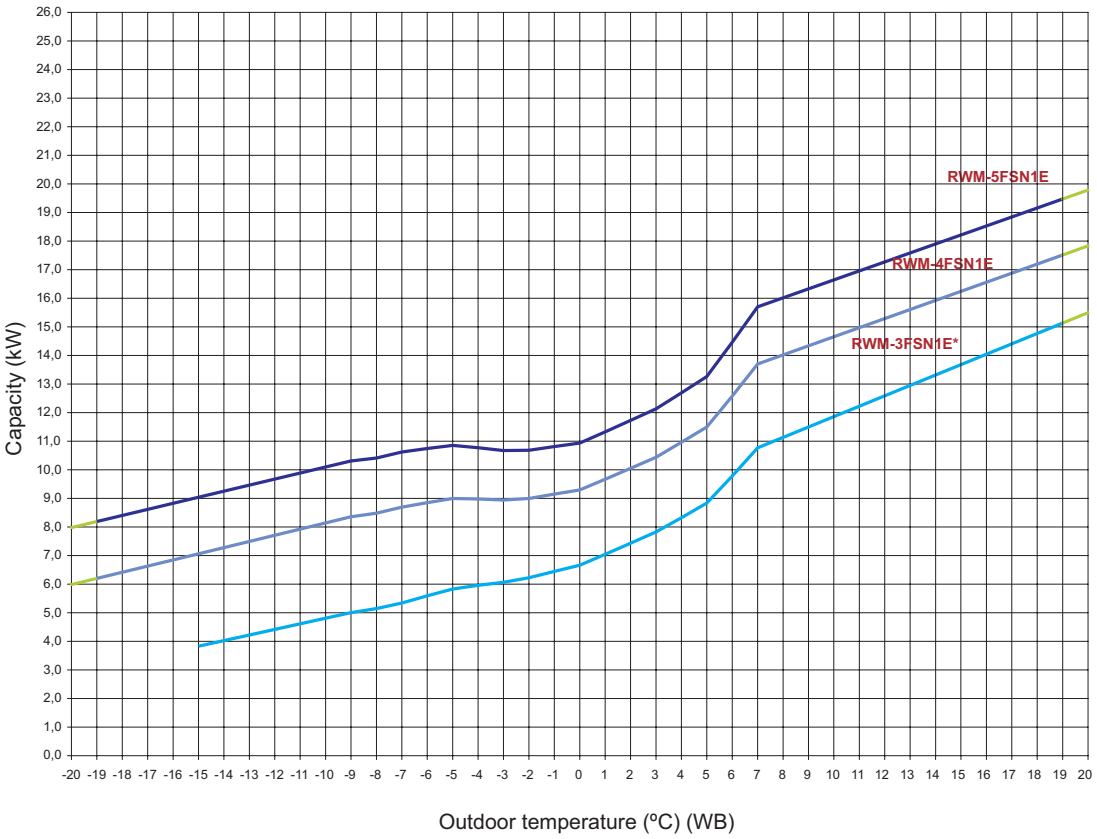
**Max. CAP:** Compressor capacity at maximum frequency (kW)

The correction factor for defrosting is included.

## Water outlet/inlet temperature (35/30 ºC)




## Water outlet/inlet temperature (45/30 ºC)




*NOTES*:

Compressor capacity at maximum frequency (kW)

The correction factor for defrosting is included.

## 4.3 Capacity in cooling mode

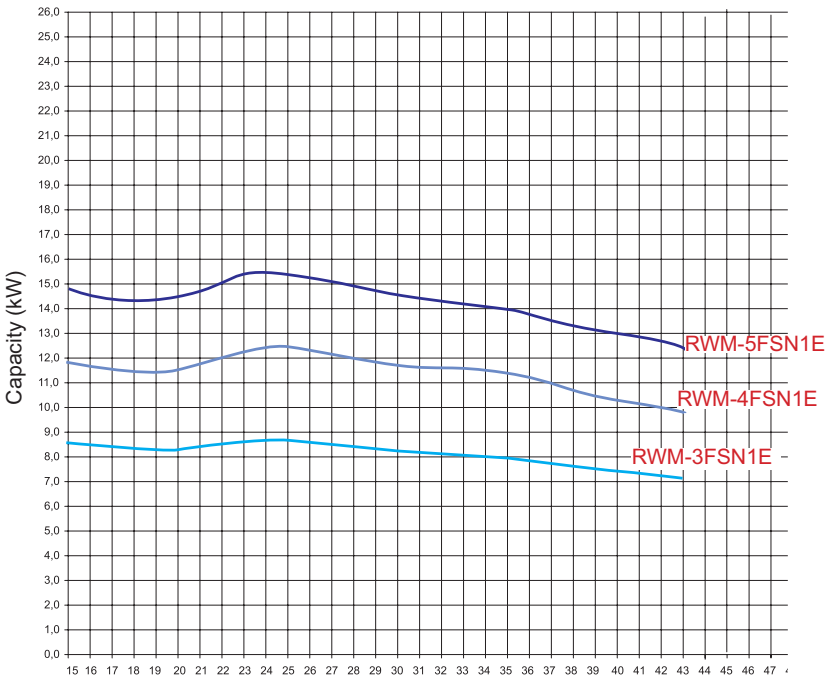
The following tables show the cooling capacity for specific outdoor temperatures, and with a water outlet/inlet temperature of 23/18 ºC.

| AquaFREE UNITS | Outdoor air inlet temperature DB (ºC) | Water outlet/inlet temperature (18/23 ºC) |
|---|---|---|
| | | Max. CAP |
| | | Radiant floor |
| RWM-3FSN1E | 15 | 8,50 |
| | 20 | 8,40 |
| | 25 | 8,80 |
| | 30 | 8,30 |
| | 35 | 8,00 |
| | 40 | 7,40 |
| | 43 | 7,10 |
| RWM-4FSN1E | 15 | 11,90 |
| | 20 | 11,70 |
| | 25 | 12,40 |
| | 30 | 11,70 |
| | 35 | 11,20 |
| | 40 | 10,40 |
| | 43 | 9,90 |
| RWM-5FSN1E | 15 | 14,80 |
| | 20 | 14,70 |
| | 25 | 15,50 |
| | 30 | 14,60 |
| | 35 | 14,00 |
| | 40 | 13,00 |
| | 43 | 12,40 |

*NOTES*:

**Max. CAP:** Compressor capacity at maximum frequency (kW)

**Water outlet/inlet temperature (18/23 ºC)**




*NOTE*:

Compressor capacity at maximum frequency (kW)

# 4.4. Capacities and electrical power consumed for the most significant values

## 4.4.1. Heating mode

| AquaFREE units | Outdoor air inlet temperature DB/WB (°C) | Water outlet/inlet temperature (35/30 °C) | | Water outlet/inlet temperature (45/40 °C) | |
|---|---|---|---|---|---|
| | | CAP | IPT | CAP | IPT |
| | | Radiant floor | | Radiators | |
| RWM-3FSN1E | 7/6 | 8,00 | 1,98 | 7,47 | 2,47 |
| RWM-4FSN1E | | 11,20 | 3,24 | 10,10 | 3,78 |
| RWM-5FSN1E | | 14,00 | 4,03 | 14,10 | 4,83 |

*NOTES*:

**CAP:** Compressor capacity at nominal frequency (kW)

**IPT:** Nominal electrical power consumed (kW)

| AquaFREE units | Outdoor air inlet temperature WB (°C) | Water outlet/inlet temperature (35/30 °C) | | Water outlet/inlet temperature (45/40 °C) | |
|---|---|---|---|---|---|
| | | Max. CAP | Max. IPT | Max. CAP | Max. IPT |
| | | Radiant floor | | Radiators | |
| RWM-3FSN1E | -7 | 6,00 | 2,74 | 5,30 | 3,06 |
| RWM-4FSN1E | | 8,60 | 3,79 | 8,70 | 4,46 |
| RWM-5FSN1E | | 12,02 | 5,34 | 10,59 | 5,85 |

*NOTES:*

**Max. CAP:** Compressor capacity at maximum frequency (kW)

**Max. IPT:** Maximum electrical power consumed (kW)

### 4.4.2. Cooling mode

| AquaFREE UNITS | Outdoor air inlet temperature DB (ºC) | Water outlet/inlet temperature (19/24 ºC) | |
|---|---|---|---|
| | | Max. CAP | Max. IPT |
| | | Radiant floor | |
| RWM-3FSN1E | 35 | 7,10 | 2,02 |
| RWM-4FSN1E | | 10,00 | 3,10 |
| RWM-5FSN1E | | 12,50 | 3,53 |

*NOTES:*

**Max. CAP:** Compressor capacity at maximum frequency (kW)

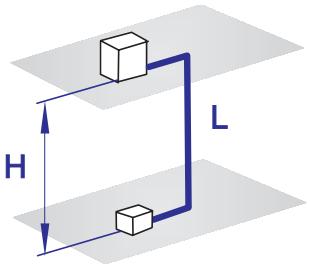
**Max. IPT:** Maximum electrical power consumed (kW)



## 4.5. Correction factors for piping length

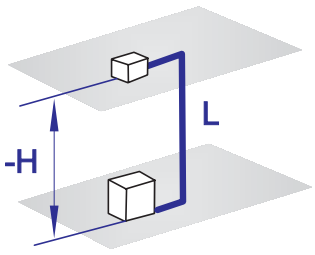
The correction factor is based on the equivalent length of tubing in metres (EL) and the height between the AquaFREE module and the outside unit, also in metres (H).

Outdoor unit on the roof




AquaFREE module on the ground

AquaFREE module on the ground




Outdoor unit in the basement

**H:**
Height between the AquaFREE module and the outdoor unit (m).

- H>0: The outdoor unit is located above the AquaFREE module (m).
- H<0: The outdoor unit is located below the AquaFREE module (m).

**L:**
The real length of tubing in one direction between the AquaFREE module and the outdoor unit (m).

**The**:
Equivalent length of tubing in one direction between the AquaFREE module and the outdoor unit (m).

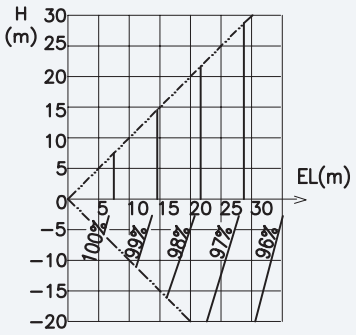
*NOTES:*

- Use the following equivalences to calculate the equivalent length of tubing:
  - An angle of 90º is equivalent to 0.5 m.
  - An angle of 180º is equivalent to 1.5 m.

## ◆ Cooling capacity

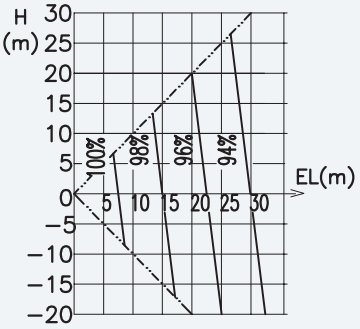
RAS-3HVRNE

Cooling



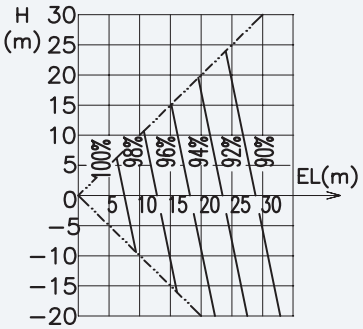

RAS-4H(V)RNE

Cooling




RAS-5H(V)RNE

Cooling




### ☛ Cooling capacity:

The cooling capacity should be corrected using the following formula:

**TCA = TC x F**

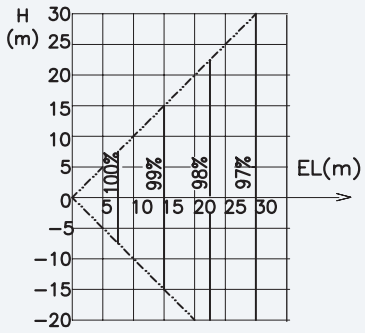
**TCA:**
Real corrected cooling capacity (kW).

**TC:**
Cooling capacity from the table of cooling capacities (kW).

**F:**
Correction factor based on the equivalent length of tubing (%).

RAS-3HVRNE

Heating






**Heating capacity:**

The heating capacity should be corrected using the following formula:

**THA = TH x F**

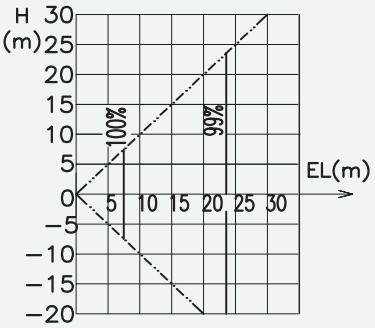
**THA:**
Real corrected heating capacity (kW).

