

Striving to make products that move you.

**ORION**

おかげさまで70年  
**70<sup>th</sup>**  
Anniversary

Mar 2016 **D-EG05**  
Precision Air Processor Catalogue

# Precision Air Processor

# PRECISION AIR PROCESSOR

Capacity Control From The Industry Leader  
In Heat Pump Balance Control



The evolution of Orion high spec air processors

Energy Saving Precision Air Processor

# PAP SERIES

PRECISION AIR PROCESSOR



Combining Energy Savings And High Accuracy  
Capacity Control From The Industry Leader  
In Heat Pump Balance Control **Patented**

Max  
**80%**  
Energy  
Savings



**PAP® Series**  
Energy Saving Precision Air Processor  
mini Type **PAGE 13**

Temperature Control Type **PAGE 15**

Temperature And Humidity Control Type **PAGE 17**



JSRAE  
**Technology Prize**  
Energy Saving Precision  
Temperature Control Air Supply Unit  
2013 Japan Society for Refrigeration and Air Conditioning Engineers



Energy Saving Precision Air Processing Equipment  
**9th Annual Prize  
for Promoting Machine Industry**  
Small and Medium Enterprise Agency Director's Prize  
2011 Juridical Foundation, Japan Society  
for the Promotion of Machine Industry



Excellent Energy Saving Equipment  
**The Japan Machinery Federation  
Chairman's Award**  
Heat Pump Balance Control (Heatless) Air Processor (PAP Series)  
2009, The Japan Machinery Federation

**Ultra ECO Product:**  
Energy Savings of 50% or Better (compared with previous models)  
"eco2" means Economy (energy savings) and Ecology (environmental protection) and reduced CO<sub>2</sub> emissions.

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

# 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 semiconductors 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® D Series

Energy Saving Precision  
Air Processors for Dehumidification

PAGE 21

## PAP® R Series

Facility Targeted Energy Saving Precision Air Processors

PAGE 21



## PAP® L Series

Energy Saving Precision  
Air Processors for Low Temperature

PAGE 23



## Air Processor

Circulation Type Temperature  
And Humidity Control Equipment

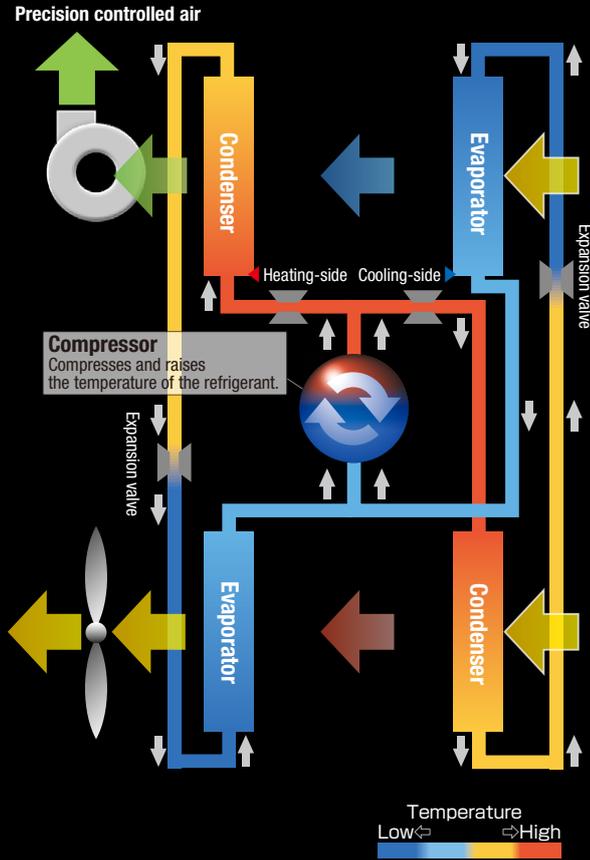
PAGE 25



## Energy Saving Dry Room

PAGE 31

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



## Completely Heatless AND Energy Saving.

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

Heater PID controls (※1) representative 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 heatless air dryers 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 ※

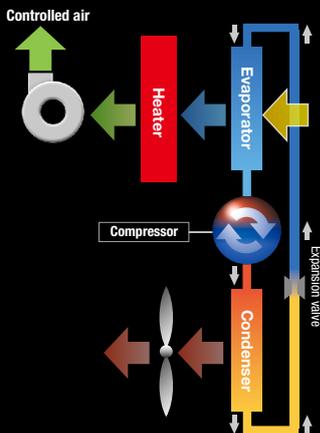
Heat pump balance control is air processing which balances the high level control of seemingly simultaneous cooling and heating operations from a single air conditioning unit. In other words, unlike a common air conditioner that moves heat either from the inside of a room to the outside, or from the 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 accuracy temperature control operation.

※Heat Pump Balance® is a registered trademark of ORION.

## How Other Precision Air Conditioners Work

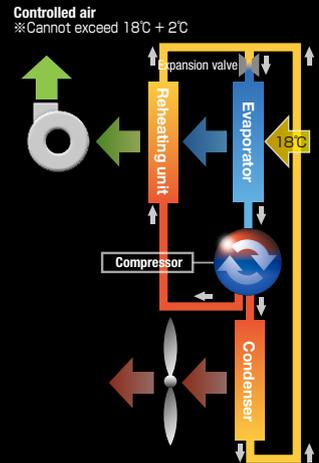
### ※ 1.Heater PID Control

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.



### ※ 2.Refrigerant Reheating Method

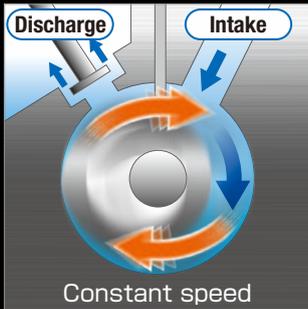
A second condenser (reheating unit) is installed, and the heat output from it is utilized as air from the evaporator is passed through it in order to re-heat the air. Even if 100% of refrigerant gas circulated through the reheating side, there would be no change in the circulation load of the evaporator and the cooling capacity would be the same, therefore, since the heating power is only equal to that of the compressor power, the air temperature can only be controlled to 2°C above the intake ambient air temperature. Under heat pump balance control, refrigerant is concentrated on the heating circulation side so that air can be controlled to temperatures to 7°C over the intake temperature, thus offering a flexible response to changes in environment such as those due to seasonal changes.



