

Precision Air Processor

PRECISION AIR PROCESSOR SERIES

The Evolution of Orion High-spec Air Processors.
Combining Energy Savings and High Precision.



Precision Air Processor **PAP Series**

Energy Saving Precision Air Processor

PAP SERIES

PRECISION AIR PROCESSOR



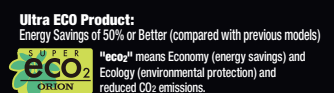
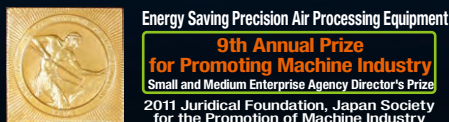
Combining Energy Savings and High Precision Capacity Control from the Industry Leader in Heat Pump Balance Control

Max
80%
Energy Savings

Taking Temperature, Humidity, and the Environment to the Next Level

ORION is striving for a higher degree of temperature and humidity control combined with a clean-environment agenda to better serve technological innovation in this bewildering high-tech market of semi-conductors and liquid crystal technologies, leading-edge energy related fields such as solar cell and biomass industries, etc., nanofabrication used in ultraprecision machine tool and medical and bio-related industries, as well as other areas such as university and private research institutions and company research divisions.

ORION's motto is "From whole-area air conditioning to localized precision air conditioning", and ORION has the world-class, leading edge heat pump balance control and DC inverter control technology needed to offer it up in its PAP Series Precision Air Processors.



PAP Web Site: <http://www.orionkikai-pap.com/>

PRECISION AIR PROCESSOR SERIES

The Evolution of Orion High-spec Air Processors.
Combining Energy Savings and High Accuracy.



PAP Series Energy Saving Precision Air Processor

mini Type

PAGE 13

Temperature Control Type

PAGE 15

Temperature and Humidity Control Type

PAGE 19



PAP L Series
Energy Saving Precision
Air Processors for Low Temperature
PAGE 24



PAP D Series
Energy Saving Precision
Air Processors for Dehumidification
PAGE 25



PAP R Series
Energy Saving Precision
Air Processors for Dehumidification
PAGE 29



AEC Series Outside-Air Air Processor
PAGE 41

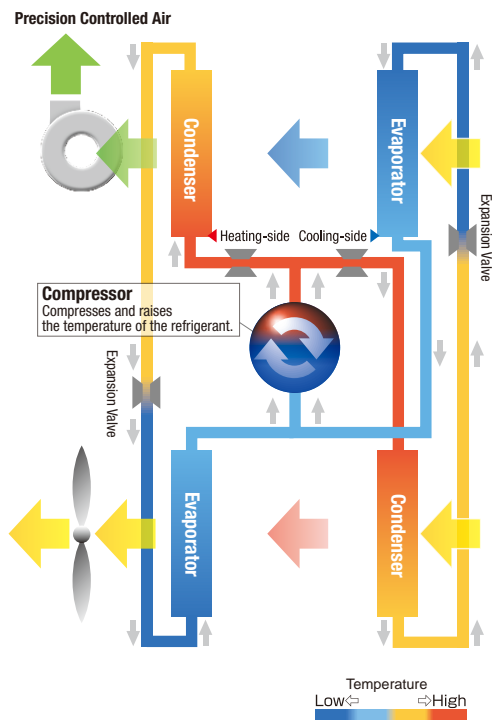


Air Processor
Energy Saving Precision
Air Processors for Low Temperature
PAGE 45



**Ultra-Low Dew Point
Dry Air Supply Equipment**
PAGE 47

Up To 80% Energy Savings With ORION'S Heat Pump Balance Control



Completely Heater-less AND Energy Saving.

We've completely eliminated the electric heater thanks to our Heat Pump Balance Control.

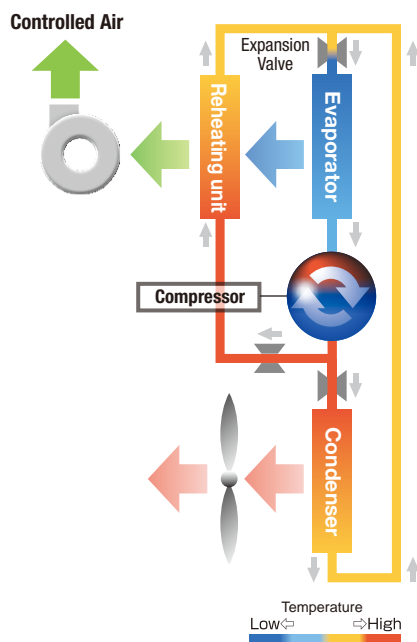
Heater PID controls (*1), which are found in production fields that demand precision air processing, starting with semiconductor and FPD production processes, represent a large shortcoming when it comes to power consumption. Due to increasing miniaturization, the demand for higher precision is also increasing. ORION is responding with its development of completely heater-less air processors that provide high precision control tied with reduced power consumption. ORION has responded to our customers' needs with refrigerant reheating (*2), a renewed technology that offers energy savings incomparable with previous heater PID control systems, and formerly impossible to achieve wide ranging setting capabilities.

Heat Pump Balance Control *

Heat pump balance control is air processing which balances the high level control of seemingly simultaneous cooling and heating operations from a single air conditioning unit. In other words, unlike a common air conditioner that moves heat either from the inside of a room to the outside, or from the outside to the inside, we've developed a bleeding edge control technology that avoids normally wasted heat movement that includes advanced control technology yielding energy savings along with high precision temperature control operation.

ORION Reheat Type (Superheat Specification)

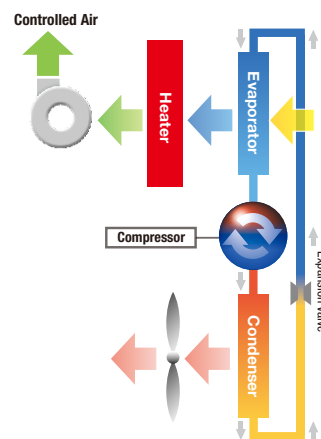
Under this control method, air is conditioned by the use of two condensers (reheaters) which are installed such that exhaust heat is used to reheat air passing through the evaporator. Even if 100% of refrigerant gas circulates to the reheater side, the amount circulated to the evaporator is constant along with the cooling capacity, so further dehumidification is possible. Furthermore, the amount of refrigeration is controlled by a separate flow shunt, which allows for highly accurate temperature control compared to conventional refrigerant reheat methods.



How Other Precision Air Conditioners Work

*1. Heater PID Control

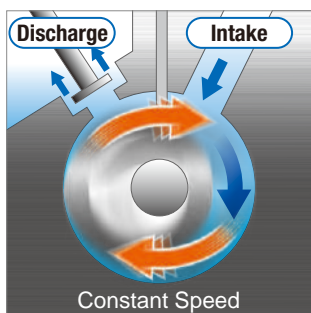
Air temperature is controlled by passing air from a constantly operating cooler over a heater of power equal to or greater than the cooling capacity of the cooler. When compared with heat pump balance control, the losses are clear, and approximately 70% of energy is wasted when the heater is operating.



DC Inverter Control for Optimum Capacity Control (Excluding PAPmini models)

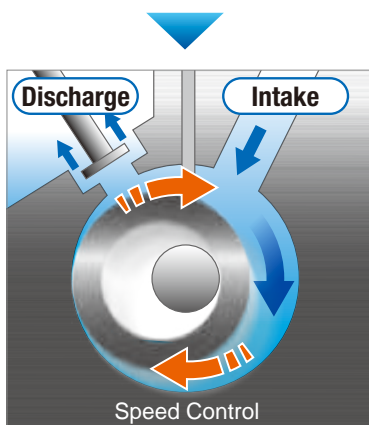
Automatically controls compressor speed in response to load.

Our compressor uses a brushless DC motor for optimum high efficiency and energy saving control.



High rotation speed during high load conditions.

Constant speed compressor is always in this constant state. There is no change in power consumption.

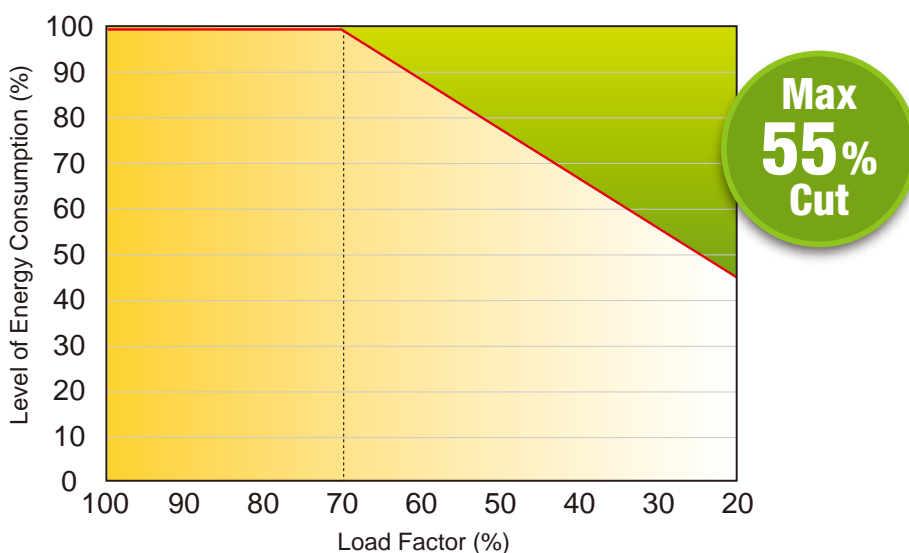


Low rotation speed during low load conditions.

The speed of the compressor is controlled in response to light load conditions in order to cut unnecessary cooling.

Controlled compressor speed during periods of low load, combined with heat pump balance control, means even greater energy savings. We offer a level of control that is impossible to achieve with constant-speed compressors.

Effective Energy Savings from Compressor Speed Control *Graph showing PAP10A1-(F)W



A freeze-prevention circuit is not needed.

Evaporator frost is prevented through speed control of the compressor. Cooling is possible down to nearly 0 °C.

No need for a hot-gas bypass circuit for freeze prevention as is the case with constant-speed compressors units.

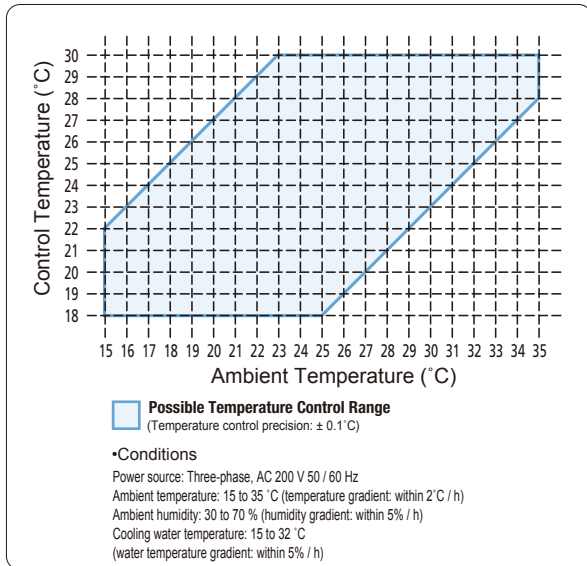
Heat Pump Balance Control

DC Inverter Control For Optimum Capacity Control

ORION
PRECISION AIR PROCESSOR
PAP SERIES

The Ultimate Algorithm Which Achieves Energy Savings And High Precision Temperature Control

ORION gives you high precision humidity and temperature control across a wide range.



PAP Series Main Features

Temperature Settings as High as 7 °C Above Intake Temperature

Our heat pump balance control achieves the wide temperature differences between intake temperature and set temperature that are simply not possible with refrigerant reheating. (Industry top class specifications)
* Ambient temperature range of 15 to 35 °C. (See graph at left.)

Temperature Control Precision: $\pm 0.1^\circ\text{C}$

(during periods of stable load)

Guarantees $\pm 0.1^\circ\text{C}$ at the discharge port within the entire temperature control range. (Standard equipped sensor cable length: 10 m, or 5 m for the PAPmini.)

All Fresh Specifications

Only 1 duct connection for easy installation. Meets your needs with a supply of clean air (class 100). (On HEPA installed models.) Circulation air processing is also possible.

Remote Management of All Air Processing

Remote operation via PC allows for combined management of all air processing within a factory.

External Communications Capability

Operation and confirmation of temperature control conditions, etc. are possible with just one easily connected cable. Built-in support for 3 communications standards. (RS-232C, 422A, 485)

Remote Monitoring & Remote Operation

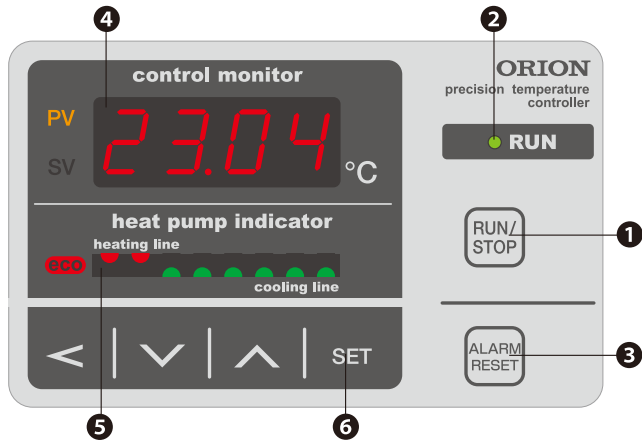
See page 47 for the ORION IoT System proposal that operates via a factory's internal network.



Built-in Intelligent Monitor

We've built in multiple parameter functions for improved ease of use.

Controller for Temperature Control Type Units

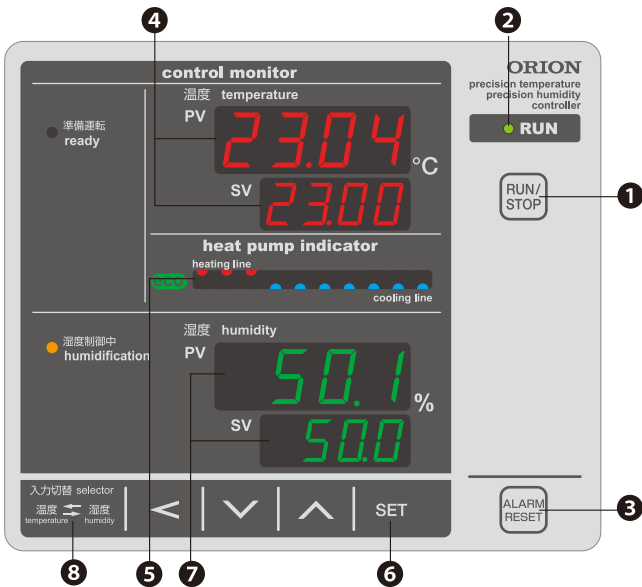


Controller Details

ORION's intelligent monitor offers a wealth of functions and monitoring capabilities combined for high-level operability.

- ① RUN/STOP button
- ② RUN lamp
- ③ ALARM RESET button
- ④ Temperature PV / SV display
- ⑤ Heating / cooling indicator
- ⑥ Function setting buttons
- ⑦ Humidity PV / SV display (only on units that have humidity and temperature control)
- ⑧ Temperature / humidity input select key (only on units that have humidity and temperature control)

Controller for Temperature and Humidity Control Type Units



List Of Main Functions

- F001** Automatic recovery after power outage
Selects the recovery pattern after a power outage.
- F002** RUN/STOP control selection
Selectively enables RUN/STOP control via the unit main control panel, remote switch, or communication functions, or any combination thereof.
- F003** Alarm signal output select
Determines whether switched contacts are open or closed when an alarm condition occurs.
- F099** Settings lock
This setting locks out changes to temperature and humidity settings.
- F100** Controlled outlet air temperature warning
"Detection enabled" or "Detection disabled"

Option Remote Controller (Not including PAP-C or mini Series)

Has all of the functionality of the main unit controller. (Wired)



For PAP-C Series



Temperature Control Type



Temperature And Humidity Control Type

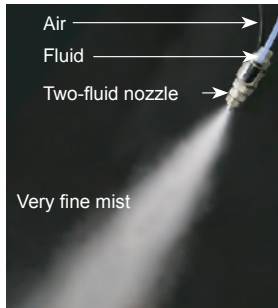
* The operation and display details for PAP-C Series models will differ from those noted above. See page 15 for details.

Completely Heater-less Humidification Because ORION Is Particular About Saving Energy

We have achieved completely heater-less humidification.

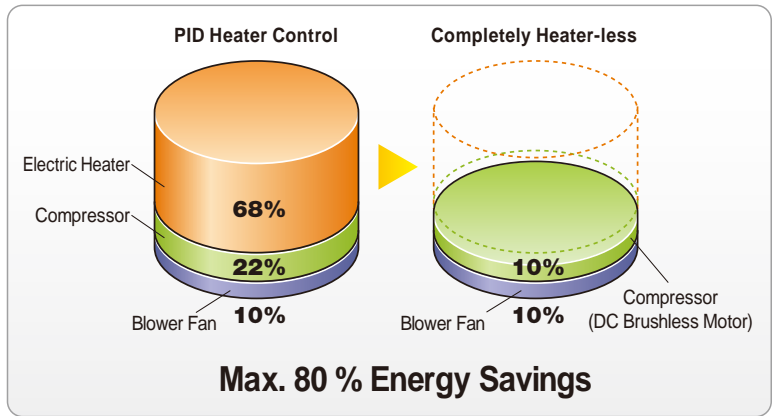
Two-Fluid Nozzle Water Mist Humidification (Not including the PAPmini)

The PAP Series takes energy saving all the way to the humidification method by going completely heater-less. ORION's water mist humidification method does not rely on a heater like that used for steam humidification and therefore the electric power that would normally be wasted is saved. In addition, with ORION's original humidity control method and PID control of the humidification water supply flow, high precision humidity control of $\pm 1\%$, and temperature precision of $\pm 0.1\text{ }^\circ\text{C}$ are possible. All combined, ORION offers extremely high quality processed air.



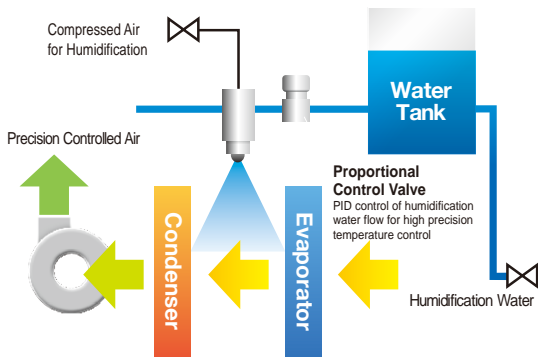
Energy Savings

Power Source Capacity and Power Consumption Comparison

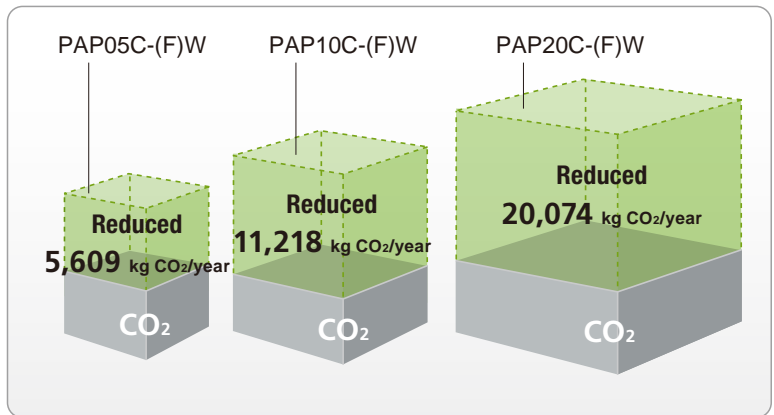


Reduced CO₂. (greenhouse gases)

Our process offers a great reduction in global environment threatening released CO₂

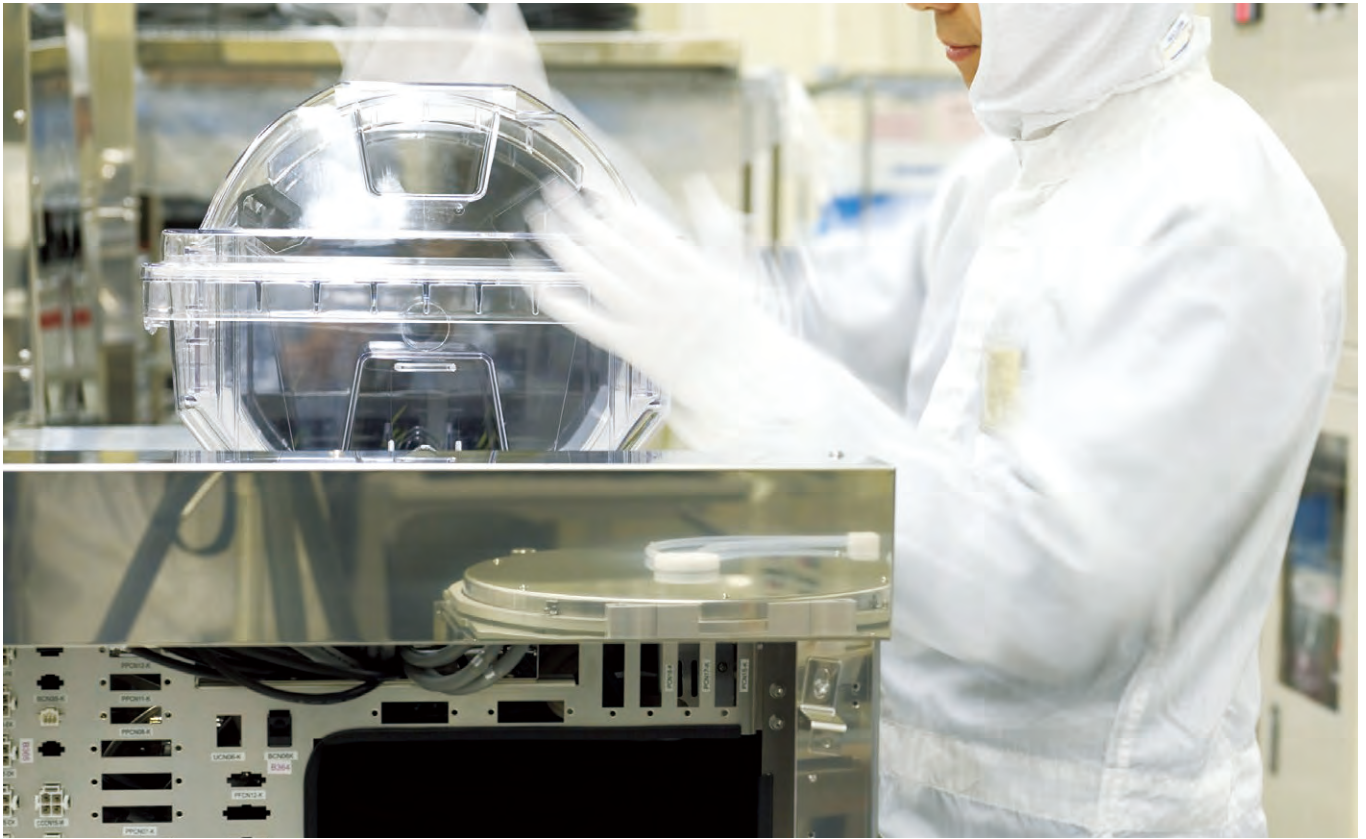


Two-fluid Nozzle Water Mist Humidification Configuration Diagram



| Model | Power Consumption Values (kWh), at 60 Hz | | | Difference in yearly power consumption (kWh) | Amount of reduced CO ₂ (kgCO ₂ /year) |
|-------------|--|------------------------|-----------------------------|--|---|
| | Other companies' previous method (A) | ORION's new method (B) | Difference in power (C) A-B | | |
| PAP05C-(F)W | 3 | 1.1 | 1.9 | 13,680 | 5,609 |
| PAP10C-(F)W | 5.3 | 1.5 | 3.8 | 27,360 | 11,218 |
| PAP20C-(F)W | 10 | 3.2 | 6.8 | 48,960 | 20,074 |

*1 Under previous method, normal operation does not deviate from maximum power, therefore the value is calculated as the rated power consumption \times 0.85.
 *2 Calculated at 24 h/day, 300 days/year.
 *3 Reduction in CO₂ emissions is 0.410, based on the average value of 8 electric companies.



Problems Facing Precision Temperature And Humidity Cleanrooms

Air Processing is Very Expensive

When conditioning large spaces, generally represented by cleanrooms, where the level of cleanliness must be maintained or in large space where temperature and humidity must be controlled to high precision, the level of conditioning must match the level of each of the manufacturing processes. Excessive high precision air processing must be present in order to meet the most demanding equipment installation and processes within the same room. And in the same area or cleanroom where high precision air processing takes place, if there are high level equipment and manufacturing processes, there will also be low level equipment present. In order to achieve whole-area processing, highly accurate air processing equipment and a very high capital investment is generally necessary.

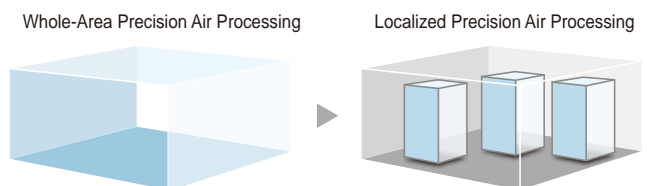
Very Large Capital Investment is Necessary to Respond to Sudden Changes in Manufacturing Circumstances

In order to surpass competitors, quality construction is a given. But on top of that, improvement of quality of conformance, which includes materials processing and assembly inspection, will incur short-term new investment. To respond to the demands of the sudden change in the manufacturing floor, whole-area air processing will also require a very large investment.

Bringing in Outside Air Requires Vast Administrative and Maintenance Expenses

Generally, a clean room requires fresh air to be piped in. The conditions of air processing cleanroom depend greatly on the supply of fresh air flowing in, as well as the ambient temperature and humidity of that air. The larger the space, the greater the cost and effort that will be required to maintain the same temperature, humidity, and level of cleanliness throughout the year. Basically, it's hard to say that there can be prudent management of high precision temperature and humidity air processing for large spaces like cleanrooms all the way down to the inner spaces of installed equipment involved in the manufacturing process.

Conventional Cleanrooms And ORION's Proposal For Local Air Processing



With conventional factory whole-area air processing, in addition to the high costs involved, air processing suitable to all machinery and equipment could not be realized. By managing air processing to the exact requirement of each stage of work, the scale of extremely high precision air processing can be reduced, and the resulting cost reductions can also be achieved.

ORION's Proposal For Energy Saving Via Localized Precision Air Processing

High Quality for Confined Spaces

Equipment, production processes, inspection processes, and spaces used in the production facilities for semiconductors, liquid crystal and solar panels, and other such devices demand high precision and highly stable air processing. Whole-area air processing that meets such demands will require extremely high associated expenses and maintenance costs. ORION proposes a high precision air processing system made of localized high-quality spaces that can minimize the utilization of limited energy.



Reductions in Expenses and Labor Associated with Maintenance Management

In whole-area air processing, expenses are associated with maintenance management of the entire area, and when trouble arises, the entire area may incur damages. In localized air processing, individual air processors can be maintained, thus reducing potential damage to the entire factory area. Furthermore, repairs and HEPA filter replacement can be done in a short time.

Easy Implementation of Highly Precise and Stable Precision Air Processing

High quality whole-area air processing that provides a high level of precision and cleanliness requires large air processing facilities. Localized air processing boasts simple, high precision temperature and humidity controlled air.

Implement a Precision Air Processing System Suitable to Your Equipment, Manufacturing Process, and Space

Diversification of workspace demands and other drastic changes require the swift creation of a suitable environment. Localized air processing offers a flexible and prompt response to the demands of the production area including improved temperature and humidity precision and improved levels of cleanliness.

Great Reductions in Facility Costs are Possible

By utilizing high precision temperature and humidity controlled clean air only in spaces where it is demanded, a great reduction of costs involved with whole-area high precision air processing can be realized by avoiding waste associated with high precision processing where it is not required.



Photolithography Equipment (Stepper)

Photolithography equipment prints minute electrode patterns onto silicon or glass on the order of nano-microns to hundreds of nano-microns in size, and the process demands air processing management of extremely high degrees of cleanliness and temperature and humidity precision.



Spin Coater

A spin coater is used in the semiconductor manufacturing process to apply a resist fluid to a wafer that has undergone deposition and is also used in the production of optical recordable discs such as CDs, DVDs, BDs, etc. in order to apply the recordable layer to the disc. When doing so, the scale of the recording layer applied is in the order of nanometers, and when making the very uniform layer which is required, any changes in viscosity due to changes in temperature and humidity can spell disaster. It is vital to plan for constant temperature and humidity management, as well as stability in quality.



Liquid Crystal Manufacturing Process

During the liquid crystal manufacturing process, temperature changes can result in expansion, contraction, and electrostatic formation on the substrate. In order to avoid trouble arising from such issues, temperature, or possibly temperature and humidity of the working environment must be precisely controlled.



Solder Paste Printer

A solder paste printer applies solder paste to a printed circuit board. In the screen printing process, a metal mask of approximately 100 – 300 microns in thickness is commonly used through which solder paste is passed to be applied to the board. Powdered solder is mixed in flux so that a moderate viscosity is formed. However, the effects of temperature can prevent proper application. Also, electrostatic formation can occur depending on the humidity. For these reasons, temperature and humidity management is necessary.



Solar Simulator

Testing apparatus for evaluation of solar cell specifications by exposure to artificial sunlight. Temperature management is required to keep down heat from light sources in order to make stable conditions for measurement.



Precision Processing Machine

With current ultraprecision machine tools, sizes down to the sub-micron order are the norm, and there is a demand nano-unit scales. The smallest changes in temperature can result in expansion and contraction of equipment and the target work, so there is always the desire for absolute temperature control precision.

Localized Air Processing For All Kinds Of Equipment



Printed Circuit Board Stocker

Printed circuit boards must be kept at a uniform temperature and humidity throughout manufacturing processes before solder paste printing. Printed circuit boards have poor thermal properties, so management of storage temperature can reduce lower yields due to poor soldering, and is effective at increasing quality.



Electron Microscope

Electron microscope resolutions are at a level of 0.1 nm, and such a working environment demands a uniform range of temperature and humidity. In order to achieve more reliable, higher analytical results, better prepared environmental conditions are indispensable.



Tablet Press

Presently, "powder processing technology", which is the means to process powder into an easy to handle shape, has become vital for all industries. A tablet press (also known as a "tableting machine") solidifies a powder by means of a kind of molding machine, and the internals of such equipment require an environment with a constant temperature and low humidity.



3D Measuring Instrument

3D measuring instruments require a minimum high-precision scale of 0.0005 – 0.00001 mm. Improvement of measurement precision demands a stable installation environment.



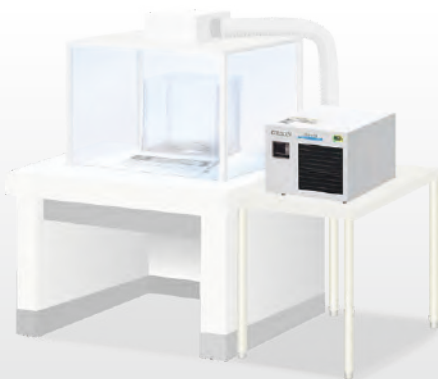
Chromatograph

Chromatograph equipment measures the respective constituent contents of a sample. Measurement sensitivity is in the order of PPM (parts per million) to PPQ (parts per quadrillion, or 1 part per 10^{15}), and the technology is particularly represented in the fields of biochemistry, pharmaceuticals, and foodstuffs. More reliable, higher level results come about with higher level improvements to the working environment.



Liquid Dispensing (Pipetting) Equipment

Liquid dispensing equipment is widely used in the fields of biology, chemistry, and medicine. Improved precision can be achieved through temperature and humidity management.



Electronic Balance

Presently, mass measurement in analytical chemistry is generally done using the electronic balance. Proper environmental management can prevent the subtle changes due to fluctuating temperature and humidity, and provide more stable measurement results.



Fume Hood

A fume hood provides internal temperature and humidity management of intake air.

PAP mini –Light Duty Series–

Air Cooled

Models

PAP01B
PAP01B-KJ
PAP03C
PAP03C-KJ

Air Processing Capacity **0.7 to 4 m³/min**

Temperature Control Precision **±0.1 °C**

Temperature Setting Range **18 to 30 °C**

Humidity Control Precision **±1 %** *KJ models only

Humidity Setting Range **45 to 75 %** *KJ models only



* Warranty period of the refrigerant circuits 2 years from the date of purchase (or 10,000 hours of operating time).



Special Specification

Special Specification Product ▶ Page 27

- Noise reducing intake duct
- Circulation intake chamber
- Exhaust chamber ■ Compact chamber box

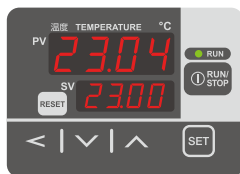
Please contact ORION regarding custom built models of specifications outside the ranges listed herein.



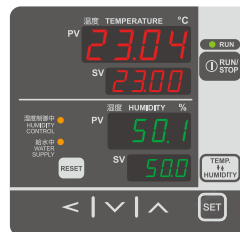
PAP01B



PAP03C-KJ



Temperature Control Type



Temperature And Humidity Control Type

Built-in Intelligent Monitor

Easy to use function keys for expanded functionality

List Of Main Functions

- F001** Automatic recovery after power outage
- F002** RUN/STOP control selection
- F003** Alarm signal output select
- F099** Settings lock
- F100** Controlled outlet air temperature warning

*Photo: PAP03C series

ORION's compact class achieves the highest level of temperature control of ±0.1 °C, and humidity control of ±1 %.