**TH:**
Heating capacity from the table of heating capacities (kW).

**F:**
Correction factor based on the equivalent length of tubing (%)

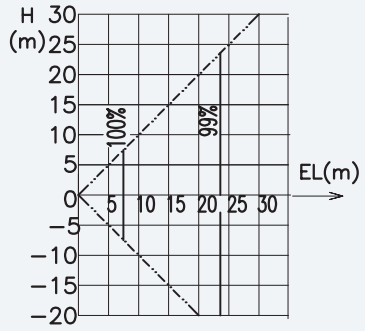
RAS-4H(V)RNE

Heating



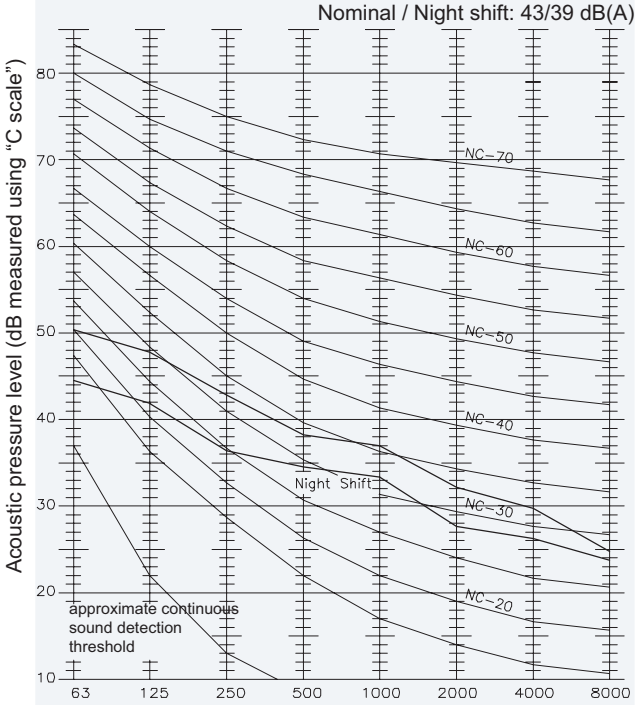

RAS-5H(V)RNE

Heating

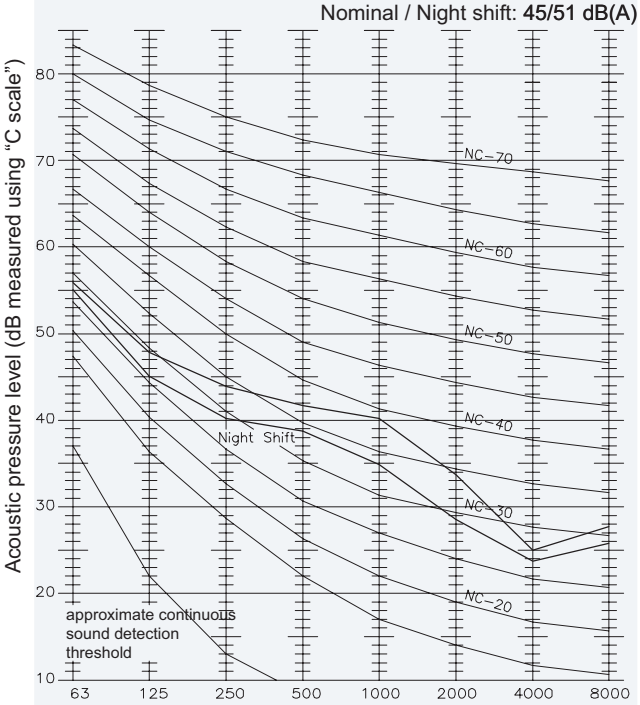


## 4.6. Data related to noise

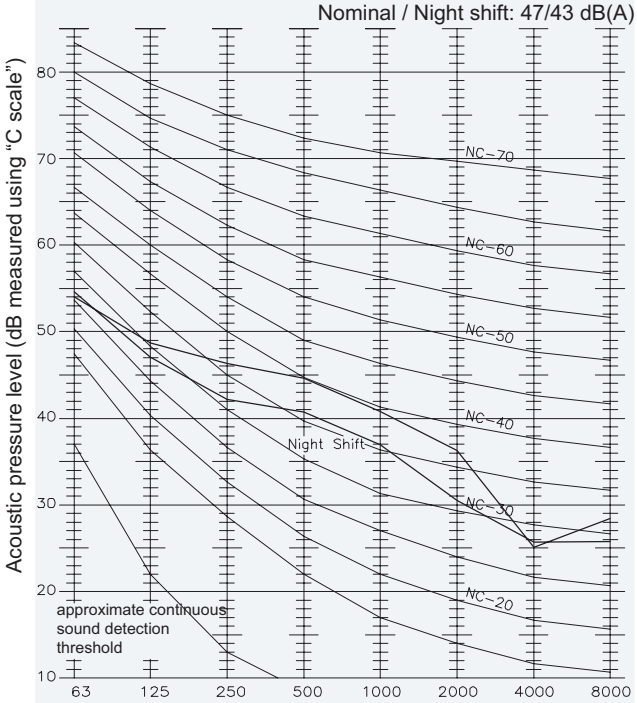
| Model: RAS-3HVRNE | Power source: 230 V 50 Hz |
|---|---|
| Point of measurement: | 1 metre from the front surface<br>1.5 metres from ground level |
| | Acoustic criteria curve |
| | Nominal / Night shift: 43/39 dB(A) |




| Model: RAS-4H(V)RNE | Power source: 230 V 50 Hz |
|---|---|
| Point of measurement: | 1 metre from the front surface<br>1.5 metres from ground level |
| | Acoustic criteria curve |
| | Nominal / Night shift: 45/51 dB(A) |



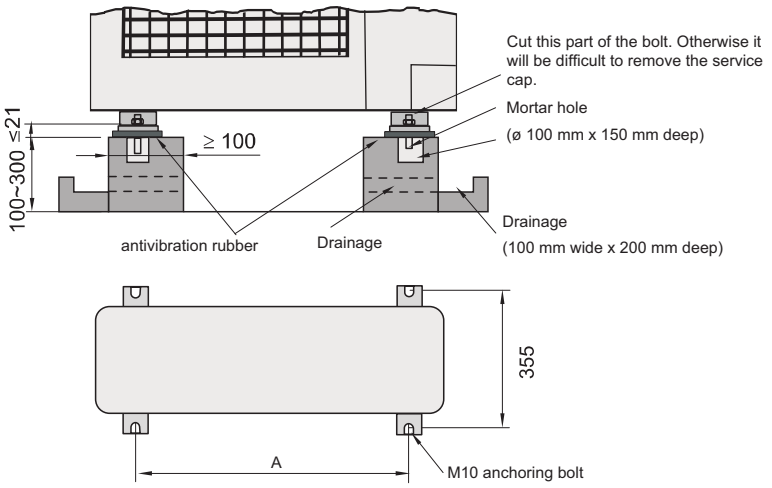

| Model: RAS-5H(V)RNE | Power source: 230 V 50 Hz |
|---|---|
| Point of measurement: | 1 metre from the front surface<br>1.5 metres from ground level |
| | Acoustic criteria curve |
| | Nominal / Night shift: 47/43 dB(A) |



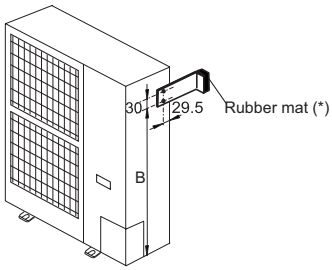
Frequency (Hz)

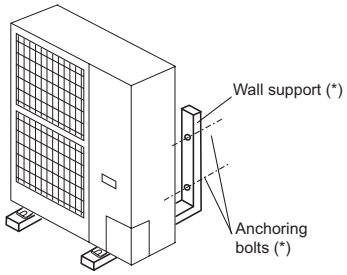
## 4.7. Foundation

### ◆ Concrete foundations




| Fix the unit to the wall | Hanging unit |
|---|---|




(*) Supplied by the installer

| MODEL | A | B |
|---|---|---|
| RAS-3HVRNE | 530 | 511 |
| RAS 4/5H(V)RNE | 600 | 796 |

Units: mm

# 5. Working range

This chapter shows the working range of the new AquaFREE units and the complementary RAS-H(V)RNE outdoor units of Hitachi's DC Inverter series.-

## Content

## 5.1. Power Supply.

| | |
|---|---|
| **Operating voltage** | 90% to 110% of the Rated Voltage |
| **Voltage Imbalance** | Within a 3% Deviation from Each Voltage at the Main Terminal of Outdoor Unit |
| **Starting Voltage** | Higher than 85% of the Rated Voltage |

Following the Council Directive 89/336/EEC and its amendments 92/31/EEC and 93/68/EEC, relating to electromagnetic compatibility, next table indicates maximum permissible system impedance $Z_{max}$ at the interface point of the user's supply, in accordance with EN61000-3-11

| MODEL | $Z_{máx}$ (Ω) |
|---|---|
| RAS-3HVRNE | 0,35 |
| RAS-4HVRNE | 0,27 |
| RAS-5HVRNE | 0,26 |
| RWM-3FSN1E-4.5H1 | 0,38 |
| RWM-4FSN1E-6H1 | 0,29 |
| RWM-5FSN1E-6H1 | 0,29 |

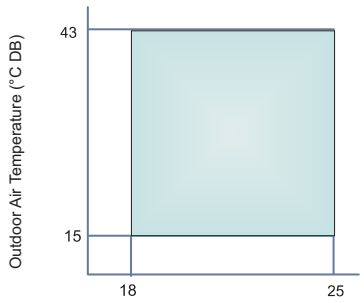
## 5.2. Temperature Range

The temperature range is indicated in the following table.

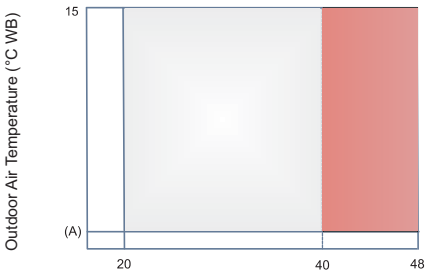
| | | Cooling Operation | Heating Operation |
|---|---|---|---|
| Water Outlet Temperature | Minimum | 18 °C | 20 °C |
| | Maximum | 25 °C | 40 ºC Radiant floor<br>48 °C Radiators |
| Outdoor Temperature | Minimum | 15 °C DB | –20 °C WB (*) |
| | Maximum | 43 °C DB | 15 °C WB |

(*) 3HP = -15ºC WB

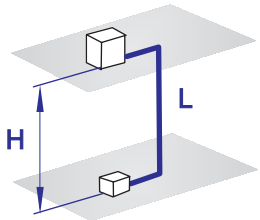
**Cooling Operation**

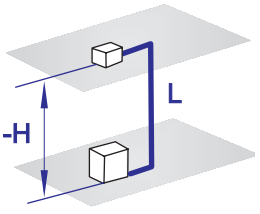



**Heating Operation**




| Model | Temperature (A) |
|---|---|
| RAS-3HVRNE | -15 ºC WB |
| RAS-4/5H(V)RNE | -20 ºC WB |




## 5.3. Piping Provision

| Unit Power | 3HP | 4HP | 5HP |
|---|---|---|---|
| Maximum Piping Length L: | | | |
| - Real length | 30 | 30 | 30 |
| - Equivalent length | 40 | 40 | 40 |
| Maximum Piping Lift H: | | | |
| Outdoor Unit located higher than Indoor Unit | | 30 | |
| Outdoor Unit located higher than Indoor Unit | | 20 | |