# DC Inverter Control For Optimum Capacity Control (excluding PAPmini models)

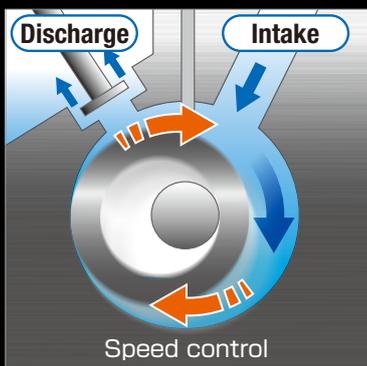
Automatic control of compressor speed in response to changes in load.

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 PAP10A-(F)W



## Freeze-prevention circuit unnecessary

Cooling unit frost is prevented thanks to compressor speed control. Cooling possible right down to just nearly 0 °C .

Units with constant speed compressors require hot-bypass circuits as a measure for freeze prevention.

Heat Pump Balance Control

DC Inverter Control For Optimum Capacity Control

**PAP** ORION  
PRECISION AIR PROCESSOR  
**SERIES**

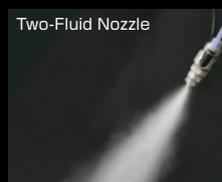
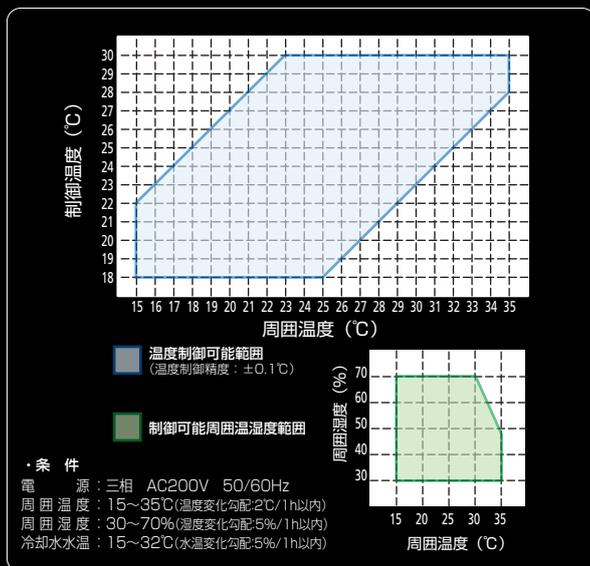
The Ultimate Algorithm Which Achieves Energy Savings And High Accuracy Temperature Control

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

### PAP<sup>®</sup> 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 ~ 35 °C. (See graph at left.)



#### Wide Range Achieved

See page 7 for heat pump balance control and two-fluid nozzle water mist humidification method (not including the PAPmini) that is completely heatless.

Temperature setting range: 18~30°C, humidity setting range: 40~75%. (Vapor humidification is used in the humidity setting range of 65~75%. The humidity setting range for the PAPmini is 45~75%.)

#### Temperature control accuracy: ±0.1°C

(during periods of stable load)

All-Fresh guarantees ±0.1 °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

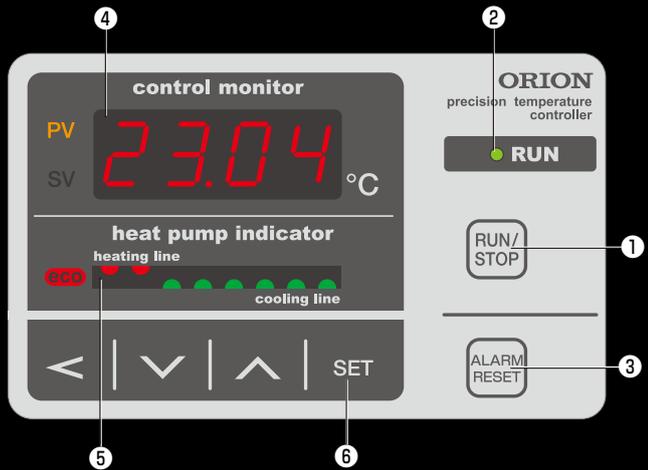
Operation and confirmation of temperature control conditions, etc. are possible with just one easily connected cable. Built-in support for 3 communications standards. (RS-232C, 422A, 485)



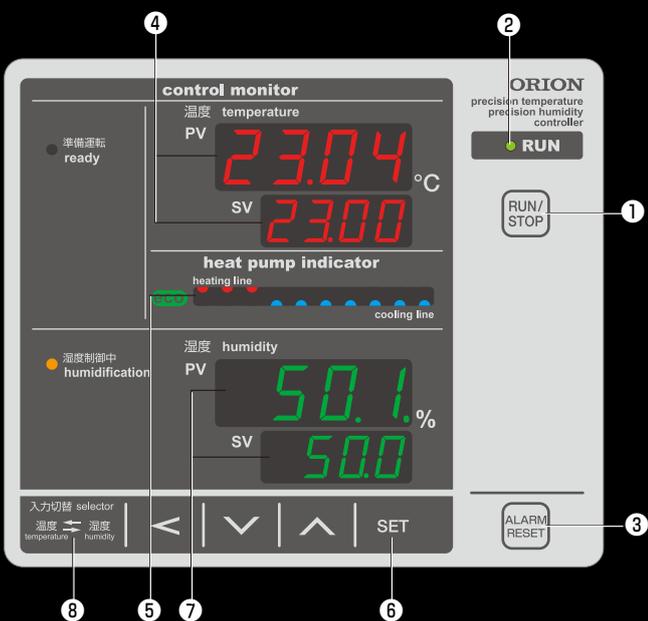
# Built-in Intelligent Monitor Patented

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

## Controller for temperature control type units



## Controller for temperature and humidity control type units



## Option Remote controller (not including the PAPmini)

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



Temperature Control Type



Temperature And Humidity Control Type

## 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 / PS display
- ⑤ Heating / cooling indicator
- ⑥ Function setting buttons
- ⑦ Humidity PV / PS 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)

## 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"

## Self diagnostics built-in

### Individual warning/alarm indications standard

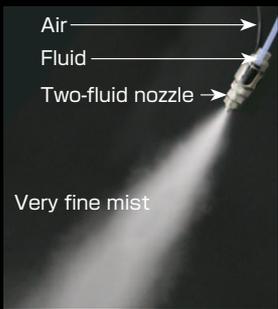
Our intelligent monitor displays various monitoring system data. This allows for a quick response when alarm conditions occur or during maintenance.