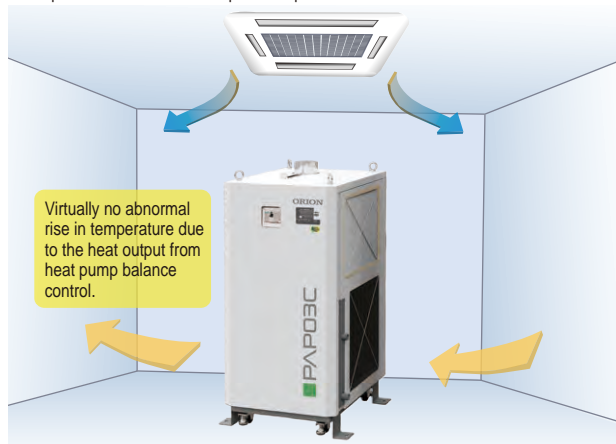
Simple and easy installation

You can plan on temperature and humidity control, and cleaning, in the air space where you need it, when you need it. And very easy to move or remove when no longer needed.

As much as 70 % Cut in Heat Output*

Extremely low heat output means a reduced load, even for air processors installed inside.

* Compared with sustained compressor operation + heater reheat method.



ORION has a System that Meets Your Needs

Compact Chamber

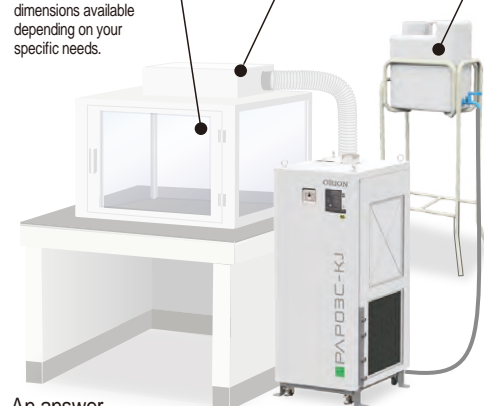
Various manufacture dimensions available depending on your specific needs.

Specialized FFU

Water Supply tank

For use with KJ types.

Sold separately
Accessory
Items Also
Available



An answer ...
We can meet each of your temperature-control needs!
Our dealers are happy to provide further information.

Compact Design

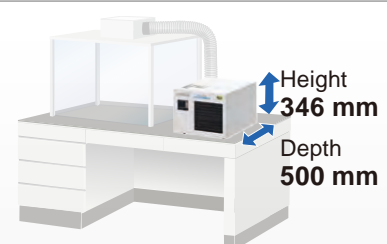
PAP01B-KJ type

A compact design that fits neatly besides your work desk.



PAP01B type

Can also be used on the desktop.



Specifications

| Model | | PAP01B | PAP01B-KJ | PAP03C | PAP03C-KJ | |
|-----------------------------------|---|---------------------|---|---------------------|---|--------------------|
| Performance Specifications | Possible Temperature And Humidity Setting Range *1 | °C,% | 18 to 30 | 18 to 30, 45 to 75 | 18 to 30 | 18 to 30, 45 to 75 |
| | Temperature and Humidity Control Precision *2 | °C,% | ±0.1 | ±0.1, ±1.0 | ±0.1 | ±0.1, ±1.0 |
| | Cooling / Heating Output (50/60 Hz) *3 | kW | 0.33 / 0.39 | 0.77 / 0.84 | 1.65 / 1.85 | 1.8 / 2.12 |
| | (Maximum Cooling Output) (50/60 Hz) | (kW) | (0.22 / 0.26) | (0.37 / 0.44) | (1.15 / 1.35) | (1.2 / 1.42) |
| Environmental Conditions | Rated Processing Airflow | m ³ /min | 0.7 to 1.0 | | 2.0 to 4.0 *1 | |
| | Maximum External Static Pressure *4 | Pa | 120 / 130 | 120 / 160 | 110 / 150 | 110 / 150 |
| | Ambient (Intake Air) Temperature and Humidity Range | °C,% | 15 to 35, 30 to 70 *1 | | 15 to 40, 30 to 70 *1 *5 | |
| External Dimensions (HxDxW) | Temperature Gradient at Intake | °C/h | Within ±1 | | | |
| | Humidity Gradient at Intake | %/h | Within ±5 | | | |
| Product Mass | kg | 346 x 500 x 412 *5 | 765 x 620 x 390 *5 | 1070 x 590 x 480 *6 | 1350 x 680 x 520 *6 | |
| Controlled Air Outlet Port (O.D.) | mm | ø75 | ø100 | ø98 | ø98 | |
| Humidification Water | Water Quality | | Deionized water (electrical conductivity: 0.1 – 10 µS/cm) | – | Deionized water (electrical conductivity: 0.1 – 10 µS/cm) | |
| | Maximum Moisture Output | kg/h | – | 0.8 *6 | – | 2.3 *7 |
| | Supply Temperature Range | °C | – | 10 to 40 | – | 10 – 40 |
| | Supply Pressure Range | MPa | – | 0.03 to 0.2 | – | 0.03 – 0.2 |
| | Connection Port Size | | – | Rc1/4 | – | Rc1/4 |
| Power Specifications | Power Supply | V(Hz) | Single phase 100V ± 10% (50 / 60) *7 *10 | | Three-phase 200 ± 10 % (50/60) *8 | |
| | Power Consumption (50/60 Hz) | kW | 0.32 / 0.34 | 1.2 / 1.2 | 0.75 / 0.85 *9 | 2.7 / 3.1 *9 |
| | Electric Current (50/60 Hz) | A | 4.0 / 3.9 *8 | 13 / 13 *8 | 3.8 / 3.8 *10 | 11 / 12 *10 |
| | Power Supply Capacity (50/60 Hz) | kVA | 0.34 / 0.38 *9 | 1.5 / 1.5 *9 | 1.4 *11 | 4.0 *11 |
| Noise Level (50/60 Hz) | dB | 54 / 56 | 58 / 60 | 64 / 65 | 65 / 66 | |
| Legal Refrigeration Tonnage | | 0.08/0.10 | 0.12/0.15 | 0.25/0.30 | 0.28/0.33 | |
| Refrigerant | | R-134a | R-407c | R-410A | R-410A | |
| Refrigerant Filling Volume | kg | 0.13 | 0.3 | 0.4 | 0.48 | |
| Compressor Output | kW | 0.25 | 0.3 | 0.8 | 0.85 | |

About the PAP01B Series

*1 The temperature and humidity control ranges noted do not necessarily indicate the actual possible controllable ranges. The actual controllable temperature and humidity ranges will depend on the temperature and humidity of the intake air as well as process airflow rate. Set the processing airflow according to the operating environment. *2 When the intake air temperature and humidity are stable. Noted precision value displayed on the controller is for one point at the outlet port. When operating at the maximum rated airflow. *3 When the intake (surrounding) air temperature and humidity are 30 °C, 70 %, at a processing airflow of 1 m³/min. *4 The external static pressure at the controlled air outlet side of the blower fan outlet side when operating at the maximum rated processing airflow. *5 Height includes the outlet port. *6 The figure noted is when operating at the top of the specified level of humidification. *7 Plug the product into a dedicated outlet in order to prevent voltage drops. *8 Maximum value within the range of the product's specifications. *9 When operating at the maximum operating current within the specified range. *10 Includes a 2 m power cord.

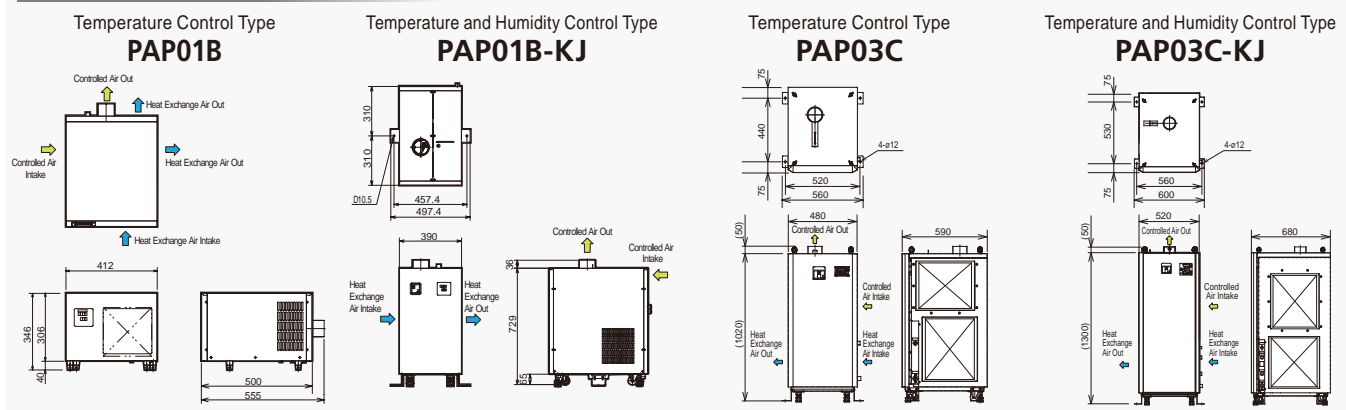
Note: Ducting should be insulated, and ducting length should be kept as short as possible. (Recommended maximum length: 3 m)

About the PAP03C Series

*1 The temperature and humidity control ranges noted do not necessarily indicate the actual possible controllable ranges. The actual controllable temperature and humidity ranges will depend on the temperature and humidity of the intake air as well as the process airflow rate. Set the processing airflow according to the operating environment. *2 When the intake air temperature and humidity are stable. Noted precision value displayed on the controller is for one point at the outlet port. When operating at the rated processing airflow (3 m³/min). After operation starts, for approx. 2 minutes the temperature will temporarily fluctuate due to operation while the compressor oil returns. Also, if the target humidity is high, and depending on the timing of the supply of the humidification water, the precision previously noted may not be able to be maintained. In such cases, by adjusting parameters related to supply water, the amount of fluctuation can be reduced. *3 When the intake (surrounding) air temperature and humidity are 30 °C, 70 %, at a processing airflow of 3 m³/min. *4 When the processing airflow is 3 m³/min. *5 See the operating manual for details regarding the possible operating range of ambient temperature and humidity. *6 Height includes the outlet port. *7 The figure noted is when operating at the top of the specified level of humidification. *8 The source voltage phase unbalance should be less than ±3 %. *9 The intake (surrounding) air temperature and humidity are 30 °C, 70 %, at a processing airflow of 3 m³/min. *10 Maximum value within the range of unit specifications. *11 The figure noted is when the product is operating at the highest capacity of its normal operating range.

Note: Ducting should be insulated, and ducting length should be kept as short as possible. (Recommended maximum length: 3 m)

External Dimensions (units: mm)

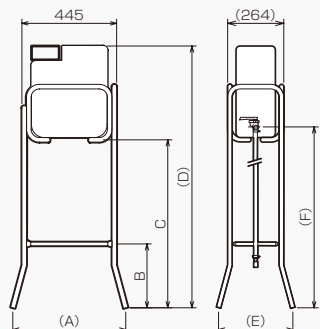


Water Supply Tank

(Accessory item, sold separately)

for PAP01B-KJ
lot No. 02030621030

for PAP03C-KJ
lot No. 02030621040



| Model | A | B | C | D | E | F |
|-----------|-----|-----|------|------|-----|------|
| PAP01B-KJ | 530 | 300 | 790 | 1230 | 350 | 850 |
| PAP03C-KJ | 655 | 400 | 1110 | 1550 | 475 | 1170 |

PAP Temperature Control Type Water Cooled

Models

PAP05C-W
 PAP05C-FW
 PAP10C-W
 PAP10C-FW
 PAP20C-W
 PAP20C-FW
 PAP40C-W
 PAP40C-FW

Air Processing Capacity **3 to 40 m³/min**

Temperature Control Precision **±0.1 °C**

Temperature Setting Range **18 to 30 °C**

FEATURES

- Uses R-32 refrigerant *
- Built-in Data Logging Functionality
 → Can save operating data to a removable USB flash drive.
- *Only available on PAP05C-W and PAP20C-FW models.
- Works in a wide range of ambient temperatures.
 Operates with intake air as much as ±7 °C from the set temperature.



* Warranty period of the refrigerant circuits 2 years from the date of purchase (or 10,000 hours of operating time).



PAP10C-W



Special Specification Special Specification Product ▶ Page 27

- Noise reducing intake duct
- Circulation intake chamber
- Exhaust chamber
- Humidity display included

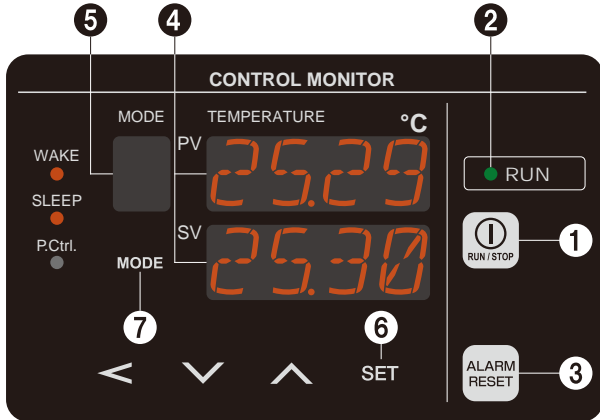
Please contact ORION regarding custom built models of specifications outside the ranges listed herein.

PAP Series

Water-Cooled PAP Temperature Control Models Offer Improved Operability and Functionality

■ Operation Panel

14-Segment Display Improved display of information compared to the old 7-segment displays.

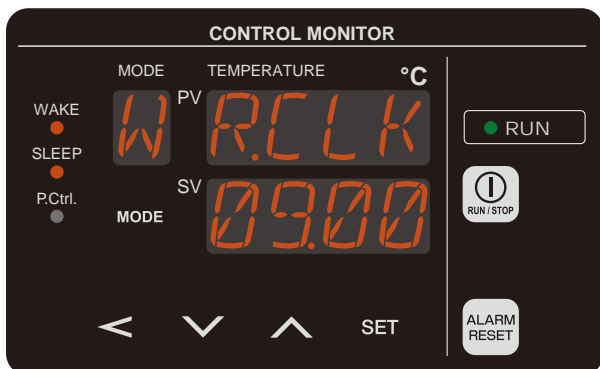


Controller Details

ORION's intelligent monitor offers a wealth of functions and monitoring capabilities combined for high-level operability.

- ① RUN/STOP Button
- ② RUN Lamp
- ③ ALARM RESET Button
- ④ Temperature PV / SV Display
- ⑤ Mode Display
- ⑥ Function Setting Buttons
- ⑦ Mode Select Key

Mode Select Method Improved operability of primary functions. Complete freedom over operation and stop time settings.



Mode List

| Mode Display | Mode Details |
|--------------|---|
| V | Controlled Outlet Air Temperature Setting |
| M | Operating Conditions Monitor |
| P | PID Parameter Setting |
| F | F Parameter Setting |
| W | Weekly Timer Setting |
| S | Program Operation |
| R | Alarm History Display |
| H | Accumulated Operating Time Display |
| L | Operation Lock Setting |
| T | Real Time Setting |
| C | Restore Default Parameter Settings |
| U | Data Transfer |

PAP Temperature Control Type Water Cooled (Superheat Specification)

Models

- PAP05C-W1
- PAP05C-FW1
- PAP10C-W1
- PAP10C-FW1
- PAP20C-W1
- PAP20C-FW1
- PAP40C-W1
- PAP40C-FW1

Air Processing Capacity **3 to 40 m³/min**

Temperature Control Precision **±0.1 °C**

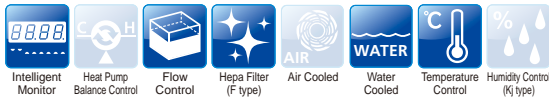
Temperature Setting Range **18 to 30 °C**



* Warranty period of the refrigerant circuits 2 years from the date of purchase (or 10,000 hours of operating time).

FEATURES

- Uses R-32 refrigerant *
- Built-in Data Logging Functionality
→ Can save operating data to a removable USB flash drive.
- * Only available on PAP05C-W and PAP20C-FW models.
- Temperature control precision AND dehumidification functionality!
Operates with intake air as much as -3 to +7 °C from the set temperature.
Wide cooling water temperature operability: 5 to 32 °C.



Special Specification Special Specification Product ▶ Page 27

- Noise reducing intake duct
- Circulation intake chamber
- Exhaust chamber
- Humidity display included

Please contact ORION regarding custom built models of specifications outside the ranges listed herein.



PAP10C-W1

PAP Series

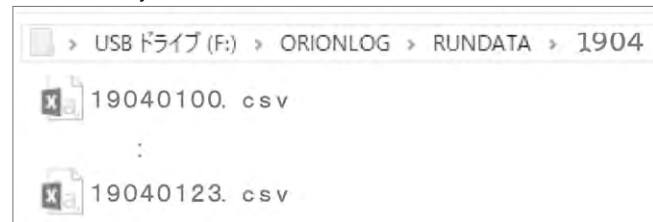
■ Built-in Data Logging Functionality

Regular temperature measurement data and operating data before and after alarm conditions can be recalled from the USB flash drive for quality assurance and help in investigating any trouble.

A USB flash drive* is inserted and required data is selected and copied over from the operation panel.
Data saved in CSV format.

* USB flash drive is not included.

USB memory contents are saved in CSV format.



(Data Details: 4/1/2019 0:0 . 4/1/23 23:59)



File Contents

| | A | B | C | D | E | F | G |
|---|----------|----|-------|---|------|---|---|
| 1 | 11:34:53 | 23 | 23.05 | 2 | | | |
| 2 | 11:35:53 | 23 | 23.05 | 2 | | | |
| 3 | 11:36:54 | 23 | 23.06 | 2 | | | |
| 4 | 11:37:54 | 23 | 23.06 | 2 | C160 | | |
| 5 | 11:38:54 | 23 | 23.06 | 2 | C160 | | |
| 6 | 11:39:54 | 23 | 23.05 | 2 | C160 | | |
| 7 | 11:40:54 | 23 | 23.05 | 2 | C160 | | |

H : M : S Set Temperature Measured Temperature Operating State Alarm Code



PAP Temperature Control Type Water Cooled

Specifications

| Model | | PAP05C-W | PAP05C-FW | PAP10C-W | PAP10C-FW | PAP20C-W | PAP20C-FW | PAP40C-W | PAP40C-FW | |
|--|--|--|----------------|------------------------------|--------------|------------------------------|--------------|------------------------------|---|--|
| Performance Specifications | Possible Temperature Setting Range *1 | 18 to 30 | | | | | | | | |
| | Temperature and Humidity Control Precision *2 | ±0.1 | | | | | | | | |
| | Cooling / Heating Output (50/60 Hz) | 3.2 | | 6.5 | | 13.0 | | 22.0 | | |
| | (Maximum Cooling Output) (50/60 Hz) | (2.0) | | (4.0) | | (8.0) | | (16.0) | | |
| | Rated Processing Airflow | 3 to 5 | | 7 to 10 | | 13 to 20 | | 25 to 40 | | |
| Environmental Conditions | Maximum External Static Pressure (50/60 Hz) *3 | 210 | 480 | 180 | 570 | 110 | 540 | 470 | 900 | |
| | Ambient (Intake Air) Temperature and Humidity Range *1 | 15 to 35, 30 to 70 | | | | | | | | |
| | Temperature Gradient at Intake | Within ±10 | | | | | | | | |
| | Humidity Gradient at Intake | Within ±5 | | | | | | | | |
| | Cooling Water Temperature Gradient | Within ±5 | | | | | | | | |
| External Dimensions (HxDxW) *4 | mm | 1240x586x513 | 1480x586x513 | 1515x720x570 | 1855x720x570 | 1515x860x640 | 1855x860x640 | 1865x1070x830 | 2337x1070x830 | |
| | Product Mass | 127 | 143 | 163 | 205 | 210 | 260 | 365 | 457 | |
| Cooling water | Controlled Air Outlet Port (OD) | mm | ø123 | ø123 HEPA filter built in | ø148 | ø148 HEPA filter built in | ø198 | ø198 HEPA filter built in | □350 □350 *5 HEPA filter built in | |
| | Rate of Supply *6 | m ³ /h | 0.6 | | 1.2 | | 2.2 | | 3.0 | |
| | Supply Temperature Range | °C | 15 to 32 | | | | | | | |
| | Supply Pressure | MPa | 0.69 or less | | | | | | | |
| | Inlet/Outlet Pressure Difference | MPa | 0.2 or greater | | | | | | | |
| Power Specifications | Connection Port Size | Rc 1/2 | | | Rc 3/4 | | | Rc 1 | | |
| | Power Source *7 | V(Hz) Three-phase 200 to 220 V ±10 % (50/60) | | | | | | | | |
| | Power Consumption (50/60 Hz) *8 | 1.1 | | 1.5 | | 3.1 | 3.2 | 5.9 | 6 | |
| | Electric Current *8 | 4.3 | | 4.6 | 4.8 | 10 | 10.3 | 21.3 | 21.4 | |
| | Power Capacity *9 | 1.5 | | 1.6 | 1.7 | 3.5 | 3.6 | 7.4 | 7.5 | |
| Noise Level (50/60 Hz) *10 | dB | 60 | 68 | 64 | 73 | 67 | 71 | 78 | 78 | |
| Operation Control Method | Heat pump balance control | | | | | | | | | |
| Legal Refrigeration Tonnage (50/60 Hz) | 0.36 | | 0.36 | 0.53 | 0.53 | 1.19 | 1.19 | 1.74 | 1.74 | |
| Refrigerant *12 | R-32 | | | | | | | R-410A | | |
| Refrigerant Filling Volume | kg | 0.35 | | 0.55 | | 0.8 | | 2.2 | | |
| Compressor Output | kW | 0.85 | | | 1.85 | | | 3.0 | | |

Superheat Specification

Specifications

| Model | | PAP05C-W1 | PAP05C-FW1 | PAP10C-W1 | PAP10C-FW1 | PAP20C-W1 | PAP20C-FW1 | PAP40C-W1 | PAP40C-FW1 | |
|--|--|---|----------------|------------------------------|--------------|------------------------------|--------------|------------------------------|---|--|
| Performance Specifications | Possible Temperature Setting Range *1 | 18 to 30 | | | | | | | | |
| | Temperature and Humidity Control Precision *2 | ±0.1 | | | | | | | | |
| | Cooling / Heating Output (50/60 Hz) | 2.0 | | 4.0 | | 8.0 | | 16.0 | | |
| | (Maximum Cooling Output) (50/60 Hz) | 0.4 | | 0.8 | | 1.6 | | 3.2 | | |
| | Rated Processing Airflow | 3 to 5 | | 7 to 10 | | 13 to 20 | | 25 to 40 | | |
| Environmental Conditions | Maximum External Static Pressure (50/60 Hz) *3 | 210 | 480 | 180 | 570 | 110 | 540 | 470 | 900 | |
| | Ambient (Intake Air) Temperature and Humidity Range *1 | 15 to 35, 30 to 70 | | | | | | | | |
| | Temperature Gradient at Intake | Within ±10 | | | | | | | | |
| | Humidity Gradient at Intake | Within ±5 | | | | | | | | |
| | Cooling Water Temperature Gradient | Within ±5 | | | | | | | | |
| External Dimensions (HxDxW) *4 | mm | 1240x586x513 | 1480x586x513 | 1515x720x570 | 1855x720x570 | 1515x860x640 | 1855x860x640 | 1865x1070x830 | 2337x1070x830 | |
| | Product Mass | 124 | 140 | 160 | 202 | 204 | 254 | 345 | 437 | |
| Cooling water | Controlled Air Outlet Port (OD) | mm | ø123 | ø123 HEPA filter built in | ø148 | ø148 HEPA filter built in | ø198 | ø198 HEPA filter built in | □350 □350 *5 HEPA filter built in | |
| | Rate of Supply *6 | m ³ /h | 0.6 | | 1.2 | | 2.2 | | 3.0 | |
| | Supply Temperature Range | °C | 15 to 32 | | | | | | | |
| | Supply Pressure | MPa | 0.69 or less | | | | | | | |
| | Inlet/Outlet Pressure Difference | MPa | 0.2 or greater | | | | | | | |
| Power Specifications | Connection Port Size | Rc 1/2 | | | Rc 3/4 | | | Rc 1 | | |
| | Power Source *7 | V(Hz) Three-phase 200 to 220V±10% (50/60) | | | | | | | | |
| | Power Consumption (50/60 Hz) *8 | 1.1 | | 1.5 | | 3.1 | 3.2 | 5.9 | 6.0 | |
| | Electric Current *8 | 4.3 | | 4.6 | 4.8 | 10 | 10.3 | 21.3 | 21.4 | |
| | Power Capacity *9 | 1.5 | | 1.6 | 1.7 | 3.5 | 3.6 | 7.4 | 7.5 | |
| Noise Level (50/60 Hz) *10 | dB | 60 | 68 | 64 | 73 | 67 | 71 | 78 | 78 | |
| Operation Control Method | Heat pump balance control (Superheat specification) | | | | | | | | | |
| Legal Refrigeration Tonnage (50/60 Hz) | 0.36 | | 0.36 | 0.53 | 0.53 | 1.19 | 1.19 | 1.74 | 1.74 | |
| Refrigerant *12 | R-32 | | | | | | | R-410A | | |
| Refrigerant Filling Volume | kg | 0.35 | | 0.55 | | 0.8 | | 2.2 | | |
| Compressor Output | kW | 0.85 | | | 1.85 | | | 3.0 | | |

*1 The temperature control range noted does not necessarily indicate the actual controllable range possible. The range of temperature control depends on the condition of the air supplied at the intake. *2 Values indicated are for when the intake air temperature and humidity, and supply water temperature and supply water flow rate are stable. Noted precision is based on measurement by the internal controller at a single air outlet point. *3 The noted external static pressure is when the controlled air is regulated at the outlet to produce the maximum rated airflow. *4 Height includes outlet port. *5 The HEPA filter box is shipped in a separate package from the main unit and must be installed on-site. *6 When processing at the maximum airflow and at the highest cooling capacity, the difference between the cooling water inlet and outlet ports is 6.5 °C. *7 Source voltage phase unbalance should be less than ±3%. *8 Maximum value within the range of unit specifications. *9 The figure noted is when the equipment is operating at the highest capacity of its normal operating range. *10 The noise level may be lowered by installing noise-absorbing ducting. *11 See page 28 for information regarding cooling water supply equipment. *12 This product contains a refrigerant gas that is slightly flammable. When installing indoors, ensure there is adequate ventilation in order to prevent combustion in cases of a refrigerant leak, and also take measures to keep fire away from the area. Note: All ducting should be insulated and ducting length should be kept as short as possible. (5 m or shorter recommended.)

PAP Temperature Control Type Air Cooled

Models

- PAP05A1
- PAP05A1-F
- PAP10A1
- PAP10A1-F
- PAP20A
- PAP20A-F

Air Processing Capacity **3 to 20 m³/min**

Temperature Control Precision **±0.1 °C**

Temperature Setting Range **18 to 30 °C**



* Warranty period of the refrigerant circuit is 2 years from the date of purchase (or 10,000 hours of operating time).



PAP10A1



Special Specification Special Specification Product ▶ Page 27

- Noise reducing intake duct ■ Circulation intake chamber
- Exhaust chamber ■ Humidity display included

Please contact ORION regarding custom built models of specifications outside the ranges listed herein.

PAP Series

Specifications

| Model | | PAP05A1 | PAP05A1-F | PAP10A1 | PAP10A1-F | PAP20A | PAP20A-F | |
|--|--|---------------------|--------------------------------|------------------------------|------------------|------------------------------|-------------------|---------------------------------|
| Performance Specifications | Possible Temperature Setting Range *1 | °C | | 18 to 30 | | | | |
| | Temperature and Humidity Control Precision *2 | °C | | ±0.1 | | | | |
| | Cooling / Heating Output (50/60 Hz) | kW | | 2.3 / 2.6 | | 4.7 / 5.3 | | 9.4 / 10.5 |
| | (Maximum Cooling Output) (50/60 Hz) | (kW) | | (1.6) / (1.8) | | (3.2) / (3.6) | | (6.5) / (7.2) |
| | Rated Processing Airflow | m ³ /min | | 3 to 5 | | 7 to 10 | | 13 to 20 |
| Environmental Conditions | Maximum External Static Pressure (50/60 Hz) *3 | Pa | 110 | 620 | 250 | 560 | 250 | 690 |
| | Ambient (Intake Air) Temperature and Humidity Range *1 | °C, % | | 15 to 35, 30 to 70 | | | | |
| | Temperature Gradient at Intake | °C/h | | Within ±1 | | | | |
| | Humidity Gradient at Intake | %h | | Within ±5 | | | | |
| External Dimensions (HxDxW) | *4 | mm | 1140 x 700 x 600 | 1423 x 700 x 600 | 1305 x 822 x 661 | 1565 x 822 x 661 | 1610 x 1150 x 770 | 2010 x 1150 x 770 |
| Mass | | kg | (130) | (155) | (185) | (210) | (290) | (365) |
| Controlled Air Outlet Port (O.d.) | | mm | ø100 | ø100 HEPA filter built in | ø150 | ø150 HEPA filter built in | ø200 | ø200 *5 HEPA filter built in |
| Power Specifications | Power Supply *6 | V(Hz) | Three-phase 200 ± 10 % (50/60) | | | | | |
| | Power Consumption *7 | kW | 1.4 | | 1.8 | | 3.9 | |
| | Electric Current *7 | A | 6.2 | | 7.5 | | 14.9 | |
| | Power Supply Capacity *8 | kVA | 2.2 | | 2.6 | | 5.2 | |
| Noise Level (50/60 Hz) *9 | | dB | 66 / 66 | 71 / 71 | 68 / 68 | 73 / 73 | 69 / 69 | 76 / 76 |
| Legal Refrigeration Tonnage (50/60 Hz) | | | 0.39 | | 0.53 | | 1.25 | |
| Operation Control Method | | | Heat pump balance control | | | | | |
| Refrigerant | | | R-410A | | | | | |
| Refrigerant Filling Volume | | kg | 0.85 | | 1.2 | | 1.8 | |
| Compressor Output | | kW | 0.7 | | 1.7 | | 3.0 | |

*1 The temperature control range noted does not necessarily indicate the actual controllable range possible. The range of temperature control depends on the condition of the air supplied at the intake.
 *2 When the air temperature and humidity is stable at the air intake. Noted precision is based on measurement by the internal controller at a single air outlet point. *3 The noted external static pressure is when the controlled air is regulated at the outlet to produce the maximum rated processing airflow. *4 Height includes outlet port. *5 The HEPA filter box is shipped in a separate package from the main unit and must be installed on-site. *6 Source voltage phase unbalance should be less than ±3 %. *7 Maximum value within the range of unit specifications. *8 The figure noted is when the equipment is operating at the highest capacity of its normal operating range. *9 Noise level can be decreased by installing a noise-reducing intake duct.

Note: All ducting should be insulated and ducting length should be kept as short as possible. (5 m or shorter recommended.)

PAP Temperature And Humidity Control Type Water Cooled

Models

PAP05B-KW
 PAP05B-FKW
 PAP10B-KW
 PAP10B-FKW
 PAP20B-KW
 PAP20B-FKW

Air Processing Capacity **3 to 20 m³/min**
 Temperature Control Precision **±0.1 °C**
 Temperature Setting Range **18 to 30 °C**
 Humidity Control Precision **±1 %**
 Humidity Setting Range **40 to 65 % (75)^{*1}**



* Warranty period of the refrigerant circuit is 2 years from the date of purchase for 10,000 hours of operating time.



PAP10B-KW



Special Specification Special Specification Product ▶ Page 27

- Noise reducing intake duct ■ Circulation intake chamber
 - Exhaust chamber ■ Humidity display included
- Please contact ORION regarding custom built models of specifications outside the ranges listed herein.