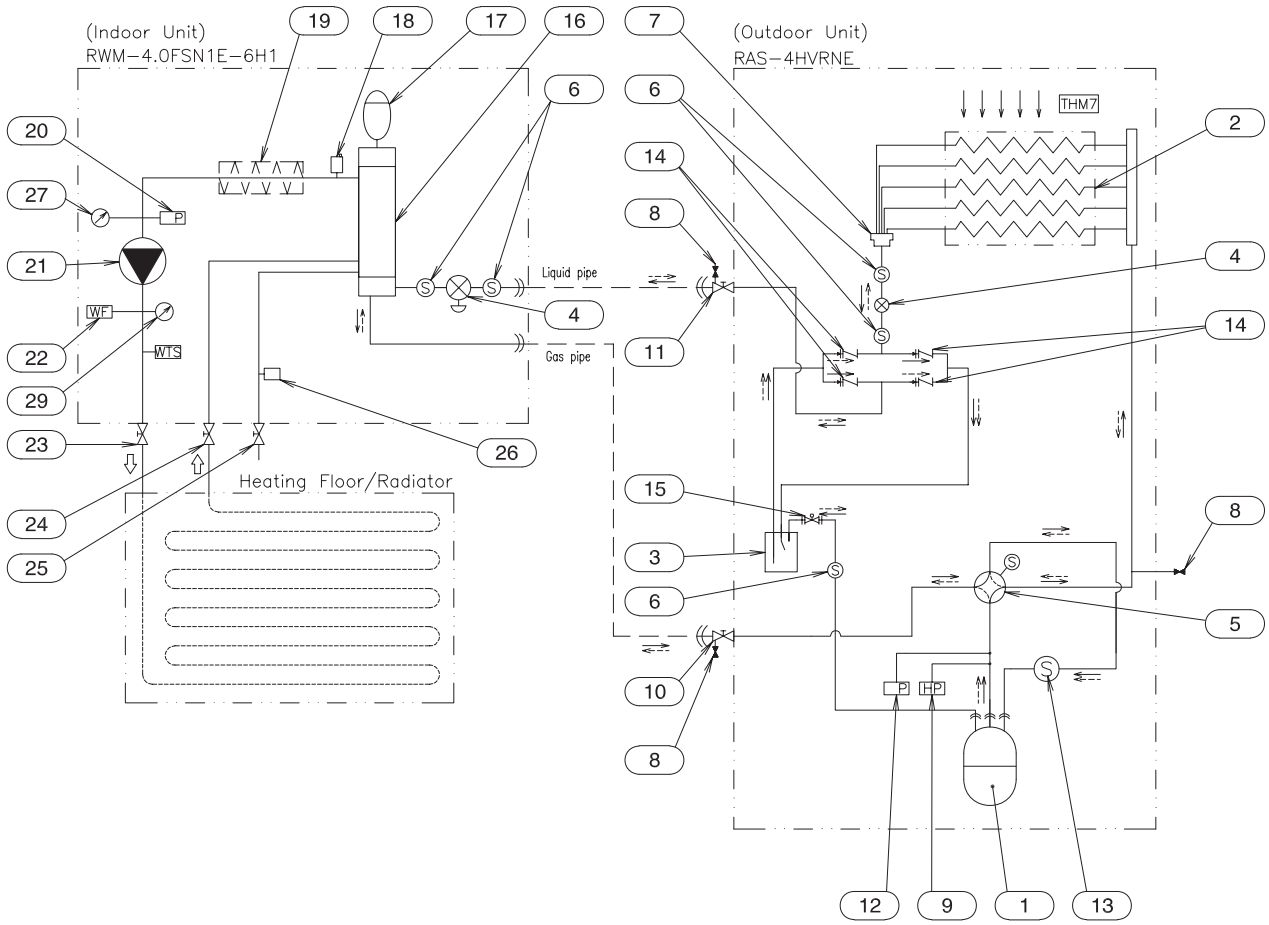
# 6. Refrigerant cycle

This chapter contains the cycle diagrams of each type of installation of AquaFREE indoor units and RAS-H(V)RNE outdoor units of Hitachi's DC Inverter series.

## Content

## 6.1. Refrigerant cycle between RWM and RAS

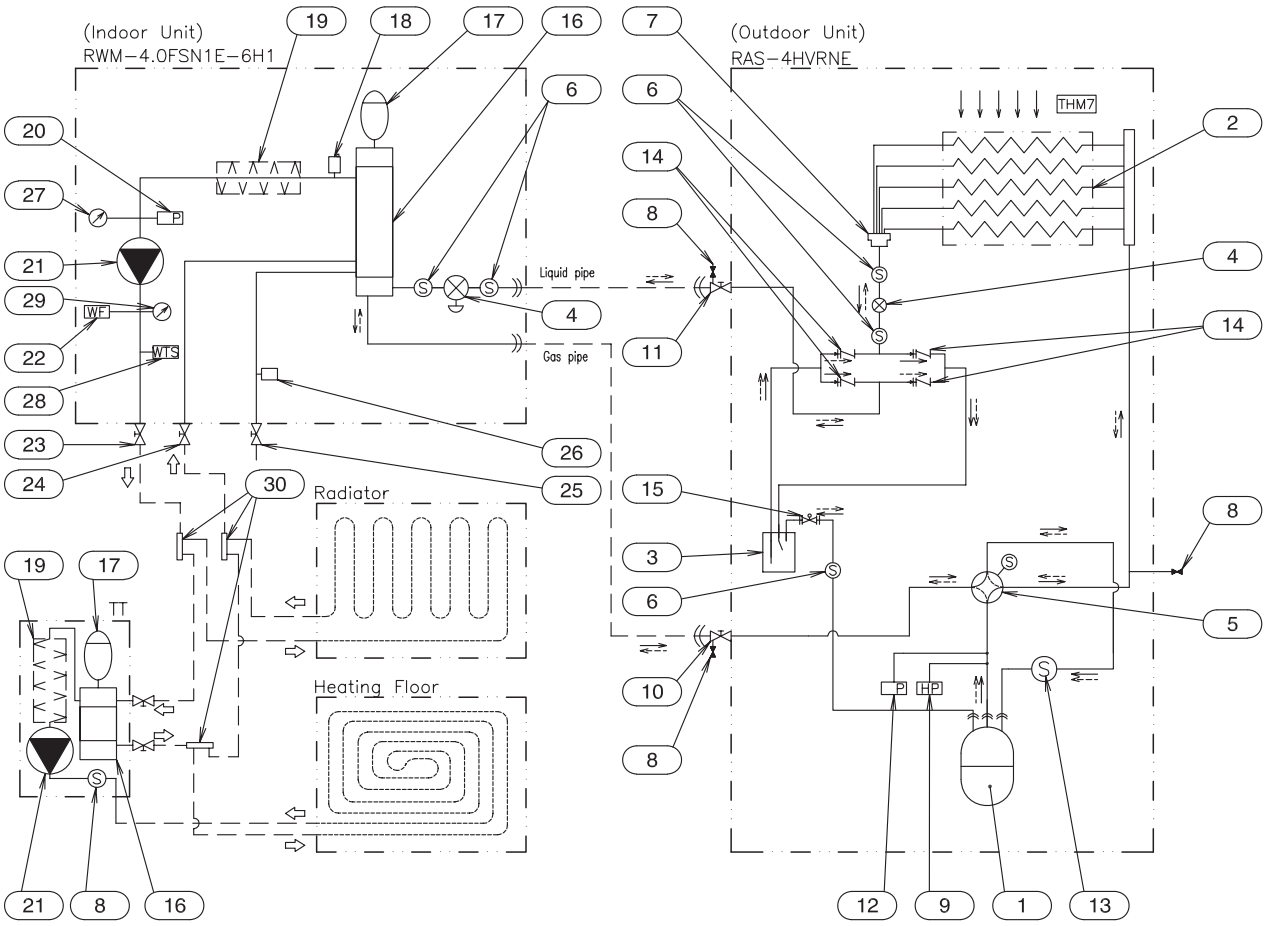
### 6.1.1. The RWM unit is connected to a Floor heating or Radiators system




| Refrigerant Flow for Cooling | Refrigerant Flow for Heating | Field-Supplied Refrigerant Piping | Connection with flare nut | Flange Connection | Brazing Connection | Water Flow direction | Refrigerant : R410A | Airtight Test Pressure 4.15 MPa |
|---|---|---|---|---|---|---|---|---|

| N | Name of item | N | Name of item | N | Name of item |
|---|---|---|---|---|---|
| 1 | Compressor | 11 | Liquid Stop Valve | 21 | Water Pump |
| 2 | Heat exchanger | 12 | Pressure switch | 22 | Water low flow switch |
| 3 | Reciver | 13 | Filter 5/8 | 23 | RWM water outlet |
| 4 | Expansion valve | 14 | Check valve | 24 | RWM water inlet |
| 5 | 4-Way valve | 15 | Solenoid valve | 25 | Water port connection |
| 6 | Filter 3/8 | 16 | Heat exchanger | 26 | Water cut Pressure swith |
| 7 | Distributor | 17 | Expansion tank | 27 | Manometer |
| 8 | Check Joint | 18 | Air purger | 28 | Security thermostat for electric heater. (Only for H units) |
| 9 | Pressure switch | 19 | Electric heater (Only for H units) | 29 | Setting thermostat for the maximum water temperature. |
| 10 | Gas Stop Valve | 20 | Water cut Pressure swith | | |

### 6.1.2. The RWM unit is connected to a Floor heating and Radiators system




| Refrigerant Flow for Cooling | Refrigerant Flow for Heating | Field-Supplied Refrigerant Piping | Connection with flare nut | Flange Connection | Brazing Connection | Water Flow direction | Refrigerant : R410A | Airtight Test Pressure 4.15 MPa |
|---|---|---|---|---|---|---|---|---|

| N | Name of item | N | Name of item | N | Name of item |
|---|---|---|---|---|---|
| 1 | Compressor | 11 | Liquid Stop Valve | 21 | Water Pump |
| 2 | Heat exchanger | 12 | Pressure switch | 22 | Water low flow switch |
| 3 | Reciver | 13 | Filter 5/8 | 23 | RWM water outlet |
| 4 | Expansion valve | 14 | Check valve | 24 | RWM water inlet |
| 5 | 4-Way valve | 15 | Solenoid valve | 25 | Water port connection |
| 6 | Filter 3/8 | 16 | Heat exchanger | 26 | Water cut Pressure swith |
| 7 | Distributor | 17 | Expansion tank | 27 | Manometer |
| 8 | Check Joint | 18 | Air purger | 28 | Security thermostat for electric heater. (Only for H units) |
| 9 | Pressure switch | 19 | Electric heater (Only for H units) | 29 | Setting thermostat for the maximum water temperature. |
| 10 | Gas Stop Valve | 20 | Water cut Pressure swith | 30 | Branch pipe |

# 7. Piping and water charge

This chapter describes the refrigerant piping and water piping connections, and how to change the amount of water in an AquaFREE modul / Outdoor unit DC Inverter.

## Content

## 7.1. Range of refrigerant piping

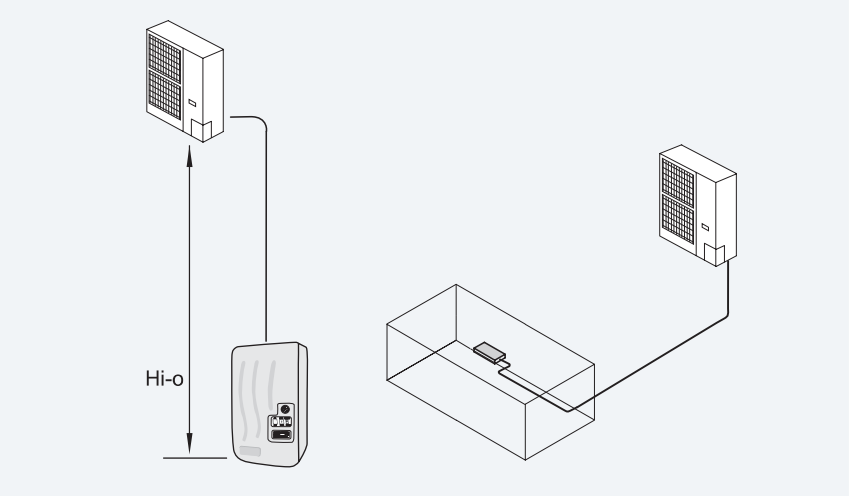
The piping selection and distribution must be designed considering the following specifications. Remember that the maximum pipe length is 30 m.

| Item | | Maximum applicable range |
|---|---|---|
| Description | Mark | |
| Total length from the OU to the AM | - | 30 m |
| Height difference (Hi-o) between OU and AM | Hi-o | 30 m |
| Height difference (Hi-o) between AM and OU | Hi-o | 20 m |

*NOTES:*

OU: Outdoor unit

AM: AquaFREE module



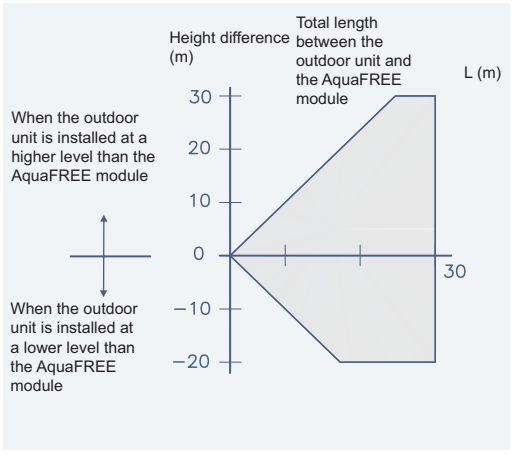

### 7.1.1. Refrigerant Piping Length

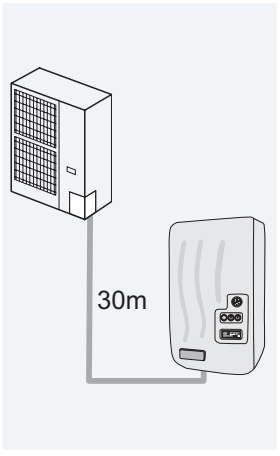
The refrigerant piping between the AquaFREE module and the Outdoor Unit should be designed using the following chart.