## Completely Heatless Humidification Because ORION Is Particular About Saving Energy. Patented

We have achieved completely heatless humidification.

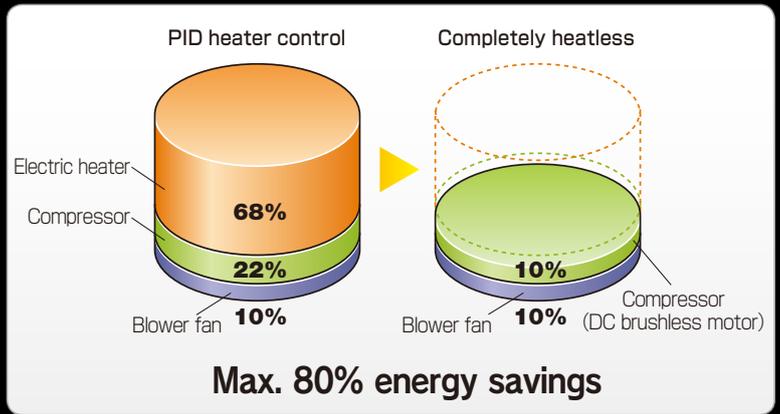
### Two-fluid nozzle water mist humidification (not including the PAPmini)

The PAP Series takes energy saving all the way to the humidification method by going completely heatless. 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 accuracy humidity control of  $\pm 1\%$ , and temperature accuracy of  $\pm 0.1\text{ }^\circ\text{C}$  are possible. All combined, ORION offers extremely high quality processed air.



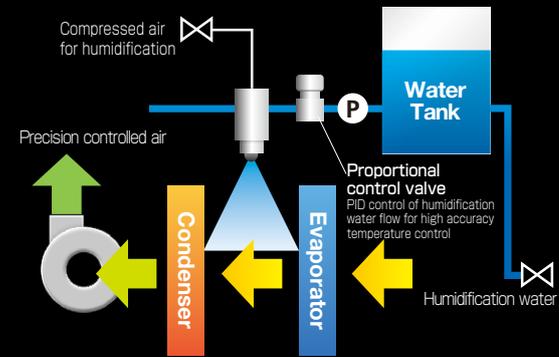
### Energy savings

#### Power source capacity and power consumption comparison

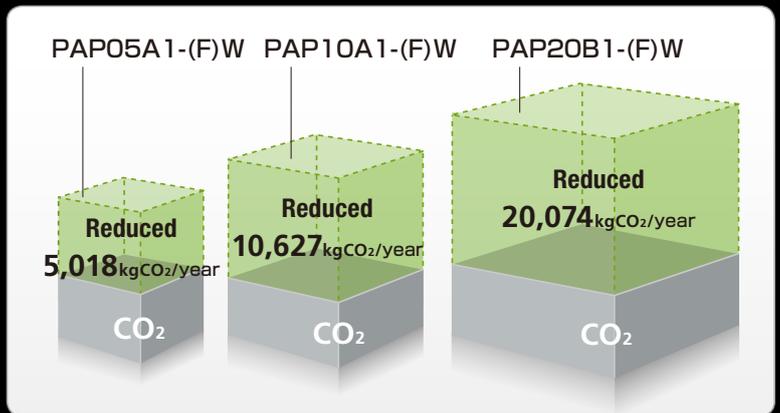


### Reduced CO<sub>2</sub> (greenhouse gases)

#### Our process offers a great reduction in global environment threatening released CO<sub>2</sub>



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 <sub>2</sub> (kgCO <sub>2</sub> / year)
	Other companies' previous method (A)	ORION's new method (B)	Difference in power (C) A - B		
PAP05A1-(F)W	3	1.3	1.7	12,240	5,018
PAP10A1-(F)W	5.3	1.7	3.6	25,920	10,627
PAP20B1-(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 × 0.85.  
 ※2 Calculated at 24 hr/day, 300 days/year.  
 ※3 Reduction in CO<sub>2</sub> emissions is 0.410, based on the average value of 8 electric companies.

# Problems Facing Whole Area Air Conditioning



## 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 accuracy, the level of conditioning must match the level of each of the manufacturing processes. Excessive highly accuracy 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.

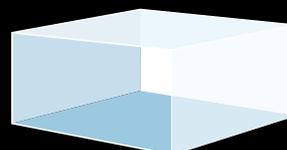
In order to surpass competitors, quality construction is a given. But on top of that, improvement of quality of conformance, which includes materials processing and assembly inspection, will incur short-term new investment. To respond to the demands of the sudden change in the manufacturing floor, whole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

### Bringing in outside air requires vast administrative and maintenance expenses.

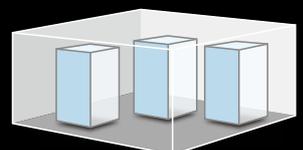
Generally, a clean room requires fresh air to be piped in. The conditions of air processing cleanroom depend greatly on the supply of fresh air flowing in, as well as the ambient temperature and humidity of that air. The larger the space, the greater the cost and effort that will be required to maintain 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 accuracy 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

Whole area precision air processing



Localized precision 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 accuracy air processing can be reduced, and the resulting cost reductions can also be achieved.



**PAP** SERIES ORION PRECISION AIR PROCESSOR **eco2** SUPER ORION

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

## High quality for confined spaces

Spaces containing equipment, production processes, and inspection processes related to semiconductor, liquid crystal, solar panel, and related technologies demand high precision and high stability air processing. As a result of these demands of whole area air processing, there are extremely high associated expenses and maintenance costs. ORION proposes construction of 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.

## Implementation of highly accurate and stable precision air processing is easy.

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

## Implement a precision air processing system suitable to your equipment, manufacturing processes, 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 accuracy and improved level of cleanliness.