PAP Series

Specifications

| Model | | PAP05B-KW | PAP05B-FKW | PAP10B-KW | PAP10B-FKW | PAP20B-KW | PAP20B-FKW | |
|-------------------------------------|--|---|--------------------------------|------------------|-------------------------------------|------------------|-------------------------------------|--|
| Performance Specifications | Possible Temperature and Humidity Setting Range *1 | 18 to 30, 40 to 65 (75) | | | | | | |
| | Temperature and Humidity Control Precision *2 | ±0.1, ±1.0 | | | | | | |
| | Cooling / Heating Output (50/60 Hz) | 3.2 / 3.2 | | 6.5 / 6.5 | | 13.0 / 13.0 | | |
| | (Maximum Cooling Output) (50/60 Hz) | (2.0) | | (4.0) | | (8.0) | | |
| | Rated Processing Airflow | 3 to 5 | | 7 to 10 | | 13 to 20 | | |
| Maximum External Static Pressure *3 | Pa | 110 | 620 | 200 | 560 | 250 | 690 | |
| Environmental Conditions | Ambient (Intake Air) Temperature and Humidity Range *1 | 15 to 35, 30 to 70 | | | | | | |
| | Temperature Gradient at Intake | Within ±1 | | | | | | |
| | Humidity Gradient at Intake | Within ±5 | | | | | | |
| | Cooling Water Temperature Gradient | Within ±3 | | | | | | |
| External Dimensions (HxDxW) *4 | mm | 1610 × 749 × 609 | 1830 × 749 × 609 | 1670 × 940 × 664 | 2076 × 940 × 664 | 1831 × 973 × 773 | 2209 × 973 × 773 | |
| Product Mass | kg | 180 | 205 | 235 | 280 | 300 | 370 | |
| Controlled Air Outlet Port (O.d.) | mm | ø98 | ø98 HEPA filter built in | ø148 | ø148 HEPA filter box included *5 | ø198 | ø198 HEPA filter box included *5 | |
| *13 Cooling water | Rate of Supply *6 | 1.0 | | 1.5 | | 2.2 | | |
| | Supply Temperature Range | 15 to 32 | | | | | | |
| | Supply Pressure | 0.69 or less | | | | | | |
| | Inlet/Outlet Pressure Difference | 0.2 or greater | | | | | | |
| | Connection Port Size | Rc 1/2 | | Rc 3/4 | | Rc 3/4 | | |
| Humidification water | Water Quality | Deionized water (electrical conductivity: 0.1 – 10 µS/cm) | | | | | | |
| | Maximum Moisture Output *7 | kg/h | 2.5 | 5.0 | | 10.0 | | |
| | Supply Temperature Range | °C | 10 to 40 | | | | | |
| | Supply Pressure Range | MPa | 0.1 to 0.5 | | | | | |
| Humidification air | Connection Port Size | Rc1/4 | | | | | | |
| | Maximum Air Consumption *8 | NL/min | 80 | 80 | | 160 | | |
| | Supply Temperature Range | °C | 20 to 40 | | | | | |
| | Supply Pressure Range | MPa | 0.40 to 0.93 | | | | | |
| Power Specifications | Connection Port Size | Rc 1/4 | | | | | | |
| | Power Supply *9 | V(Hz) | Three-phase 200 ± 10 % (50/60) | | | | | |
| | Power Consumption *10 | kW | 1.5 | 2.2 | | 3.8 | | |
| | Electric Current *10 | A | 6.3 | 7.8 | | 13.5 | | |
| Power Supply Capacity *11 | kVA | 2.2 | 2.8 | | 4.7 | | | |
| Noise Level (50/60 Hz) *12 | dB | 68 / 68 | 73 / 73 | 70 / 70 | 75 / 75 | 72 / 72 | 78 / 78 | |
| Operation Control Method | | Heat pump balance control | | | | | | |
| Legal Refrigeration Tonnage | | 0.35 | | 0.76 | | 1.01 | | |
| Refrigerant | | R-410A | | | | | | |
| Refrigerant Filling Volume | | 0.7 | | 1.2 | | 1.7 | | |
| Compressor Output | kW | 0.7 | | | | | | |

*1 The temperature and humidity control range noted does not necessarily indicate the actual controllable range possible. The actual controllable temperature and humidity ranges will depend on the temperature and humidity of the intake air. (Vapor humidification is used in the humidity setting range of 65 to 75 %)
 *2 Values indicated are for when the intake air temperature and humidity, and supply water temperature and flow rate are stable. Single output port; controller display precision. This product achieves humidification through use of a water mist nozzle. There may be momentary fluctuations in humidity exceeding ±1.0% due to the inflow of air bubbles into the humidification water mist system. *3 The noted external static pressure is when the controlled air is regulated at the outlet to produce the maximum rated processing airflow. *4 Height includes outlet port. *5 The HEPA filter box is shipped in a separate package from the main unit and must be installed on-site. *6 When processing at the maximum airflow and at the highest cooling capacity, the difference between the cooling water inlet and outlet ports is 6.5 °C. *7 The figure noted is when the equipment is operating at the highest level of humidification. *8 Supply compressed air that has been cleaned through filter and/or other processing. The cleanliness of the compressed air supply should match the air cleanliness standard of the target area to which the controlled air will be supplied. *9 Source voltage phase unbalance should be less than ±3 %. *10 Maximum value within the range of unit specifications. *11 The figure noted is when the equipment is operating at the highest capacity of its normal operating range. *12 The noise level may be lowered by installing noise-absorbing ducting. *13 See page 28 for information regarding cooling water supply equipment.
 Note: All ducting should be insulated and ducting length should be kept as short as possible. (5 m or shorter recommended.)

PAP Temperature And Humidity Control Type Air Cooled

Models

- PAP05A1-K
- PAP05A1-FK
- PAP10A1-K
- PAP10A1-FK
- PAP20A-K
- PAP20A-FK

Air Processing Capacity **3 to 20 m³/min**

Temperature Control Precision **±0.1 °C**

Temperature Setting Range **18 to 30 °C**

Humidity Control Precision **±1 %**

Humidity Setting Range **40 to 65 % (75)^{*1}**



* Warranty period of the refrigerant circuit is 2 years from the date of purchase (or 10,000 hours of operating time).



PAP10A1-K



Special Specification Special Specification Product ▶ Page 27

- Noise reducing intake duct ■ Circulation intake chamber
- Exhaust chamber

Please contact ORION regarding custom built models of specifications outside the ranges listed herein.

PAP Series

Specifications

| Model | | PAP05A1-K | PAP05A1-FK | PAP10A1-K | PAP10A1-FK | PAP20A-K | PAP20A-FK |
|---------------------------------|---|--------------------------------------|---|------------------------------|-------------------------------------|-------------------------------|-------------------------------------|
| Performance Specifications | Possible Temperature and Humidity Setting Range *1 | 18 to 30, 40 to 65 (75) °C, % | | | | | |
| | Temperature and Humidity Control Precision *2 | ±0.1, ±1.0 °C, % | | | | | |
| | Cooling / Heating Output (50/60 Hz) | 2.3 / 2.6 kW | | 4.7 / 5.3 kW | | 9.4 / 10.5 kW | |
| | (Maximum Cooling Output) | (1.6) / (1.8) (kW) | | (3.2) / (3.6) (kW) | | (6.5) / (7.2) (kW) | |
| | Rated Processing Airflow | 3 to 5 m ³ /min | | 7 to 10 m ³ /min | | 13 to 20 m ³ /min | |
| Environmental Conditions | Maximum External Static Pressure (50/60 Hz) *3 | 110 Pa | 620 Pa | 250 Pa | 560 Pa | 250 Pa | 690 Pa |
| | Ambient (Intake Air) Temperature and Humidity Range | 15 to 35, 30 to 70 °C, % | | | | | |
| | Temperature Gradient at Intake | Within ±1 °C/h | | | | | |
| External Dimensions (HxDxW) | Humidity Gradient at Intake | Within ±5 %/h | | | | | |
| | Product Mass | 1589 x 800 x 650 mm (190 kg) | 1810 x 800x650 mm (215 kg) | 1798 x 940 x 664 mm (235 kg) | 2203 x 940 x 664 mm (280 kg) | 1863 x 1150 x 820 mm (370 kg) | 2263 x 1150 x 820 mm (445 kg) |
| Controlled Air Outlet Port (OD) | Controlled Air Outlet Port (OD) | ø100 mm | ø100 mm HEPA filter built in | ø150 mm | ø150 mm HEPA filter box included | ø200 mm | ø200 mm HEPA filter box included |
| | Humidification water | Water Quality | Deionized water (electrical conductivity: 1 – 10 µS/cm) | | | | |
| Maximum Moisture Output *6 | | 2.5 kg/h | | 5.0 kg/h | | 10.0 kg/h | |
| Supply Temperature Range | | 10 to 40 °C | | | | | |
| Supply Pressure Range | | 0.1 to 0.5 MPa | | | | | |
| Humidification Air | Connection Port Size | Rc 1/4 | | | | | |
| | Maximum Air Consumption *7 | 23 NL/min | | 38 NL/min | | 80 NL/min | |
| | Supply Temperature Range | 20 to 40 °C | | | | | |
| | Supply Pressure Range | 0.40 to 0.93 MPa | | | | | |
| Power Specifications | Connection Port Size | Rc1/4 | | | | | |
| | Power Supply *8 | Three-phase 200 ± 10 % (50/60) V(Hz) | | | | | |
| | Power Consumption *9 | 1.6 kW | | 2.2 kW | | 4.5 kW | |
| | Electric Current *9 | 6.6 A | | 8.0 A | | 16.0 A | |
| Noise Level (50/60 Hz) | Power Supply Capacity *10 | 2.3 kVA | | 2.8 kVA | | 5.6 kVA | |
| | Noise Level (50/60 Hz) *11 | 66 / 68 dB | 73 / 73 dB | 70 / 70 dB | 75 / 75 dB | 72 / 72 dB | 78 / 78 dB |
| Operation Control Method | Heat pump balance control | | | | | | |
| Legal Refrigeration Tonnage | 0.39 | | 0.86 | | 1.25 | | |
| Refrigerant | R-410A | | | | | | |
| Refrigerant Filling Volume | 0.85 | | 1.2 | | 1.8 | | |
| Compressor Output | 0.7 kW | | 1.7 kW | | 3.0 kW | | |

*1 The temperature and humidity control range noted does not necessarily indicate the actual controllable range possible. The actual controllable temperature and humidity ranges will depend on the temperature and humidity of the intake air. (Vapor humidification is used in the humidity setting range of 65 to 75 %.) *2 When the air temperature and humidity is stable at the air intake. Noted precision is based on measurement by the internal controller at a single air outlet point. *3 The noted external static pressure is when the controlled air is regulated at the outlet to produce the maximum rated processing airflow. *4 Height includes outlet port. *5 The HEPA filter box is shipped in a separate package from the main unit and must be installed on-site. *6 The figure noted is when the equipment is operating at the highest level of humidification. *7 Supply compressed air that has been cleaned through filter and/or other processing. The cleanliness of the compressed air supply should match the air cleanliness standard of the target area to which the controlled air will be supplied. *8 Source voltage phase unbalance should be less than ±3 %. *9 Maximum value within the range of unit specifications. *10 The figure noted is when the equipment is operating at the highest capacity of its normal operating range. *11 Noise level can be decreased by installing a noise reducing duct.
Note: All ducting should be insulated and ducting length should be kept as short as possible. (5 m or shorter recommended.)

PAP Temperature Control Type

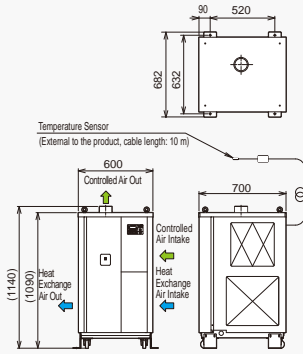
Air Cooled

Water Cooled

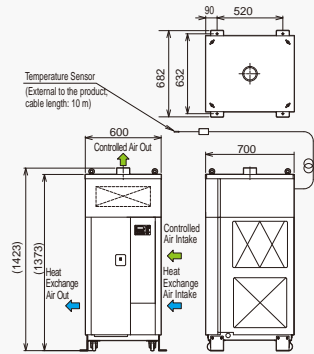
PAP Series

External Dimensions (units: mm)

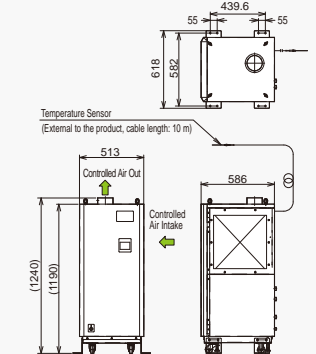
Temperature Control Type **PAP05A1**



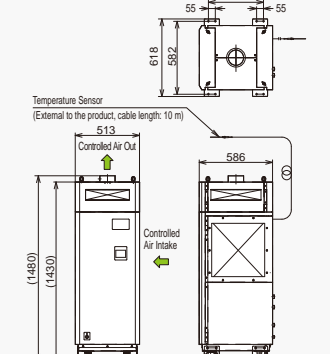
Temperature Control Type **PAP05A1-F**



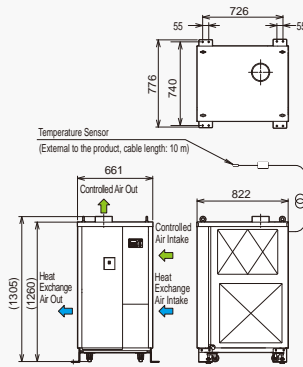
Temperature Control Type **PAP05A1-W**



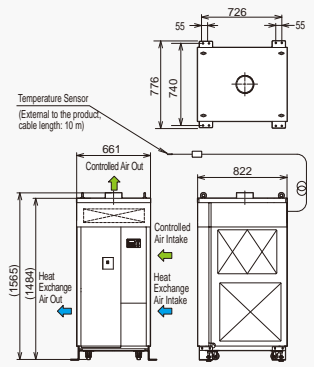
Temperature Control Type **PAP05A1-FW**



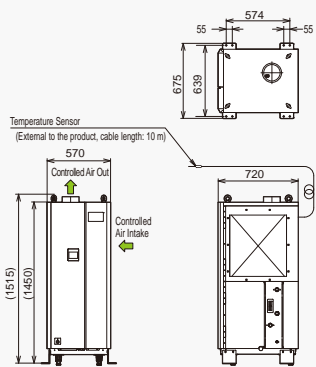
Temperature Control Type **PAP10A1**



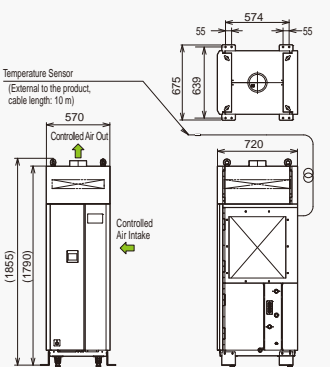
Temperature Control Type **PAP10A1-F**



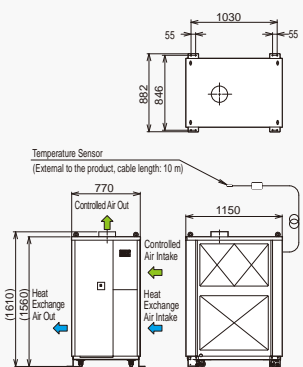
Temperature Control Type **PAP10A1-W**



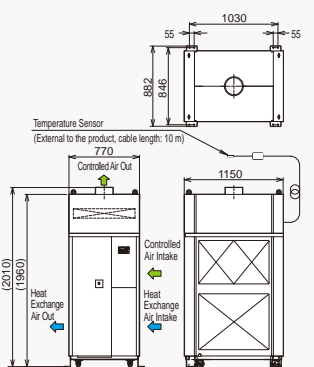
Temperature Control Type **PAP10A1-FW**



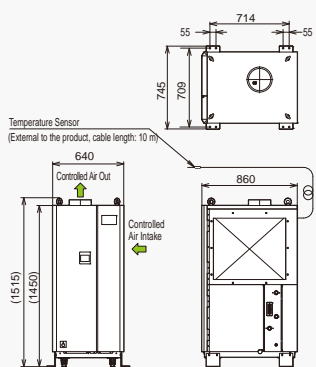
Temperature Control Type **PAP20A**



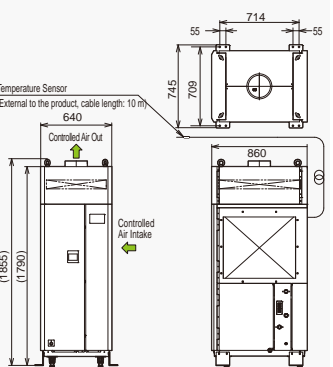
Temperature Control Type **PAP20A-F**



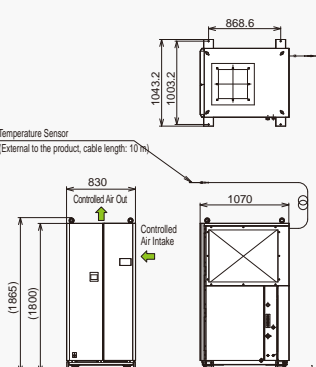
Temperature Control Type **PAP20C-W**



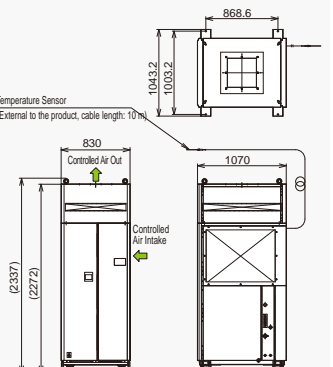
Temperature Control Type **PAP20C-FW**



Temperature Control Type **PAP40C-W**



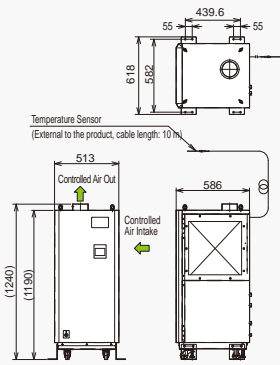
Temperature Control Type **PAP40C-FW**



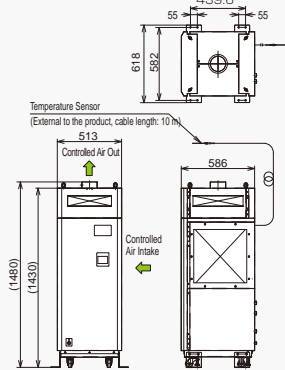
PAP Temperature Control Type Water Cooled (Superheat Specification)

External Dimensions (units: mm)

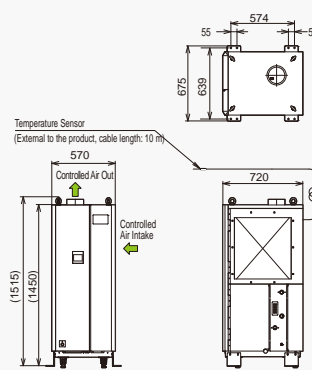
Temperature Control Type **PAP05C-W1**



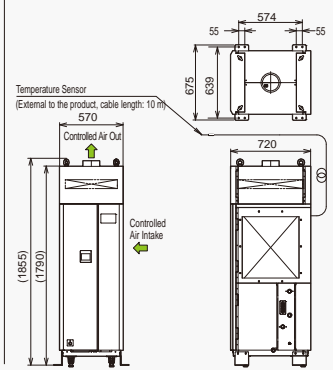
Temperature Control Type **PAP05C-FW1**



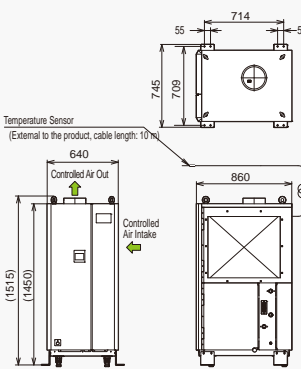
Temperature Control Type **PAP10C-W1**



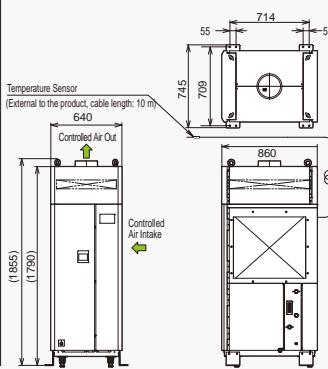
Temperature Control Type **PAP10C-FW1**



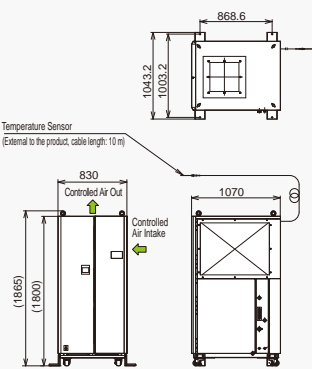
Temperature Control Type **PAP20C-W1**



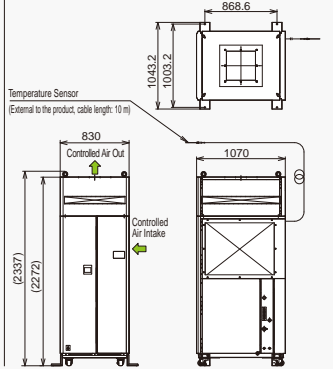
Temperature Control Type **PAP20C-FW1**



Temperature Control Type **PAP40C-W1**



Temperature Control Type **PAP40C-FW1**



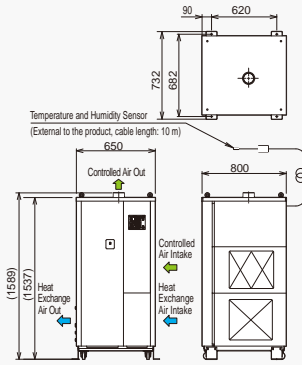
PAP Temperature And Humidity Control Type

Air Cooled

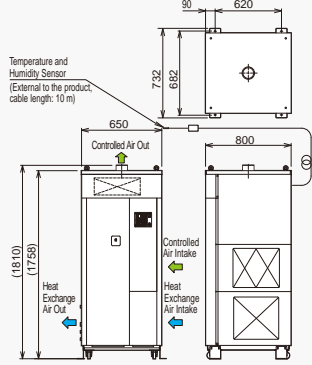
Water Cooled

External Dimensions (units: mm)

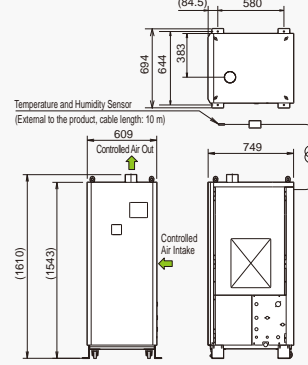
Temperature And Humidity Control Type **PAP05A1-K**



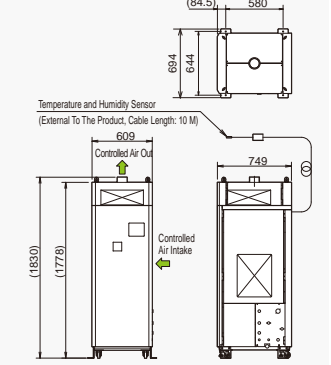
Temperature And Humidity Control Type **PAP05A1-FK**



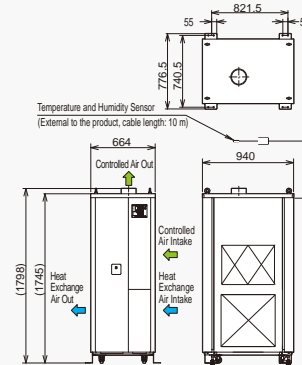
Temperature And Humidity Control Type **PAP05B-KW**



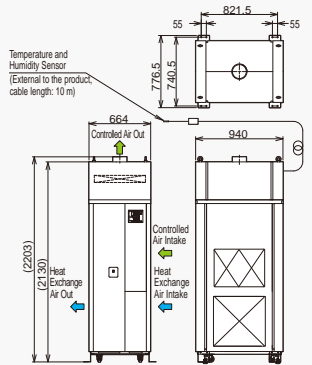
Temperature And Humidity Control Type **PAP05B-FKW**



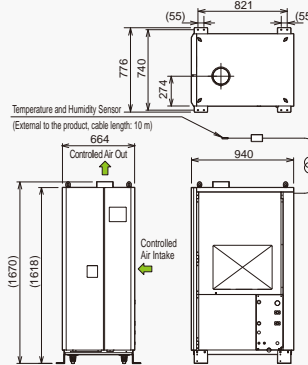
Temperature And Humidity Control Type **PAP10A1-K**



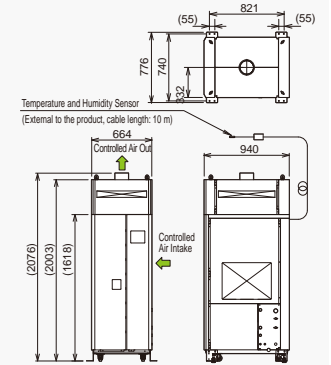
Temperature And Humidity Control Type **PAP10A1-FK**



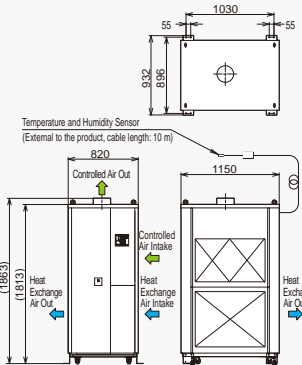
Temperature And Humidity Control Type **PAP10B-KW**



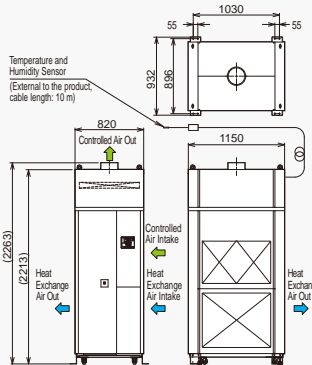
Temperature And Humidity Control Type **PAP10B-FKW**



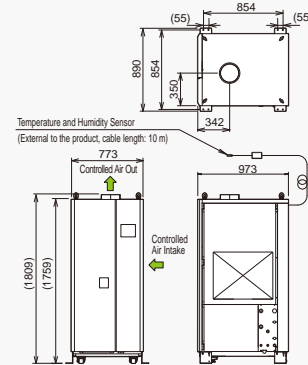
Temperature And Humidity Control Type **PAP20A-K**



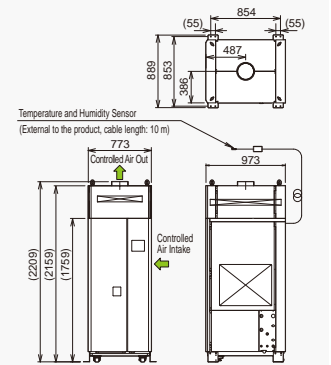
Temperature And Humidity Control Type **PAP20A-FK**



Temperature And Humidity Control Type **PAP20B-KW**



Temperature And Humidity Control Type **PAP20B-FKW**



PAP L Series **Low Temperature**

Models

PAP05A-L

- Air Processing Capacity **5 to 7 m³/min**
- Temperature Control Precision **±2 °C**
- Temperature Setting Range **8 to 18 °C**



Over 50% energy savings (compared with previous models)



* Warranty period of the refrigerant circuit is 2 years from the date of purchase (or 10,000 hours of operating time).



Special Specification [Special Specification Product ▶ Page 27](#)

- Noise reducing intake duct ■ Circulation intake chamber
- Exhaust chamber ■ Includes humidity display

Please contact ORION regarding custom built models of specifications outside the ranges listed herein.

Can cool 35 °C fresh air down to 8 °C.

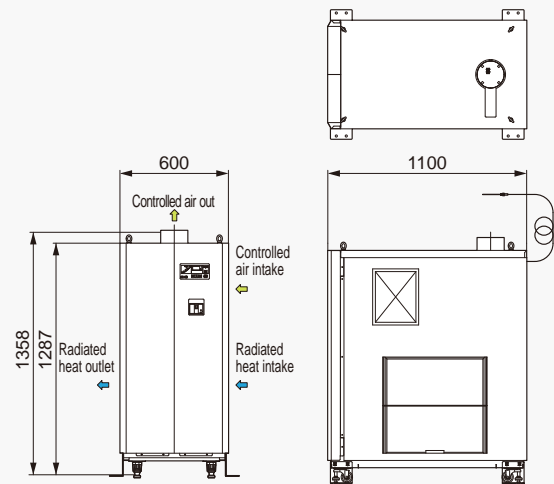
Useful in applications such as rapid cooling of heating devices or pre-cooling of desiccant airprocessors.

Specifications

| Model | | PAP05A-L |
|---------------------------------------|--|---|
| Performance Specifications | Possible Temperature Setting Range *1 | °C 8 to 18 |
| | Temperature Control Precision *2 | °C ±2 |
| | Maximum Cooling Capacity *3 | kW 7.0 |
| | Rated Processing Airflow | m ³ /min 5 to 7 |
| | Maximum External Static Pressure *8 | Pa 200 |
| Environmental Conditions | Ambient Temperature and Humidity Range*1 | °C,% 15 to 35, 30 to70 |
| | Temperature Gradient at Intake | °C/h Within ±1 |
| | Humidity Gradient at Intake | %/h Within ±5 |
| External Dimensions (HxD×W) *4 | | mm (1358×1100×600) |
| Product Mass | | kg 195 |
| Controlled Air Outlet Port (OD) | | mm ø150 |
| Power Specifications | Power Supply *5 | V(Hz) Three-phase 200 ± 10 % (50/60) |
| | Power Consumption *6 | kW (4.7) |
| | Electric Current *7 | A (17) |
| | Power Supply Capacity *7 | kVA (6.5) |
| Operation Control Method | | Inverter speed control + hot gas bypass control |
| Legal Refrigeration Tonnage (50/60Hz) | | 1.14 |
| Refrigerant | | R-410A |
| Refrigerant Filling Volume | | kg 1.4 |
| Compressor Output | | kW 1.7 |

External Dimensions (Units: mm)

PAP05A-L



*1 The temperature control range noted does not necessarily indicate the actual possible controllable range. The actual controllable temperature range will differ depending on the airflow and the temperature and humidity of the intake air. For cooling only. The temperature setting must be lower than the temperature of the air at the inlet port. The compressor will cycle ON and OFF during times of low loads. The condition of the 8 °C outlet temperature is when the load is less than the cooling load stated in comment *3. *2 Values indicated are for when the intake air temperature and pressure are stable and when the ambient temperature is in the range of 15 to 35 °C, at one point of the discharge port, and indicates the display precision of the controller. Note that this does not include times of light cooling load when the compressor is cycling ON and OFF. *3 Conditions of the cooling capacity calculation are as follows: Airflow: 5 m³/min. Outlet temp and humidity: 8 °C, 100%. (Enthalpy: 5.92 kcal/kg.) Inlet temperature and humidity: 35 °C, 65%. (Enthalpy: 22.68 kcal/kg.) *4 Height includes discharge port. *5 Source voltage phase unbalance should be less than ±3%. *6 Maximum value within the range of product specifications. *7 The figure noted is when the product is operating at the highest capacity of its normal operating range. *8 The external static pressure is when operating under the following conditions: the blower fan operating frequency is 60 Hz, the controlled air outlet port shutter is fully open, and the controlled air discharge-side restricted airflow is 7 m³/min. Note: All ducting should be insulated and ducting length should be kept as short as possible. (5 m or shorter recommended.)

Units with flow rates beyond the above specifications are available. Please consult your dealer.

PAP D Series Dehumidification

Air Cooled
Water Cooled

Models

PAP03A-D
PAP03A-WD
PAP06A-D
PAP06A-WD
PAP03A-D-CE (Built To Order)
PAP06A-D-CE (Built To Order)

Temperature Setting Range **18 to 30 °C**

Humidity Setting Range **20 to 40 %**

Temperature Control Precision **±0.2 °C**



* Warranty period of the refrigerant circuits 2 years from the date of purchase (for 10,000 hours of operating time).



Special Specification

- Noise reducing intake duct
- Circulation intake chamber
- Exhaust chamber
- HEPA filter built in

Please contact ORION regarding custom built models of specifications outside the ranges listed herein.



Instant Dehumidification From 30 °C / 55% to 23 °C / 28% With All-Fresh Air

Achieves defrost-free performance relying on the refrigeration cycle only, with an industry top-class dew point of 3.5 °C.



The PAP-D Series

Precision Air Processing
AND Dehumidification Combined

Air Cooled

PAP03A-D(-CE)
PAP06A-D(-CE)
PAP10A-D

Water Cooled

PAP03A-WD
PAP06A-WD
PAP10A-WD

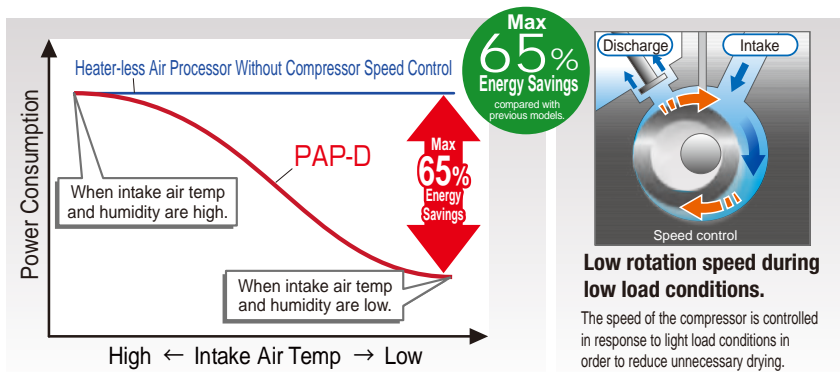
Performance examples } PAP06A-D,WD(-CE), Airflow : 6 m3/min
PAP03A-D,WD(-CE), Airflow : 3 m3/min
PAP10A-D,WD, Airflow : 10 m3/min

| Intake Air | Outlet Air |
|--------------|-----------------------|
| 30 °C / 55 % | 25 °C / 25 % or lower |
| 28 °C / 65 % | 23 °C / 28 % or lower |
| 27 °C / 70 % | 21 °C / 32 % or lower |

* Please contact your dealer or ORION regarding other conditions. PAP-D Series will differ from the selection method provided under "Making the Right Model Choice" at the end of this catalog.

Of Course Heater-less! And Compressor Speed Control for Energy Savings as much as 65 %!

Once the set humidity is attained, compressor speed control takes over for energy savings.