Keep the design point within the dark area of the chart, which shows the applicable height difference according to piping length

*NOTES:*

If the length of the piping is less than 5 m contact your Hitachi distributor.




| Maximum length of refrigerant piping |
|---|
| Actual piping length ≤ 30 m |
| Equivalent piping length ≤ 40 m |

### 7.1.2. Refrigerant piping selection

Select piping sizes according to the following values:

| Outdoor unit | | Pipe size | | | |
|---|---|---|---|---|---|
| Series | (HP) | Gas pipe | Thickness (mm) | Liquid Piping | Thickness (mm) |
| H(V)RNE | 3.0 | 15.88 (5/8) | 1.00 | 9.53 (3/8) | 0.80 |
| | 4.0 | 15.88 (5/8) | 1.00 | 9.53 (3/8) | 0.80 |
| | 5.0 | 15.88 (5/8) | 1.00 | 9.53 (3/8) | 0.80 |

Select the pipe size with adequate thickness and material, and with enough pressure.

## 7.2. Amount of refrigerant charged

*CAUTION:*

When charging refrigerant accurately measure refrigerant to be charged.

Overcharging or undercharging of refrigerant can cause compressor trouble.

The amount of refrigerant charged at factory allows to install up 30 m of piping. It is not necessary to add additional Refrigerant charge.

| Outdoor Unit Model | Kg |
|---|---|
| RAS-3HVRNE | 2.4 |
| RAS-4H(V)RNE | 3.6 |
| RAS-5H(V)RNE | 3.6 |



## 7.3. Caution in case of refrigerant leakage

Installers and installation designers are responsible for complying with local codes and regulations which specify safety requirements against refrigerant leakage.

### 7.3.1. Maximum permissible concentration of HCFC Gas

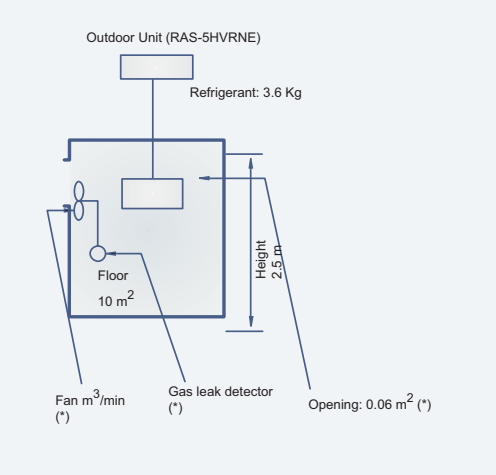
Refrigerant R410A, which is charged in the AQUA FREE system, is an incombustible non-toxic gas. However, if leakage occurs and the gas fills a room, the gas may cause suffocation. The maximum permissible concentration of HCFC R410A in the air is 0,44 kg/m³, according to the refrigeration and air conditioning facility standard (KHK S 0010) of the High Pressure Gas Protection Association (KHK) from Japan.

Therefore, some effective measure must be taken to lower the R410A concentration in air below 0,44 kg/m³, in case of leakage.

### 7.3.2. Calculation of Refrigerant Concentration

1. Calculate the total quantity of refrigerant R (kg) charged in the system connecting the AquaFREE module of the room to be air-conditioned.
2. Calculate the volume V ($m^3$) of each room.
3 Calculate the refrigerant concentration C ($kg/m^3$) of the room according to the following equation:

| | |
|---|---|
| $\frac{R}{V} = C$ | R: Total quantity of charged refrigerant (kg)<br>V: Room volume ($m^3$)<br>C: refrigerant concentration (≤0,44* $kg/m^3$ for R410A) |




*NOTE:*

(*) Use this value only for reference because this value is not fixed.

(*)These conditions occur whenever the concentration (c) exceeds the established limit.

| Room | R (kg) | V ($m^3$) | C ($kg/m^3$) | Countermeasure |
|---|---|---|---|---|
| A | 3,6 | 25 | 0,144 | - |

### 7.3.3. Countermeasure in case of refrigerant leakage according to the KHK Standard

The facility must be layed out according to to the KHK standards, so that the refrigerant concentration will be below 0.44 $kg/m^3$.

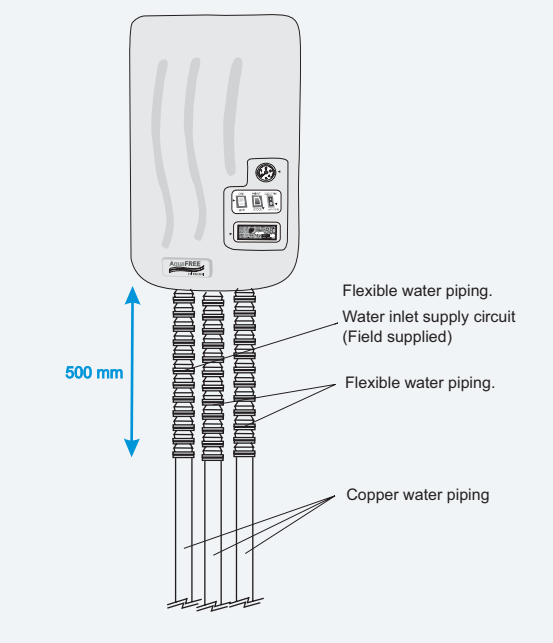
1. Provide a shutterless opening that will allow the fresh air to circulate into the room.
2. Provide a doorless opening with a size at least 0.15% of the floor area.
3- Provide a fan, connected to a gas leak detector, with a ventilating capacity of at least 0.5 $m^3$/min per Japanese Refrigeration Ton (=compressor displacement 8.5 $m^3$/h) of the air conditioning system utilizing refrigerant.
4. Pay special attention to the location, such as a basement,etc., where refrigerant can stagnate, since refrigerant is heavier than air.

# 7.4. Hydraulic circuit

## 7.4.1. Installation procedure

### ◆ Piping connection

1. Connect the water piping to the AquaFREE module.



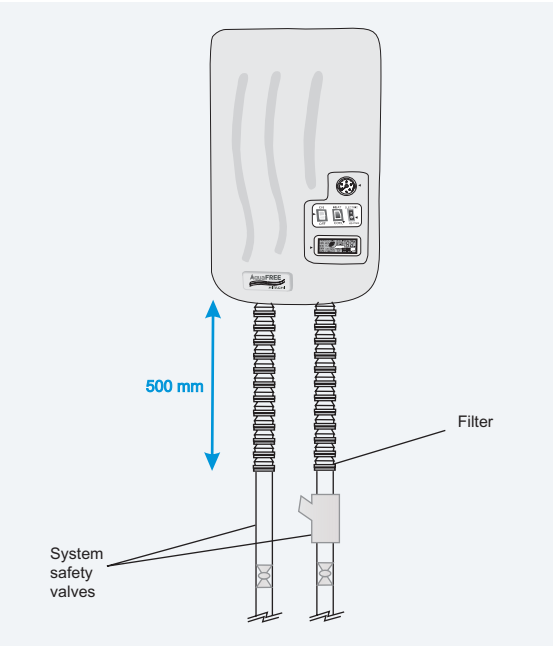

*CAUTION:*

When connecting the water piping to the indoor unit, is necessay install 500mm of flexible water piping from the indoor unit, in order to avoid metal expansion problems due to temperature. After these 500mm install copper Piping.

*NOTE:*

The maximum piping lenght depends on the maximum pressure availability in the water oulet pipe. Please check the pump curves.

2. Install two valves. One at the water inlet pipe, and other at the water outlet pipe.



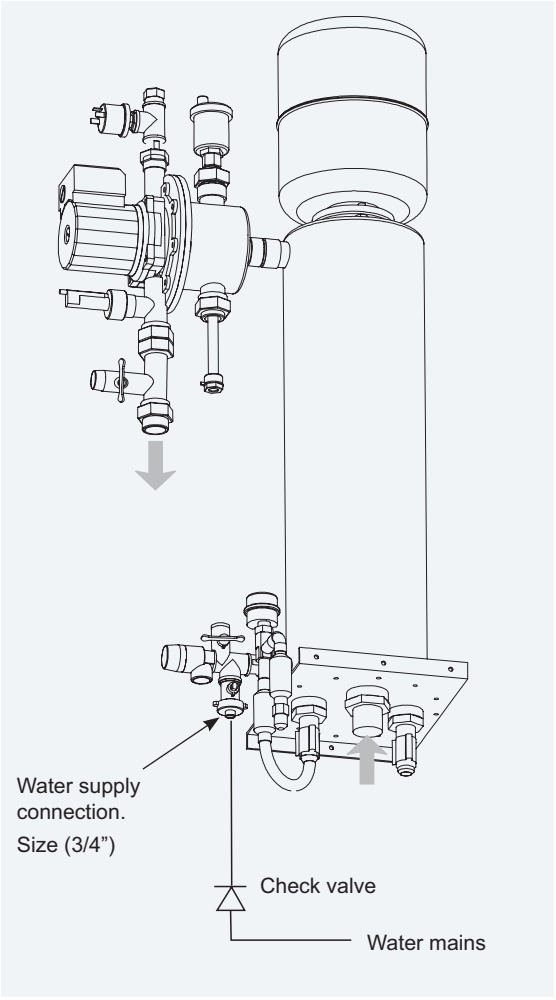

*NOTES:*

- Selected enough space to connect the pipes in some space that there is enough operation space.
- It is recomended to use the flexible joints for the piping inlet and outlet, to avoid the transmission vibrations.
- It is recomended cover the water pipes with insolutacion for dew problems.
- Before the comissioning is necessary to clean the hydralic pipes using water. After cleaning the hydraulic system fill in the circuit.
- It is recommended install a filter of 1000 µm before water inlet connection pipe.

3. It is recommended to install a filter at the water inlet piping.

### ◆ Piping connection

1. Install a check valve and flexible tube at inlet power supply.




2. Charge the system with water by introducing it through the filling valve. The nominal pressure of the water of the system must be (1.7~2.0) bar. (Recommended 1.8 bar).

   Water pressure in the circuit must be between 1 and 3 bar.

3. The system has got two safety devices:
   - One low pressure switch.
   - One relief valve

**CAUTION:**

The quality of the water that you need is the standard water without any material that can cause damage inside the piping system.

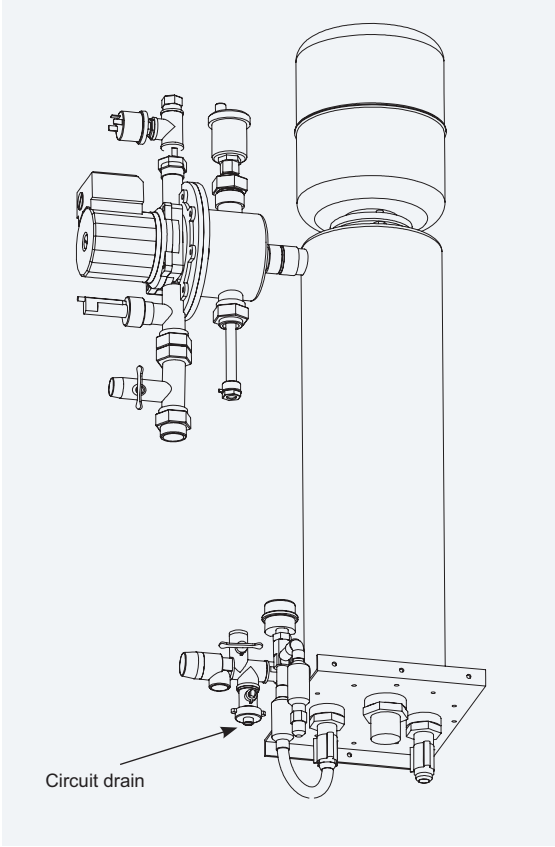
**NOTE:**

- In case that the Water piping would be located in a higher position than AquaFREE air purger, it is necessary to add an auxiliary purger system in the highest position of water piping installation.
- During the system water filling, it must be not purgue air system, at the same time.
- When a system refilling is performed, please check that general water pressure is higher than main water pressure

**CAUTION:**

In case of circuit refilling, takes mesures to prevent backsiphonage of non potable water into the water main.