## Great reductions in facility costs are possible.

By utilizing high accuracy temperature and humidity controlled, clean air only in spaces where it is demanded, a great reduction of costs involved with whole area high accuracy air processing can be realized by avoiding waste associated with high accuracy 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 accuracy.



### 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 nano units, 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.



### Precision temperature control for liquid crystal glass substrates

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 (solder cream) printer (screen 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 applications. 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 stoker

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.



## 3-D measuring instrument

3-D measuring instruments require a minimum high-accuracy scale of 0.0005 ~ 0.00001 mm. Improvement of measurement accuracy, 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 particular 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 accuracy can be achieved through temperature and humidity accuracy.



## 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<sup>®</sup> mini –Light Duty Series– Air cooled

## Models

PAP01B  
PAP01B-KJ  
PAP03B  
PAP03B-KJ

Air processing capacity **0.7~4m<sup>3</sup>/min**

Temperature control accuracy **±0.1°C**

Temperature setting range **18~30°C**

Humidity control accuracy **±1%** ※KJ models only

Humidity setting range **45~75%** ※KJ models only



PAP01B

PAP03B-KJ

〈Special order model〉 For more information on special order models ▶ 21P

- 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.



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

## Specifications

Model		PAP01B	PAP01B-KJ	PAP03B	PAP03B-KJ	
Performance specifications	Possible temperature and humidity setting range ※1	18 ~ 30	18 ~ 30, 45 ~ 75	18 ~ 30	18 ~ 30, 45 ~ 75	
	Temperature and humidity control accuracy ※2	± 0.1	± 0.1, ± 1.0	± 0.1	± 0.1, ± 1.0	
	Cooling / heating output (50/60Hz)	0.33 / 0.39	0.77 / 0.84	1.44 / 1.6	1.8 / 2.12	
	(Maximum cooling output)	(0.22 / 0.26)	(0.37 / 0.44)	(0.94 / 1.1)	(1.2 / 1.42)	
Rated processing airflow	0.7 ~ 1.0		2.0 ~ 4.0			
Maximum external static pressure ※3	Pa	120/130	120/160	100	110	
Environmental conditions	Surrounding (intake air) temperature and humidity range ※1	15 ~ 35, 30 ~ 70				
	Temperature gradient at intake	Within ± 1				
	Humidity gradient at intake	Within ± 5				
Outside dimensions (H × D × W) ※4	mm	346×500×412	765×620×390	1062×590×570	1350×740×570	
Mass	kg	(32)	(69)	(104)	(150)	
Controlled air outlet port	mm	φ 75	φ 100	φ 100	φ 100	
Humidification water	Water quality	—	Deionized water (electrical conductivity: 1~10 μS/cm)	—	Deionized water (electrical conductivity: 1~10 μS/cm)	
	Maximum moisture output ※5	kg/h	—	0.8	—	2.3
	Supply temperature range	°C	—	10 ~ 40	—	10 ~ 40
	Connection port size	—	—	Rc1/4	—	Rc1/4
Power specifications	Power source ※6	V(Hz) Single phase 100V ± 10% (50/60)		Three-phase 200V ± 10% (50/60)		
	Power consumption	kW	0.32/0.34	1.2/1.2	0.6/0.7	3.0/3.5
	Electric current ※7	A	4.0/3.9	13/13	2.8/2.8	12/13
	Power capacity ※8	kVA	0.34/0.38	1.5/1.5	1.1/1.1	4.0/4.4
	Noise level (50/60Hz) ※9	dB	58/60	58/60	69/71	70/73
Refrigerant	—	R134a	R407c	R407c	R407c	
Compressor output	kW	0.25	0.3	0.4	0.9	

※ 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 accuracy is based on measurement by the internal controller at a single air outlet point. Air flow at max. rated value. ※ 3 The noted external static pressure is when the controlled air is regulated at the outlet to produce the maximum rated processing air flow. ※ 4 Height includes outlet port. ※ 5 Operating at the highest level of humidification within the specified operating range. ※ 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 duct.



# PAP<sup>®</sup> Temperature Control Type Air cooled

## Models

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

Air processing capacity **3~20m<sup>3</sup>/min**

Temperature control accuracy **±0.1°C**

Temperature setting range **18~30°C**



<Special order model> For more information on special order models ▶ 21P

- 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.



PAP10A1

## Specifications

Model		PAP05A1	PAP05A1-F	PAP10A1	PAP10A1-F	PAP20A	PAP20A-F
Performance specifications	Possible temperature setting range ※1			18 ~ 30			
	Temperature and humidity control accuracy ※2			± 0.1			
	Cooling / heating output (50/60Hz)	2.3 / 2.6		4.7 / 5.3		9.4 / 10.5	
	(Maximum cooling output)	(1.6) / (1.8)		(3.2) / (3.6)		(6.5) / (7.2)	
Rated processing airflow	3 ~ 5		7 ~ 10		13 ~ 20		
Maximum external static pressure(50/60Hz)※3	Pa	110	620	250	560	250	690
Environmental conditions	Surrounding (intake air) temperature and humidity range ※1			15 ~ 35, 30 ~ 70			
	Temperature gradient at intake			Within ± 1			
	Humidity gradient at intake			Within ± 5			
Outside dimensions (H x D x W) ※4	mm	1140×700×600	1423×700×600	1305×822×661	1565×822×661	1610×1150×770	2010×1150×770
Mass	kg	(130)	(155)	(185)	(210)	(290)	(365)
Controlled air outlet port	mm	φ 100	φ 100 HEPA filter built in	φ 150	φ 150 HEPA filter built in	φ 200	φ 200 ※5 HEPA filter box included
Power specifications	Power source ※6			Three-phase 200 ± 10% (50/60)			
	Power consumption ※7	1.4		1.8		3.9	
	Electric current ※7	6.2		7.5		14.9	
	Power capacity ※8	2.2		2.6		5.2	
	Noise level (50/60Hz) ※9	dB	66/66	71/71	68/68	73/73	69/69
Operation control method		Heat pump balance control					
Refrigerant		R410A					
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 accuracy 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 air flow. ※ 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.