CE Marking Certified

2 Lineups of CE Marking Certified Models (Built-to-Order)
UL/CSA61010-1 Conformity Evaluation Completed / Conformity Report Available for Submission



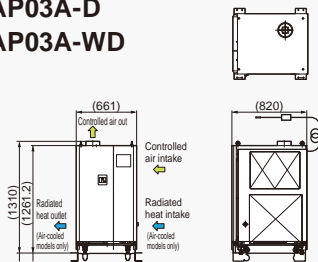
Specifications

| Model | Air Cooled | | | | | Water Cooled | | | | | | | | | | | |
|---|---|--------------------------------|--------------------|---------------------|---------------------|---------------------|--------------------|---------------------|---------------------|------------|-----|------------|--|------------|--|------|--|
| | PAP03A-D | PAP03A-D-CE | PAP06A-D | PAP06A-D-CE | PAP10A-D | PAP03A-WD | PAP06A-WD | PAP10A-WD | | | | | | | | | |
| Possible Temperature and Humidity Setting Ranges *1 | °C,% 18 to 30, 20 to 40 | | | | | | | | | | | | | | | | |
| Temperature and Humidity Control Precision *2 | °C ±0.2 (This product does not include humidification functionality. Please contact us directly regarding your specific humidity-control needs.) | | | | | | | | | | | | | | | | |
| Attainable Process Air Dew Point (Lower Limit) *3 | °C 3.5 | | | | | | | | | | | | | | | | |
| Maximum Cooling Output *4 | kW (3.7) | | kW (6.6) | | kW (10.5) | | kW (11.0) | | | | | | | | | | |
| Heating Capacity *5 | kW (0.3) | | kW (0.7) | | kW (1.1) | | kW (1.1) | | | | | | | | | | |
| Rated Processing Airflow | m³/min 3 to 5 | | m³/min 6 to 8 | | m³/min 10 to 12 | | m³/min 10 to 12 | | | | | | | | | | |
| Maximum External Static Pressure *6 | Pa | 500 (3 m³/min) | | 500 (6 m³/min) | | 500 (10 m³/min) | | 500 (10 m³/min) | | | | | | | | | |
| | Pa | 100 (5 m³/min) | | 300 (8 m³/min) | | 200 (12 m³/min) | | 100 (5 m³/min) | | | | | | | | | |
| Ambient Temperature And Humidity Range | °C,% 17 to 35, 30 to 70 | | | | | | | | | | | | | | | | |
| Temperature Gradient at Intake | °C/h Within ±1 | | | | | | | | | | | | | | | | |
| Humidity Gradient at Intake | %h Within ±5 | | | | | | | | | | | | | | | | |
| Cooling Water Temperature Gradient | °C/h - / Within ±3 | | | | | | | | | | | | | | | | |
| External Dimensions (HxDxW) *7 | mm | (1310 x 820 x 661) | (1654 x 820 x 661) | (1610 x 1150 x 770) | (1802 x 1150 x 770) | (1860 x 1200 x 990) | (1310 x 820 x 661) | (1610 x 1150 x 660) | (1860 x 1200 x 900) | | | | | | | | |
| Product Mass | kg | (210) | (230) | (330) | (350) | (450) | (210) | (330) | (450) | | | | | | | | |
| Controlled Air Outlet Port (O.D.) | mm | ø150 | | | ø200 | | ø150 | | ø200 | | | | | | | | |
| Cooling Water *12 | Rate of Supply *11 | m³/h | | | | | 2.0 | | 2.7 | | 3.0 | | | | | | |
| | Supply Temperature Range | °C | | | | | 5 to 32 | | | | | | | | | | |
| | Supply Pressure | MPa | | | | | 0.69 or higher | | | | | | | | | | |
| | Inlet/Outlet Pressure Difference | MPa | | | | | 0.2 or higher | | | | | | | | | | |
| | Connection Port Size | | | | | | Rc 3/4 | | Rc 1 | | | | | | | | |
| Power Source *8 | V(Hz) | Three-phase 200 ± 10 % (50/60) | | | | | | | | | | | | | | | |
| Power Consumption *9 | kW | 0.8 to 2.9 | | 1.3 to 4.1 | | 1.6 to 4.4 | | 1.6 to 5.3 | | 0.7 to 2.6 | | 1.1 to 3.9 | | 1.5 to 4.7 | | | |
| Electric Current *10 | A | 11.3 | | 17.2 | | 20.2 | | 18.3 | | 20.2 | | 10.7 | | 16.6 | | 19.5 | |
| Power Capacity *10 | kVA | 4.7 | | 6.6 | | 7.2 | | 4.2 | | 6.3 | | 6.9 | | | | | |
| Operation Control Method | Heat Pump Balance Control (Super Reheat Spec. Models) | | | | | | | | | | | | | | | | |
| Legal Refrigeration Tonnage (50/60Hz) | | 1.06 | | 1.74 | | 1.79 | | 1.06 | | 1.74 | | | | | | | |
| Compressor Output | kW | 1.7 | | 3.0 | | 1.7 | | 3.0 | | 3.0 | | | | | | | |
| Refrigerant | R-410A | | | | | | | | | | | | | | | | |
| Refrigerant Filling Volume | kg | 1.5 | | 1.98 | | 3.3 | | 1.2 | | 1.65 | | 2.9 | | | | | |

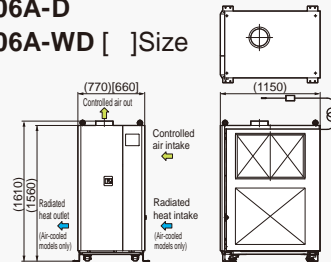
*1 The temperature and humidity control ranges noted do not necessarily indicate the actual controllable range possible. The actual controllable temperature and humidity ranges will depend on the temperature and humidity of the intake air. (This unit does not include a humidification function.) *2 Values indicated for when intake air temp and humidity are stable. (For water cooled models: cooling water temperature and rate of supply are stable.) Noted precision is based on measurement by the internal controller at a single air outlet point. **Over-dehumidification in some cases depending on operating conditions.** *3 The attainable dew point depends on the condition of the air supplied at the intake. *4 The stand-alone capacity of the built-in evaporator. *5 The difference in capacities between the built-in heater and evaporator. *6 The external static pressure at the controlled air outlet side when the blower fan is operating at 60 Hz, and the product is operating at the prescribed airflow. *7 Height includes outlet port. *8 Source voltage phase unbalance should be less than ±3 %. *9 Minimum and maximum specified values for the specified operating range. *10 Maximum value within the range of unit specifications. *11 The figure noted is when the equipment is operating at the highest capacity of its normal operating range. *12 See page 28 for information regarding cooling water supply equipment.

External Dimensions (Units: mm)

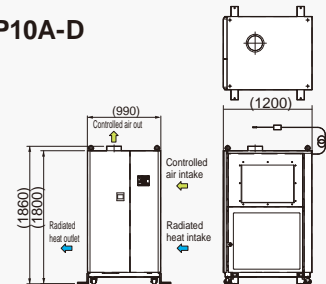
**PAP03A-D
PAP03A-WD**



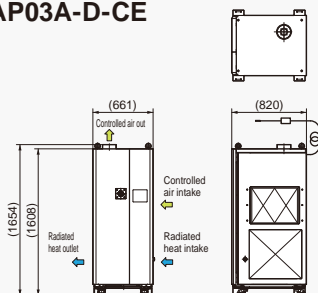
**PAP06A-D
PAP06A-WD []Size**



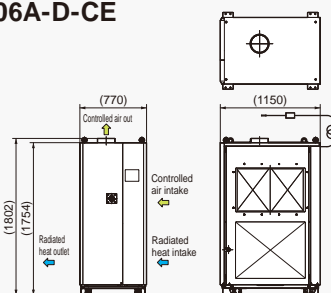
PAP10A-D



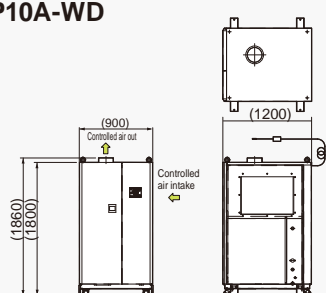
PAP03A-D-CE



PAP06A-D-CE



PAP10A-WD



ORION Precision Air Processing For Every Application

PAP Series Special Specifications

1 Noise Reducing Intake Duct

Applicable Models

PAP Temperature Control Type
 PAP Temperature And Humidity Control Type
 PAPmini Series



2 Circulation Intake Chamber

Applicable Models

PAP Temperature Control Type
 PAP Temperature And Humidity Control Type
 PAPmini Series



3 Duct Set (Please ask about available lengths.)

Applicable Models

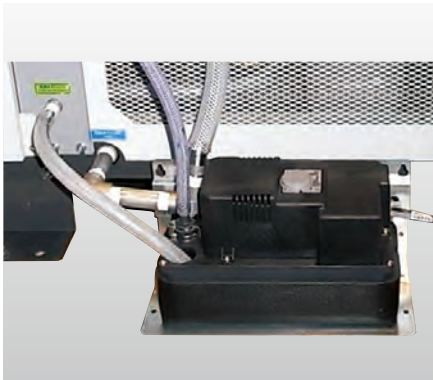
PAP Temperature Control Type
 PAP Temperature And Humidity Control Type
 PAPmini Series



4 Drain Pump Set

Applicable Models

PAP Temperature Control Type
 PAP Temperature And Humidity Control Type
 PAPmini Series



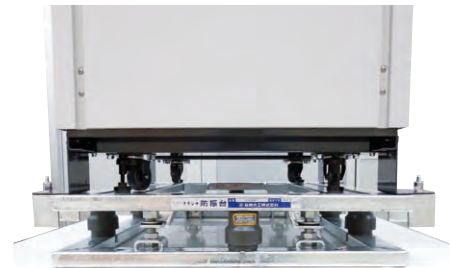
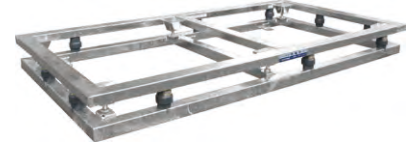
5 Sensor Extension (Please ask about available lengths.)

Applicable Models

PAP Temperature Control Type
 PAP Temperature And Humidity Control Type
 PAPmini Series



6 Vibration Reducing Base



Base Installation Example

Other Special Order Equipment

7 Steam Humidification

Applicable Models

PAP Temperature And Humidity Control Type

8 Humidity Display

Applicable Models

PAP Temperature Control Type

9 HEPA Differential Pressure Gauge

Applicable Models

PAP Temperature Control Type
 PAP Temperature And Humidity Control Type

10 Low Ambient Temperature Cooling Water Specification

Applicable Models

PAP Temperature Control Type
 PAP Temperature And Humidity Control Type

Water Cooling Proposal for the Water-Cooled PAP Series Free Cooling Chiller

Please also see our D-RG02 catalog which focuses on these products.

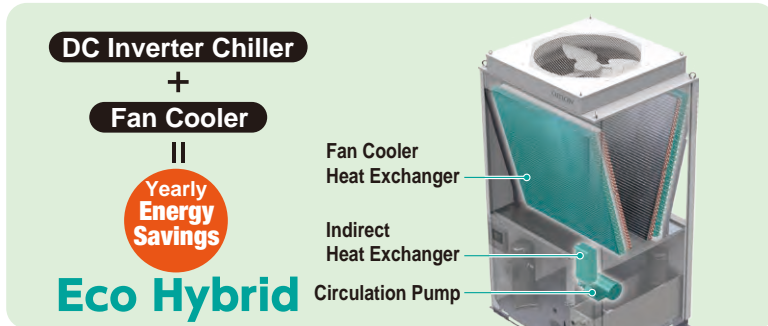
Chiller with Built-In Fan Cooler FCC15B

Eco Hybrid

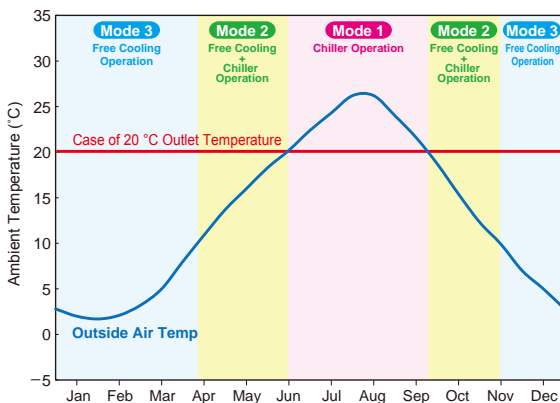
* "ORION Eco Hybrid" is a registered trademark of Orion Machinery Co., Ltd.



* Warranty period of the refrigerant circuit is 2 years from the date of purchase (or 10,000 hours of operating time).



Automatic Operation Mode Switching Based on Ambient Temperature



Three Operating Modes

Free Cooling Operation (Mode 3)

Free-cooling-only operation in winter season. Power is only used for the fan cooler, resulting in significant energy savings.

Free Cooling + Chiller Operation (Mode 2)

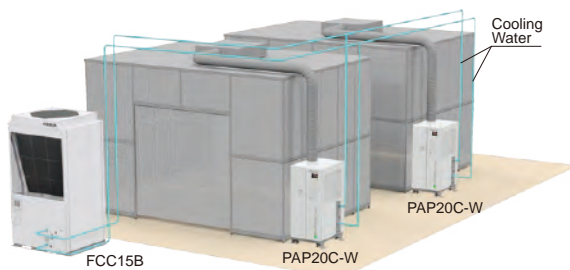
During times of mild weather, free cooling will be the primary means of cooling. And at times when the outside temperature rises and cooling capacity is lacking, the chiller will be used for additional cooling, so there is no worry of insufficient cooling.

Chiller Operation (Mode 1)

The chiller will be used for primary cooling in summer months. The built-in inverter assures that operation will use the minimum amount of electric power.

PAP Connection Configuration

Connection example of one FCC15B unit for two PAP20C-W (W) units



Up to 10 FCC15B units can be connected. The number of operating units is optimized as the load increases.

Specifications

| 型 式 | | FCC15B |
|----------------------------|---------------------------------------|--|
| Performance Specifications | Cooling Output | *1 kW 37 |
| | Ambient Temperature Range | *5/6 °C -20 to 45 |
| | Liquid Temp Setting Range | °C 5 to 35 |
| | Control Precision | *4 ±1.0°C During free cooling: ±2.0 °C |
| Power Specifications | Power Supply | *2 V (Hz) Three-phase 200 to 220 V ±10 % (50/60) |
| | Power Consumption | kW 14.4 |
| | Electric Current | *1 A 47 |
| | Power Supply Capacity | *3 kVA 19.5 |
| | Compressor Output | 3.73x2 |
| | Legal Refrigeration Tonnage (50/60Hz) | 4.17 |
| | Refrigerant | R-410A |
| | Refrigerant Filling Volume | k g 6.6 |
| | External Dimensions (HxDxW) | mm 2392x1100x1300 |
| | Product Mass | kg 680 |

*1. Operation under the following conditions: chilled water temp: 20 °C, ambient temp: 32 °C, chilled water pressure: 0.5 MPa, chilled water flow rate at the minimum operating flowrate. Cooling capacity is at least 95% of listed figures.

*2. The power supply voltage phase unbalance should be within ±3%.

*3. The figure noted is when operating at the highest capacity of the specified operating range.

*4. When the continuous current load fluctuation is within 10%, the ambient temperature and power source, etc. are stable, and the chilled water flow is at least 50 L/min.

Does not apply in the following cases:

① Within 4 min after the compressor was started. (Temperature control will start approx. 4 min after the compressor is started.)

② When the cooling load is small and the compressor is simply cycling ON and OFF, or when the thermal expansion valve goes from fully closed to open, or from open to fully closed.

③ When the current load fluctuation is ±10% or greater, or when changing modes. At such times, the value will be ±2.0 °C.

④ When the water temperature setting is changed.

*5. Also indicates the product storage temperature.

*6. When the chilled water circuit is not frozen.

*No optional items are included with the product. Such items are sold separately. Please order such items on an as-needed basis.

For Cleanrooms and Precision Measurement Rooms Constant Temperature (Constant Humidity) Equipment **R** Series

Ro1 Environmentally Friendly and Ultra-Energy-Saving Design

Conventional type
Typical Air Processor + Heater

22.4 kW

Conventional type

Conventional type
Typical Air Processor + Heater

PAP Energy Savings from Heat Balance Control (Super Reheat Spec. Models)

Reduce 53%

10.5 kW

PAP40C-R

PAP Heat Pump Balance Control (Super Reheat Spec. Models)

PAP Inverter Speed Control for Added Energy Savings

Reduce 80%

4.5 kW

Setting temp: 23°C
Outdoor unit Ambient temp: 35°C
Reference value at no load condition

PAP DC Inverter Controlled Compressor

Low Rotation Speed During Low Load Conditions
The speed of the compressor is controlled in response to light load conditions in order to cut unnecessary cooling.

Heat Pump Balance Control (Super Reheat Spec. Models) + Inverter Speed Control

Thanks to our built-in heat pump balance control (Super Reheat Spec. Models) + inverter speed control compressor, we've gained as much as 80 % in energy savings compared with constant temperature and humidity air processing offered by normal air processors + heater control.

INVERTER

Cuts Wasted Electricity by Turning OFF the Auxiliary Heater when the Temperature Rises to the Set Value

Heat formed from the cooling process is used so that heat otherwise provided via an electric heater is no longer needed. This results in large energy savings compared to the common method of reheating with an electric heater. The heater is used when heating.

Built-in DC Inverter Drive Compressor

Great energy savings achieved through use of ORION's original speed control. Optimum operation is achieved by controlling the compressor based on the load conditions. Plus, the constant humidity type reduces wasted humidification, and offers energy saving operation

INVERTER

Inverter Fan Built Into Both the Indoor and Outdoor Units

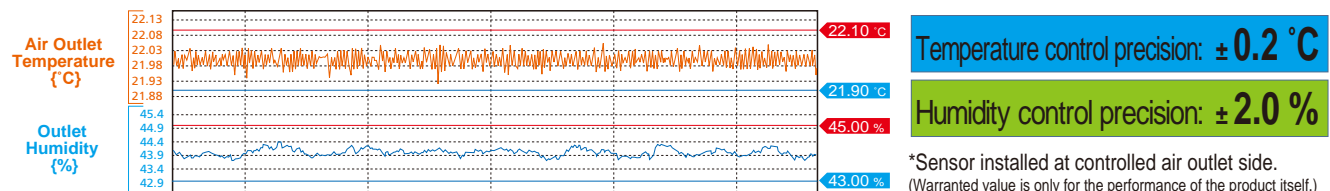
This, combined with our newly developed special controller results in ORION's original, optimized refrigeration cycle control operation.

INVERTER

Ro2 High Precision Temperature Control Air Processing

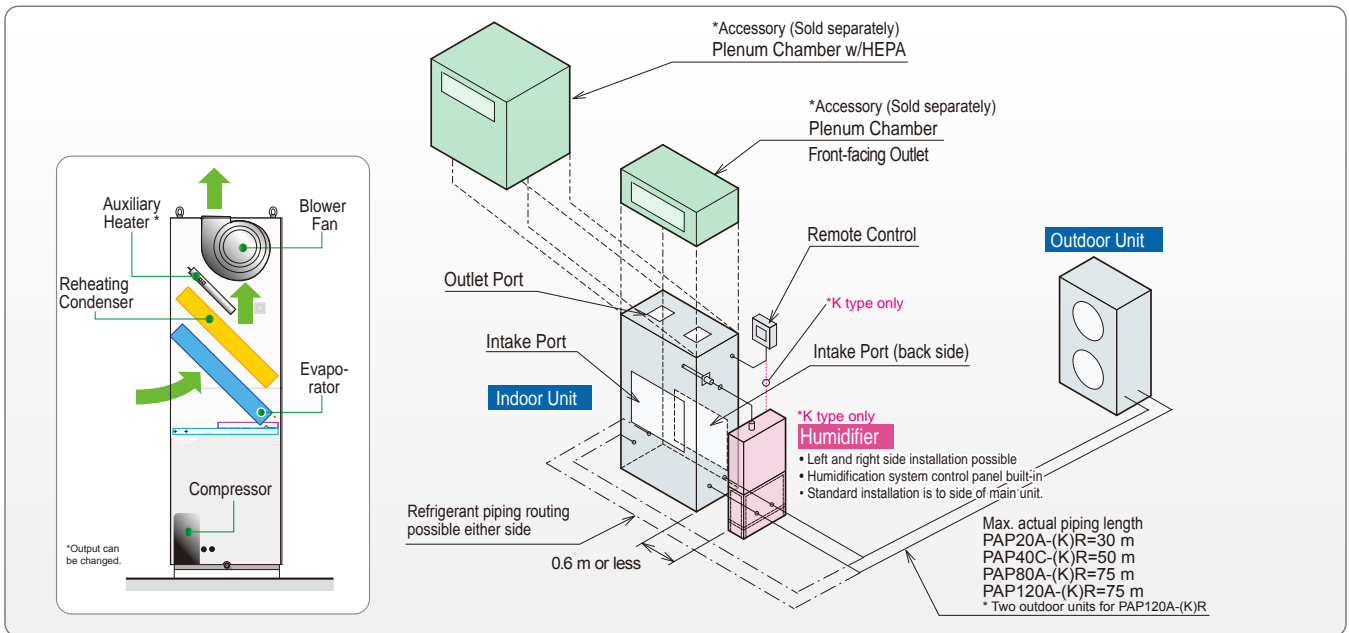
Achieves high precision not even possible with typical air processors or previous models based on reheating control.

Experience precision air processing from ORION's PAP Precision Air Processors.



*Measured data when operating under settings of 22 °C and 44 %.

R₀₃ Easy to use All-In-One System Design (Includes Automatic Control Functionality)



No On-site Instrumentation Construction Required



The control board is built-in, so no on-site instrumentation construction is needed. Construction-saving realized for an easy constant temperature (and constant humidity) space.

Easy Control of On-site Initial Test Runs



Modularized air processor makes short work of troublesome post-installation initial test run control.

Easy System Design



A system of necessary equipment is already in place. That, and a wealth of options eliminates the need for troublesome system design.

Layout with Complete Control



Indoor unit piping and wiring, including refrigerant piping connection port, wiring access port, condensation water outlet port, humidification water connection port (for models with humidification), can all be installed to the left or right. Freedom to make the installation layout as you like.

R₀₄ High Functionality and Enhanced Design

Constant Year-Round Fixed Air Control that Completely Eliminates the Need for A/C-style Cooling/Heating Switchover



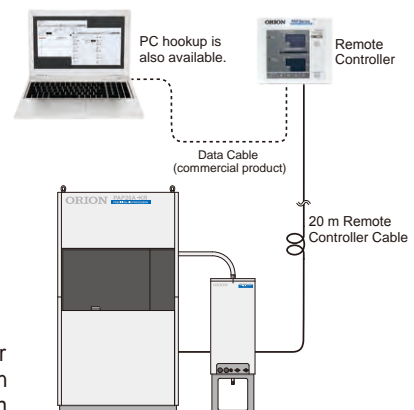
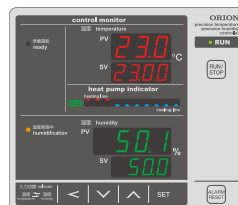
Constant precision air processing is delivered throughout the year. In particular, the inverter air conditioner eliminates temperature fluctuations from difficult-to-control intermediary stage temperatures of spring and summer.

Multi-Function Control Panel Built-in



The intelligent monitor offers improved ease-of-use

- Various parameter settings available that allow functionality such as power-cutoff recovery patterns, and operation/stop preferences via the local product control panel, remote switch, or by communications control.
- Specific error codes are displayed when problems occur.
- Comes equipped with external input/output contact terminals (for operation signal input, operation/alarm output).
- Includes built-in support for external communications function standards (RS-232C, 422A, 485).



Includes 20 m Remote Control Cable



The remote control cable is 20 m long. Can be installed anywhere. Convenient for temperature and humidity control in pre-determined locations. Allows for the installation of an integrated control board. (50 m or 100 m options available.) Optional software integration allows for remote operation via PC. Using our integrated controller (sold separately), up to 8 air processors can be simultaneously controlled via communication links.

For Cleanrooms and Precision Measurement Rooms

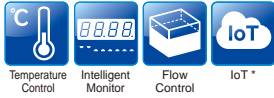
Constant Temperature Equipment **R** Series

Models

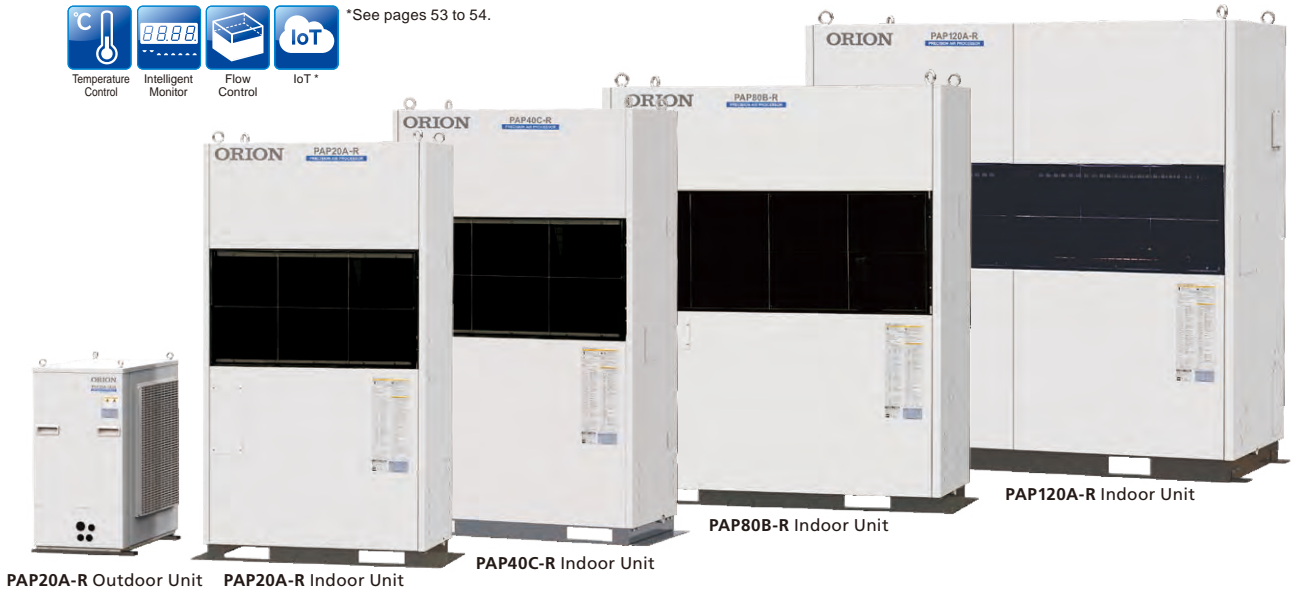
| | |
|--------------------------|--|
| Temperature Control Type | Air Processing Capacity 20 to 120 m³/min |
| PAP20A-R | Temperature Control Precision ±0.2 °C |
| PAP40C-R | Temperature Setting Range 18 to 30 °C |
| PAP80B-R | |
| PAP120A-R | |



* Warranty period of the refrigerant circuits 2 years from the date of purchase (or 10,000 hours of operating time)

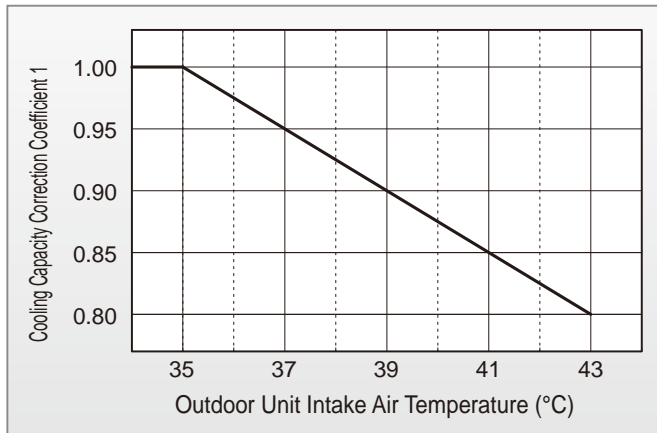


*See pages 53 to 54.



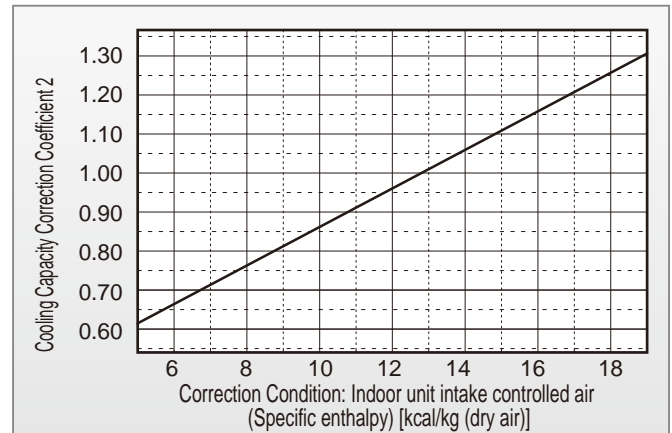
■ Cooling Capacity Correction Chart 1

Correction Condition: Outdoor unit intake air temperature



■ Cooling Capacity Correction Chart 2

Correction Condition: Indoor unit intake controlled air (specific enthalpy)



PAP R Series

Specifications

| Model | | | PAP20A-R | PAP40C-R | PAP80B-R | PAP120A-R | |
|-----------------------------|---|--------------------------------|--|--|---|--|-----|
| Performance Specifications | Possible Setting Range (Circulation Specifications) | *1 °C | 18 to 30 | | | | |
| | Temperature Control Precision | *2, 13 °C | ±0.2 | | | | |
| | Cooling Capacity | *3 kW | 8.0 | 12.0 | 25.0 | 38.0 | |
| | Heating Capacity | *4 kW | 3.0 | 5.0 | 13.0 | 14.5 | |
| | Rated Processing Airflow | m ³ /min | 20 to 23 | 40 to 45 | 75 to 80 | 110 to 120 | |
| Environmental Conditions | Maximum External Static Pressure (50/60 Hz) | *5 Pa | 200 | | 400 | | |
| | Indoor Unit Installation Temperature Conditions | °C | 5 to 35 | | | | |
| | Indoor Unit Installation Temperature Conditions | °C | -5 to 43 | | | | |
| | Outdoor Unit Installation Temperature Conditions | °C/h | Within ±2 | | | | |
| External Dimensions | Indoor Unit (HxDxW) | *6 mm | 1800×980×555 | 1800×1100×555 | 1800×1500×600 | 1870×1900×790 | |
| | Outdoor Unit (HxDxW) | *6 mm | 824×810×420 | 1160×810×420 | 1420×870×800 | 1420×870×800 x2 | |
| Product Mass | Indoor Unit | kg | 240 | 260 | 400 | 700 | |
| | Outdoor Unit | kg | 65 | 80 | 130 | 130x2 | |
| Power Specific | Power Supply | *7 | Three-phase 200 ± 10 % (50/60) | | | | |
| | Power Consumption (50/60 Hz) (When Auxiliary Heater is Off) | *8 kW | 4.8 / 6.6 | 7.5 / 10.5 | 11 / 17 | 22.5 / 31.5 | |
| | Operating Current (50/60 Hz) (When Auxiliary Heater is Off) | *8 A | 18 / 23 | 31 / 40 | 42 / 60 | 93 / 122 | |
| Noise Level | Power Supply Capacity | *9 kVA | 8.0 | 14.0 | 23.0 | 40.0 | |
| | Sound Pressure Level | Indoor Unit (50/60 Hz) *10 dB | 68 or less | 69 or less | 69 or less | 69 or less | |
| | | Outdoor Unit (50/60 Hz) *10 dB | 59 or less | 59 or less | 59 or less | 59 or less | |
| Temperature Control Method | | | Heat Pump Balance Control (Super Reheat Spec.) | | | | |
| Legal Refrigeration Tonnage | | | 1.01 | 1.61 | 2.74 | 3.82 | |
| Device Specifications | Compressor Output | kW | Fully sealed 1.7 (DC inverter drive) | Fully sealed 3.0 (DC inverter drive) | Fully sealed 4.6 (DC inverter drive) | Fully sealed 7.5 (DC inverter drive) | |
| | Heat Exchanger | Radiated Heat Side | Fin and tube | | | | |
| | | Process Air Side | Fin and tube | | | | |
| | Blower Fan | Indoor Unit *11 kW | Dual intake centrifugal fan 0.4 (inverter drive) | Dual intake centrifugal fan 0.4 (inverter drive) | Dual intake centrifugal fan2.2 (inverter drive) | Dual intake centrifugal fan3.75 (inverter drive) | |
| | | Outdoor Unit *11 kW | Pressure fan 0.2 (inverter drive) | Pressure fan 0.1x2 (inverter drive) | Pressure fan 0.75 (inverter drive) | Pressure fan 0.75 x2(inverter drive) | |
| | Refrigerant Control Method | | | Electronic proportional control valve | | | |
| | Refrigerant | | | R410A | | R407C | |
| | Refrigerant Filling Volume | | | 2.55 | 3.51 | 5.8 | 12 |
| | Auxiliary Heater *12 kW | | | 1.8 | 3.0 | 6.0 | 9.0 |
| | Temperature Controller | | | Digital electronic humidity and temperature control system | | | |
| Temperature Sensor | | | Platinum resistance thermometer | | | | |
| Condenser Fan Control | | | Inverter control | | | | |
| Operation Panel | | | Includes remote controller with 20 m controller cable. | | | | |
| Communication | Standard | | | EIA standard RS-422A/485, RS-232C based | | | |
| | Number of Units that can be Connected | | | RS-422A/485: 32, RS232C: 1 | | | |

*1 May not operate under some conditions. In addition, the cooling and heating loads including the amount of cooling capacity required for dehumidification should be kept within the above-mentioned specified ranges of cooling and heating capacity. Depending on control conditions, the processing airflow might have to be controlled to within the previously noted specified range. Note that the internal air circuit is not completely sealed. *2 When the temperature and humidity of the intake air of the indoor unit and the wind speed and temperature surrounding the outdoor unit are stable. Controller display precision (measured at 1 point) when the control sensor is set at the discharge port and the temperature setting is within the control range. Note that if the control sensor is installed on the intake side, maintaining the above-mentioned precision might not be possible due to the volume of the air-conditioned area or load fluctuations. *3 Conditions based on the JIS standard (when indoor unit intake air is 27 °C db, 19 °C wb, and the outdoor unit intake air is 35 °C db). See page 16 for information regarding cooling capacity correction based on the air conditions of the indoor and outdoor units. *4 Conditions based on the JIS standard (when indoor unit intake air is 20 °C db, and the outdoor unit intake air is 2 °C db). The capacity when the indoor unit intake air is 20 °C db or lower will be 75% or greater of the above-noted value (including that of the auxiliary heater). Also, when the indoor unit intake air falls to approx. 15 °C db or lower, then there may be cases when the compressor will stop, and the auxiliary heater alone will operate. In addition to heating functionality, there is also re-heating functionality built in that uses up to 100% of sensible heat from the refrigerant. *5 The noted external static pressure is when the blower fan is operating at 60 Hz and the process air is regulated at the outlet to produce the rated airflow. *6 Does not include optional parts or protruding components. The outdoor unit, remote control, and option items are shipped separately and need to be installed on-site. *7 The power supply voltage phase unbalance should be less than ±3%. *8 This is the maximum value within the range of the product's specification. *9 The figure noted is the maximum operating current while operating within specified ranges. *10 Measured value (A scale) when operating at the rated processing airflow, at a position of non-resonance, 1 m from the front face of the indoor unit, and at 1 m from the front face of the outdoor unit, at a height of 1.5 m. May be higher than the noted value due to the effects of surrounding noise or echoing. *11 The airflow from the blower cannot be increased. *12 Only used when starting during cold months or when there are increased heating loads. *13 Use the measured temperature bias function to correct for the error between the controller temperature display and the user's reference temperature sensor. * Power supply wiring and wiring going between the outdoor and indoor units are not included and should be supplied by the user. Use the following guidelines when choosing wiring. ① Power cable: CV2 4-core single cable. ② Signal cable: CVVS 1.25 4-core single cable (shielded cable). Do not bundle power and signal cables together and do not route through the same conduit or ducting. Also, a heavier gauge of wire should be used if the cable length is excessively long compared to the refrigerant piping length, or if the ambient temperature may become high. * This product does not detect nor have built-in protection against electric shorts. An earth leakage breaker must be installed on the primary side of the power supply.