4- Install the drain pipe from the automatic drain valve until the general drain system. This securety drain valve will be activated when water pressure arrivest o 3 bars.




*NOTE:*

Install the unit in area that does not affect other elements if the drain valve blow-off.

### 7.4.2. Water piping length procedure



◆ **Pump range procedure**

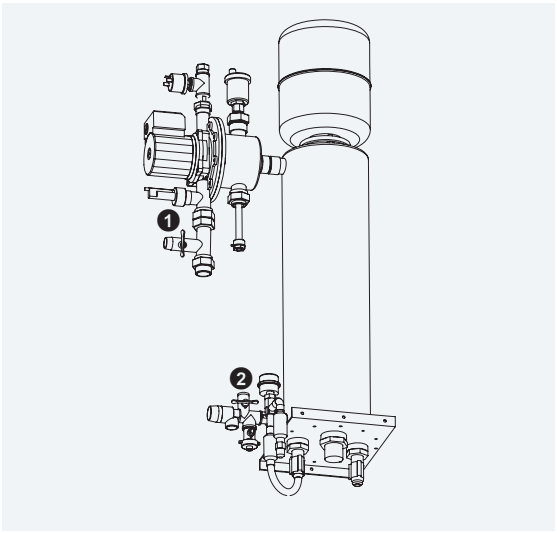
In order to control the water flow rate you must lower the water pressure. The value of this pressure is calculated from the difference between the value of the inlet and outlet water pressure.

Two pressure gauges must be installed in order to obtain this value:

1. Located after the pump (at the water outlet toward the radiating floor circuit)
2. Located over the water inlet port (as shown in the following figure).

*NOTES:*

- It is recommended to cover the water piping with insulation to avoid problems caused by moisture.




*NOTE:*

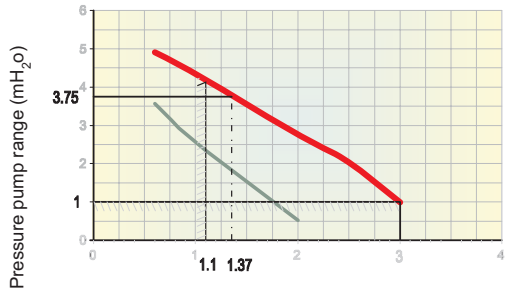
The second manometer is only necesary for comissioning. After this you can turn off

The value of the water's pressure drop must be between the minimal and maximal values of the range of the water flow ratio curve.

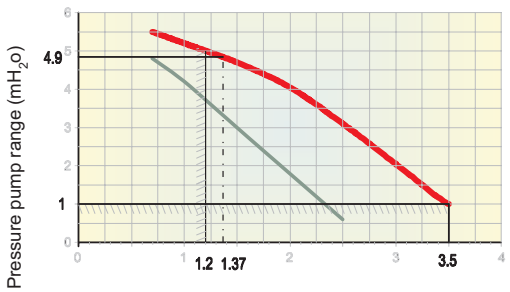
## Curves of the pump

The values of the water pressure must be within the range of the pressure pump.

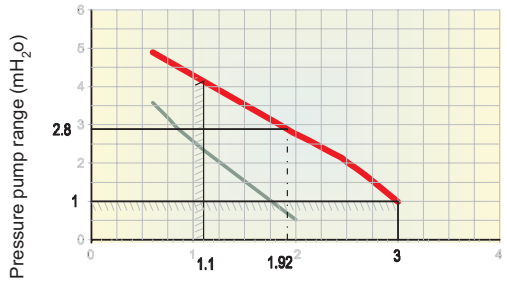
### RWM-3FSN1E- (S1)



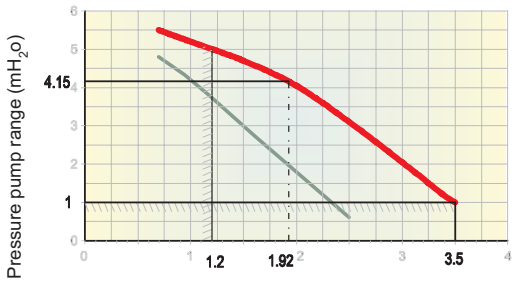

### RWM-3FSN1E- (S1) - 4.5H1



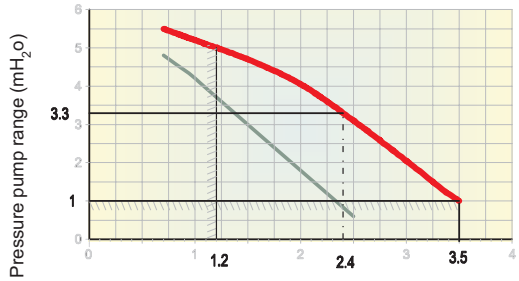

### RWM-4FSN1E- (S1)




### RWM-4FSN1E- (S1) - 6H3




### RWM-5FSN1E- (S1)




### RWM-5FSN1E- (S1) - 6H3


Max. speed

Med. speed

Nominal Heating water flow

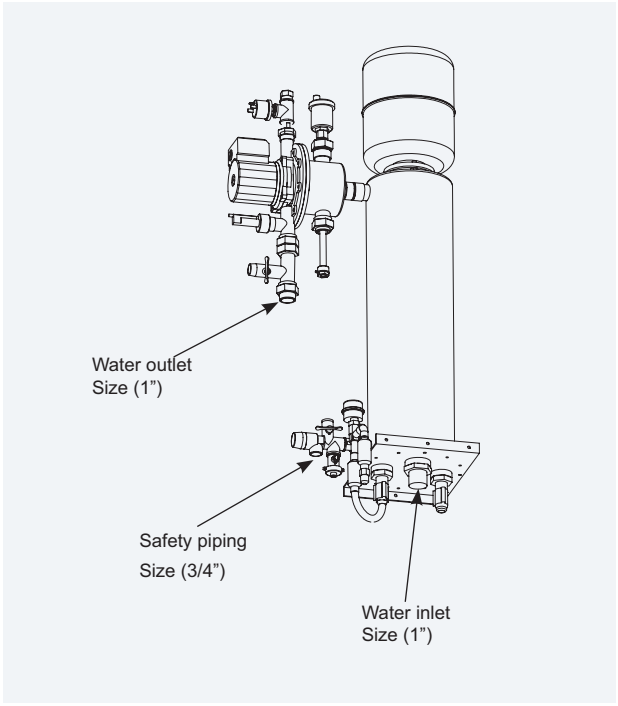
### 7.4.3. Selecting the water piping

Select piping sizes for the connection according to the following values:

| | Diameter of Steel piping | | |
|---|---|---|---|
| AQUA FREE | Water Inlet | Water Outlet | Safety piping |
| RWM-FSN1E | 26~34 (1”) | 26~34 (1”) | 20~27 (3/4”) |

| | Diameter of Copper piping | | |
|---|---|---|---|
| AQUA FREE | Water Inlet | Water Outlet | Safety piping |
| RWM-FSN1E | 26~28 (1”) | 26~28 (1”) | 20~22 (3/4”) |

◆ **Status of piping connection:**



# 8. Electrical data

This chapter describes the electrical requirements for each unit of the AquaFREE modules and their complementary RAS-H(V)RNE outdoor units of Hitachi's DC Inverter series.

## Content

## 8.1. AquaFREE module

| Model | | Unit Main Power | | | Applicable Voltage | | Water pump motor | | | Electric resistance | | | MC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (V) | F | HZ | Max | Min. | F | RNC | TP | F | RNC | TP | |
| - Aqua Free - basic | RWM-3FSN1E | 230 | 1 | 50 | 253 | 207 | 1 | 0.5 | 0.11 | - | - | - | 1 |
| | RWM-4FSN1E | | | | | | | 0.5 | 0.11 | - | - | - | 1 |
| | RWM-5FSN1E | | | | | | | 0.6 | 0.13 | - | - | - | 1 |
| - Aqua Free - with electric heater | RWM-3FSN1E-4.5H1 | | | | | | | 0.5 | 0.11 | 1 | 19.6 | 4.50 | 20 |
| | RWM-4FSN1E-6H1 | | | | | | | 0.5 | 0.11 | 1 | 26.5 | 6.00 | 32 |
| | RWM-5FSN1E-6H1 | | | | | | | 0.6 | 0.13 | 1 | 26.5 | 6.00 | 32 |
| | RWM-4FSN1E-6H3 | 400 | 3 | 50 | 456 | 342 | 1 | 0.5 | 0.11 | 3 | 10.7 | 6.00 | 11 |
| | RWM-5FSN1E-6H3 | | | | | | | 0.6 | 0.13 | 3 | 10.7 | 6.00 | 11 |
| - Aqua Free - basic for swimming pool | RWM-3FSN1E-S1 | | | | | | | | | | | | |
| | RWM-4FSN1E-S1 | | | | | | | | | | | | |
| | RWM-5FSN1E-S1 | | | | | | | | | | | | |
| - Aqua Free - for swimming pool and with electric heater | RWM-3FSN1E-S1-4.5H1 | | | | | | | | | | | | |
| | RWM-4FSN1E-S1-6H1 | | | | | | | | | | | | |
| | RWM-5FSN1E-S1-6H1 | | | | | | | | | | | | |
| | RWM-4FSN1E-S1-6H3 | | | | | | | | | | | | |
| | RWM-5FSN1E-S1-6H3 | | | | | | | | | | | | |

To be informed later

(V): Supply Voltage (V)
PH: Phase (φ)
Hz: Frequency (Hz)
RNC: Running Current (A)
TP: Total power (kW)
MC: Maximum Current(A)

*NOTE*

Specifications in these tables are subject to change without notice in order that HITACHI may bring the latest innovations to their customers

## 8.2. Outdoor Units

| Model | Unit Main Power | | | Applicable Voltage | | Total Power Consumption | | | | | MC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | U | F | HZ | Max | Min. | F | STC | Cooling Operation | | Heating Operation | | |
| | | | | | | | | RNC | TP | RNC | TP | |
| RAS-3HVRNE | 230 | 1 | 50 | 253 | 207 | 1 | 6.5 | 9.3 | 2.02 | 9.1 | 1.98 | 25 |
| RAS-4HVRNE | | | | | | | 10.5 | 14.2 | 3.11 | 14.7 | 3.24 | 32 |
| RAS-5HVRNE | | | | | | | 15.0 | 16.2 | 3.53 | 18.6 | 4.03 | 32 |
| RAS-4HRNE | 400 | 3 | 50 | 440 | 360 | 3 | 10.5 | 4.7 | 3.11 | 5.0 | 3.24 | 11 |
| RAS-5HRNE | | | | | | | 15.0 | 5.4 | 3.53 | 6.2 | 4.03 | 15 |

(V): Supply Voltage (V)
PH: Phase (φ)
Hz: Frequency (Hz)
STC: Starting Current (A)
RNC: Running Current (A)
TP: Total Power (kW)
MC: Maximum Current(A)

*NOTES*

1. These values are in combination with AquaFREE module.
2. This data is based on the same conditions ase the nominal heating and cooling capacities. Refer to the notes of the Unit's General Data. Specifications in these tables are subject to change without notice in order that HITACHI may bring the latest innovations to their customers

# 9. Electrical wiring and setup

This chapter describes the electrical wiring connection and shows how to set the Dip switches in the new AquaFREE modules and the complementary RAS-H(V)RNE outdoor units from Hitachi's DC Inverter series.