# PAP® Temperature Control Type Water cooled

## Models

- PAP05A1-W
- PAP05A1-FW
- PAP10A1-W
- PAP10A1-FW
- PAP20B1-W
- PAP20B1-FW
- PAP40B-W
- PAP40B-FW

- Air processing capacity **3~40m<sup>3</sup>/min**
- Temperature control accuracy **±0.1°C**
- Temperature setting range **18~30°C**



PAP10A1-W

<Special order model> For more information on special order models ▶ 21P

- 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.



## Specifications

Model		PAP05A1-W	PAP05A1-FW	PAP10A1-W	PAP10A1-FW	PAP20B1-W	PAP20B1-FW	PAP40B-W	PAP40B-FW
Performance specifications	Possible temperature setting range ※1	18 ~ 30							
	Temperature and humidity control accuracy ※2	± 0.1							
	Cooling / heating output (50/60Hz)	3.2/3.2		6.5/6.5		13.0/13.0		22.0/22.0	
	(Maximum cooling output)	(2.0)		(4.0)		(8.0)		(16.0)	
	Rated processing airflow	3 ~ 5		7 ~ 10		13 ~ 20		25 ~ 40	
Environmental conditions	Maximum external static pressure(50/60Hz) ※3	410/660	300/620	870/870	560/560	650/1000	300/690	300/300	1000/1000
	Surrounding (intake air) temperature and humidity range ※1	15 ~ 35 , 30 ~ 70							
	Temperature gradient at intake	Within ± 2							
	Humidity gradient at intake	Within ± 5							
	Cooling water temperature gradient	Within ± 5							
Cooling water specifications	Outside dimensions (H × D × W) ※4	1489 × 586 × 538		1703×763×655		1842×973×653		2291×973×653	
	Mass	120	130	215	260	220	290	440	540
	Controlled air outlet port	φ 100	φ 100 HEPA filter built in	φ 150	φ 150 ※5 HEPA filter box included	φ 200	φ 200 HEPA filter box included	□ 350	□ 350 ※5 HEPA filter box included
	Rate of supply ※6	1.0		1.5		2.2		3.0	
	Supply temperature range	15 ~ 32							
Power specifications	Supply pressure	0.69 or less							
	Inlet/outlet pressure difference	0.2 or greater							
	Connection port size	Rc 1/2		Rc3/4		Rc3/4		Rc1	
	Power source ※7	Three-phase 200 ± 10% (50/60)							
	Power consumption (50/60Hz) ※8	1.2/1.3		1.7		3.0/3.2		6.0	
Electric current ※8	4.5/5.2		7.1		12.0/12.5		24.0		
Power capacity ※9	1.8		2.5		4.4		8.3		
Noise level(50/60Hz) ※10	68 / 71		73/73		73/76		75/75 , 83/83		
Operation control method	Heat pump balance control								
Refrigerant	R410A								
Compressor output	0.7		1.7		3.0		8.3		

※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 accuracy 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 air flow 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.

# PAP<sup>®</sup> Temperature And Humidity Control Type Air cooled

## Models

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

Air processing capacity **3~20m<sup>3</sup>/min**

Temperature control accuracy **±0.1°C**

Temperature setting range **18~30°C**

Humidity control accuracy **±1%**

Humidity setting range **40~65% (75)<sup>※1</sup>**



PAP10A1-K

<Special order model> For more information on special order models ▶ 21P

- 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.



## Specifications

Model		PAP05A1-K	PAP05A1-FK	PAP10A1-K	PAP10A1-FK	PAP20A-K	PAP20A-FK
Performance specifications	Possible temperature and humidity setting range <sup>※1</sup>	18 ~ 30, 40 ~ 65 (75) °C,%					
	Temperature and humidity control accuracy <sup>※2</sup>	± 0.1, ± 1.0 °C,%					
	Cooling / heating output (50/60Hz)	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 ~ 5 m <sup>3</sup> /min		7 ~ 10 m <sup>3</sup> /min		13 ~ 20 m <sup>3</sup> /min	
Environmental conditions	Maximum external static pressure(50/60Hz) <sup>※3</sup>	110 Pa	620 Pa	250 Pa	560 Pa	250 Pa	690 Pa
	Surrounding (intake air) temperature and humidity range	15 ~ 35, 30 ~ 70 °C,%					
	Temperature gradient at intake	Within ± 1 °C/h					
	Humidity gradient at intake	Within ± 5 %/h					
	Outside dimensions (H × D × W) <sup>※4</sup>	1589×800×650 mm	1810×800×650 mm	1798×940×664 mm	2203×940×664 mm	1863×1150×820 mm	2263×1150×820 mm
Mass	190 kg	215 kg	235 kg	280 kg	370 kg	445 kg	
Controlled air outlet port	φ 100 mm	φ 100 mm HEPA filter built in	φ 150 mm	φ 150 mm <sup>※5</sup> HEPA filter box included	φ 200 mm	φ 200 mm <sup>※5</sup> HEPA filter box included	
Humidification water	Water quality	Deionized water (electrical conductivity: 1 ~ 10 μ S/cm)					
	Maximum moisture output <sup>※6</sup>	2.5 kg/h		5.0 kg/h		10.0 kg/h	
	Supply temperature range	10 ~ 40 °C					
	Supply pressure range	0.1 ~ 0.5 MPa					
Humidification air	Connection port size	Rc 1/4					
	Maximum air consumption <sup>※7</sup>	23 NL/min		38 NL/min		80 NL/min	
	Supply temperature range	20 ~ 40 °C					
	Supply pressure range	0.40 ~ 0.93 MPa					
Power specifications	Connection port size	Rc 1/4					
	Power source <sup>※8</sup>	Three-phase 200 ± 10% (50/60) V(Hz)					
	Power consumption <sup>※9</sup>	1.6 kW		2.2 kW		4.5 kW	
	Electric current <sup>※9</sup>	6.6 A		8.0 A		16.0 A	
	Power capacity <sup>※10</sup>	2.3 kVA		2.8 kVA		5.6 kVA	
Noise level (50/60Hz) <sup>※11</sup>	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						
Refrigerant	R410A						
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 ~ 75%.) ※ 2 When the air temperature and humidity is stable at the air intake. Noted accuracy 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 air flow. ※ 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.