For Cleanrooms and Precision Measurement Rooms

Constant Temperature & Humidity Equipment **R** Series

Models

Temperature and Humidity Control Type

- PAP20A1-KR
- PAP40C1-KR
- PAP80B1-KR
- PAP120A1-KR

Air Processing Capacity **20 to 120 m³/min**

Temperature Control Precision **±0.2 °C**

Temperature Setting Range **18 to 30 °C**

Humidity Control Precision **±2 %**

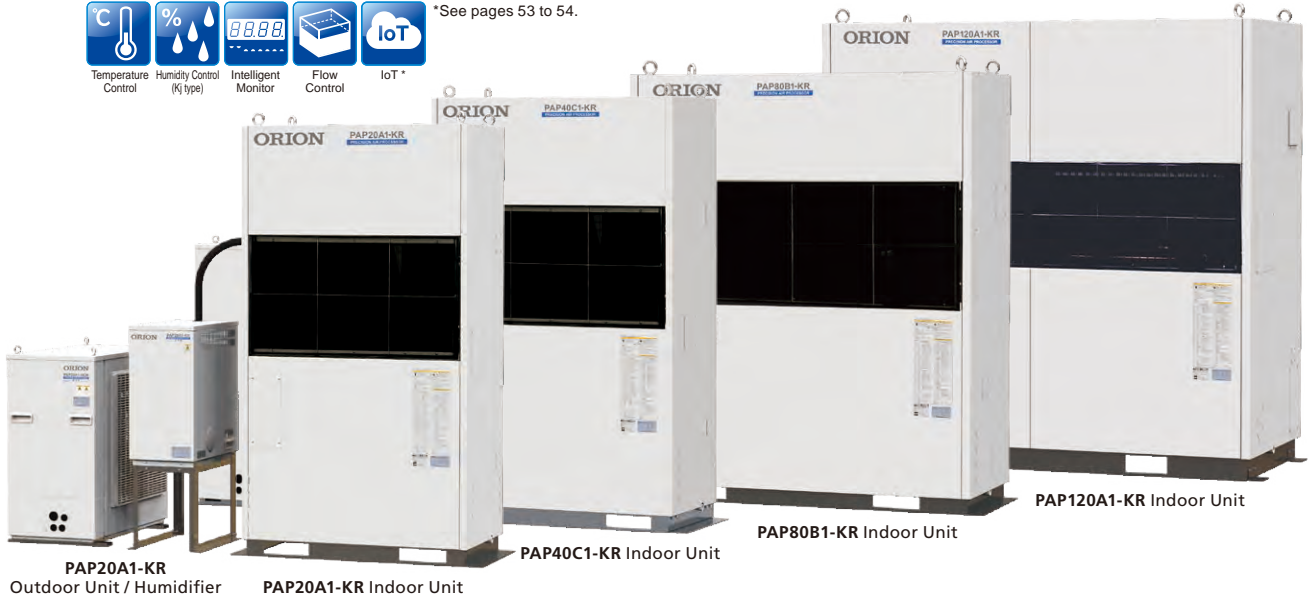
Humidity Setting Range **45 to 60 %**



* Warranty period of the refrigerant circuits 2 years from the date of purchase (or 10,000 hours of operating time)

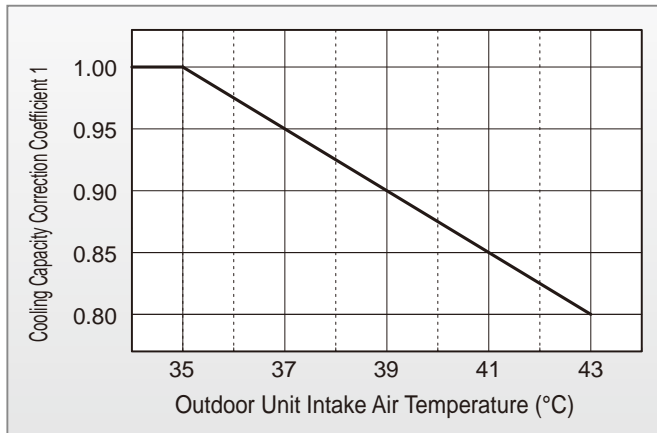


*See pages 53 to 54.



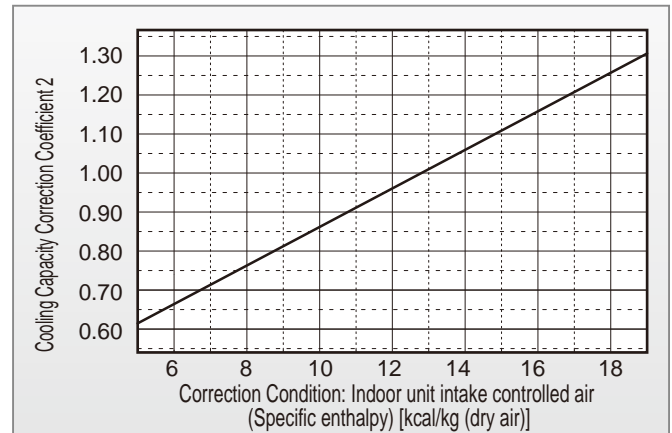
■ **Cooling Capacity Correction Chart 1**

Correction Condition: Outdoor unit intake air temperature

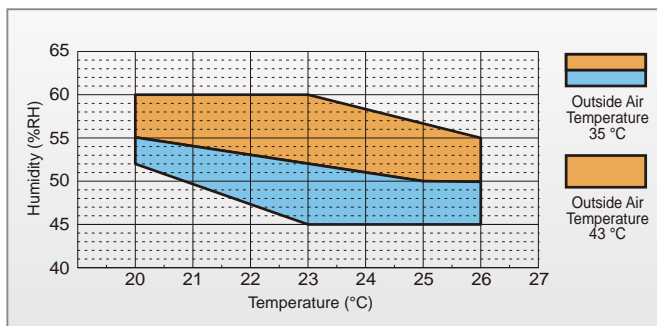


■ **Cooling Capacity Correction Chart 2**

Correction Condition: Indoor unit intake controlled air (specific enthalpy)



■ **Temperature and Humidity Control Range Table**



<Conditions> Controlled Air Circuit: Circulating, with no load / Controlled-Air Airflow: Rated Airflow
 *Indicates the range where control is possible within primary operating ranges while not under load.
 For actual possible control ranges, please consider load calculations that include other operating ranges.

PAP R Series

Specifications

| Model | | PAP20A1-KR | PAP40C1-KR | PAP80B1-KR | PAP120A1-KR | | |
|-----------------------------|---|--|--------------------------------------|--|--|---|--|
| Performance Specifications | Possible Setting Range (Circulation Specifications) *1 | °C, % | | | | 18 to 30, 45 to 60 | |
| | Temperature Control Precision *2, 13 | °C, % | | | | ±0.2, ±2.0 | |
| | Cooling Capacity *3 | kW | 8.0 | 12.0 | 25.0 | 38.0 | |
| | Heating Capacity *4 | kW | 3.0 | 5.0 | 13.0 | 14.5 | |
| | Rated Processing Airflow | m ³ /min | 20 to 23 | 40 to 45 | 75 to 80 | 110 to 120 | |
| | Maximum External Static Pressure (50/60 Hz) *5 | Pa | 200 | 200 | 400 | 400 | |
| Environmental Conditions | Indoor Unit Installation Temperature Conditions | °C | | | | 5 to 35 | |
| | Outdoor Unit Installation Temperature Conditions | °C | | | | -5 to 43 | |
| | Temperature Gradient at Intake | °C/h | | | | Within ±2 | |
| | Humidity Gradient at Intake | %h | | | | Within ±5 | |
| External Dimensions | Indoor Unit (HxDxW) *6 | mm | 1800x980x555 | 1800x1100x555 | 1800x1500x600 | 1870x1900x790 | |
| | Outdoor Unit (HxDxW) *6 | mm | 824x810x420 | 1160x810x420 | 1420x870x800 | 1420x870x800 x2 | |
| | Humidifier (HxDxW) *6 | mm | 960x300x520 | 960x300x520 | 960x500x590 | 960x550x790 | |
| Product Mass | Indoor Unit | kg | 240 | 260 | 400 | 700 | |
| | Outdoor Unit | kg | 65 | 80 | 130 | 130x2 | |
| | Humidifier | kg | 37 | 37 | 61 | 90 | |
| Humidifier | Water Quality *16, 17 | Deionized water (electrical conductivity: 1 to 10 µS/cm) | | | | | |
| | Max. Water Flow Rate | kg/h | 8.6 | 12.5 | 30.0 | 42 | |
| | Humidification Capacity *7 | kg/h | 5 | 8 | 20 | 28 | |
| | Supply Temperature Range | °C | | | | 20 to 60 | |
| | Supply Pressure Range *8 | MPa | 0.1 to 0.2 | | | | |
| | Connection Port Size | Rc3/8 | | | | | |
| Power Specific | Power Supply *9 | Three-phase 200 ± 10 % (50/60) | | | | | |
| | Power Consumption (50/60 Hz) (When Auxiliary Heater is Off) *10 | kW | 10.9 / 12.7 | 15.0 / 18.0 | 26 / 32 | 45 / 54 | |
| | Operating Current (50/60 Hz) (When Auxiliary Heater is Off) *10 | A | 35 / 40 | 53 / 62 | 86 / 104 | 165 / 193 | |
| | Power Supply Capacity *11 | kVA | 15.7 | 21.5 | 38 | 66 | |
| Noise Level | Sound Pressure Level | Indoor Unit (50/60 Hz) *12 | dB | 68 or less | 69 or less | 69 or less | |
| | Outdoor Unit (50/60 Hz) *12 | dB | 59 or less | 59 or less | 59 or less | 59 or less | |
| Temperature Control Method | Heat Pump Balance Control (Super Reheat Spec.) | | | | | | |
| Legal Refrigeration Tonnage | 1.01 | | 1.61 | 2.74 | 3.82 | | |
| Device Specifications | Compressor Output | kW | Fully sealed 1.7 (DC inverter drive) | Fully sealed 3.0 (DC inverter drive) | Fully sealed 4.6 (DC inverter drive) | Fully sealed 7.5 (DC inverter drive) | |
| | Heat Exchanger | Radiated Heat Side | Fin and tube | | | | |
| | | Process Air Side | Fin and tube | | | | |
| | Blower Fan | Indoor Unit *13 | kW | Dual intake centrifugal fan 0.4 (inverter drive) | Dual intake centrifugal fan 0.4 (inverter drive) | Dual intake centrifugal fan2.2 (inverter drive) | Dual intake centrifugal fan3.75 (inverter drive) |
| | | Outdoor Unit *13 | kW | Pressure fan 0.2 (inverter drive) | Pressure fan 0.1x2 (inverter drive) | Pressure fan 0.75 (inverter drive) | Pressure fan 0.75 x2(inverter drive) |
| | Refrigerant Control Method | Electronic proportional control valve | | | | | |
| | Refrigerant | R410A | | | | R407C | |
| | Refrigerant Filling Volume | 2.55 | | 3.51 | 5.8 | 12 | |
| | Auxiliary Heater *14 | kW | 1.8 | 3.0 | 6.0 | 9.0 | |
| | Humidification Unit | kW | Pan-type sheathed heater: 6.0 | Pan-type sheathed heater: 7.5 | Pan-type sheathed heater: 15 | Pan-type sheathed heater: 22.5 | |
| | Humidification Tank Capacity | L | 10.4 | | 30.7 | 48.5 | |
| | Temperature Controller | Digital electronic humidity and temperature control system | | | | | |
| | Temperature Sensor | Platinum resistance thermometer | | | | | |
| | Humidity Sensor | Capacitive polymer sensor | | | | | |
| Condenser Fan Control | Inverter control | | | | | | |
| Operation Panel | Includes remote controller with 20 m controller cable. | | | | | | |
| Communication | standard | EIA standard RS-422A/485, RS-232C based | | | | | |
| | Number of Units that can be Connected | RS-422A/485: 32, RS232C: 1 | | | | | |

*1 The temperature and humidity control ranges noted do not necessarily indicate the actual possible controllable ranges. In addition, the cooling and heating loads, including the amount of cooling capacity required for dehumidification, should be kept within the above-mentioned specified ranges of cooling and heating capacity. Depending on control conditions, the processing airflow might have to be controlled to within the previously noted specified range. Note that the internal air circuit is not completely sealed. *2 When the temperature and humidity of the intake air of the indoor unit, and the wind speed and temperature surrounding the outdoor unit are stable. Controller display precision (measured at 1 point) when the control sensor is set at the discharge port and the temperature setting is within the control range. Note that if the control sensor is installed on the intake side, maintaining the above-mentioned precision might not be possible due to the volume of the air-conditioned area or load fluctuations. *3 Conditions based on the JIS standard (when indoor unit intake air is 27 °C db, 19 °C wb, and the outdoor unit intake air is 35 °C db). See page 16 for information regarding cooling capacity correction based on the air conditions of the indoor and outdoor units. *4 Conditions based on the JIS standard (when indoor unit intake air is 20 °C db, and the outdoor unit intake air is 2 °C db). The capacity when the indoor unit intake air is 20 °C db or lower will be 75% or greater of the above-noted value (including that of the auxiliary heater). Also, when the indoor unit intake air falls to approx. 15 °C db or lower, then there may be cases when the compressor will stop, and the auxiliary heater alone will operate. In addition to heating functionality, there is also re-heating functionality built in that uses up to 100% of sensible heat from the refrigerant. *5 The noted external static pressure is when the blower fan is operating at 60 Hz and the process air is regulated at the outlet to produce the rated airflow. *6 Does not include optional parts or protruding components. The outdoor unit, remote control, humidification unit, and optional items will be shipped separately from the indoor unit and must be installed on-site. *7 The figure noted is when operating at the maximum degree of humidification. Dehumidification can occur inside the air processor. With regard to the amount of humidification, always include the amount of internal dehumidification and stay within the specified humidification capacity. *8 If the supply pressure goes over 0.2 MPa, then a pressure reducing valve should be installed on the water supply piping. If there is abnormal noise coming from the water supply piping, then reduce the water supply pressure, even if the pressure is otherwise within the specified range. Always install the included strainer. *9 The source voltage phase imbalance should be ±3% or less. *10 Maximum value within the specified range for the product. *11 The figure noted is when the product is operating at the highest capacity within its specified operating range. *12 Measured value (A scale) when operating at the rated processing airflow, at a position of non-resonance, 1 m from the front face of the indoor unit, and at 1 m from the front face of the outdoor unit, at a height of 1.5 m. May be higher than the noted value due to the effects of surrounding noise or echoing. *13 The airflow from the blower cannot be increased. *14 Only used when starting during cold months or when there are increased heating loads. *15 The temperature and humidity bias setting should be adjusted in order to correct for the error between the controller temperature and humidity display and the user's temperature and humidity measurement standard. *16 If operating with soft water, then supply soft water that has been treated using a water softening device that has automatic regeneration functionality. Also, use tap water as the primary source for the water softening device. When making connections to the water softening device, follow the manufacturer's instruction manual for the water softening device used. *17 If using deionized water, ensure the electrical conductivity of the water is 0.01 to 1 mS/m (0.1 to 10 µS/cm). Also note that the default setting needs to be changed. (The default setting is for use with softened water.) Check the instruction manual for compatible humidification water setting details.

* Power supply wiring and wiring going between the outdoor and indoor units are not included and should be supplied by the user. Use the following guidelines when choosing wiring. ① Power cable: CV2 4-core single cable. ② Signal cable: CVVS 1.25 4-core single cable (shielded cable). Do not bundle power and signal cables together and do not route through the same conduit or ducting. Also, a heavier gauge of wire should be used if the cable length is excessively long compared to the refrigerant piping length, or in cases where the ambient temperature may become high. * Signal wiring (power and signal) for the humidification unit and indoor units, and the vapor hose are included. * This product does not detect nor have built-in protection against electric shorts. An earth leakage breaker must be installed on the primary side of the power supply.

For Cleanrooms and Precision Measurement Rooms Constant Temperature (Constant Humidity) Equipment **R** Series

PAP-R Series Technical Data

Installation Points^① (Also see Installation Procedure^② on the following page.)

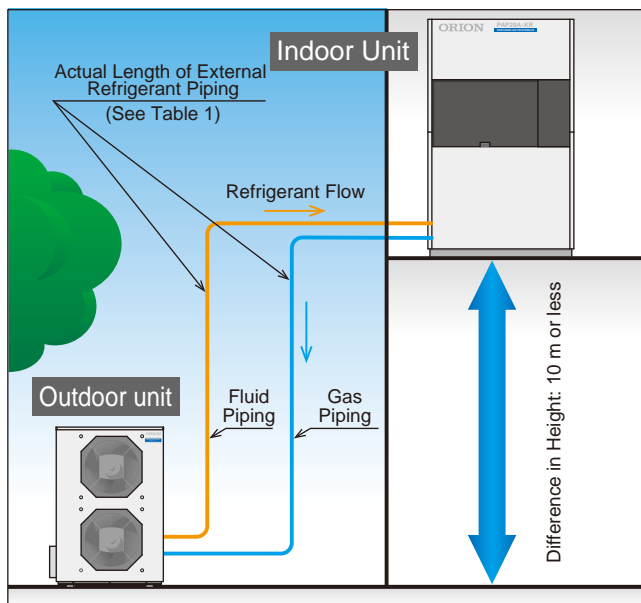
Greater Freedom of Installation, Fewer Constraints and, Excellent Construction

| Item/Model | | PAP20A-R | PAP20A1-KR | PAP40C-R | PAP40C1-KR | PAP80B-R | PAP80B1-KR | PAP120A-R | PAP120A1-KR |
|--|----------------------------|--|--|--|--|----------|------------|-----------|-------------|
| Power Supply Voltage | Voltage Fluctuation | Rated voltage $\pm 10\%$ or better | | | | | | | |
| | Phase Unbalance | 3% or lower | | | | | | | |
| Leakage Breaker Capacity | A | 30 | 60 | 60 | 75 | 75 | 150 | 150 | 225 |
| Current Sensitivity | mA | 100 (High-speed type. Switch delay time of 0.1 s or less.) | | | | | | | |
| Primary Power Supply Terminal Block ^① | | M5 | | M6 | | M8 | | M10 | |
| Terminal Block Width | mm | 13 | | 19 | | 23 | | 32 | |
| Indoor/Outdoor Unit Terminal Block ^② | | M3.5 | | | | | | | |
| Terminal Block Width | mm | 7.5 | | | | | | | |
| Indoor/Outdoor Unit Terminal Block ^③ | | M3.5 | | | | | | | |
| Terminal Block Width | mm | 7.5 | | | | | | | |
| External Refrigerant Piping | Gas Piping *1 | \varnothing mm | 15.88 | 15.88 | 19.05 | 25.4 | | | |
| | Fluid Piping *1 | \varnothing mm | 9.53 | 9.53 | 12.7 | 15.88 | | | |
| External Refrigerant Piping Length | Piping Length (One way) *2 | m | Actual length: 30 or shorter Equiv. length: 35 or shorter | Actual length: 50 or shorter Equiv. length: 60 or shorter | Actual length: 75 or shorter Equiv. length: 90 or shorter | | | | |
| Indoor/Outdoor Unit Difference in Height *2 | m | 10 or lower | | | | | | | |
| Pipe-end Processing (Type) | | Indoor: Flare connection / Outdoor: Brazing / Outdoor Unit Side: Expanding rubber pipe stopper / Indoor Unit Side: Service valve flared stop. * PAP 120 A - R / PAP 120 A1 - KR models have brazed indoor unit gaps piping connections. [When shipped] Cap: Brazed. | | | | | | | |

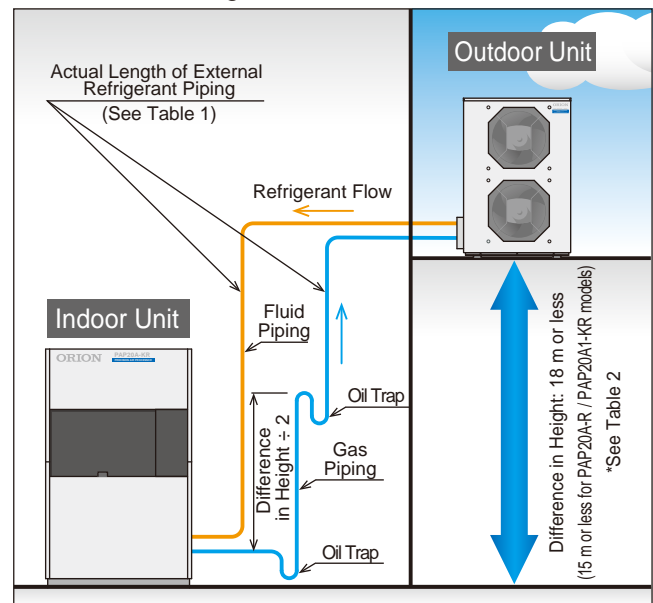
*1 Does not include refrigerant piping, which must be prepared by the end-user. Also, if the length of refrigerant piping (one way) is 5 m or longer, then the following amount of additional refrigerant will be needed for each 1 m of fluid piping: PAP 20A-R / PAP 20A1-KR: 30 g/m, PAP40C-R / PAP40C1-KR: 32 g/m, PAP80B-R / PAP80B1-KR: 63 g/m, PAP120A-R / PAP120A1-KR: 108 g/m. Example: One-way 20 m: (20 m - 5 m) \times 30 g/m = 450 g of additional refrigerant.

*2 If the difference in height to the outdoor unit is 10 m or more, then external refrigerant piping length (in meters) will be as shown in Table 1, and the cooling and heating capacity will be as shown in table 2. If the external unit is lower, then the difference in height should be 10 m or less.

Outdoor Unit is Lower



Outdoor Unit is Higher



■ Table 1 Actual Piping Length (Max.)

| | Difference in Height | PAP20A-R | PAP20A1-KR | PAP40C-R | PAP40C1-KR | PAP80B-R | PAP80B1-KR | PAP120A-R | PAP120A1-KR |
|--|----------------------|----------|------------|----------|------------|----------|------------|-----------|-------------|
| Actual Length of External Refrigerant Piping (m) | 18 m | — | — | 34 | — | 51 | — | 51 | — |
| | 15 m | 24 | — | 40 | — | 60 | — | 60 | — |
| | 12 m | 27 | — | 46 | — | 69 | — | 69 | — |

■ Table 2 Cooling and Heating Capacity Nominal Value

| | Difference in Height | PAP20A-R | PAP20A1-KR | PAP40C-R | PAP40C1-KR | PAP80B-R | PAP80B1-KR | PAP120A-R | PAP120A1-KR |
|-----------------------|----------------------|----------|------------|----------|------------|----------|------------|-----------|-------------|
| Cooling Capacity (kW) | 18 m | — | — | 9.6 | — | 20.0 | — | 30.4 | — |
| | 15 m | 7.0 | — | 10.5 | — | 21.8 | — | 33.3 | — |
| | 12 m | 7.6 | — | 11.4 | — | 23.7 | — | 36.0 | — |
| Heating Capacity (kW) | 12 m or longer | 1.8 | — | 3.0 | — | 6.0 | — | 9.0 | — |

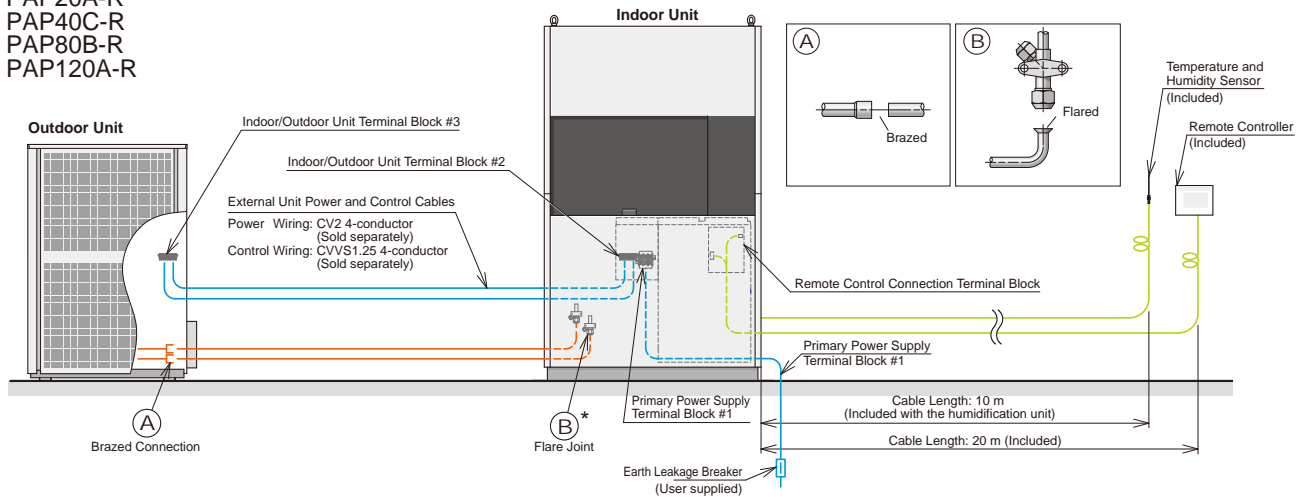
* Capacity is for operation in proportion to JISB8616.

PAP-R Series Technical Data

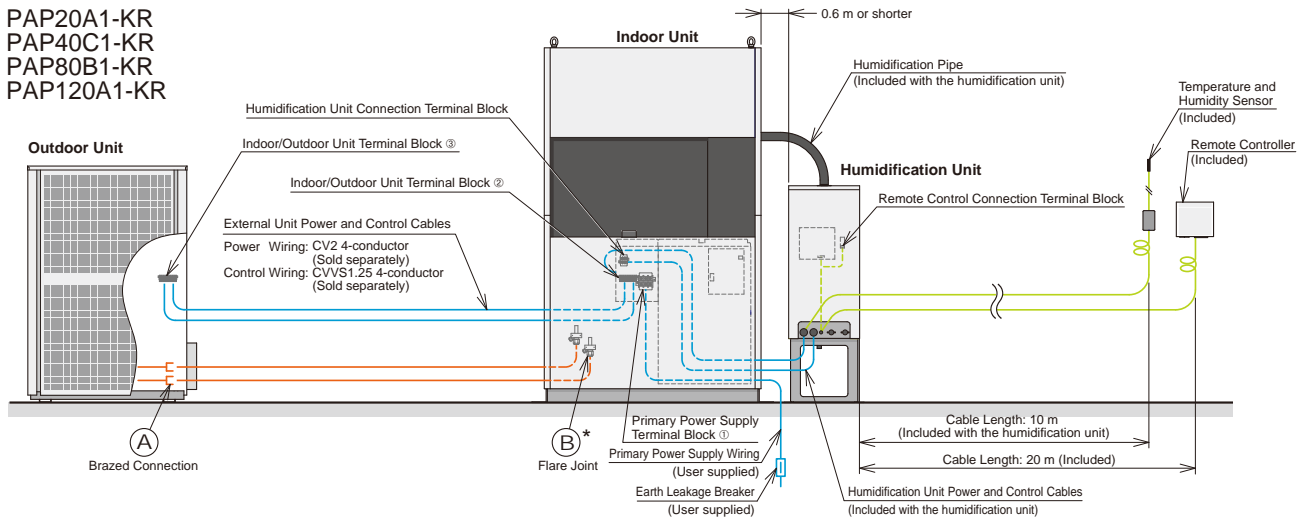
Installation Points②

Greater Freedom of Installation, Fewer Constraints and, Excellent Construction

PAP20A-R
PAP40C-R
PAP80B-R
PAP120A-R



PAP20A1-KR
PAP40C1-KR
PAP80B1-KR
PAP120A1-KR



* Brazed connection on PAP120A-(K)R models.

For Cleanrooms and Precision Measurement Rooms

Constant Temperature (Constant Humidity) Equipment R Series

If Using Soft Water

1. Regarding Water Processing Devices

Use a water softening device that has built-in automatic regeneration functionality. When supplying soft water, operate with the automatic blow setting for water softening. (The automatic blow setting is the factory default setting.)



Water Softening Device (With built-in automatic regeneration functionality)

Ion exchange resin removes cations (hard scaling constituent such as Ca, etc.) from supply water. Anions will not be removed. If salt (NaCl) is fed into the water softening device and regenerative operation occurs (automatically via a timer) then scaling constituents adsorbed by the resin will be replaced by sodium ions, which will result in the ion exchange resin being regenerated. There will be an outflow of sodium ions and anions, etc., therefore, in order to avoid concentration of these components, a blow operation on the humidification unit (to replace the humidification water) should be carried out periodically.

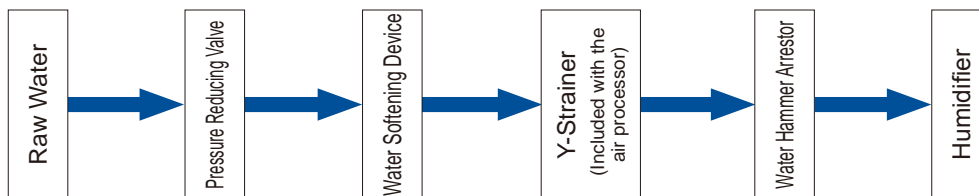
2. Automatic Blow Functionality of the Soft Water in the Humidification Unit

The humidification unit in the product uses an electric heater to heat the humidification water in order to create steam. Scaling constituents (Ca ion, etc.) dissolved in the humidification water can become concentrated over time and precipitate out, which can result in breakdown of the humidification unit. The product has built-in "Blow Functionality" in order to prevent concentration of such

scaling constituents. Adding an amount of water somewhat more than the amount of water consumed from the humidification process can prevent scaling constituents from becoming concentrated. Accordingly, a small amount of drain water will be released from the humidification unit drain port during the automatic blow operation. The estimated amount of drainage released is shown in the chart below.

| Model | PAP20A1-KR | PAP40C1-KR | PAP80B1-KR | PAP120A1-KR |
|---|------------|------------|------------|-------------|
| Wastewater volume L/h Numbers in () are maximum values. | 1.6 (3.6) | 2.0 (4.5) | 5.0 (10.0) | 8.0 (14.0) |

3. Humidification Water Supply Piping Installation Example and Important Considerations During Installation



- Install water processing devices such as pressure gauges or maintenance valves, etc. according to the relevant device instruction manuals. Also note that water processing filters or other items may be required by manufacturers of water processing devices depending on the water quality of the source water.
- Use tap water as the primary water source for the water softening device. Consult the manufacturer of the water processing device for details on how to connect to tap water sources.
- Install a pressure reducing valve. Adjust the pressure setting of the pressure reducing valve so that the water pressure is within the water pressure range specified by the water softening device and the humidification unit. (Humidification unit operable supply pressure range: 0.1 to 0.2 MPa)
- Be sure to install the included Y-strainer onto the inlet of the humidification unit. Failure to install the Y-strainer can result in breakdown of the solenoid valve inside the humidification unit.
- Installation of a water hammer arrestor is recommended. Depending on piping conditions, water hammer that occurs when the solenoid valve inside the humidification unit is functioning can result in breakdown of piping components such as the pressure gauge, etc. Also, in case there is a hose installed between the water softening device and the humidification unit, water hammer can cause hose movement which can worsen the hose coupling, therefore, it is important to adequately secure the hose connection.

4. Choosing Water Processing Devices

Choose water processing devices that can process the maximum amount of water required by the humidification unit.

| Model | PAP20A1-KR | PAP40C1-KR | PAP80B1-KR | PAP120A1-KR |
|-----------------------------|------------|------------|------------|-------------|
| Max. Water Flow Rate (kg/h) | 8.6 | 12.5 | 30.0 | 42.0 |

Also, before introducing a water processing device, a water quality test should be conducted by the manufacturer of the water processing device. Please consult the manufacturer of the water processing device.

5. Management Items

- Ensure that there is always salt inside the saltwater tank of the water softening device, and replenish the salt as required. There is a timer alarm function to remind that the salt in the humidification unit needs to be replenished. See the instruction manual of the precision air processor for details about the timer alarm function.
- Do not use edible salt that contains minerals for regeneration salt. Edible salt inside the saltwater tank is problematic because it tends to clump easily. Use of



- salt marketed by the manufacturer of the water processing device for use in the water softening device is recommended. (If the salt clumps, despite salt being present, the salt will not dissolve, causing the concentration of the salt to be low, and regeneration to be impaired.)
- Periodically perform a water hardness test or other means to check the water at the outlet of the water softening device. Contact the manufacturer of the water processing device regarding the water hardness test.
- The ion exchange resin has regeneration capability, but it deteriorates with use. Replace the ion exchange resin every two to three years.
- See the instruction manual for the water processing device for other management-item details.