## Content

## 9.1 General check

***ATTENTION:***

- *Turn OFF the main power switch to the indoor unit and the outdoor unit before electrical wiring work or a periodical check is performed.*
- *Check to ensure that the outdoor fan have stopped before electrical wiring work or periodical check is performed.*
- *Protect the wires, drain pipe, electrical parts, etc. from rats or other small animals. If all these parts are not protected, rats or other small animals may gnaw at them. In the worst case, a fire may occur.*
- *Prevent the wires from touching the refrigerant pipes, plate edges and electrical parts inside the unit. Otherwise, the wires will be damaged and at the worst, a fire will occur.*
- *Do not touch the factory set Remote Controller of Electric Box.*

***CAUTION:***

*Tightly secure the wires with the cord clamp inside the indoor unit.*

*NOTE:*

*Fix the rubber bushes with adhesive when the ducts to the outdoor unit are not used.*

1. Make sure that the field-supplied electrical components (main power switches, circuit breakers, wires, duct connectors and wire terminals) have been properly selected according to the electrical data given in this technical catalogue. Make sure that the components comply with the National Electrical code.
2. Check to ensure that the power supply voltage is within 10% of the rated voltage.
3. Check the capacity of the electrical wires. If the power source capacity is too low, the system cannot be started due to the voltage drop.
4. Check to ensure that the earth wire is connected.
5. Power Source Main Switch
   Install a multi-pole switch with a space of 3.5mm or more between each phase.

## 9.2. Setting and function of DIP Switches for Outdoor Units

*NOTE:*
*The "■" mark indicates the position of the dip switches. The figures show the settings before the shipment or after the selection.*

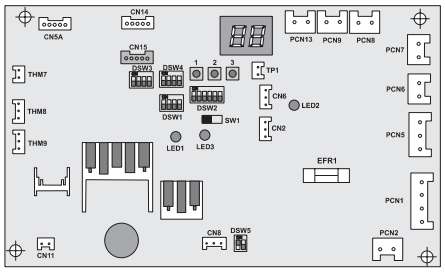
*When using DSW4, 5 the unit starts up or stops after 10 to 20 seconds after the switch is operated.*

***CAUTION:***
*Before setting DIP switches, first turn off power source. If the switches are set without turning off the power source, the contents of the setting are invalid.*

*NOTE:*
*Refer to service manual SM42 for additional information concerning switch settings of the RAS DC-Inverter units.*

The PCB of the outdoor unit has 5 DIP switches (DSW) and 3 push switches (PSW) whose setting can be changed to perform unit maintenance and adapt the default configuration for each specific installation or operating mode.

Layout of the Dip switches and pulse switches on the PCB:




**DIP Switch:**

**DSW1: Startup test.**

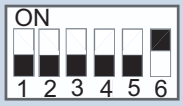
Setting before shipment is all OFF (Refrigerant cycle No. 0).

| | Cycle num 0 |
|---|---|
| Setting before shipment |  |



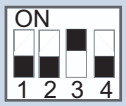
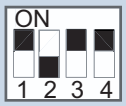
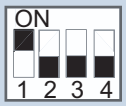
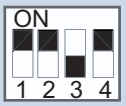
**DSW2: Setting Installation**

The following setting must be established for the outdoor unit to detect that it will be working with a AquaFREE module:

| | |
|---|---|
| Setting before shipment |  |
| Charge at installation |  |



**DSW3: Unit Capacity.**

| Model | RAS-3 HVRNE | RAS-4 HVRNE | RAS-5 HVRNE | RAS-4 HRNE | RAS-5 HRNE |
|---|---|---|---|---|---|
| Setting |  |  |  |  |  |



**DSW4: Setting for the number of refrigerant cycles installed in the system.**

| | Unit No. 0 |
|---|---|
| Setting |  |



**DSW5: Transmission Setting of end Terminal Resistance.**

This setting is activated before shipment. To cancel this setting, change the position of Pin 1.

| | Before shipment | Cancellation |
|---|---|---|
| Setting |  |  |



**Push Switches:**

| | |
|---|---|
| Manual defrosting | PSW1 |
| For check | PSW2<br>PSW3 |

## 9.3. Setting and function of DIP Switches for AquaFREE module

AquaFREE module operate with two different PCBs:

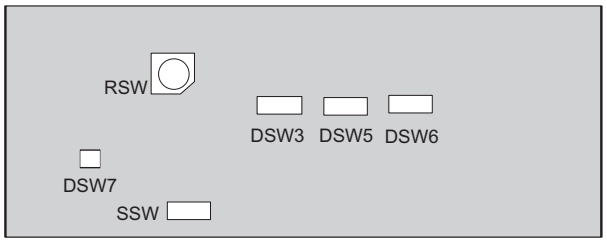
- Main PCB
- Control PCB

### 9.3.1. Main PCB

*NOTE:*
*The "■" mark indicates the position of the dip switches. The figures show the settings before the shipment or after the selection.*

***CAUTION:***
*Before setting DIP switches, first turn off power source. If the switches are set without turning off the power source, the contents of the setting are invalid.*

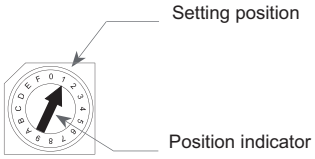
The Main PCB of the AquaFREE module operates with four DIP switches, 1 slide switch and one rotating switch.




**RSW: Indoor Unit nº setting.**

The rotating switch of the AquaFREE module must show position No. 1

The RWM units are delivered with this default setting.

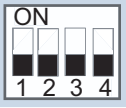



**DSW3: Unit Capacity.**

| Model | RWM-3 | RWM-4 | RWM-5 |
|---|---|---|---|
| Setting |  |  |  |

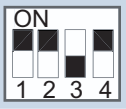


**DSW5: Setting for the number of refrigerant cycles installed in the system.**

| | Unit No. 0 |
|---|---|
| Setting |  |



**DSW6: Indoor unit model setting**

| | RWM |
|---|---|
| Setting |  |



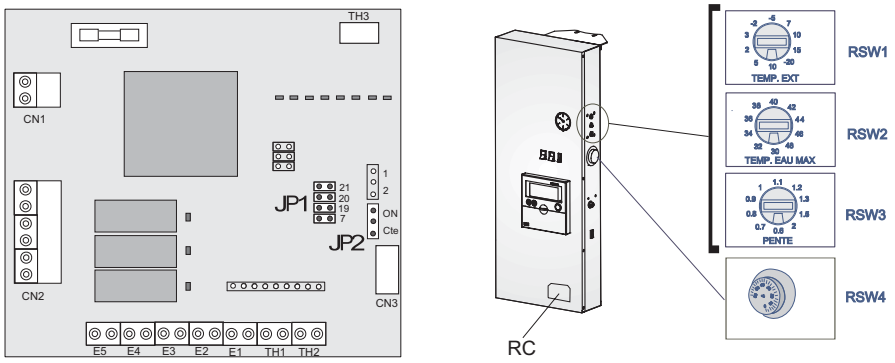
**DSW7: Fuse recovery / Remote Control setting**

| | |
|---|---|
| Factory setting |  |
| If high voltage is applied to terminal 1,2 of the Terminal board (TB), the fuse of the PCB will blow. In this case, first fix the wiring of the Terminal board (TB) and place pin No. 1 on ON, as shown in the figure. |  |

### 9.3.2. Control PCB

The control PCB has 4 rotational switches (RSW) and 2 groups of “jumpers” (JP) whose setting can be changed to perform unit maintenance and adapt the default configuration for each specific installation or operating mode.

Layout of the switches and the “jumpers” in the PCB and in the electrical box:



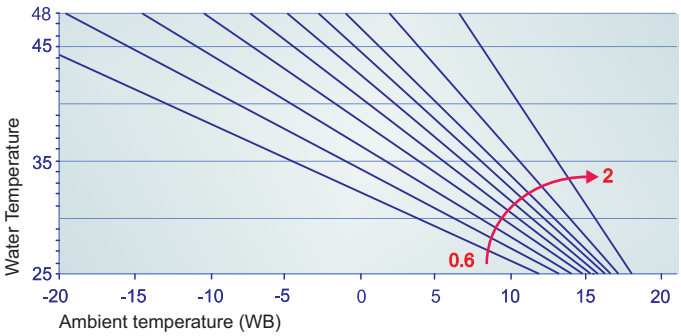

- RSW1: Room temperature (to activate the electric heater)
  (Factory setting -10ºC)
- RSW2: Water temperature (to activate and control the electric resistance)
  (Factory setting 34ºC)
- RSW3: Water temperature regulator (Water rule)
  (Factory setting 0.8)
- RWS4: Maximum water temperature regulator thermostat.
  (Factory setting 48ºC)

*NOTE:*
*The rotating switches (RSW) on the RWM units are located on the outside right part of the electrical box.*

#### ◈ Water Rule (RSW3)

The “Water rule” is the straight line representing outdoor temperatures which results from the value in RSW3 (value of the slope), plus a constant.

The possible “water rules” are represented graphically in the following way:




*NOTE:*
*The SW3 switch only exists on the units with electric resistances.*

*NOTE:*
*WB: Wet Bulb*

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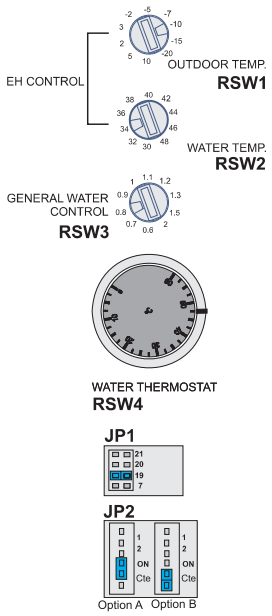
◈ Settings: of the control PCB

*NOTE:*
*Factory settings of the switches and the "Jumpers":*




## Heating mode:

The control PCB has a rotating switch (RSW3) which is used to adjust the temperature of the water in the heating circuit (radiant floor / radiator).

For Radiant floor mode is recommended to select the rotary switch in the numbers 0.6/0.7/0.8/0.9/1 (Set temperature is increased, through the rotary switch position from (0.6 to 1)).

For Radiator mode (or mix Radiators + Radiant floor) is recommended to select the rotary switch in the numbers 1.1/1.2/1.3/1.5/2

(Set temperature is increased, through the rotary switch position from (1.1 to 2)).

- **Electric resistance:** (Only in 4.5/6H1/3 units)

- Activation:

When outdoor temperature conditions are extreme, the system can be helped by activating the electric resistance.

To activate the electric resistance, you must set next conditions:

- "Thermo ON" condition, (compresor working)
- SW2 in "Heat mode"
- SW3 in "ON"

The electric Heater starts up if one of the following premises occurs and unit is in Thermo ON, and "Heat" Mode 1:

1. If the outdoor temperature is lower than the temperature selected on RSW1
   Up to 10 different positions can be selected, with a temperature range that runs from 10ºC to -20ºC.
2. If the water temperature is lower than the temperature selected on RSW2.
   Up to 10 different positions can be selected, with a temperature range that runs from 48ºC to 30ºC.

- **Setting the electric resistance:**

- Turning OFF:

There are two ways to adjust the electric resistance, depending on how it is configured (JP2):

**Option A**

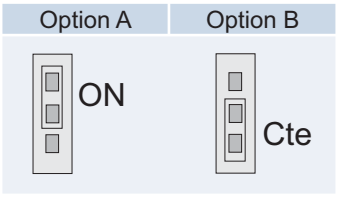
The system adjusts the electric resistance depending on the unit's "Water rule" (RSW3), and decides to turn the electric resistance off when the temperature of the water reaches the lower of the following values:

Value defined in (RSW3) - Water rule.

Value defined in (RSW2) - Water temperature for the electric resistance or Ambient temperature is higher than the value defined in RSW1.

**Option B**

The system adjusts the electric resistance until it reaches the value defined in RSW2 (water temperature for the electric resistance),
or Ambient temperature is higher than the value defined in RSW1.




*NOTE:*
*Use of the electric resistance:*

*In order to optimize the Inverter function of the outdoor unit, it is recommended to not select the minimum temperature when in heating mode.*

*This temperature must be selected when performing the startup of the unit in order to adapt it to the usage mode.*

*NOTE:*
*En (JP1) the goal is to keep the water temperature between 19ºC and 21ºC.*

*The unit comes with a default setting of 19C.*

*The JP of 7ºC is not available*

## Cooling Mode:

When in cooling mode, the desired water temperature must be selected by means of (JP1)

Select the temperature depending on the relative humidity of the air.