# PAP® Temperature And Humidity Control Type Water cooled

## Models

PAP05A1-KW	Air processing capacity	3~40m <sup>3</sup> /min
PAP05A1-FKW	Temperature control accuracy	±0.1°C
PAP10A1-KW	Temperature setting range	18~30°C
PAP10A1-FKW	Humidity control accuracy	±1%
PAP20A1-KW	Humidity setting range	40~65% (75)※1
PAP20A1-FKW		
PAP40A-KW		
PAP40A-FKW		



PAP10A1-KW

<Special order model> For more information on special order models ▶ 21P

- Noise reducing intake duct ■ Circulation intake chamber
- Exhaust chamber ■ Steam humidification method

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



## Specifications

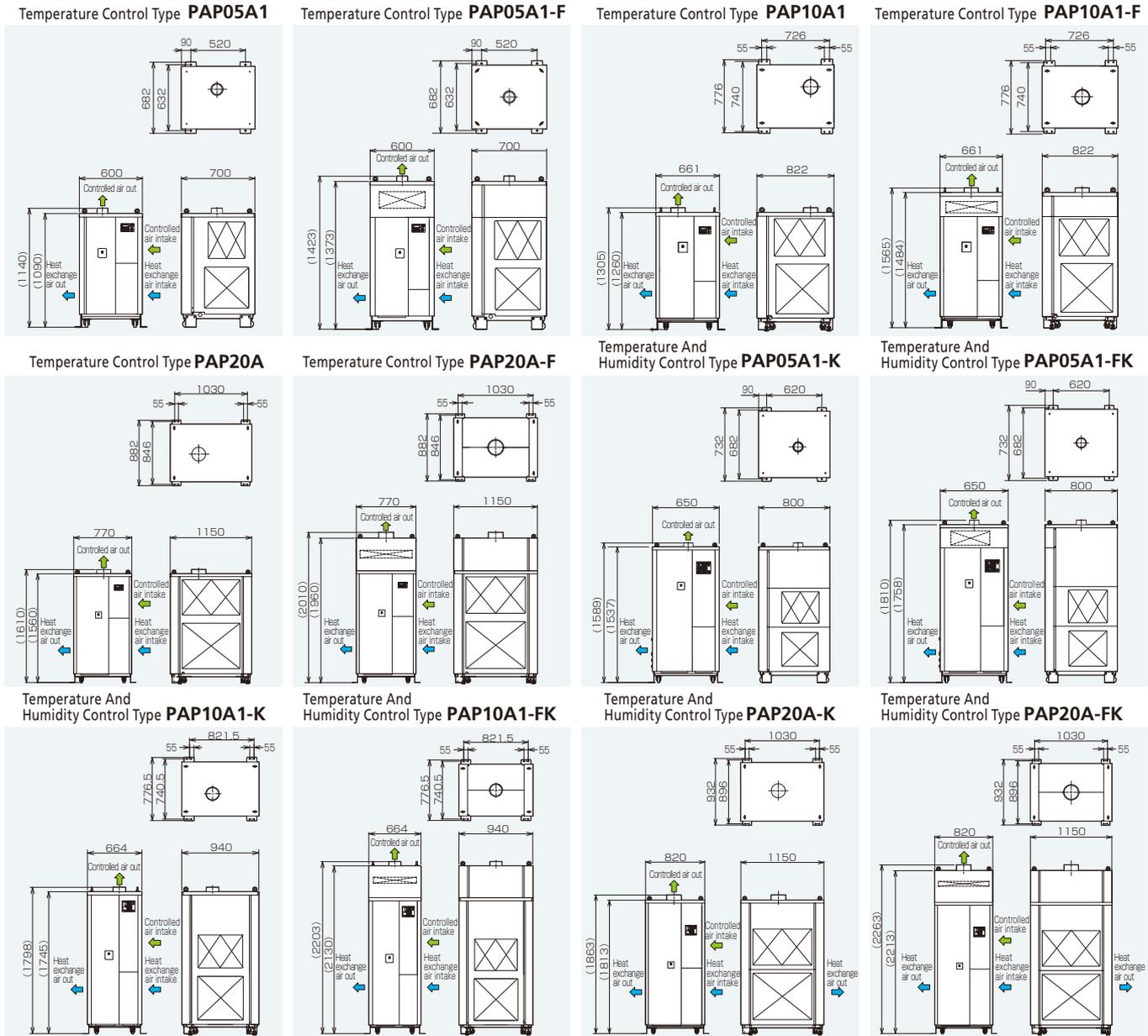
Model		PAP05A1-KW	PAP05A1-FKW	PAP10A1-KW	PAP10A1-FKW	PAP20A1-KW	PAP20A1-FKW	PAP40A-KW	PAP40A-FKW
Performance specifications	Possible temperature and humidity setting range※1	18 ~ 30, 40 ~ 65 (75)							
	Temperature and humidity control accuracy ※2	± 0.1, ± 1.0							
	Cooling / heating output (50/60Hz)	3.2/3.2		6.5/6.5		13.0/13.0		22.0/22.0	
	(Maximum cooling output)	(2.0)		(4.0)		(8.0)		(16.0)	
Rated processing airflow	m <sup>3</sup> /min	3 ~ 5		7 ~ 10		13 ~ 20		25 ~ 40	
	Maximum external static pressure ※3	110	620	200	560	250	690	300	1000
Environmental conditions	Surrounding (intake air) temperature and humidity range ※1	15 ~ 35, 30 ~ 70							
	Temperature gradient at intake	Within ± 1							
	Humidity gradient at intake	Within ± 5							
	Cooling water temperature gradient	Within ± 3							
Cooling water	Outside dimensions (H x D x W) ※4	1610x750x610	1830x750x610	1670x940x664	2076x940x664	1831x973x773	2209x973x773	1800x1300x1084	2323x1300x1084
	Mass	180	205	235	280	300	370	540	640
Humidification water	Controlled air outlet port	φ 100	φ 100 HEPA filter built in	φ 150	φ 150 HEPA filter box included	φ 200	φ 200 HEPA filter box included	□ 350	□ 350 HEPA filter box included
	Rate of supply ※6	1.0		1.5		2.2		3.0	
	Supply temperature range	15 ~ 32							
	Supply pressure	0.69 or less							
Humidification air	Inlet/outlet pressure difference	0.2 or greater							
	Connection port size	Rc 1/2		Rc 3/4		Rc 3/4		Rc 1	
	Water quality	Deionized water (electrical conductivity: 1 ~ 10 μ S/cm)							
	Maximum moisture output※7	2.5		5.0		10.0		20.0	
Power specifications	Supply temperature range	10 ~ 40							
	Supply pressure range	0.1 ~ 0.5							
	Connection port size	Rc 1/4							
	Maximum air consumption※8	23		38		80		200	
Power specifications	Supply temperature range	20 ~ 40							
	Supply pressure range	0.40 ~ 0.93							0.45 ~ 0.93
	Connection port size	Rc 1/4							
	Power source ※9	Three-phase 200 ± 10% (50/60)							
Power specifications	Power consumption ※10	1.5		2.2		3.8		6.6	
	Electric current ※10	6.3		7.8		13.5		26.0	
	Power capacity ※11	2.2		2.8		4.7		9.0	
	Noise level(50/60Hz) ※12	68/68	73/73	70/70	75/75	72/72	78/78	75/75	83/83
Operation control method	Heat pump balance control								
Refrigerant	R410A								
Compressor output	0.7		1.7		3.0				