If Using Deionized Water

1. Regarding Water Processing Devices

When supplying deionized water, the water should have an electrical conductivity of 0.01 to 1 mS/m (0.1 to 10 μ S/cm).

Deionizer (Ion exchange resin type)

While it is possible to remove both cations and anions, when doing so, regeneration of the resin is not possible and the ion exchange resin (cartridge) must be periodically replaced (and returned to the manufacturer of the water processing device).



2. Automatic Blow Functionality of the Soft Water in the Humidification Unit

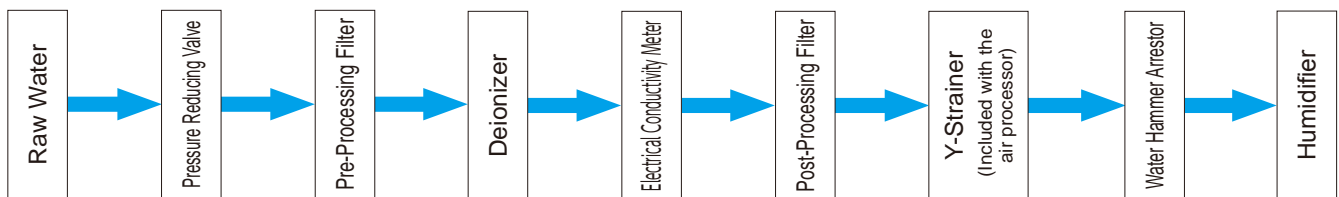
If deionized water is to be supplied, then operate with the automatic blow setting turned OFF.

* (PAP120A1-KR models do not have built-in automatic blow functionality and therefore do not require this setting change.)

It is no problem to use the automatic blow setting in such cases, however, the ion exchange resin will become saturated more quickly and will require regeneration as a result, therefore, using the

automatic blow setting is not recommended in this case. However, even if deionized water is supplied, residual scaling constituents will become concentrated over time and precipitate out, which can lead to breakdown, and therefore, periodic forced blow operation to replace the humidification water is required. See the instruction manual of the precision air processor for details.

3. Humidification Water Supply Piping Installation Example and Important Considerations During Installation



- Install water processing devices such as pressure gauges or maintenance valves, etc. according to the relevant device instruction manuals. Also note that water processing filters or other items may be required by manufacturers of water processing devices depending on the water quality of the source water.
- Consult the manufacturer of the water processing device for details on how to connect to tap water sources.
- Install a pressure reducing valve. Adjust the pressure setting of the pressure reducing valve so that the water pressure is within the water pressure range specified by the water softening device and the humidification unit. (Humidification unit operable supply pressure range: 0.1 to 0.2 MPa)
- Install an electrical conductivity meter.
- Be sure to install the included Y-strainer onto the inlet of the humidification unit. Failure to install the Y-strainer can result in breakdown of the solenoid valve inside the humidification unit.
- Installation of a water hammer arrestor is recommended. Depending on piping conditions, water hammer that occurs when the solenoid valve inside the humidification unit is functioning can result in breakdown of piping components such as the pressure gauge, etc. Also, in case there is a hose installed between the water softening device and the humidification unit, water hammer can cause hose movement which can worsen the hose coupling, therefore it is important to adequately secure the hose connection.

4. Choosing Water Processing Devices

Please consult the manufacturer of the water processing device or a local dealer. When choosing a water processing device, use the maximum humidification capacity of the humidification unit as a reference.

| Model | PAP20A1-KR | PAP40C1-KR | PAP80B1-KR | PAP120A1-KR |
|-------------------------------------|------------|------------|------------|-------------|
| Max. Humidification Capacity (kg/h) | 5.0 | 8.0 | 20.0 | 28.0 |

Also, before introducing a water processing device, a water quality test should be conducted by the manufacturer of the water processing device. Please consult the manufacturer of the water processing device.

The deionizer is also set to the lower limit value of the processing flowrate. Be aware that if used below the processing flowrate lower limit value, a saturated state may occur before the maximum intake flowrate is reached.

5. Management Items

- Regularly replace the ion exchange resin cartridges (by returning the cartridges to manufacturer of the water processing device for regeneration). Use of electrical conductivity measurement is recommended in order to gauge the replacement period. Install an electrical conductivity meter that includes an alarm signal output. By connecting that signal to the air processor, the air processor can generate an alarm when there is a rise in the electrical conductivity. See the instruction manual of the precision air processor for details.

R Series System Upgrade Products for Facilities

Outside-Air Air Processor **Fresh Eco Cube**

Solves problems of sealing measures and ventilation!

Fresh Eco Cube

Outside-Air Air Processor

AEC Series

The need for ventilation is becoming evident as a measure for air conditioning in sealed spaces during times of the 3 Cs (avoiding closed spaces, crowds, and close contact). By delivering dehumidified outside air to the inside, our outside-air air processor, the "Fresh Eco Cube", can achieve reduced air conditioning load along with energy savings and comfort.

Models

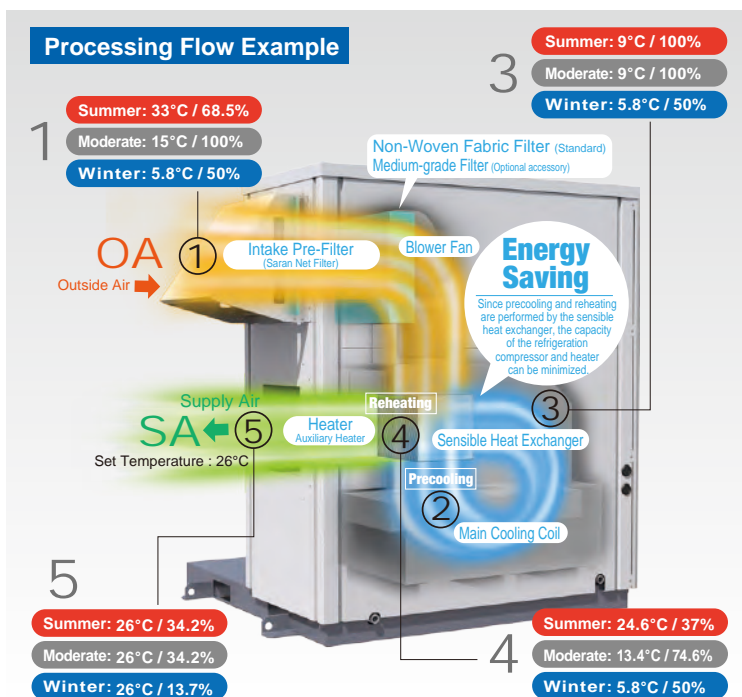
| | | |
|----------|--------------------------|-------------------------------|
| AEC600A | Rated Processing Airflow | 480 to 600 m ³ /hr |
| AEC1200A | Rated Processing Airflow | 960 to 1200m ³ /hr |



* Warranty period of the refrigerant circuit is 2 years from the date of purchase (or 10,000 hours of operating time).



IoT



[Many Accessories Available (Sold separately)]



Stable Supply of Low Dew Point Air Year-Round

Internal Cooling Temp Range: 9 to 12 °C (Opt. setting)^{*1}

The refrigeration circuit is operated in mild weather months to supply low dew point air year-round.

Outlet air temp also settable via a shift key press.
(Will operate as-is in summer months, etc. as in figure ④ above where the temperature is higher than the set temperature.)

Energy-Saving Sensible Heat Exchanger Built-In

Precooling (figure ② above) and reheating (figure ④ above) occur in the sensible heat exchanger, saving energy.

(The total amount reduced saved from cooling energy and reheating energy is 41% * compared with our other products.)

All-in-One Design Eliminates Need for Refrigeration Piping

With our all-in-one condensing unit, refrigeration piping is not needed and installation is possible with only installing ducting.

The standard-equipped remote control allows for operation from inside.
(Operation also possible directly on the unit itself.)

*1 The product does not perform precision control of the dew point temperature of the product discharge air.



How is the *Fresh Eco Cube* different from normal outside-air processing air processors?

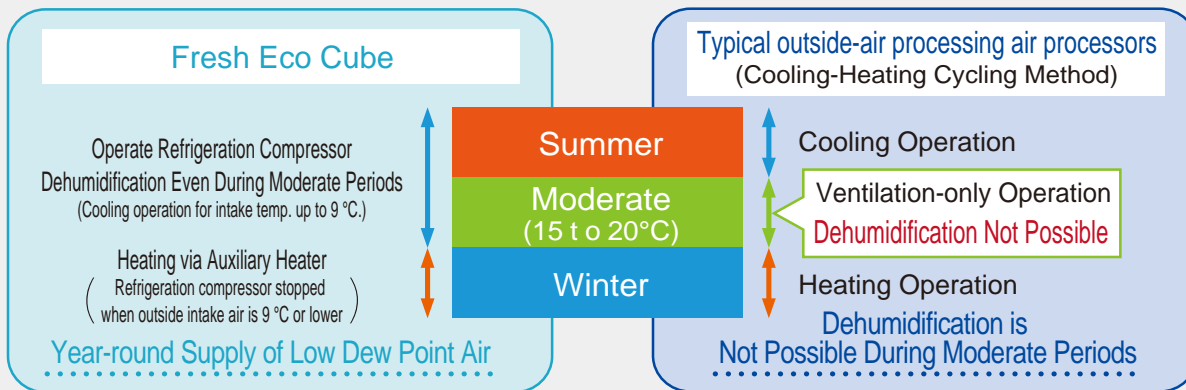
It offers a stable supply throughout all four seasons. And it performs dehumidification even during moderate periods!

Typical outside-air processing air processors generally operate by cycling between cooling and heating. During moderate periods of spring and autumn (15 to 20 ° C), dehumidification is impossible due to ventilation operation of such processors. In addition, heat pump type processors that have external units require defrost processing when performing heating operation during winter months, and electric heaters must be used because of intermittent drops in supply temperature. The "Fresh Eco Cube" employs a year-round cooling method, and therefore can perform dehumidification operation even in moderate periods of spring and autumn. And thanks to refrigeration circuit control, continuous operation is possible because defrost and oil-return operations are not required. In cases when the intake air is low, such as in winter months, the refrigeration compressor is stopped, and heated air is supplied using the auxiliary heater.



Difference from normal outside-air processing air processors

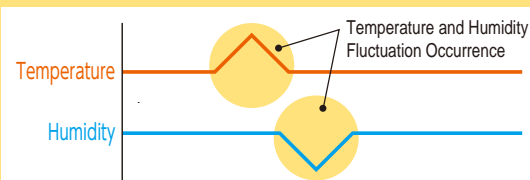
- When the cooling-heating cycling method is used in moderate periods of spring and autumn, dehumidification is not possible due to ventilation operation.



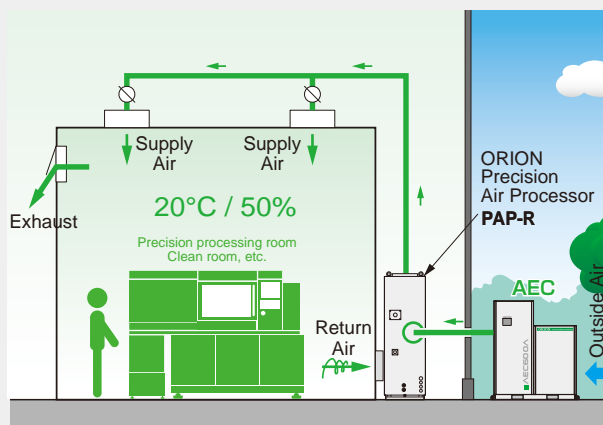
- For heat pump operation, heating during winter months requires defrost operation, so supply temperature and humidity are not stable.

The "Fresh Eco Cube" employs a year-round cooling method, and therefore can perform dehumidification operation even in moderate periods of spring and autumn. And thanks to refrigeration circuit control, continuous operation is possible because defrost and oil-return operations are not required. In cases when the intake air is low, such as in winter months, the refrigeration compressor is stopped, and heated air is supplied using the auxiliary heater.

Illustrative Depiction of Defrost Operation



System Example



PAP R Series

R Series System Upgrade Products for Facilities

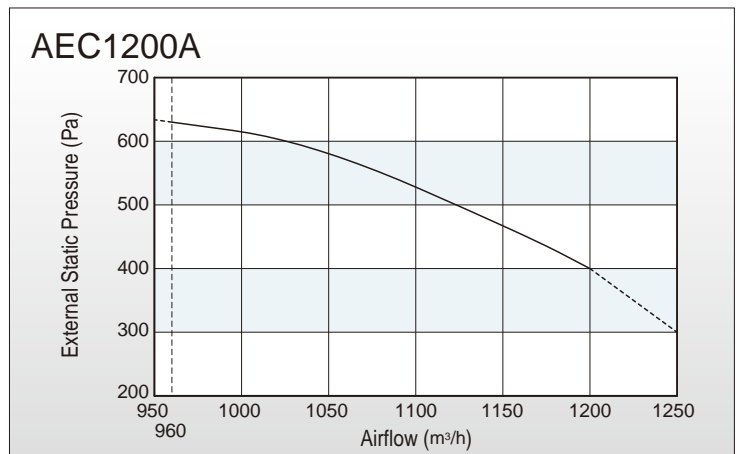
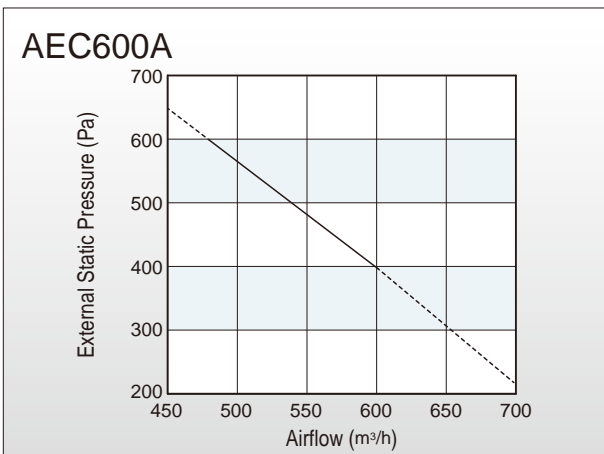
Outside-Air Air Processor **Fresh Eco Cube**

Specifications

| Model | | AEC600A | | AEC1200A | | |
|--|---|---|--|----------------|---|--|
| Performance | Possible Setting Range | Discharge Air Temperature *1,*2 °C (DB) | 18 to 30 | | | |
| | | Internal Cooling Temperature *3 °C (DB) | 9 to 12 | | | |
| | Maximum Cooling Capacity *4 | kW | 9.0 | 18.0 | | |
| | Maximum Precooling (Reheating) Capacity | kW | 3.2 | 6.4 | | |
| | Rated Processing Airflow | | m ³ /h | 480 to 600 | 960 to 1200 | |
| | | (m ³ /min) | (8 to 10) | (16 to 20) | | |
| | External Static Pressure *4 | Pa | 400 | | | |
| Environments Conditions (range A) | Normal Operating Range *12 | | Within DB -5 to 33°C, WB 28°C | | | |
| | Possible Setting Range *6,*12 | | Within DB -5 to 40°C, WB 30°C | | | |
| External Dimensions *7 | mm | 1800x1505x1503 | | 1800x1505x1856 | | |
| Product Mass | kg | 600 | | 800 | | |
| Process Air Discharge Port (Open Port) | mm | □344 | | 650x344 | | |
| Electrical Specifications | Power Supply *8 | V(Hz) | Three-phase 200 ± 10 % (50/60) | | | |
| | Power Consumption *9 | A | 12 | 21 | | |
| | Current *9 | A | 34 | 65 | | |
| | Power Supply Capacity *10 | kVA | 14 | 22 | | |
| Sound Level *11 | dB | 66 | 69 | | | |
| Operation Control Method | Temp Control | | Heater PID Control | | | |
| | Dehumidification Control | | Compressor Speed Control | | | |
| Legal Refrigeration Tonnage (50/60Hz) | | | 1.74 | 3.13 | | |
| Device Specifications | Compressor | kW | Hermetically sealed (Rotary type) 3.0 (DC Inverter Control) | | Hermetically sealed (Rotary type) 7.46 (DC Inverter Control) | |
| | Sensible Heat Exchanger | | Crossflow plate type | | | |
| | Process Air Heat Exchanger | | Fin and tube | | | |
| | Radiated Hot Air Heat Exchanger | | Fin and tube | | | |
| | Process Air Blower Fan | kW | Airfoil fan 0.4 (Inverter drive) | | Airfoil fan 0.75 (Inverter drive) | |
| | Condenser Fan | kW | Pressure Fan 0.1 (Inverter drive) | | Pressure Fan 0.4 (Inverter drive) | |
| | Refrigerant Control Method | | Electronic proportional control valve | | | |
| | Refrigerant | | R410A | | | |
| | Refrigerant Filling Volume | kg | 2.2 | 4.0 | | |
| | Auxiliary Heater | kW | Sheathed heater with fan 5.01 | | Sheathed heater with fan 10.02 | |
| | Temperature Controller | | Digital electronic temperature control system | | | |
| | Discharge Air Temp Sensor | | Platinum resistance thermometer | | | |
| | Operation Panel | | Incl. remote control. Incl. 20 m cable. | | | |
| Communication | | USB 2.0, EIA standard | | | | |

*1 The discharge air temperature control range noted does not necessarily indicate the actual possible controllable range. The actual controllable temperature range will differ depending on the temperature and humidity of the intake air and the processing airflow. Also, the displayed value indicates the temperature at a single point at the discharge port and is not a guaranteed absolute temperature. *2 This product conducts heat exchange of inside cooling air with outside air, and therefore the temperature of the discharge air will fluctuate depending on the condition of the outside air. *3 This is a target value for the cooling temperature to dehumidify air inside the product and indicates a guideline of when chiller operation is to be stopped. There will be fluctuation of the discharge air temperature and humidity at times when the compressor changes between operating and stopped states. Also, the product does not perform precision control of the dew point temperature of the product discharge air. *4 During times of the maximum rated processing airflow in accordance with the JRA standard (intake air temperature of 33 °C db and 28 °C wb). *5 The noted external static pressure is when the blower fan is operating at 60 Hz and the process air is regulated at the outlet to produce the maximum rated processing airflow. *6 The product will continue to operate, however, operation output may be limited in order to protect the device. Also, in cases where the ambient temperature is less than the set internal cooling temperature, chiller operation may stop while heater-only operation occurs. Note that condensation may form based on operating conditions. *7 Excluding protruding parts. *8 The power supply voltage phase imbalance must be within ±3%. *9 This is the maximum value within the range of the product specifications. *10 The figure noted is when operating at the highest capacity within normal operating ranges. *11 Typical level at the maximum rated processing airflow under conditions based on the JIS standard (B8616). *12 Note that condensation may form based on operating conditions.

■ Blower Fan Performance curves

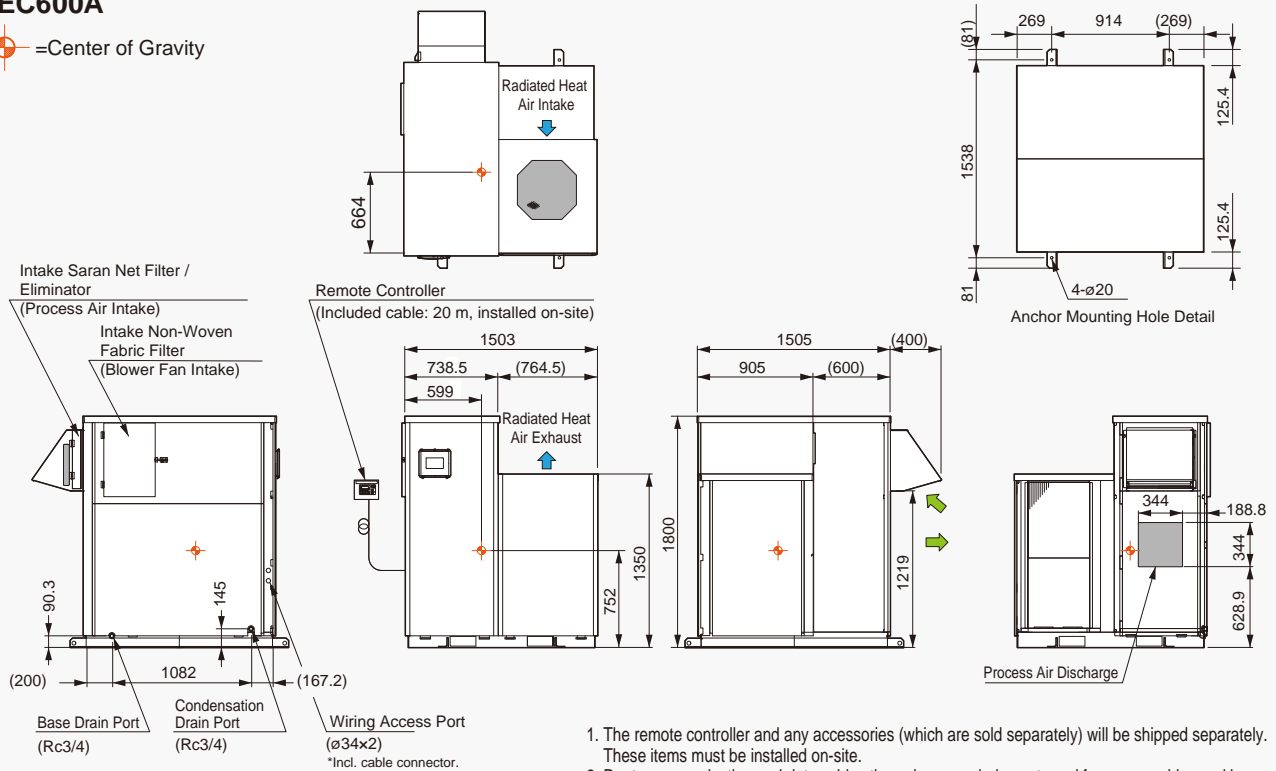


Please contact us for details.

External Dimensions (Units: mm)

AEC600A

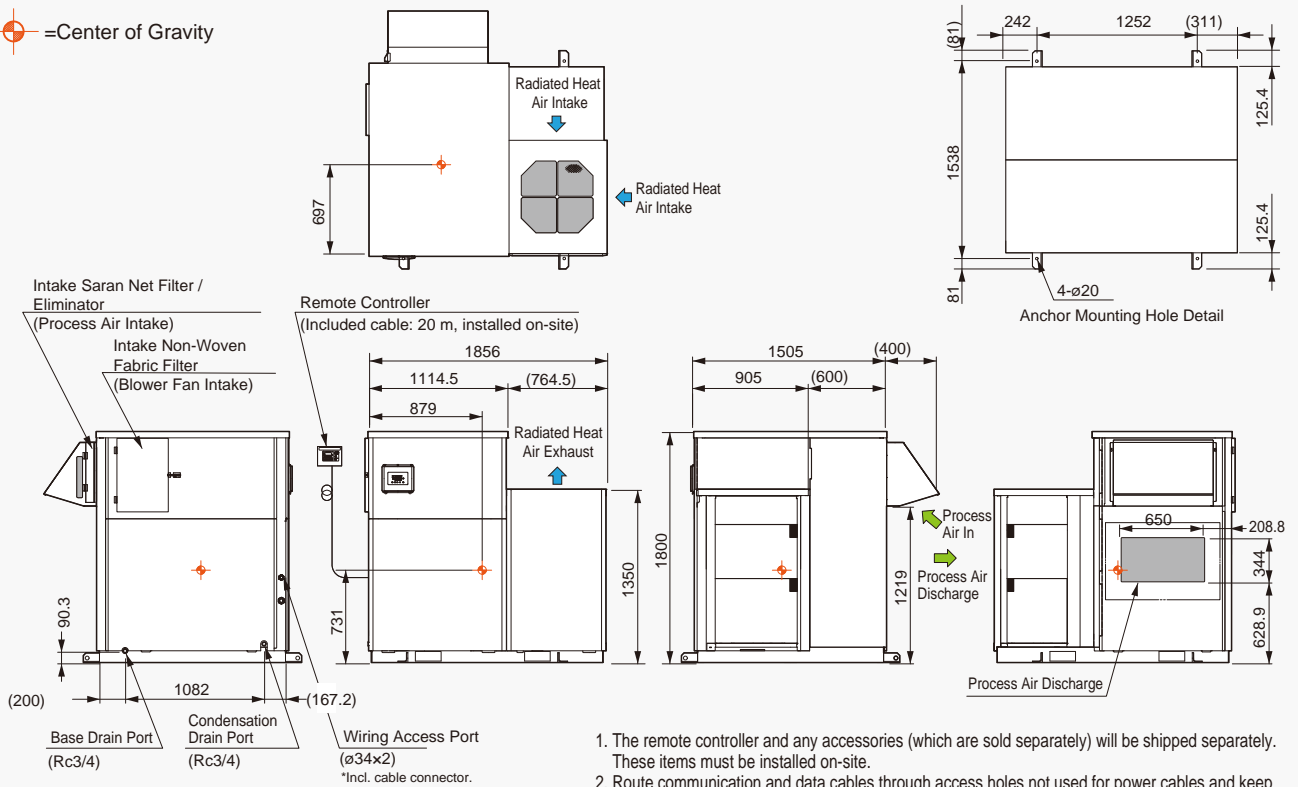
=Center of Gravity



1. The remote controller and any accessories (which are sold separately) will be shipped separately. These items must be installed on-site.
2. Route communication and data cables through access holes not used for power cables and keep the communication and data cables separate from power cables.
3. Be sure to drain condensate drain outside the product. Also, install separate base drain piping.
4. Install pipe insulation and take anti-freezing measures for external piping.

AEC1200A

=Center of Gravity



1. The remote controller and any accessories (which are sold separately) will be shipped separately. These items must be installed on-site.
2. Route communication and data cables through access holes not used for power cables and keep the communication and data cables separate from power cables.
3. Be sure to drain condensate drain outside the product. Also, install separate base drain piping.
4. Install pipe insulation and take anti-freezing measures for external piping.

PAP R Series

Air Processor (Circulation Type) Air Cooled

Models

AP-750M-E1

Air Processing Capacity **4 to 15 m³/min**

AP-750MV-E1

Humidity Setting Range **30 to 90 %**

AP-750MVK-E1

AP-1500M-E1

AP-1500MV-E1

AP-1500MVK-E1



* Warranty period of the refrigerant circuit is 2 years from the date of purchase (or 10,000 hours of operating time).



AP1500MVK-E1

A localized precision air processing unit that can be used to fill each of the needs of various industrial fields. The circulating type air circuit easily enables low to high temperature environments.

Compact Design

The environment box (testing chamber) can be easily replaced or moved according to your needs.

Three Functions to Choose From

3 functions of temperature control, humidity control, purification (special order) offer a total response to your local air space needs.

Specifications

| Model | | AP-750M-E1 | AP-750MV-E1 | AP-750MVK-E1 | AP-1500M-E1 | AP-1500MV-E1 | AP-1500MVK-E1 | |
|--|-------------------------------------|---------------------|--|--------------|--|-------------------------------|---------------|--|
| Performance Specifications ¹⁾ | Temperature Control Range | °C | 5 to 35 | 5 to 70 | 15 to 70 (While under temperature-only control: 5 to 70) | 5 to 35 | 5 to 70 | 15 to 70 (While under temperature-only control: 5 to 70) |
| | Humidity Control Range | *1 % | — | | 30 to 90 (When at 40 to 60 °C) | — | | 30 to 90 (When at 40 to 60 °C) |
| | Control Precision | *2 °C,% | ±0.5 | | ±0.5, ±3 | | ±0.5, ±3 | |
| | Control Method | | Digital setting, Digital display, Heater PID control | | | | | |
| | Cooling Capacity | *3 kW | 1.5 / 1.75 | | | 3.25 | | |
| Processed Airflow (50/60 Hz) | | m ³ /min | 4 to 6 / 4 to 7 | | | 10 to 13 / 10 to 15 | | |
| Ambient Temp Range | | °C | 15 to 35 | | | | | |
| Process Air Discharge/Intake (I.D.) | | | ø100 (incl. companion flange) | | | ø150 (incl. companion flange) | | |
| Power Specifications | Power Supply | V(Hz) | Three-phase 200 ± 10 % (50/60) | | | | | |
| | Maximum Operating Current | A | 18 | | 27 | 37 | | 58 |
| | Maximum Operating Power Consumption | kW | 5.7 | | 9.0 | 11.5 | | 19.0 |
| Circuit Breaker | | | Built-in | | | | | |
| Legal Refrigeration Tonnage (50/60Hz) | | | 0.24/0.29 | | | 0.52/0.62 | | |
| Refrigerant | | | R-407C | | | | | |
| Refrigerant Filling Volume | | kg | 0.7 | | | 1.5 | | |
| Compressor Output | | kW | 0.65 | | | 1.4 | | |
| Product Mass | | kg | 120 | | 130 | 195 | | 205 |
| External Dimensions (H X D X W) | | mm | 1044x548x660 | | | 1374x618x753 | | |

*1 When under temperature and humidity control, refer to the "Temperature and humidity control range" chart shown in the next page.

*2 No load, no sample, specified voltage, temperature (humidity) taken at unit air outlet port for a short time.

*3 Maximum airflow, control temp: 25 °C, ambient temp: 25 °C (Not the case for humidity control.)

* Never operate on explosive or combustible substances, nor with substances that may contain explosive or combustible compounds.

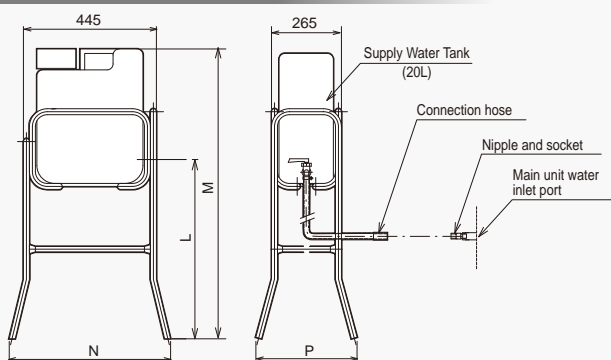
* Install in a location free from the effects of corrosive gases (especially those harmful to copper and stainless steel).

Refrigerators and Freezers that Use Rigid Polyurethane Foam



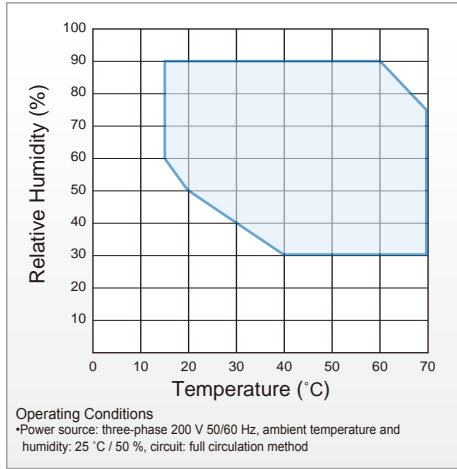
Supply Water Tank (Accessory -- sold separately)

External Dimensions (units: mm)

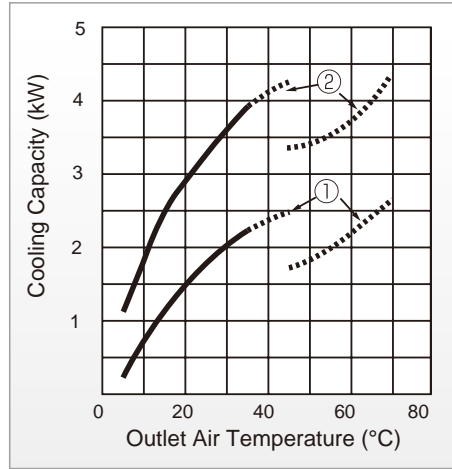


| Model | L | M | N | P |
|---------------|------|------|-----|-----|
| AP-750MVK-E1 | 850 | 1230 | 535 | 370 |
| AP-1500MVK-E1 | 1170 | 1560 | 660 | 480 |

Temperature and Humidity Control Range (AP-MVK)



Cooling Capacity Curves



| | |
|-------|--|
| ② | |
| No. | Solid line applicable models |
| ① | AP-750M-E1 |
| ② | AP-1500M-E1 |
| ----- | |
| No. | Solid- and Dashed-line Applicable Models |
| ① | AP-750M-E1 • MVK-E1 |
| ② | AP-1500M-E1 • MVK-E1 |

Operating conditions

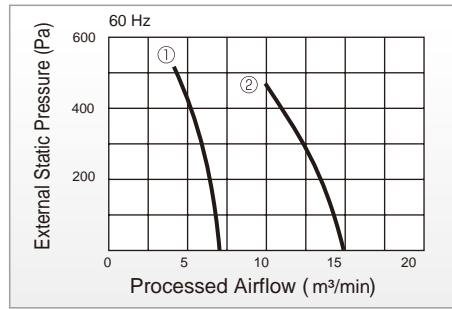
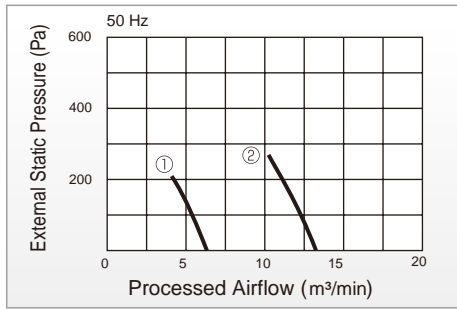
- Power source: Three-phase, 200 V 60 Hz
- Ambient temperature and humidity: 25 °C / 50 %
- Processed airflow: rated airflow (external pressure: 0 Pa)

Cooling capacity compensation value

Note 1: Power source of 50 Hz will be 85 % of 60 Hz. (AP-1500 is same value for 50 or 60 Hz.)