- For dry areas, select low temperatures. (19ºC)
- For humid areas, select high temperatures (21ºC)

## 9.4 Common Wiring

### 9.4.1. Electrical Wiring Between AquaFREE module and outdoor units

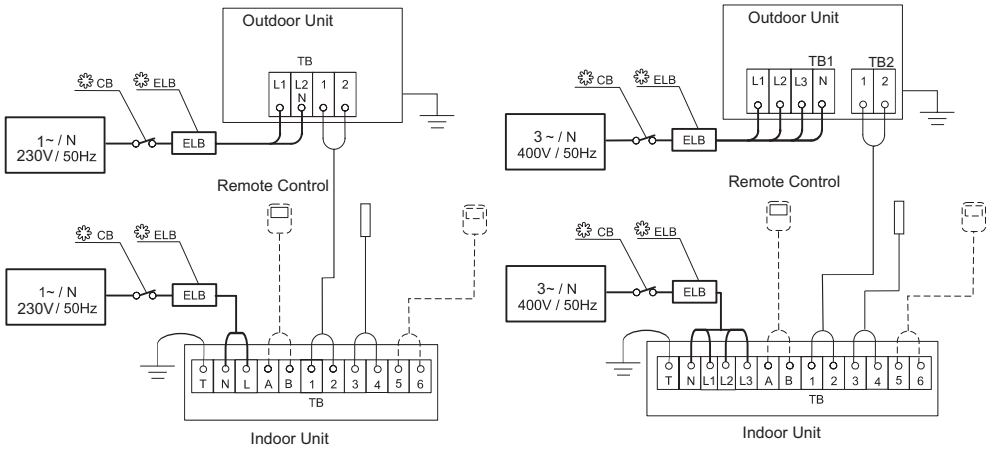
- Connect the electrical wires between the indoor unit and the outdoor unit, as shown in the next diagram.
- Follow local codes and regulations when performing electrical wiring.
- If the refrigerant piping and the control wiring are connected to the units in the same refrigerant cycle.
- Use twist pair wire (more than 0.75 mm²) for operation wiring between outdoor unit and indoor unit, and operation wiring between indoor unit and indoor unit.
- Use 2-core wire for the operating line (Do not use wire with more than 3 cores).
- Use shielded wires for intermediate wiring to protect the units from noise obstacle at length of less than 300m and size complied with local code.
- Open a hole near the connection hole of power source wiring when multiple outdoor units are connected from one power source line.
- The recommended breaker sizes are shown in Table of electrical data and recommended Wiring, Breaker Size/1 O.U.
- In the case that a conduit tube for field-wiring is not used, fix rubber bushes with adhesive on the panel.
- All the field wiring and equipment must comply with local and international codes.

***ATTENTION:***
*Furthermore, none of the safety protections must be activated.*

***ATTENTION:***
*Pay attention to the connection of the operating line. Incorrect connection may cause the failure of the PCB.*

***CAUTION:***
*All of the wiring and electrical components must comply the local standards of where they are to be installed.*

***ATTENTION:***
*Pay attention to the connection of the operating line. Incorrect connection may cause the failure of PCB.*




***ATTENTION:***
*Power suppply must be connected to outdoor unit and indoor unit separately.*

*NOTES:*

| | | |
|---|---|---|
| TB | : | Connections bar |
| CB | : | Circuit breakers |
| ELB | : | Earthleakage breaker |
| - - - - | : | Internal wiring |
| | : | Field-supplied |
| | : | Optional accessory |
| A - B | : | Remote control switch |
| 3 - 4 | : | Outdoor thermistor connection (non polarity) |
| 5 - 6 | : | Room's thermostat connection |

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◈ Recommended minimum sizes for field provided wiring:

| Model | Power Supply. | Max Current | Power source cable size | Transmitting cable size | |
|---|---|---|---|---|---|
| | | | EN60 335-1 ❶ | EN60 335-1 ❶ | MLFC ❷ |
| RWM-3/4FSN1E | 1Ø/230V/50Hz | 1 A | 0.75 mm² | 0.75 mm² | 0.5 mm² |
| RWM-5FSN1E | | 1 A | 0.75 mm² | | |
| RWM-3FSN1E-4.5H1 | | 20 A | 2.5 mm² | | |
| RWM-4FSN1E-6H1 | | 32 A | 6 mm² | | |
| RWM-5FSN1E-6H1 | | 32 A | 6 mm² | | |
| RWM-4FSN1E-6H3 | 3Ø/400V/50Hz | 11 A | 2.5 mm² | | |
| RWM-5FSN1E-6H3 | | 11 A | 2.5 mm² | | |
| RAS-3HVRNE | 1Ø/230V/50Hz | 25 A | 4 mm² | | |
| RAS-4HVRNE | | 32 A | 6 mm² | | |
| RAS-5HVRNE | | 32 A | 6 mm² | | |
| RAS-4HRNE | 3Ø/400V/50Hz | 11 A | 2.5 mm² | | |
| RAS-5HRNE | | 15 A | 2.5 mm² | | |

- The wire sizes shown in the table above and marked with ❶ have been selected at the maximum current of the unit according to the European Standard, EN60335-1.

| Selection according to EN60 335-1 | |
|---|---|
| Current i (A) | Wire size |
| I ≤ 6 | 0.75 mm² |
| 6 < i ≤ 10 | 1.0 mm² |
| 10 < i ≤ 16 | 1.5 mm² |
| 16 < i ≤ 25 | 2.5 mm² |
| 25 < i ≤ 32 | 4.0 mm² |
| 32 < i ≤ 40 | 6.0 mm² |
| 40 < i ≤ 63 | 10.0 mm² |

***NOTE:***

*Follow local codes and regulations when selecting field wires, Circuit breakers and Earth Leakage breakers.*

*Use wires that are not lighter than the ordinary polychloroprene sheathed flexible cord (code designation H05RN-F).*

The earth cable size must comply with standards: IEC 245, nº571.

◈ Protection of the main switches

Select the main switches according to the following table.

| Model | Power Supply | Maximum Current | CB | ELB Num. of poles/A/mA |
|---|---|---|---|---|
| RWM-3/4FSN1E | 1Ø/230V/50Hz | 1 A | 6 A | 2 /40 / 30 |
| RWM-5FSN1E | | 1 A | 6 A | |
| RWM-3FSN1E-4.5H1 | | 20 A | 25 A | |
| RWM-4FSN1E-6H1 | | 32 A | 40 A | 2 / 63 / 30 |
| RWM-5FSN1E-6H1 | | 32 A | 40 A | |
| RWM-4FSN1E-6H3 | 3Ø/400V/50Hz | 11 A | 15 A | 4 / 40 / 30 |
| RWM-5FSN1E-6H3 | | 11 A | 15 A | |
| RAS-3HVRNE | 1Ø/230/50Hz | 25 A | 32 A | 2 / 40 / 30 |
| RAS-4HVRNE | | 32 A | 40 A | 4 / 63 / 30 |
| RAS-5HVRNE | | 32 A | 40 A | |
| RAS-4HRNE | 3Ø/400V/50Hz | 11 A | 15 A | 4 / 40 / 30 |
| RAS-5HRNE | | 15 A | 20 A | |

***NOTE:***

*ELB: Differential switch.*

*CB: Magnetothermic switch..*

# 10. Room Thermostat Operation

This chapter describes the operation of the room thermostat that the new AquaFREE modules use and their complementary RAS-H(V)RNE outdoor units of Hitachi's DC Inverter series.

## Content





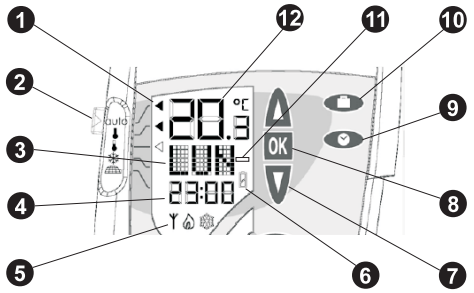
*CAUTION*
*Press switches only with fingers. Do not press switches by any other item, as it may damage the switches.*

## 10.1. Remote control switch

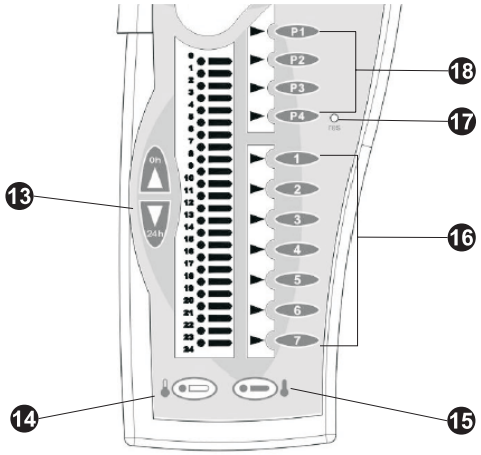
◈ Appearance:

◈ Liquid Crystal Display (L.C.D) Area

Upper Part:




Lower Part:




◈ Features:

The device (PRT) lets you program and select the temperature required for the room where it is installed.

This device also lets you choose between 4 predefined programs (that can be changed) that adapt the temperature conditions of the room to your lifestyle.

Its operation can even be adjusted during long holiday periods away from home.

All the adjustments are displayed on its liquid crystal display.

Thanks to its design, you can decide to install the device on the wall or on a table since both supports come as standard accessories.

*NOTE:*

– *The room's temperature will depend on the mode of use specified for this device*

– *This device includes a radio transmitter that allows it to be used as a wireless device.*

❶ Operation mode Selection Switch

❷ Operation mode Selection Cursor

- "auto" **Automatic**
- **Comfort**
- **Reduced**
- **No Frost**
- **Stop / Holidays**

❸ Current day indicator

❹ Hours and minutes indicator

❺ Transmission indicator

❻ Battery level indicator

❼ (+ / -) Switch

❾ Time function switch (date and time setting)

❽ Selection confirmation switch

❿ Holiday mode switch

⓫ Holiday mode set symbol

⓬ Room Temperature indicator

⓭ Time switch (time adjustment)

⓮ Switch to memorize program settings

⓯ Comfort mode switch

- **Cooling**
- **Heat**

⓰ Day switch

- **1 = Monday**
- **...**
- **7 = Sunday**

⓱ Reset to initial setting switch.

⓲ Program switch (operating mode)

- **P1 = Program 1 (Heating / Cooling)**
- **P2 = Program 2 (Heating / Cooling)**
- **P3 = Program 3 (Heating / Cooling)**
- **P4 = Program 4 (Heating / Cooling)**

*NOTE:*
*In this chapter, the CTA IMH RF A remote control switch is defined as a PRT (Programmable Remote Transmitter) device.*

### 10.1.1.Display

◈ Operation

ATTENTION

The liquid crystal display shows the user information about all the selected settings.

Basic data is displayed in the upper part:

- Room temperature.
- Operation mode.
- Selected program.
- Day / Time.
- Battery status.
- Connection status (remote control switch / Water Free).


Programming related data is displayed in the lower part:

- Specific programmed settings.
- Days of the week.

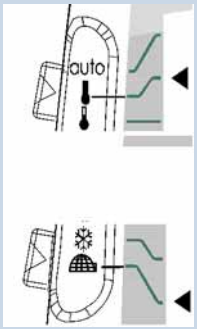
### 10.1.2 Operating mode selection:

◈ Operation

ATTENTION

The operating mode switch (❷) has 5 positions:

- Automatic mode.
  The unit runs according to the selected program.
- Comfort mode.
  The unit runs in heating mode in order to reach the selected temperature.
- Reduced mode.
  The unit runs in cooling mode in order to reach the selected temperature.
- No Frost
  Recommended when unit is stopped during the winter. The unit runs in protection mode to avoid that the temperature of the heating circuit drop below levels that could damage it.
- Stop mode (Stop/Holidays)
  Interruped operation mode.




*NOTE:*
*The selected program can be changed at any time.*

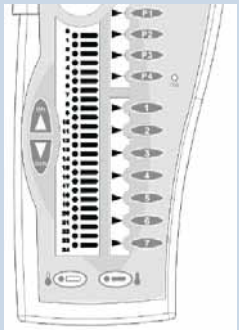
### 10.1.3.Control keypad

◈ Operation

ATTENTION

This palette of commands allows to modify the factory predefined programs and, for each program, to select the daily times of operation either in Heating or Cooling mode.

In order to perform this operation, press the switches located below each symbol.



10

### 10.1.4. Settings of the installed parameters of the PRT

◈ Programming

ATTENTION

To modify the predefined settings of the parameters of your PRT, press “24h” and “OK” simultaneously.

You can modify the settings of the following parameters:

- Heating or Air conditioning
- ON/OFF or PID selection of setting a type
- Start/Stop of the optimization function
- Start/Stop of the pump protection system

24h → OK

*NOTE:*
*Validate the new setting with the OK switch - (8)*

OK

### 10.1.5. Language selection

◈ Programming

ATTENTION

You can configure the language your remote control switch (PRT) will use to show the information on the Display.