※1 The temperature and humidity control ranges noted do not necessarily indicate the actual controllable ranges 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 ~ 75%). ※2 Values indicated are for when the intake air temperature and humidity, and supply water temperature and supply water flow rate are stable. Noted accuracy 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 air flow. ※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 air flow 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.

# PAP® Series external dimensions

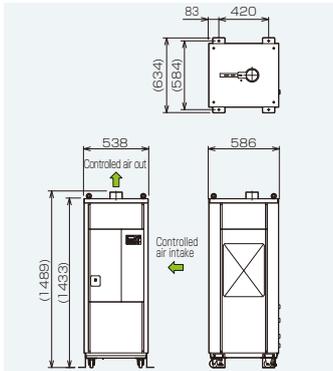
Air processing capacity: 3~20m<sup>3</sup>/min **Air cooled**

PAP Series

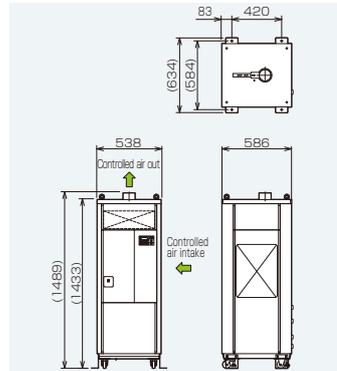


Air processing capacity: **3~40m<sup>3</sup>/min** Water cooled

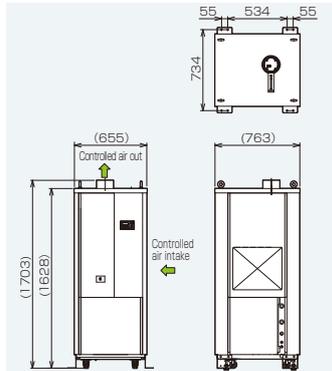
Temperature Control Type **PAP05A1-W**



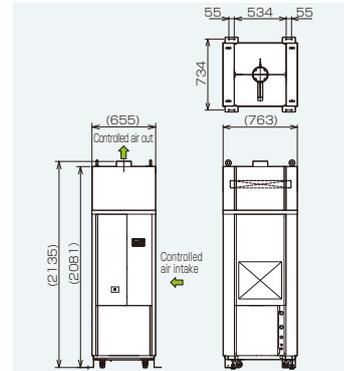
Temperature Control Type **PAP05A1-FW**



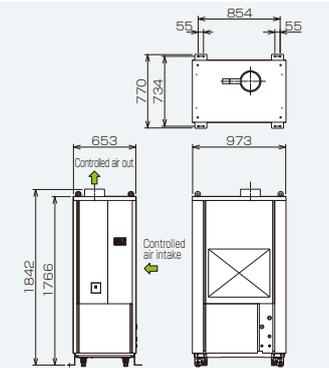
Temperature Control Type **PAP10A1-W**



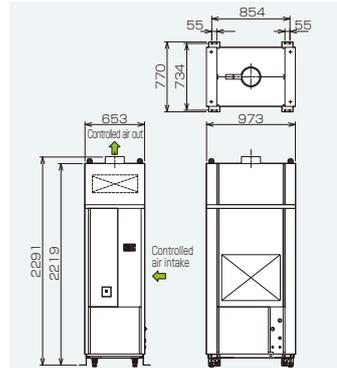
Temperature Control Type **PAP10A1-FW**



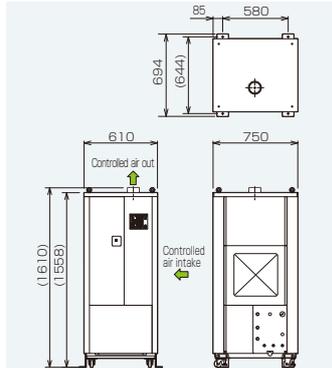
Temperature Control Type **PAP20B1-W**



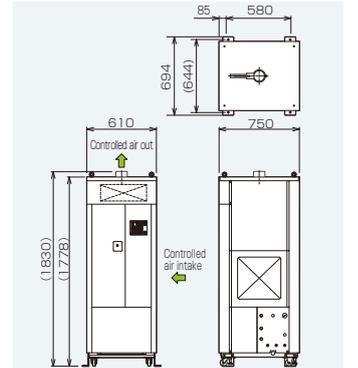
Temperature Control Type **PAP20B1-FW**



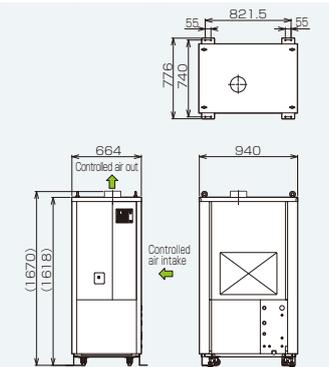
Temperature And Humidity Control Type **PAP05A1-KW**



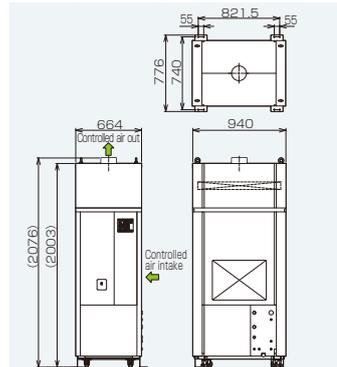
Temperature And Humidity Control Type **PAP05A1-FKW**