Note 2: Cooling capacity curve during temperature control. The power curve will be different during humidity control.

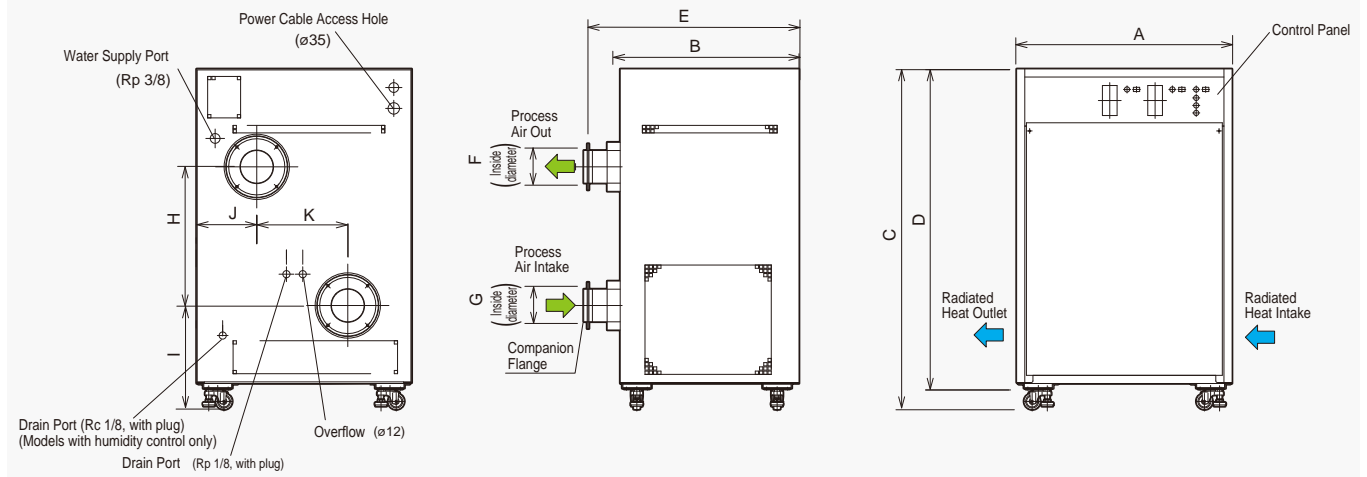
Processed Airflow Performance Charts



- ① AP-750M-E1 • MV-E1 • MVK-E1
- ② AP-1500M-E1 • MV-E1 • MVK-E1

* Do not operate at processing airflows outside what is listed in these charts.

External Dimensions (units: mm)



| Model | A | B | C | D | E | F | G | H | I | J | K |
|------------------------------|-----|-----|------|------|-------|------|------|-----|-----|-----|-----|
| AP-750M-E1 / MV-E1 / MVK-E1 | 660 | 548 | 1044 | 964 | (647) | ø100 | ø100 | 425 | 319 | 185 | 279 |
| AP-1500M-E1 / MV-E1 / MVK-E1 | 753 | 618 | 1374 | 1294 | (719) | ø150 | ø150 | 598 | 446 | 227 | 283 |

ORION's Energy Saving Air Processing System Proposal Energy Saving Dry Room System

Ultra-Low Dew Point Dry Air Supply Equipment

DPU02A

Integrated Unit Provides for an Easy, Ultra-Low Humidity Space

Perfect for experimentation and research applications!

Precooler + Dehumidifier + After-Temperature Controller in a single unit. Integrated Unit Provides for an Easy, Ultra-Low Humidity Space

Precooler, desiccant dehumidifier, after-temperature controller all integrated into a single unit that will save valuable factory floor space.

This single unit provides a stable supply of ultra-low dew point air.

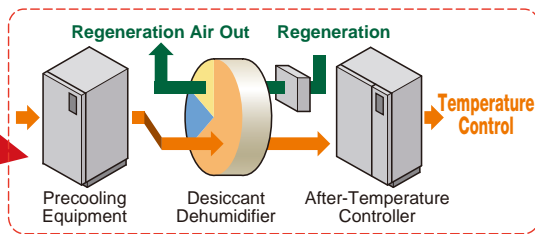
-60°C
Dew Point

Carefree
2-year
Warranty
on the Refrigerant Circuit

* Warranty period of the refrigerant circuit is 2 years from the date of purchase (or 10,000 hours of operating time).



All-in-One Design for Improved Space-Savings



Ultra-low Dew Point

Achieves a discharge dew point of $-60\text{ }^{\circ}\text{C}$.

High Precision Temperature Control (Supply-Side)

Temperature Control of $\pm 0.5\text{ }^{\circ}\text{C}$

Space Saving

Precooler, dehumidifier, and after-temperature controller in a single unit.

Energy Saving

The dew point control offers both low humidity and energy savings.

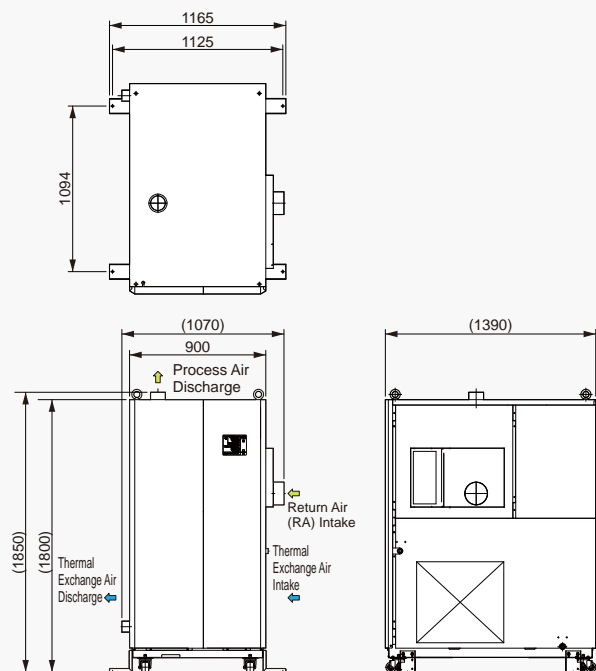
Specifications

| | Model | DPU02A |
|-----------------------------|--|--|
| Performance Specifications | Supply Air (SA) Dew Point ¹ | $^{\circ}\text{C}$ -60 or less |
| | SA Set Temp Setting Range | $^{\circ}\text{C}$ 23 to 27 |
| | SA Temp Precision ² | $^{\circ}\text{C}$ ± 0.5 |
| Environmental Conditions | Processing Airflow | m^3/min 1.0 to 2.5 |
| | Outside Air Conditions | $^{\circ}\text{C}, \%$ 15 to 30, 30 to 60 |
| | Process Air Outlet | $^{\circ}\text{C}/\text{h}$ Within ± 1 |
| External Dimensions | Regeneration Air Outlet | $\%/h$ Within ± 5 |
| | External Dimensions | mm 1850x1390x1070 |
| | Product Mass | kg (500) |
| Power Specific | Process Air Discharge | mm $\varnothing 98$ |
| | Process Air Intake | mm $\varnothing 148$ |
| | Regeneration Air Outlet | mm $\varnothing 74$ |
| | Power Supply | V(Hz) Three-phase 200 \pm 10 % (50/60) |
| Dehumidification Method | Power Consumption | kW (6.3) |
| | Current | A (20) |
| | Power Supply Capacity | kVA (9.0) |
| | Dehumidification Method | Refrigeration + desiccant dehumidification |
| Temp Control Method | Heat Pump Balance Control (Super Reheat Spec.) | |
| Legal Refrigeration Tonnage | 1.11 | |
| Refrigerant | R-410A | |
| Refrigerant Filling Volume | kg 1.2 | |
| Compressor Output | kW 1.7 | |

¹ No load, capacity when operating at a circulation rate of $2\text{ m}^3/\text{min}$. ² When the intake air temperature and humidity are stable, at one point at the discharge point, at controller display-value precision.

*Dew point control is achieved by changing the desiccant rotor regeneration air temperature.

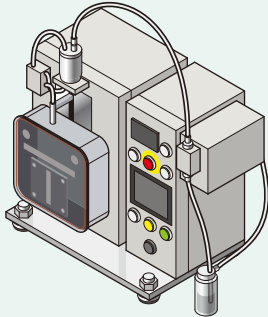
External Dimensions (units: mm)



Lithium-ion Cell Research and Development Use Example

Electrolyte Injection Machine

Machine that injects electrolyte into cells



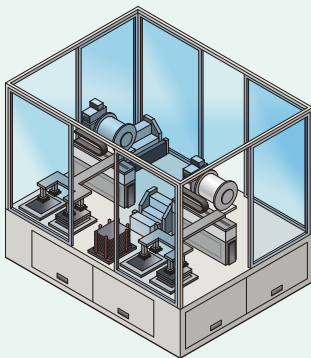
Inspection Glovebox

Used for electrolyte dispensing, handling of sulfur-based solid electrolytes, or sample production for analysis.



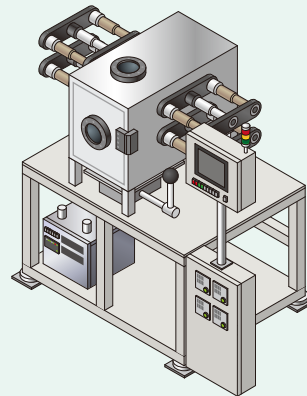
Laminating Machine for Research or Inspection

The laminating machine quickly and precisely layers separator material between the cathode and anode electrodes of lithium-ion cells.



Degas Sealing

A device that releases gas generated during the initial charge of a cell and then re-seals it.



Also used in research and development of next-generation "all-solid-state batteries".



What are All-Solid-State Batteries?

All-solid-state batteries are batteries where the anode, electrolyte, and cathode are all solid materials. These batteries combine safety, energy density, lifespan, and wide operating temperature ranges, and are expected to be the ultimate next-generation battery technology.

Example of use

Lithium-ion battery research and development (electrode material preparation, electrode coating and drying, electrolyte injection, etc.), all-solid-state battery research and development (oxide-based inorganic solid electrolyte and polymer electrolyte), etc.

ORION's Energy Saving Air Processing System Proposal Energy Saving Dry Room System

System Improvement with a Localized Low-Humidity Space and Energy Saving Design

The localized low humidity space provided by our Dry Glovebox can also meet user demands and improve upon existing systems. The chamber itself can be separate from dry air supply equipment. Ask your ORION dealer for details.

Dry Glove Box Specification

| | |
|-------------------------------|--------------|
| Temperature Setting Range | 23 to 27 °C |
| Temperature Control Precision | ±0.5 °C |
| Box Volume | 90 to 1500 L |
| Target Dew Point Range | Below -60 °C |



For your inspection or production line process.



ORION also has dry room system proposals for even larger workspaces.

Examples of Installation A System Design Not Limited to Dry Rooms



ORION's Energy Saving Air Processing System Proposal

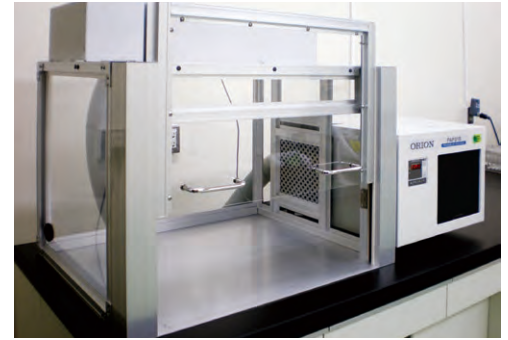
Compact Panel System

ORION Has System Proposals Built Around the PAP Series to Meet All of Your Needs

System Proposals that Fit in the Range of About 33 m².



Chromatograph



Compact Tabletop Chamber



Constant Temperature, Constant Humidity Room



Example of Internal Air Discharge



Example of Internal Air Discharge



3D Measurement Room



Example of External Air Intake

ORION's Energy Saving Air Processing System Proposal Clean Booth

ORION Has System Proposals Built Around the PAP Series to Meet All of Your Needs

Orion offers systems that offer localized precision air processing and localized cleaning.

ORION's original functionality gives improved reliability. With our wide selection, we have the booth that meets your needs. Orion offers systems that offer localized precision air processing and localized cleaning.



Clean Booth System Examples

Temperature and Humidity Control Clean Booth

Temperature and Humidity Control Type with HEPA Filter

| Effective Range | |
|-------------------|---|
| Temperature | ○ |
| Humidity | ○ |
| Cleanliness class | ○ |



Temperature Control Booth

Temperature Control Type Configuration

| Effective Range | |
|-------------------|---|
| Temperature | ○ |
| Humidity | × |
| Cleanliness class | × |



Section Clean Fan Filter Unit

Light duty to heavy duty (high airflow) models available for every application.



Built in AC Motor

1 Made with Mirror Polished Stainless Steel for Excellent Chemical and Corrosion Resistance
Wide ranging applications include electronics, biotechnology, food service, optics, experimentation and research.

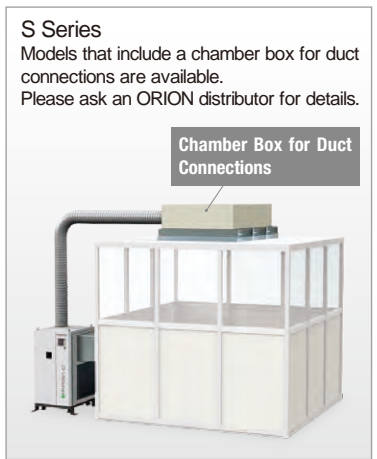
2 Illuminated Filter
LED indicator shows operating conditions.
(Not available on MAC-IIA-10 models.)

3 Full Lineup
S Series: Chamber box for duct connection available.

Specifications

| Model | 100V | MAC-IIA-10 | MAC-IIA-31 | MAC-IIA-51 | | MAC-IIA-100 | MAC-IIA-150 | MAC-IIA-250 |
|-----------------------------------|---|-------------------------|--|---------------------|---------------|----------------|----------------|----------------|
| | 200V | | | | MAC-IIA-51-21 | MAC-IIA-100-21 | MAC-IIA-150-21 | MAC-IIA-250-21 |
| Dust Collection Efficiency | Over 99.99 % of particulate of 0.3 μm or larger (at atmospheric pressure) | | | | | | | |
| Dust Collection Main Filter | HEPA filter | | | | | | | |
| Filter Elements | Pre-filter | Non-woven fabric filter | | Processed saran net | | | | |
| Rated Processing Airflow (m³/min) | Approx. 1.0/0.8 | Approx. 3.0/3.5 | Approx. 4.5/5.4 | Approx. 4.5/5.1 | Approx. 10.0 | Approx. 15.0 | Approx. 25.0 | |
| Airflow Wind Speed (m/sec) | Avg.: 0.36/0.29 | Avg.: 0.38/0.44 | Avg.: 0.35/0.42 | Avg.: 0.35/0.39 | Avg.: 0.51 | Avg.: 0.37 | Avg.: 0.61 | |
| Noise (dBA) | Approx. 51/49 | Approx. 53/55 | Approx. 53/55 | Approx. 51/53 | Approx. 56/57 | Approx. 56/57 | Approx. 59/59 | |
| Power Supply | Single-phase AC 100 V, 50/60 Hz | | Single-phase AC 100 V, 50/60 Hz or Single-phase AC 200 V, 50/60 Hz | | | | | |
| Power Consumption (W) | 35/40 | 29/37 | 50 | 53/63 | 98/114 | 141/157 | 190/230 | |
| Blower Fan | AC Motor | | | | | | | |
| Number of Blower Fans | 1 | 1 | 1 | 1 | 1 | 1 | 2 | |
| Product Mass (kg) | Approx. 4 | Approx. 6.5 | Approx. 11.5 | Approx. 11.5 | Approx. 14.5 | Approx. 22.0 | Approx. 25.0 | |
| Construction | Body: SUS430 with mirror finish | | | | | | | |
| Operating Indicator Lamp | High luminosity LED * With Illuminated filter | | | | | | | |
| Accessories | Includes sponge gasket to seal the perimeter of the air outlet port. | | | | | | | |

* Noise level measured at 1 m from the air outlet port in an anechoic room.



External Dimensions (units: mm)

MAC-IIA-10

Power Cord, Pre-Filter, Switch (Includes circuit protector.), AC Motor X1, Main Filter, Insert-Nut for Equipment Installation, Operating Indicator Lamp, Bottom View, Lathing (Downstream side only).

MAC-IIA-31

Power Cord, Pre-Filter, Switch (Includes circuit protector.), AC Motor X1, Main Filter, Insert-Nut for Equipment Installation (M4×4), Operating Indicator Lamp, Bottom View, Lathing (Downstream side only).

MAC-IIA-51 MAC-IIA-100

Power Cord, Pre-Filter, Switch (Includes circuit protector.), AC Motor X1, Main Filter, Insert-Nut for Equipment Installation (M4×4), Operating Indicator Lamp, Bottom View, Lathing (Downstream side only).

MAC-IIA-150 MAC-IIA-250

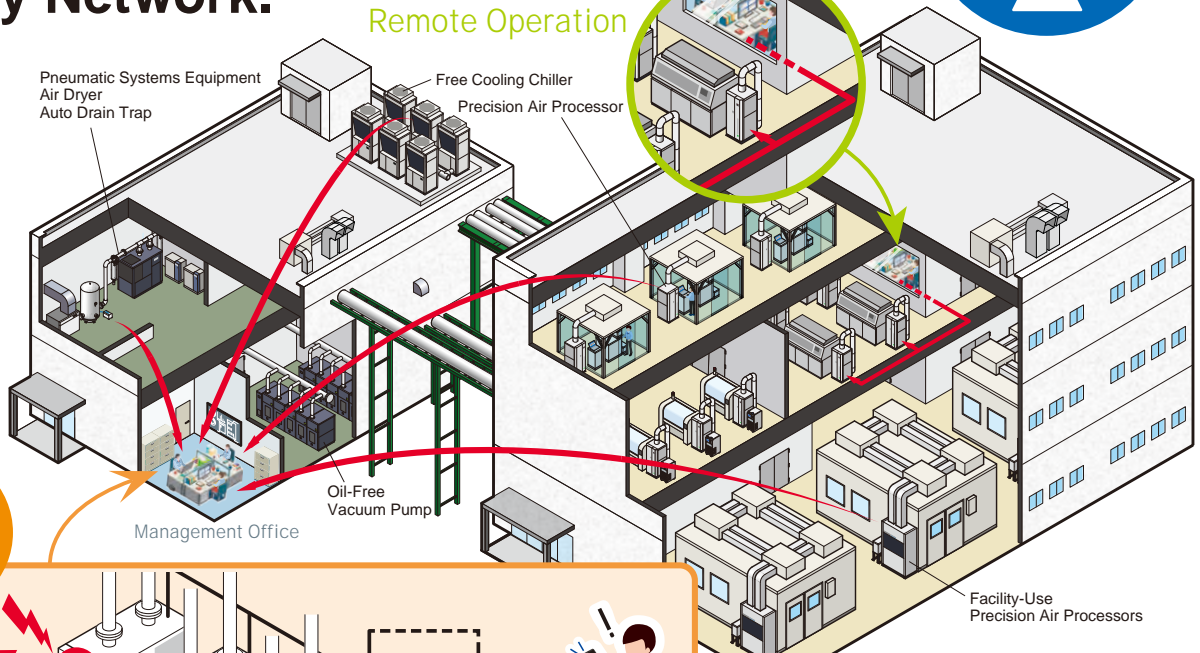
Power Cord, Pre-Filter X1, Pre-Filter X2, Switch (Includes circuit protector.), AC Motor X1, Main Filter, Insert-Nut for Equipment Installation (M4×8), Operating Indicator Lamp, Bottom View, Lathing (Downstream side only).

| Models | W | W1 | D | D1 |
|-------------|-----|-----|-----|-----|
| MAC-IIA-51 | 500 | 460 | 500 | 470 |
| MAC-IIA-100 | 610 | 570 | 610 | 580 |

Remote Monitoring and Remote Operation of ORION Products Introducing the ORION IoT System



Our proposal for a safe and trustworthy IoT System that won't leak information because it's based on your Internal Factory Network.



Remote Operation



For LAN-Equipped Facilities

The ORION IoT System is the solution to your troubles!

Alert notification

| Precision Air Processor | Outside-Air Air Processor |
|---|--|
| PAP(-C) Series | AEC Series |
| <ul style="list-style-type: none"> Monitoring Data Collection* Communication | <ul style="list-style-type: none"> Monitoring Data Collection Communication |

* For serial communication connections.
PAP Series (excluding 01B, 03B, D, L models)
When connecting to the (optional) LAN Board
PAP-C Series (excluding 03C models)

For users who want an overview of operating conditions... Contact-State Monitoring Software

Includes Mail-Alert Functionality

Need to walk to the site every day in order to check the operating state of your equipment? Alarms not enough to get your attention?

If only I didn't have to actually go there just to check the operating state!

Monitoring of product operating states from remote sites is possible. Can be used as long as contact outputs are non-voltage contacts. Get email alerts when alarms occur! Getting alerts while away from the PC gives peace of mind!

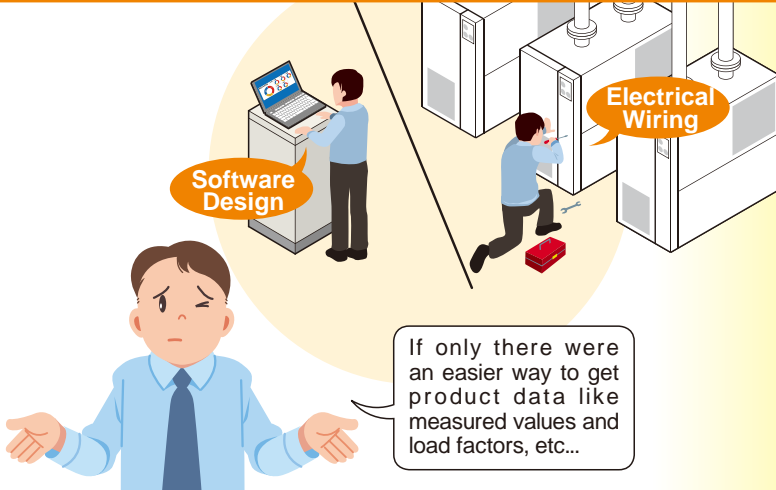
Checking operating states is easy! Mail alerts for alarm conditions give peace of mind when away from the site.



For users who want an easy way to collect operation data.

Operation Data Acquisition Software

✉ Includes Mail-Alert Functionality



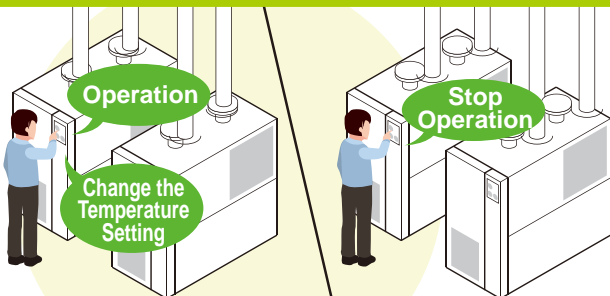
Can perform CSV-format logging of product operation status. Data graphing software is available as a free download and offers ease of use and peace of mind!

Data can be viewed from other PCs or tablets through the Internet.



For users who would like to perform operation and setting changes remotely!

ORION Communication Software



Run/Stop operations are possible from remote locations. And temperature settings can also be changed.

Run/Stop and other operations are easier!

Need to walk to the factory each time to start and stop operation...

If only I didn't have to go all the way to the site just to start or stop operation...

How to Download our IoT Software

STEP1

Visit our website.



ORION IoT system

<https://www.orionkikai.co.jp/download/iot/>

STEP2

Confirm the download you need from the list of software.

* See our IoT Introduction Page to check for compatible models and converters.

STEP3

Perform the registration process, enter the product model number and serial number.



Download Complete

Note that our software is only offered in Japanese.

Operation with non-Japanese operating systems has not been confirmed. Please refer to the instruction manual for required equipment and specifications.

Technical Data




■ Air Processor Model Choice Considerations

We at ORION would like to help you make the optimum air processor choice to best match your air processing use-targets and conditions. And in addition to helping our customers choose an air processor, we would also like to offer system proposals that also include the process-air target space (booth). Feel free to contact us with any inquiries. We have various series of products to suit particular air processing needs.

| Purpose | Series |
|--|--|
| <p>Need to maintain uniform temperature in the target space.</p> <p>Need to provide a constant supply of uniform temperature air to the target space.</p> | <p>PAP Temperature Control Series (See pages 15 to 18.)</p> <p>* See the graph on page 5 for the controllable range of the integrated temperature control type models.</p> <p>PAP ORION PRECISION AIR PROCESSOR SERIES eco₂ SUPER ORION</p> |
| <p>Need to maintain uniform temperature and humidity in the target space.</p> <p>Need to provide a constant supply of air at a uniform temperature and humidity to the target space.</p> | <p>PAP Temperature and Humidity Control Series (See pages 19 to 23.)</p> <p>PAP ORION PRECISION AIR PROCESSOR SERIES eco₂ SUPER ORION</p> |
| <p>Need to supply clean air at a constant temperature (humidity) to the target space.</p> | <p>We have a lineup of air processors that come standard equipped with built-in HEPA filters.</p> <p>Model Example: PAP20C-<u>F</u>W</p> <p style="text-align: center;">↑ F : HEPA filter built-in spec.</p> <p>* Please consult your dealer regarding model lineups that do not come with built-in HEPA filters.</p> <p>PAP ORION PRECISION AIR PROCESSOR SERIES eco₂ SUPER ORION</p> |
| <p>Need to supply low-temperature air to the target space.</p> | <p>PAP-L Series (See pages 24.)</p> <p>PAP L ORION PRECISION AIR PROCESSOR SERIES eco₂ SUPER ORION</p> |
| <p>Need to lower the humidity of the target space (at a constant temperature)</p> | <p>PAP-D Series (See pages 25 and 26.)</p> <p>* The DPU02A model is also available which can supply air with ultra-low dew point (dew point: -60 °C).</p> <p>PAP D ORION PRECISION AIR PROCESSOR SERIES eco₂ SUPER ORION</p> |
| <p>Would like to use dehumidified and temperature-controlled outside air for ventilation.</p> | <p>AEC Series (See pages 41 to 44.)</p> <p>Fresh Eco Cube</p> <p>Outside-Air Air Processor AEC Series</p> |

■ Integrated Model with Remote Condenser Type

Lineup of R Series Precision Air Processors with remote condenser type (separate indoor and outdoor units) also available. Integrated models with other PAP series also available.

| | |
|--|---|
| <p>Remote Condenser Type R Series (See pages 29 to 40)</p>  | <p>Requires installation of piping between indoor and outdoor units. Heat output is released outside the room via the outdoor unit.</p> |
| <p>Integrated Water-Cooled Type</p>  | <p>Requires installation of cooling water piping. Heat output is released via cooling water. *</p> |
| <p>Integrated Air-Cooled Type</p>  | <p>Does not require installation of refrigerant piping or cooling water piping. Heat output is released into the air surrounding the air processor. *</p> |

ORION Precision Air Processors employ heat pump balance control which features lower heat output.

■ About Airflow

Providing tighter temperature profiles for the inside of constant-temperature chambers requires an increase in flow rate. This is to dampen the effects of the cooling and heating load from intake air, etc. And in case of cleanrooms, the airflow required will depend on the degree of the cleanliness of the cleanroom. The airflow may be expressed in terms of air change rate. The air change rate is an airflow rate equivalent to the number of times in one hour that a volume of air equal to the volume of air in the target air space is exchanged.

Calculation: $N = F \times 60 \div V$

N: Air Change Rate (times/h) **F:** Flow Rate (m³/min) **V:** Volume of Air in the Target Air Space (m³)

The range of airflow rate (rated processing airflow) is determined for each model of air processor. Therefore, the amount of air processing required for a particular target air space is one factor in determining the selection of an air processor.

Technical Data

■ Power Calculations Required for Air Processors

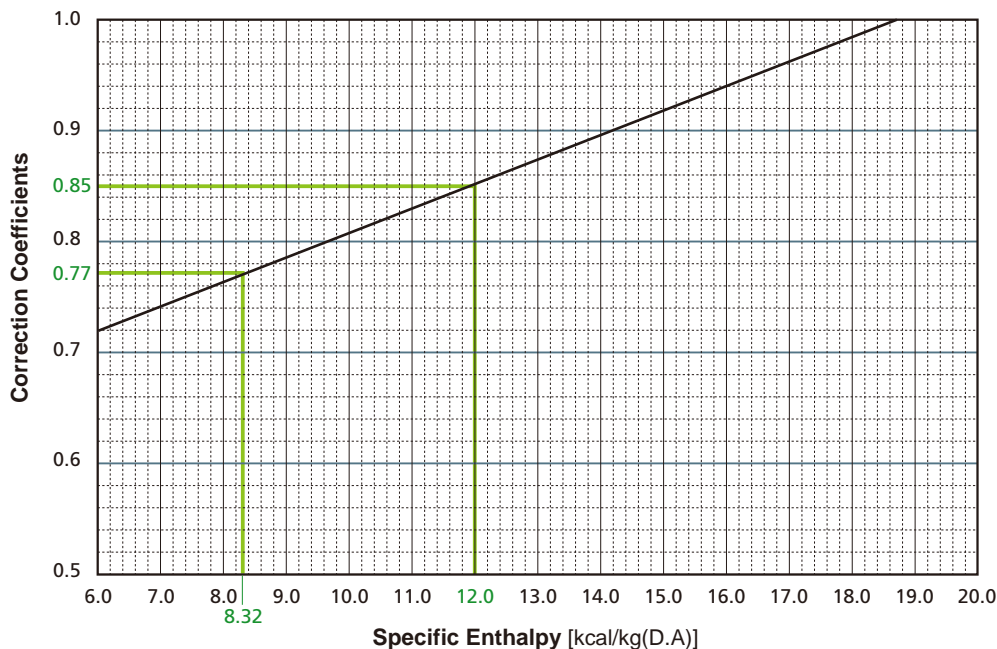
It is possible to calculate the required capacity of the air processor using the following calculation, given the air temperature and humidity of the air going into the air processor, and the desired air temperature, humidity, and flow rate required for the air leaving the air processor. Please contact us directly if a product that meets the required airflow and cooling capacity, etc. is not found in the catalog.

* Cooling capacity specifications noted in the catalog are typical values based on certain operating conditions. Corrections based on intake air conditions may be required.

* This document uses kcal as the unit of thermal energy.

The SI unit conversion is 1 kcal = 4.1868 kJ

[Cooling and Heating Capacity] Intake Air Correction Chart



* Indicates the cooling capacity correction coefficient under the super re-heat specification.

* Use the correction charts on page 33 for constant temperature (constant humidity) facility-use R-Series models.

* Note that correction coefficients will differ for PAP-D Series models (dehumidification), PAP-L Series models (low temperature), AP750, and AP1500 Series models. Please consult your dealer for details.

Calculation Example 1: Necessary cooling capacity based on cooling and dehumidification requirements of intake air:

[Conditions]

Air Processor Intake Air: 27 °C, 60%

Processing Airflow: 10 m³/min

Air Processor Discharge Air: 23 °C, 50%

Calculation for required cooling capacity:

$$\text{Calculation: } Q = (i_2 - i_1) \times 1.2 \times F \times 60 \div 860$$

Q: Cooling capacity in kW (1 kW = 860 kcal/h) **i₂:** Intake air specific enthalpy (kcal/kg)

i₁: The specific enthalpy (kcal/kg) at the intake air dew point temperature / 100%

1.2: Specific gravity of air (kg/m³), **F:** Airflow (m³/min)

Look up the specific enthalpy of the intake air temperature and humidity of 27 °C at 60% in the "**Specific Enthalpy Chart**" on page 59.

i2 = 14.66

Look up the dew point temperature of the discharge air temperature and humidity of 23 °C at 50% in the "**Dew Point Temperature Chart**" on page 59.

Dew Point Temperature: 12 °C

Look up the enthalpy of 12 °C at 100% in the "**Specific Enthalpy Chart**" on page 59

i1 = 8.14

Calculate the cooling capacity based on the formula.

Q = (14.66 - 8.14) × 1.2 × 10 × 60 ÷ 860 ≈ 5.6 kW

*It is important to include a fair amount of leeway when choosing air processor power based on calculated results

Calculation Example 2: Required heating capacity (without humidification) based on rising intake air temperature:

[Conditions]

Air Processor Intake Air: 18 °C

Processing Airflow: 10 m³/min

Air Processor Discharge Air: 25 °C

Calculation for required heating capacity:

* Calculation only for change in temperature (without heating or dehumidification)

Calculation: Q = F × 60 × 1.2 × 0.24 × (t₁ - t₂) ÷ 860

Q: Heating Power kW (1 kW = 860 kcal/h), **F:** Airflow (m³/min), **1.2:** Specific Gravity of Air (kg/m³)
0.24: Specific Heat of Air (kcal/kg·°C), **t₁:** Discharge Air Temp (°C), **t₂:** Intake Air Temp (°C)

Calculate the heating capacity based on the formula.