To change the language, press “0h” and “OK” simultaneously.

You can select from 10 different languages:

- French (FRA)
- English (ENG)
- German (DEU)
- Italian (ITA)
- Spanish (ESP)
- Dutch (HOL)
- Finnish (SUO)
- Norwegian (NOR)
- Swedish (SVE)
- Danish (DEN)

0h → OK

*NOTE:*
*Validate the new setting with the OK switch - (8)*

OK

### 10.1.6. Connection between the receiver (AquaFREE) and the PRT

◈ Programming

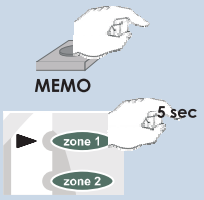
ATTENTION

The following procedure has to be followed to establish communication between the Water Free unit and our PRT:

1. Put the receiver in “memory” mode.
2. Press the program selection switch (P1 to P4) of your PRT for 5 seconds.
3. The transmission indicator (5) of the PRT turns on to indicate that connection has been established.

Perform the following operations and check that the unit responds adequately:

1. Put your PRT in "comfort" mode.
   Increase the temperature setting of your PRT until your unit starts running.
2. On your PRT put the operation mode cursor in the permanent "Stop" position. Your RWM unit should stop after a few seconds.




*NOTE:*
*In order to the form of the procedure correctly, referred to the specific instructions for the receiver.*

- *Repeat the operation for each one of the receivers or auxiliary resistances that must operate with the PRT device*

### 10.1.7. Date and Time configuration

◈ Programming

ATTENTION

To set the date and time on the PRT, put the unit in Automatic operation mode.

Perform the following procedure:

1. Press (❾) (Date and Time selector).
   Select the Hour with the selector (❼) - (▼/ ▲).
   Validate the selection by pressing (OK).
2. Then select the minutes with the selector (❼) - (▼/ ▲).
   Validate the selection by pressing (OK).
3. Finally, select the day of the week with the selector (❼) - (▼/ ▲).
   Validate the selection by pressing (OK).

### 10.1.8. Operation mode selection (Comfort, Reduction and "No frost" temperatures)

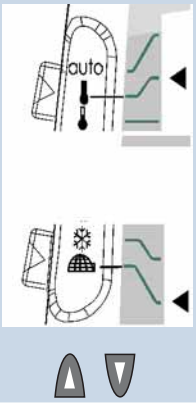
◈ Programming

ATTENTION

You can change the predefined values of the different operation modes.

Perform the following procedure to change these values:

1. Move the operation mode selection cursor (❷) to the required mode.
2. Change the value with the (❼) (▼/ ▲) selector and put the operation mode selection cursor back in (❾) the "Auto" mode.




### 10.1.9. Holidays mode selection

◈ Programming

ATTENTION

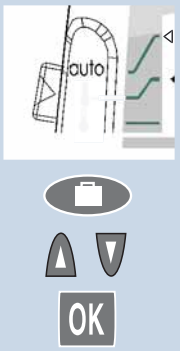
The Holidays mode allows to interrupt the heating or cooling program during a period of absence (from 1 to 99 days). This is only possible when in the Automatic operation mode.

To activate the Holidays mode, follow the instructions below:

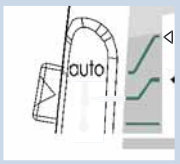
1. First, but the unit in Automatic mode with the selection cursor (❷).
2. Press (❿)
3. Set the number of days you wish to interrupt the heating or cooling program (from 01 to 99).
4. Validate your selection by pressing (OK)

Example:

| | | |
|---|---|---|
| Today | = | Monday |
| Programmed | = | 3 days |
| Return to "Auto" mode | = | Tuesday at 0h01m |




If you want to interrupt the Holidays mode, just move the (❷) cursor from "Auto" to "Reduced" and back again to "Auto". With this action, your PRT device will once again run with the selected program, and the Holidays mode will be deactivated




*NOTE:*
*In Holidays mode of the, when programming the number of days, the current day counts as one.*

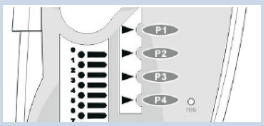
10

### 10.1.10 Select and modify an established program

◈ Programming

ATTENTION

Your thermostat comes with 4 factory preset programs for the heating or cooling functions. The values defined for each program can be easily modified with the switches located beneath the cover of your PRT. These programs correspond to the different user profiles (home, office, personnel, elderly, etc...).




The factory defined values for the programs are:

Heating Mode

P1: Every day of the week, comfort from 06h00 to 23h00

P2: From Monday to Friday, comfort from 06h00 to 09h00 and from 16h00 to 23h00
From Saturday to Sunday, comfort from 06h00 to 23h00

P3: From Monday to Friday, comfort from 06h00 to 09h00, from 11h00 to 14h00 and from 16h00 to 23h00
From Saturday to Sunday, comfort from 06h00 to 23h00

P4: Every day of the week, comfort from 00h00 to 24h00

Cooling Mode

P1: Every day of the week, reduced from 06h00 to 23h00

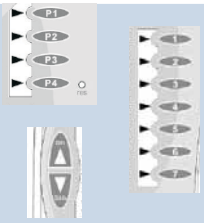
P2: From Monday to Friday, cooling from 06h00 to 09h00 and from 16h00 to 23h00
From Saturday to Sunday, cooling from 06h00 to 23h00

P3: From Monday to Friday, cooling from 06h00 to 09h00, from 11h00 to 14h00 and from 16h00 to 23h00
From Saturday to Sunday, cooling from 06h00 to 23h00

P4: Every day of the week, cooling from 00h00 to 24h00

To change one of these predefined profiles, follow the procedure below:

1. Select the number of the program you want to modify
2. Select the day of the week with the (16) switches, and indicate the time by pressing (13). (-/+). Afterwards, choose Comfort or Reduced for the Heating or Cooling function.




You can also copy the profile from one day to another. To perform this operation, follow the procedure below:

1. Keep the switch of the day you want to copy from pressed, and at the same time press the switch of the day you want to copy to.

In the same way you can also copy one complete profile (7 days) to another profile

*NOTE:*
*To modify the preset values the selection cursor must be in "Auto" mode.*

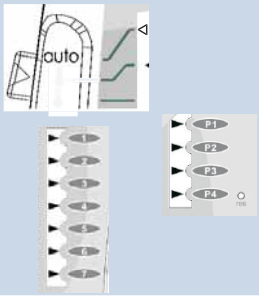
### 10.1.11.Display of the programs' profiles

◈ Programming

ATTENTION

To display the profiles that have been memorized, follow the procedure below:

1. Place the operation mode selection cursor (9) on "Auto" mode.
2. Press the switch of the profile you want to display, and display the configuration by selecting the day.



# 11. Available optional functions

This chapter gives a brief explanation of the available optional functions for the new Hitachi AquaFREE system

## Content

## 11.1. Available optional functions for outdoor units

The following table gives information concerning the optional functions that are available for the AquaFREE series

| Optional functions | | Outdoor Unit Series |
|---|---|---|
| **Optional Function** | **Explanation** | **H(V)RNE** |
| Night mode operation (low sound level) | This function decreases the sound level of the units, as well as the cooling capacity. | ● |
| Defrosting condition change over | This function changes the defrosting operation conditions. It is specially interesting for cold areas. | ● |

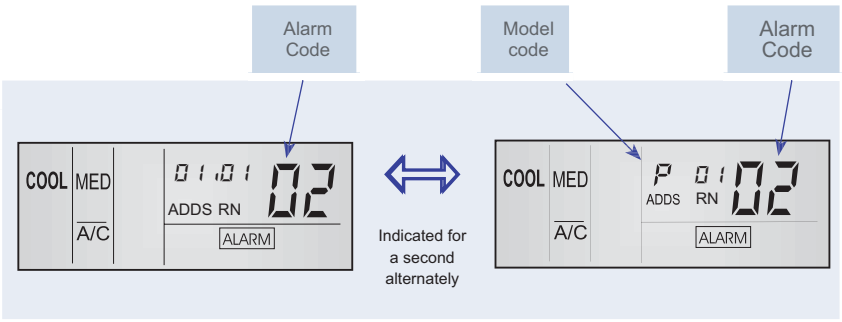
● Available

# 12. Troubleshooting

This chapter provides you with a concise description of the most common alarm codes of the new Hitachi AquaFREE system.

## Content

## 12.1. Alarm Code Indication of Remote Control Switch:




| Model code | |
|---|---|
| Indication | Model |
| H | Heat pump |
| P | Inverter |
| F | Multi |
| C | Cooling only |
| E | Others |

## 12.2. Alarm codes

| Code No. | Item | Content of Abnormality | Main cause |
|---|---|---|---|
| 01 | Indoor Unit | Tripping of the protection device | Activation of the flow rate controller, low water level pressure switch. |
| 02 | Outdoor unit | Tripping of the protection device | Activation of PSH, Locked Motor |
| 03 | Transmission | Abnormality between Indoor (or Outdoor) and Outdoor (or Indoor) units | Incorrect Wiring., failure of PCB (indoor or outdoor), fuse disconnected, fuse blown, power supply (module or outdoor unit) OFF |
| 04 | | Abnormality between Inverter and Control PCB | Failure in Transmission between PCBs (for the Inverter) |
| 05 | | Abnormality of power source wiring | Reverse phase incorrect wiring |
| 06 | Voltage Drop | Voltage Drop by Excessively Low or High Voltage in Outdoor Unit | Power Supply Voltage Dropy, Incorrect Wiring or insufficient Capacity of Power Supply Wiring |
| 07 | Cycle | Decrease in the discharge gas superheat | Excessive Refrigerant Charge, Expansion Valve Open Lock |
| 08 | | Increase in the discharge gas temperature | Insufficient Refrigerant charge, refrigerant leakage, expansion valve lock closed or clogged |
| 11 | Sensor on the indoor unit | Control PCB | Failure of Thermistor, control card, Connection |
| 12 | | Heater assigned in THM2 | |
| 13 | | Freeze Protection Thermistor | |
| 14 | | Gas Pipe Thermistor | |
| 19 | | Flow controller blocked | Cranck the controller.<br>Check pump operation |

I

◆ **Alarm codes (Cont.)**

| Code No. | Item | Content of Abnormality | Main cause |
|---|---|---|---|
| 20 | Sensor on the Outdoor Unit | Compressor thermistor | Failure of thermistor, sensor, or connection |
| 22 | | Outdoor Air Thermistor | |
| 24 | | Evaporation thermistor | |
| 31 | | Incorrect setting of Outdoor and Indoor Units | Incorrect setting of capacity code |
| 35 | | Incorrect setting of Indoor Unit No. | Duplication of the Indoor Unit number |
| 38 | | Abnormality of Protective Circuit in Outdoor Unit | Faulty PCB in the the outdoor unit, incorrect connection of cabling to PCB in indoor unit |
| 41 | Pressure | Surcharge in cooling mode (high-pressure pressures switch tripped) | Check air flow rate of a condenser (fan motor, battery).<br>Presence of non-condensed gas<br>Refrigerant overcharge |
| 42 | | Overcharge in cooling mode (high-pressure pressures switch tripped) | Presence of non-condensed gas<br>Refrigerant overcharge<br>Check the pump (insufficient water flow rate). |
| 47 | | Activation of Low Pressure Decrease Protection Device | Stoppage due to excessive decrease of evaporation temperature (Te < -35 ºC) activated three times in one hour, incorrect overheating (lack of gas), insufficient water flow rate |
| 51 | Inverter | Abnormality of Current Sensor for Inverter | Failure of Control PCB, ISPM |
| 52 | | Activation of Overcurrent protection | Failure of ISPM, Clogging of Heat Exchanger, Locked Compressor |
| 53 | | Activation of ISPM protection | ISPM failure, compressor failure, clogging of heat exchanger |
| 54 | | Increase in Inverter Fin Temperature | Abnormal Inverter fin thermistor<br>Clogging of the heat exchanger<br>Outdoor unit fan abnormality |
| 55 | ISPM | ISPM Abnormality | Faulty ISPM |
| 57 | Outdoor Fan | Fan Motor Abnormality | Disconnected wire or in correct wiring between the control PCB and the Inverter PCB<br>Incorrect wiring or abnormality of the fan motor |
| EE | Compressor | Compressor Protection Alarm | Failure of Compressor. |

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