Q = 10 × 60 × 1.2 × 0.24 × (25 - 18) ÷ 860 ≈ 1.4 kW

*It is important to include a fair amount of leeway when choosing air processor power based on calculated results

Calculation Example 3: Necessary humidification capacity to humidify intake air:

[Conditions]

Air Processor Intake Air: 18 °C, 35%

Processing Airflow: 10 m³/min

Air Processor Discharge Air: 25 °C, 50%

Calculation for required cooling capacity:

Calculation: X = (x₁ - x₂) × 1.2 × F × 60

X: Humidification Power (kg/h), **x₁:** Specific humidity of discharge air (kg/kg)
x₂: Specific humidity of intake air (kg/kg), **1.2:** Specific gravity of air (kg/m³), **F:** Airflow (m³ /min)

Look up the specific humidity of discharge air of 25 °C at 50% in the "**Specific Humidity Chart**" on page 60.

x1 = 0.00988 kg/kg

Look up the specific humidity of intake air of 18 °C at 35% in the "**Specific Humidity Chart**" on page 60.

x2 = 0.00447 kg/kg

Calculate the humidification power based on the formula.

X = (0.00988 - 0.00447) × 1.2 × 10 × 60 ≈ 3.9 kg/h

* It is important to include a fair amount of leeway when choosing air processor power based on calculated results

* When considering the required amount of humidification, it is also important to consider the dehumidification capacity.

Technical Data

Dew point Temperature Chart (°C)

| Temperature(°C) | Relative Humidity | | | | | | | | | | | | | | |
|-----------------|-------------------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 20% | 25% | 30% | 35% | 40% | 45% | 50% | 55% | 60% | 65% | 70% | 75% | 80% | 85% | 90% |
| 5 | -16.1 | -13.4 | -11.1 | -9.2 | -7.5 | -5.9 | -4.5 | -3.3 | -2.1 | -1.0 | 0.0 | 0.9 | 1.8 | 2.7 | 3.5 |
| 6 | -15.3 | -12.5 | -10.3 | -8.3 | -6.6 | -5.0 | -3.6 | -2.3 | -1.2 | -0.1 | 0.9 | 1.9 | 2.8 | 3.7 | 4.5 |
| 7 | -14.4 | -11.7 | -9.4 | -7.4 | -5.7 | -4.1 | -2.7 | -1.4 | -0.2 | 0.9 | 1.9 | 2.9 | 3.8 | 4.6 | 5.5 |
| 8 | -13.6 | -10.8 | -8.5 | -6.5 | -4.8 | -3.2 | -1.8 | -0.5 | 0.7 | 1.8 | 2.9 | 3.8 | 4.8 | 5.6 | 6.5 |
| 9 | -12.8 | -10.0 | -7.6 | -5.6 | -3.9 | -2.3 | -0.9 | 0.4 | 1.7 | 2.8 | 3.8 | 4.8 | 5.7 | 6.6 | 7.4 |
| 10 | -11.9 | -9.1 | -6.8 | -4.7 | -3.0 | -1.4 | 0.1 | 1.4 | 2.6 | 3.7 | 4.8 | 5.8 | 6.7 | 7.6 | 8.4 |
| 11 | -11.1 | -8.3 | -5.9 | -3.9 | -2.1 | -0.5 | 1.0 | 2.3 | 3.5 | 4.7 | 5.7 | 6.7 | 7.7 | 8.6 | 9.4 |
| 12 | -10.3 | -7.4 | -5.0 | -3.0 | -1.2 | 0.4 | 1.9 | 3.2 | 4.5 | 5.6 | 6.7 | 7.7 | 8.6 | 9.5 | 10.4 |
| 13 | -9.4 | -6.5 | -4.2 | -2.1 | -0.3 | 1.4 | 2.8 | 4.2 | 5.4 | 6.6 | 7.7 | 8.7 | 9.6 | 10.5 | 11.4 |
| 14 | -8.6 | -5.7 | -3.3 | -1.2 | 0.6 | 2.3 | 3.7 | 5.1 | 6.4 | 7.5 | 8.6 | 9.6 | 10.6 | 11.5 | 12.4 |
| 15 | -7.8 | -4.8 | -2.4 | -0.3 | 1.5 | 3.2 | 4.7 | 6.0 | 7.3 | 8.5 | 9.6 | 10.6 | 11.6 | 12.5 | 13.4 |
| 16 | -6.9 | -4.0 | -1.5 | 0.6 | 2.4 | 4.1 | 5.6 | 7.0 | 8.2 | 9.4 | 10.5 | 11.6 | 12.5 | 13.5 | 14.4 |
| 17 | -6.1 | -3.1 | -0.7 | 1.4 | 3.3 | 5.0 | 6.5 | 7.9 | 9.2 | 10.4 | 11.5 | 12.5 | 13.5 | 14.5 | 15.3 |
| 18 | -5.3 | -2.3 | 0.2 | 2.3 | 4.2 | 5.9 | 7.4 | 8.8 | 10.1 | 11.3 | 12.4 | 13.5 | 14.5 | 15.4 | 16.3 |
| 19 | -4.4 | -1.5 | 1.0 | 3.2 | 5.1 | 6.8 | 8.3 | 9.8 | 11.1 | 12.3 | 13.4 | 14.5 | 15.5 | 16.4 | 17.3 |
| 20 | -3.6 | -0.6 | 1.9 | 4.1 | 6.0 | 7.7 | 9.3 | 10.7 | 12.0 | 13.2 | 14.4 | 15.4 | 16.4 | 17.4 | 18.3 |
| 21 | -2.8 | 0.2 | 2.8 | 5.0 | 6.9 | 8.6 | 10.2 | 11.6 | 12.9 | 14.2 | 15.3 | 16.4 | 17.4 | 18.4 | 19.3 |
| 22 | -2.0 | 1.1 | 3.6 | 5.8 | 7.8 | 9.5 | 11.1 | 12.5 | 13.9 | 15.1 | 16.3 | 17.4 | 18.4 | 19.4 | 20.3 |
| 23 | -1.1 | 1.9 | 4.5 | 6.7 | 8.7 | 10.4 | 12.0 | 13.5 | 14.8 | 16.1 | 17.2 | 18.3 | 19.4 | 20.3 | 21.3 |
| 24 | -0.3 | 2.8 | 5.4 | 7.6 | 9.6 | 11.3 | 12.9 | 14.4 | 15.8 | 17.0 | 18.2 | 19.3 | 20.3 | 21.3 | 22.3 |
| 25 | 0.5 | 3.6 | 6.2 | 8.5 | 10.5 | 12.2 | 13.9 | 15.3 | 16.7 | 18.0 | 19.1 | 20.3 | 21.3 | 22.3 | 23.2 |
| 26 | 1.3 | 4.5 | 7.1 | 9.4 | 11.4 | 13.2 | 14.8 | 16.3 | 17.6 | 18.9 | 20.1 | 21.2 | 22.3 | 23.3 | 24.2 |
| 27 | 2.1 | 5.3 | 8.0 | 10.2 | 12.3 | 14.1 | 15.7 | 17.2 | 18.6 | 19.9 | 21.1 | 22.2 | 23.3 | 24.3 | 25.2 |
| 28 | 3.0 | 6.1 | 8.8 | 11.1 | 13.1 | 15.0 | 16.6 | 18.1 | 19.5 | 20.8 | 22.0 | 23.2 | 24.2 | 25.2 | 26.2 |
| 29 | 3.8 | 7.0 | 9.7 | 12.0 | 14.0 | 15.9 | 17.5 | 19.0 | 20.4 | 21.8 | 23.0 | 24.1 | 25.2 | 26.2 | 27.2 |
| 30 | 4.6 | 7.8 | 10.5 | 12.9 | 14.9 | 16.8 | 18.4 | 20.0 | 21.4 | 22.7 | 23.9 | 25.1 | 26.2 | 27.2 | 28.2 |

Specific Enthalpy Chart (kcal/kg) 1 kcal = 4.1868 kJ

| Temperature(°C) | Relative Humidity | | | | | | | | | | | | | | |
|-----------------|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| | 20% | 25% | 30% | 35% | 40% | 45% | 50% | 55% | 60% | 65% | 70% | 75% | 80% | 100% | |
| 5 | 1.84 | 2.00 | 2.17 | 2.33 | 2.49 | 2.65 | 2.81 | 2.97 | 3.14 | 3.30 | 3.46 | 3.62 | 3.79 | 4.44 | |
| 6 | 2.13 | 2.30 | 2.48 | 2.65 | 2.82 | 3.00 | 3.17 | 3.34 | 3.52 | 3.69 | 3.87 | 4.04 | 4.22 | 4.92 | |
| 7 | 2.42 | 2.61 | 2.79 | 2.98 | 3.16 | 3.35 | 3.54 | 3.72 | 3.91 | 4.10 | 4.28 | 4.47 | 4.66 | 5.41 | |
| 8 | 2.71 | 2.91 | 3.11 | 3.31 | 3.51 | 3.71 | 3.91 | 4.11 | 4.31 | 4.51 | 4.71 | 4.91 | 5.11 | 5.92 | |
| 9 | 3.01 | 3.22 | 3.44 | 3.65 | 3.86 | 4.08 | 4.29 | 4.51 | 4.72 | 4.94 | 5.15 | 5.37 | 5.58 | 6.45 | |
| 10 | 3.31 | 3.54 | 3.77 | 4.00 | 4.22 | 4.45 | 4.68 | 4.91 | 5.14 | 5.37 | 5.60 | 5.83 | 6.07 | 6.99 | |
| 11 | 3.61 | 3.86 | 4.10 | 4.35 | 4.59 | 4.84 | 5.08 | 5.33 | 5.58 | 5.82 | 6.07 | 6.32 | 6.56 | 7.56 | |
| 12 | 3.92 | 4.18 | 4.44 | 4.71 | 4.97 | 5.23 | 5.49 | 5.76 | 6.02 | 6.28 | 6.55 | 6.81 | 7.08 | 8.14 | |
| 13 | 4.23 | 4.51 | 4.79 | 5.07 | 5.35 | 5.63 | 5.91 | 6.20 | 6.48 | 6.76 | 7.04 | 7.33 | 7.61 | 8.75 | |
| 14 | 4.55 | 4.85 | 5.15 | 5.45 | 5.75 | 6.05 | 6.35 | 6.65 | 6.95 | 7.25 | 7.55 | 7.86 | 8.16 | 9.38 | |
| 15 | 4.87 | 5.19 | 5.51 | 5.83 | 6.15 | 6.47 | 6.79 | 7.11 | 7.43 | 7.76 | 8.01 | 8.40 | 8.73 | 10.03 | |
| 16 | 5.20 | 5.54 | 5.88 | 6.22 | 6.56 | 6.90 | 7.25 | 7.59 | 7.93 | 8.28 | 8.62 | 8.97 | 9.32 | 10.71 | |
| 17 | 5.53 | 5.89 | 6.25 | 6.62 | 6.98 | 7.35 | 7.71 | 8.08 | 8.45 | 8.82 | 9.19 | 9.56 | 9.93 | 11.42 | |
| 18 | 5.86 | 6.25 | 6.64 | 7.03 | 7.41 | 7.80 | 8.20 | 8.59 | 8.98 | 9.37 | 9.77 | 10.16 | 10.56 | 12.15 | |
| 19 | 6.20 | 6.62 | 7.03 | 7.44 | 7.86 | 8.28 | 8.69 | 9.11 | 9.53 | 9.95 | 10.37 | 10.79 | 11.21 | 12.92 | |
| 20 | 6.55 | 6.99 | 7.43 | 7.87 | 8.32 | 8.76 | 9.20 | 9.65 | 10.10 | 10.54 | 10.99 | 11.44 | 11.90 | 13.71 | |
| 21 | 6.90 | 7.37 | 7.84 | 8.31 | 8.78 | 9.26 | 9.73 | 10.21 | 10.68 | 11.16 | 11.64 | 12.12 | 12.60 | 14.54 | |
| 22 | 7.26 | 7.76 | 8.26 | 8.76 | 9.27 | 9.77 | 10.27 | 10.78 | 11.29 | 11.80 | 12.31 | 12.82 | 13.33 | 15.40 | |
| 23 | 7.63 | 8.16 | 8.69 | 9.23 | 9.76 | 10.30 | 10.84 | 11.38 | 11.92 | 12.46 | 13.00 | 13.55 | 14.10 | 16.30 | |
| 24 | 8.00 | 8.57 | 9.13 | 9.70 | 10.27 | 10.84 | 11.42 | 11.99 | 12.57 | 13.14 | 13.72 | 14.31 | 14.89 | 17.24 | |
| 25 | 8.38 | 8.98 | 9.59 | 10.19 | 10.80 | 11.40 | 12.01 | 12.63 | 13.24 | 13.86 | 14.47 | 15.09 | 15.71 | 18.22 | |
| 26 | 8.77 | 9.41 | 10.05 | 10.69 | 11.34 | 11.98 | 12.63 | 13.28 | 13.94 | 14.59 | 15.25 | 15.91 | 16.57 | 19.24 | |
| 27 | 9.17 | 9.85 | 10.53 | 11.21 | 11.90 | 12.58 | 13.27 | 13.97 | 14.66 | 15.36 | 16.06 | 16.76 | 17.47 | 20.31 | |
| 28 | 9.57 | 10.29 | 11.02 | 11.74 | 12.47 | 13.20 | 13.94 | 14.67 | 15.41 | 16.15 | 16.90 | 17.65 | 18.40 | 21.43 | |
| 29 | 9.99 | 10.75 | 11.52 | 12.29 | 13.06 | 13.84 | 14.62 | 15.40 | 16.19 | 16.98 | 17.77 | 18.57 | 19.37 | 22.59 | |
| 30 | 10.41 | 11.22 | 12.04 | 12.86 | 13.68 | 14.50 | 15.33 | 16.16 | 17.00 | 17.84 | 18.68 | 19.53 | 20.38 | 23.81 | |
| 31 | 10.85 | 11.71 | 12.57 | 13.44 | 14.31 | 15.19 | 16.07 | 16.95 | 17.84 | 18.73 | 19.63 | 20.53 | 21.43 | 25.09 | |
| 32 | 11.29 | 12.20 | 13.12 | 14.04 | 14.96 | 15.89 | 16.83 | 17.77 | 18.71 | 19.66 | 20.61 | 21.57 | 22.53 | 26.43 | |
| 33 | 11.74 | 12.71 | 13.68 | 14.66 | 15.64 | 16.63 | 17.62 | 18.62 | 19.62 | 20.63 | 21.64 | 22.66 | 23.68 | 27.82 | |
| 34 | 12.21 | 13.23 | 14.26 | 15.30 | 16.34 | 17.39 | 18.44 | 19.50 | 20.56 | 21.63 | 22.71 | 23.79 | 24.88 | 29.29 | |
| 35 | 12.68 | 13.77 | 14.86 | 15.96 | 17.06 | 18.17 | 19.29 | 20.41 | 21.54 | 22.68 | 23.82 | 24.97 | 26.13 | 30.82 | |



Specific Humidity Chart (kg/kg)

| Temperature(°C) | Relative Humidity | | | | | | | | | | | | |
|-----------------|-------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | 20% | 25% | 30% | 35% | 40% | 45% | 50% | 55% | 60% | 65% | 70% | 75% | 80% |
| 1 | 0.00081 | 0.00101 | 0.00121 | 0.00142 | 0.00162 | 0.00182 | 0.00203 | 0.00223 | 0.00243 | 0.00263 | 0.00284 | 0.00304 | 0.00324 |
| 2 | 0.00087 | 0.00108 | 0.00131 | 0.00152 | 0.00174 | 0.00196 | 0.00217 | 0.00240 | 0.00261 | 0.00283 | 0.00305 | 0.00327 | 0.00348 |
| 3 | 0.00093 | 0.00117 | 0.00140 | 0.00163 | 0.00187 | 0.00210 | 0.00234 | 0.00257 | 0.00281 | 0.00304 | 0.00328 | 0.00351 | 0.00375 |
| 4 | 0.00100 | 0.00125 | 0.00150 | 0.00176 | 0.00200 | 0.00226 | 0.00251 | 0.00276 | 0.00301 | 0.00326 | 0.00351 | 0.00377 | 0.00402 |
| 5 | 0.00108 | 0.00135 | 0.00161 | 0.00188 | 0.00215 | 0.00242 | 0.00269 | 0.00296 | 0.00323 | 0.00350 | 0.00377 | 0.00404 | 0.00431 |
| 6 | 0.00116 | 0.00144 | 0.00173 | 0.00202 | 0.00231 | 0.00260 | 0.00289 | 0.00317 | 0.00347 | 0.00376 | 0.00404 | 0.00434 | 0.00462 |
| 7 | 0.00124 | 0.00155 | 0.00185 | 0.00216 | 0.00247 | 0.00279 | 0.00309 | 0.00340 | 0.00371 | 0.00403 | 0.00433 | 0.00465 | 0.00496 |
| 8 | 0.00132 | 0.00165 | 0.00199 | 0.00232 | 0.00264 | 0.00298 | 0.00332 | 0.00364 | 0.00397 | 0.00431 | 0.00464 | 0.00498 | 0.00532 |
| 9 | 0.00141 | 0.00177 | 0.00212 | 0.00248 | 0.00284 | 0.00319 | 0.00355 | 0.00391 | 0.00426 | 0.00462 | 0.00498 | 0.00533 | 0.00569 |
| 10 | 0.00151 | 0.00189 | 0.00227 | 0.00265 | 0.00303 | 0.00341 | 0.00379 | 0.00418 | 0.00456 | 0.00494 | 0.00532 | 0.00570 | 0.00609 |
| 11 | 0.00162 | 0.00202 | 0.00243 | 0.00284 | 0.00324 | 0.00365 | 0.00406 | 0.00447 | 0.00488 | 0.00529 | 0.00569 | 0.00611 | 0.00651 |
| 12 | 0.00173 | 0.00216 | 0.00260 | 0.00303 | 0.00346 | 0.00390 | 0.00434 | 0.00478 | 0.00521 | 0.00565 | 0.00608 | 0.00653 | 0.00696 |
| 13 | 0.00185 | 0.00231 | 0.00277 | 0.00324 | 0.00370 | 0.00417 | 0.00464 | 0.00510 | 0.00557 | 0.00604 | 0.00650 | 0.00697 | 0.00744 |
| 14 | 0.00197 | 0.00247 | 0.00296 | 0.00346 | 0.00395 | 0.00445 | 0.00494 | 0.00545 | 0.00595 | 0.00644 | 0.00694 | 0.00745 | 0.00795 |
| 15 | 0.00211 | 0.00263 | 0.00316 | 0.00369 | 0.00422 | 0.00475 | 0.00528 | 0.00582 | 0.00634 | 0.00688 | 0.00742 | 0.00795 | 0.00849 |
| 16 | 0.00224 | 0.00281 | 0.00337 | 0.00394 | 0.00450 | 0.00507 | 0.00563 | 0.00620 | 0.00677 | 0.00735 | 0.00791 | 0.00848 | 0.00906 |
| 17 | 0.00239 | 0.00299 | 0.00359 | 0.00420 | 0.00480 | 0.00540 | 0.00600 | 0.00662 | 0.00722 | 0.00783 | 0.00844 | 0.00906 | 0.00967 |
| 18 | 0.00255 | 0.00319 | 0.00383 | 0.00447 | 0.00511 | 0.00576 | 0.00641 | 0.00705 | 0.00770 | 0.00834 | 0.00900 | 0.00965 | 0.01031 |
| 19 | 0.00271 | 0.00339 | 0.00408 | 0.00476 | 0.00545 | 0.00614 | 0.00682 | 0.00751 | 0.00820 | 0.00889 | 0.00959 | 0.01028 | 0.01098 |
| 20 | 0.00289 | 0.00361 | 0.00434 | 0.00507 | 0.00580 | 0.00653 | 0.00726 | 0.00800 | 0.00874 | 0.00947 | 0.01022 | 0.01095 | 0.01169 |
| 21 | 0.00307 | 0.00384 | 0.00461 | 0.00539 | 0.00617 | 0.00695 | 0.00773 | 0.00851 | 0.00929 | 0.01009 | 0.01088 | 0.01166 | 0.01245 |
| 22 | 0.00327 | 0.00409 | 0.00491 | 0.00574 | 0.00656 | 0.00740 | 0.00822 | 0.00905 | 0.00990 | 0.01073 | 0.01157 | 0.01242 | 0.01326 |
| 23 | 0.00347 | 0.00435 | 0.00522 | 0.00610 | 0.00697 | 0.00786 | 0.00875 | 0.00964 | 0.01052 | 0.01142 | 0.01231 | 0.01321 | 0.01411 |
| 24 | 0.00368 | 0.00462 | 0.00555 | 0.00648 | 0.00741 | 0.00836 | 0.00930 | 0.01024 | 0.01119 | 0.01215 | 0.01309 | 0.01405 | 0.01500 |
| 25 | 0.00392 | 0.00491 | 0.00590 | 0.00689 | 0.00787 | 0.00888 | 0.00988 | 0.01089 | 0.01190 | 0.01290 | 0.01392 | 0.01494 | 0.01595 |
| 26 | 0.00416 | 0.00521 | 0.00626 | 0.00731 | 0.00837 | 0.00942 | 0.01050 | 0.01156 | 0.01263 | 0.01371 | 0.01480 | 0.01587 | 0.01697 |
| 27 | 0.00441 | 0.00552 | 0.00664 | 0.00776 | 0.00889 | 0.01001 | 0.01115 | 0.01228 | 0.01342 | 0.01457 | 0.01571 | 0.01687 | 0.01802 |
| 28 | 0.00468 | 0.00586 | 0.00705 | 0.00823 | 0.00943 | 0.01063 | 0.01183 | 0.01303 | 0.01425 | 0.01547 | 0.01668 | 0.01791 | 0.01914 |
| 29 | 0.00496 | 0.00621 | 0.00747 | 0.00873 | 0.01000 | 0.01127 | 0.01255 | 0.01383 | 0.01512 | 0.01642 | 0.01771 | 0.01902 | 0.02032 |
| 30 | 0.00526 | 0.00656 | 0.00792 | 0.00925 | 0.01060 | 0.01196 | 0.01331 | 0.01467 | 0.01604 | 0.01742 | 0.01879 | 0.02017 | 0.02157 |

Important Safety Guidelines

Safety Symbols

The safety precautions listed herein are to ensure safe and proper use of this equipment for your protection and to prevent losses to you, the surrounding area, and people nearby. Important safety precautions are classified into two categories,

 WARNINGS and  CAUTIONS.



WARNING


Failure to follow instructions contained in a **WARNING** may result in death or serious injury.




CAUTION

Failure to follow instructions contained in a **CAUTION** may result in personal injury or damage to property.





 symbols inform you of a **WARNING** or **CAUTION** to observe. The illustration within the triangle shows the nature of the precaution. (For example, the symbol at the left indicates possible danger from a rotating fan.)



 symbols indicate actions which must be taken. The illustration within the circle shows the nature of the precaution. (For example, the symbol at the left indicates that the unit must be grounded.)



 symbols indicate prohibited actions. The illustration within the circle shows the nature of the action which is prohibited. (The example to the left indicates that user disassembly is prohibited.)

Please note that items noted in  **CAUTIONS** can result in very serious consequences depending on the particular situation. Both **CAUTIONS** and **WARNINGS** must be heeded to ensure adequate safety.



WARNING

Failure to follow instructions contained in a **WARNING** may result in death or serious injury.

Regarding the Working Environment



Product Use Limitations

- (1) When using this equipment in connection with important facilities, be sure to establish backup and/or failsafe measures so that even in the event of breakdown of this equipment, such breakdown won't lead to serious accidents or losses.
- (2) This equipment is designed and produced as general purpose equipment to be used in general manufacturing applications. Accordingly, the warranty does not apply to nor cover the following applications. However, in cases where the customer/user takes full responsibility and confirms the performance of the equipment in advance, and takes necessary safety precautions, please consult with ORION and we will consider if use of the unit in the desired application is appropriate.
 1. Atomic energy, aviation, aerospace, railway works, shipping, vehicles, medical applications, transportation applications, and/or any applications where it might have a great effect on human life or property.
 2. Electricity, gas, or water supply systems, etc. where high levels of reliability and safety are demanded.



Do not operate where the product could come into contact with wind, rain, or water. Exposure to water splash or rain could lead to electric shock or fire.



Operate the product on a level and stable surface that can fully withstand the weight of the product.

Failure to use the product on a stable surface can lead to water leakage and tipping over or falling, which in turn could lead to injury.



Ensure adequate drain piping.

Improper drain construction can lead to trouble such as water leakage or failure of drainage to properly drain.



Be certain that all electrical wiring is done in accordance with relevant electrical construction and internal wiring regulations, and use only prescribed cables.

Installation with an insufficient power supply or improper installation can result in electric shock or fire. Improperly securing cables to electrical contacts can lead to electric shock, overheating, or fire.



Do not operate this product in areas where leakage of corrosive or flammable gases could possibly occur.

Corrosive gases either in the air to be processed, or in the area surrounding the product, could lead to product breakdown. And if by some chance there were a flammable gas leakage and the gas accumulated near the product, it could result in a fire.



Always properly ground this equipment.

Do not attach the grounding wire to gas pipes, water pipes, lightning rods, etc. Improper grounding can lead to electric shock.



Please arrange for installation by your dealer or other qualified persons.

Installation undertaken by unqualified or inexperienced persons may result in improper installation, which can lead to water leakage, electric shock, or fire.



Be sure to install an earth leakage breaker.

Using the equipment without an earth leakage breaker can lead to electric shock.

Regarding Installation



Be sure to read the operating manual before operating this equipment.

Mistakes in operation can lead to product breakdown or result in an accident. Read the operating manual and use this equipment properly. Keep the operating manual in safe place.



Before cleaning or performing maintenance or inspections, always cut off the power source.

Failure to do so may result in electric shock, injury, or burns.



When transferring this product, be sure to also include the instruction manual.

The instruction manual should be included with the product in the event that it is sold or transferred so that the new owner can also refer to in order to safely operate the product.



Operate the product within its specified operating ranges.

Operating equipment outside specified operating ranges can result in damage to the equipment, which may result in injury, leakage, etc.



Do not modify this equipment.

Modifying this equipment will void the product warranty.



Take measures to prevent combustion in case of refrigerant leaks.

For products that contain combustible refrigerant gas (R32) that are installed indoors, measures against the refrigerant combusting should be carried out, such as providing adequate ventilation and preventing nearby flames.



Do not stick fingers or other objects into the air intake or outlet vents.

Contact with the internal high speed fan could lead to injury.



Do not sit on or put things on this equipment.

Doing so can cause the machine to tip or fall and may lead to injury.



If abnormal operation is observed, stop operation of the product and consult with your dealer or a qualified repair person.

Continued operation when the product is performing abnormally can lead to electric shock or fire.



After confirming the safety of the product and everything related to it, have someone sufficiently knowledgeable and experienced operate the product.



Always carry out proper inspections and cleaning as indicated in the instruction manual.



Do not modify settings of safety features of this equipment.

Modifying such settings can lead to an damage or fire.



Do not use water directly on the product or in the unit component area and do not wash the unit with water.

Failure to follow this warning may lead to electric shock or fire.



CAUTION

Failure to follow instructions contained in a CAUTION may result in personal injury or damage to property.

Regarding Standard Operation

! The following water quality standard should be used as a guideline for primary cooling water (water for water-cooled condensers in refrigeration equipment, and conditioned water used for humidification).

○ Primary cooling water water quality standard level As for water-cooled models, if using something other than distilled water for industrial use as the primary cooling water, please use water that falls within the following water standard guidelines.

○ Deionized water for humidification Operate with RO treated (deionized) water that meets the following water quality.

Water Quality (Electrical conductivity) | 1 to 10 μS/cm

* If the quality of water to be used for humidification does not fall within the prescribed guidelines, it may encourage corrosion and/or clogging, etc. in the circulation or humidifier sections of the equipment. Please confirm water quality prior to use.

* Compatible models.....AP * MVK
PAP * K • KW • KR • KJ

| Item | Cooling Water Type | | Has Tendency Towards: | | |
|----------------------|---|---------------|-----------------------|---------|---|
| | Circulating Water | Make-Up Water | Corrosion | Scaling | |
| Standard Components | pH(25 °C) | 6.5 to 8.2 | 6.0 to 8.0 | ○ | ○ |
| | Conductivity (μS/cm) (25 °C) | Max. 800 | Max. 300 | ○ | ○ |
| | Chloride ion (mgCl ⁻ /L) | Max. 200 | Max. 50 | ○ | |
| | Sulphate (mgSO ₄ ²⁻ /L) | Max. 200 | Max. 50 | ○ | |
| | Acid consumption (pH4.8) (mgCaCO ₃ /L) | Max. 100 | Max. 50 | | ○ |
| | Total hardness (mgCaCO ₃ /L) | Max. 200 | Max. 70 | | ○ |
| | Calcium hardness (mgCaCO ₃ /L) | Max. 150 | Max. 50 | | ○ |
| | Silica ion (mgSiO ₂ /L) | Max. 50 | Max. 30 | | ○ |
| Reference Components | Iron (mgFe/L) | Max. 1.0 | Max 0.3 | ○ | ○ |
| | Copper (mgCu/L) | Max 0.3 | 0.1 or less | ○ | |
| | Sulfide ion (mgS ²⁻ /L) | Not detected | Not detected | ○ | |
| | Ammonium ion (mgNH ₄ ⁺ /L) | Max. 1.0 | Max. 1.0 | ○ | |
| | Residual chlorine (mgCl/L) | Max 0.3 | Max 0.3 | ○ | |
| | Free carbon dioxide (mgCO ₂ /L) | Max. 4.0 | Max. 4.0 | ○ | |
| | Ryznar Stability Index | 6.0 to 7.0 | — | ○ | ○ |

Excerpt from JRA-GL-02-1994 of The Japan Refrigeration and Air Conditioning Industry Association

- Within the "Tendency toward" column, items marked with a ○ indicate this component can lead to corrosion or scaling as indicated.
- The 15 items listed above are the primary components that can lead to corrosion or scaling.



Do not apply excessive force to the temperature (or humidity) sensor.
Doing so can result in product breakdown.

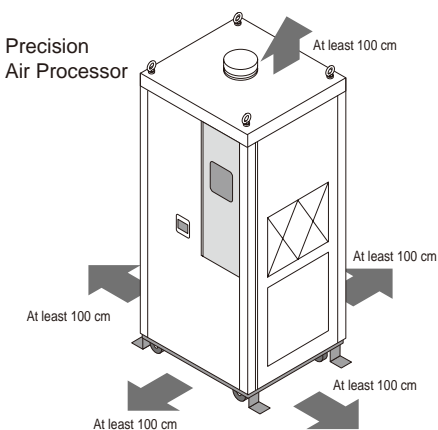
Regarding Inspection and Maintenance

! Periodically inspect the condenser and each of the filters for dirt and clean as required.



When cleaning the condenser, do not directly touch the fins. (On air-cooled models only) Doing so can result in injury.

! Plan for enough space around the product to facilitate optimum unit performance as well as a working space for maintenance tasks.



! Orion Products -- Service and Safety

● Safety Notes

- Before operating this equipment, please read the instruction manual carefully, and only use as indicated.
- For installation of this equipment and required wiring, employ a qualified person or consult your dealer.
- Be sure to select equipment which suits your needs. Do not use this equipment for purposes other than those for which it is intended. Doing so can lead to accidents or equipment breakdown.

● Air-Cooled Models

If the condenser becomes clogged with dust or dirt, heat exchange will be greatly reduced and electricity consumption will increase. This will lead not only to decreased performance, but can also lead to the activation of built-in safety devices, and eventual damage to the equipment. For these reasons, the condenser should be cleaned on a regular basis.

● Water-Cooled Models

In general, water used to cool condensers will be well-water, tap water, or water from a cooling tower. However water of insufficient quality can lead to scaling in cooling pipes resulting in lower levels of heat exchange, increased electricity consumption and lower performance. Therefore water quality should be confirmed on a regular basis.

Regarding After-Service

- For information regarding repair of equipment that has been in operation, please consult your dealer.
- The customer will be responsible for charges incurred for repairs conducted after the warranty period has expired. In cases where equipment function can be improved by certain service procedures, such procedures will be taken at the specific request of the customer.
- Regarding spare parts... "Spare parts" are those which are necessary in order to maintain the function of the product. It is the policy of ORION to maintain a stock of replacement parts for 7 years after production of the product ceases.

Recommended Maintenance Inspections

- Depending on the particular item, extended use can lead to the product becoming dirty or worn, which can lead to decreased performance. In order to realize continued best performance of this equipment, in addition to prescribed customer maintenance, it is also recommended that regular inspections be conducted. (Service and inspection fees apply.) For further information please consult your dealer or contact ORION directly.

Refrigerant Management

Some of the products in this catalog contain HFC refrigerants. Refrigeration technologies that use HFC refrigerants are essential for achieving efficient temperature control, and while such technologies make great contributions toward saving energy, there is also concern of the impact that the accidental release of HFC refrigerants into the atmosphere has on global warming.

When dealing with HFCs, please ensure compliance with laws and regulations and be sure to manage them appropriately for your safety and for the protection of the environment.

●GWP Values of Refrigerants Used in Our Products

| Refrigerant | Global Warming Potential (100-year GWP) |
|-------------|--|
| R-134a | 1430 |
| R-404a | 3920 |
| R-407c | 1770 |
| R-410A | 2090 |
| R-32 | 675 |

* For details about the refrigerant used in specific products, please refer to the product's specification page.

ORION is continuing to develop a complete and trustworthy nationwide network of expedient sales and service -- everywhere, anytime.



* ORION has wide reaching regional service bases in various countries throughout the world. Please consult your ORION dealer for details.



ISO9001 / ISO14001 obtained
at Main Plant, Koshoku Plant
and Chitose Plant.



We at ORION Machinery support
the Sustainable Development Goals
(SDGs).



* Warranty period of the
refrigerant circuit is 2 years
from the date of purchase
(or 10,000 hours of operating time).

For inquiries, please contact the following representative:

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