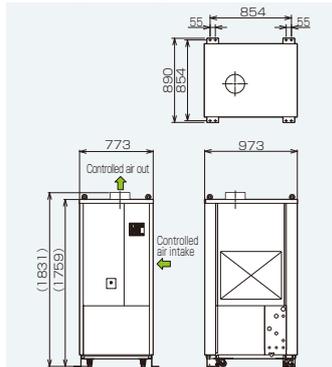
Temperature And Humidity Control Type **PAP10A1-KW**



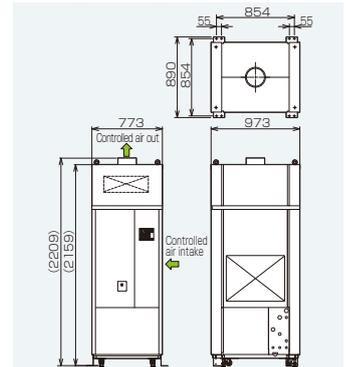
Temperature And Humidity Control Type **PAP10A1-FKW**



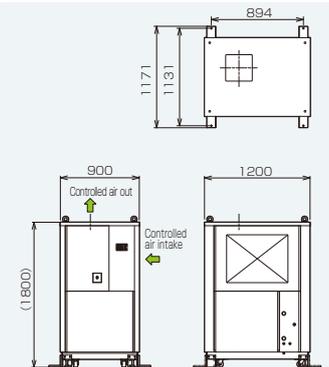
Temperature And Humidity Control Type **PAP20A1-KW**



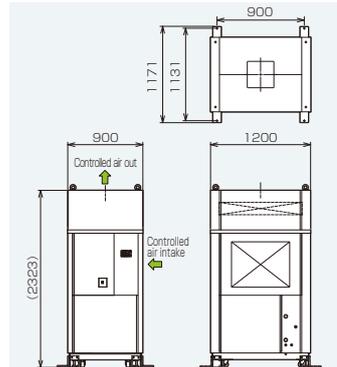
Temperature And Humidity Control Type **PAP20A1-FKW**



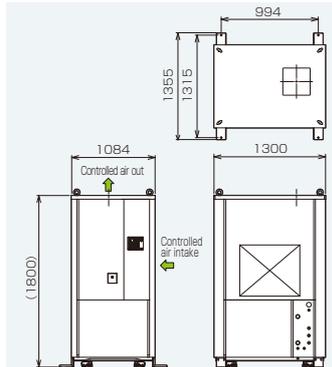
Temperature Control Type **PAP40B-W**



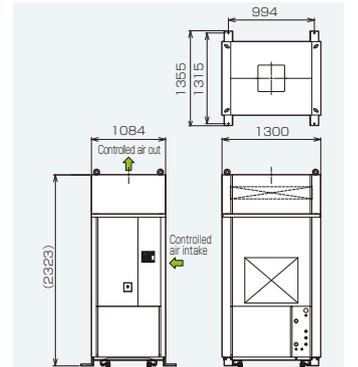
Temperature Control Type **PAP40B-FW**



Temperature And Humidity Control Type **PAP40A-KW**



Temperature And Humidity Control Type **PAP40A-FKW**



# PAP<sup>®</sup> D Series Dehumidification

## Models

PAP03A-D  
 PAP03A-WD  
 PAP06A-D  
 PAP06A-WD  
 PAP10A-WD

Temperature setting range 18~30°C  
 Humidity setting range 20~40%  
 Temperature control accuracy ±0.2°C



<Special order model>

For more information on special order models ▶ 21P

- 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.



**Instant Dehumidification From 27°C / 70% 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

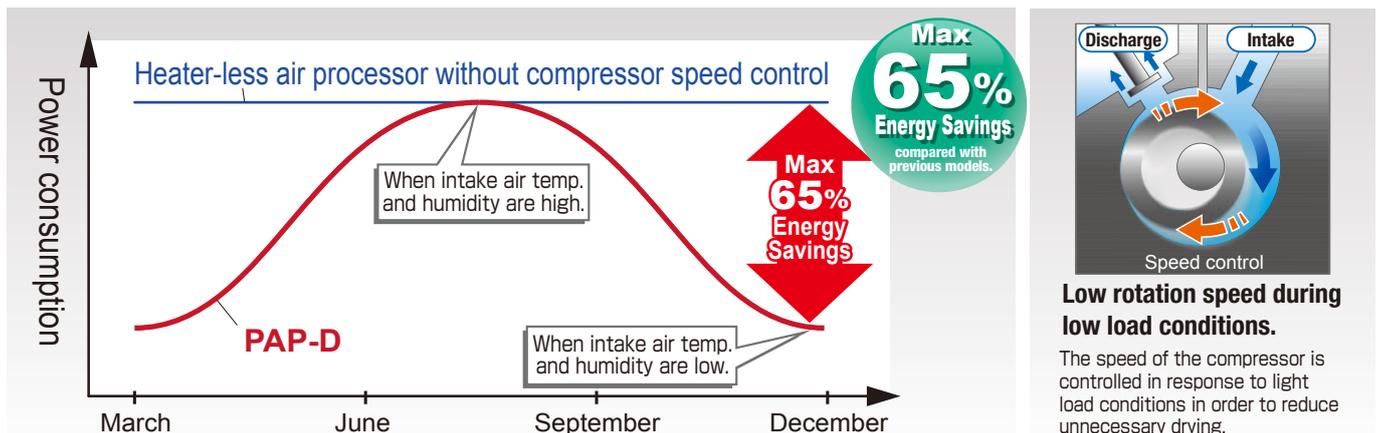
Air cooled	Water cooled
PAP03A-D	PAP03A-WD
PAP06A-D	PAP06A-WD
PAP10A-D	PAP10A-WD

[Performance examples] PAP06A-D,WD, air flow : 6m<sup>3</sup>/min  
 PAP03A-D,WD, air flow : 3m<sup>3</sup>/min  
 PAP10A-D,WD, air flow : 10m<sup>3</sup>/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

## 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.

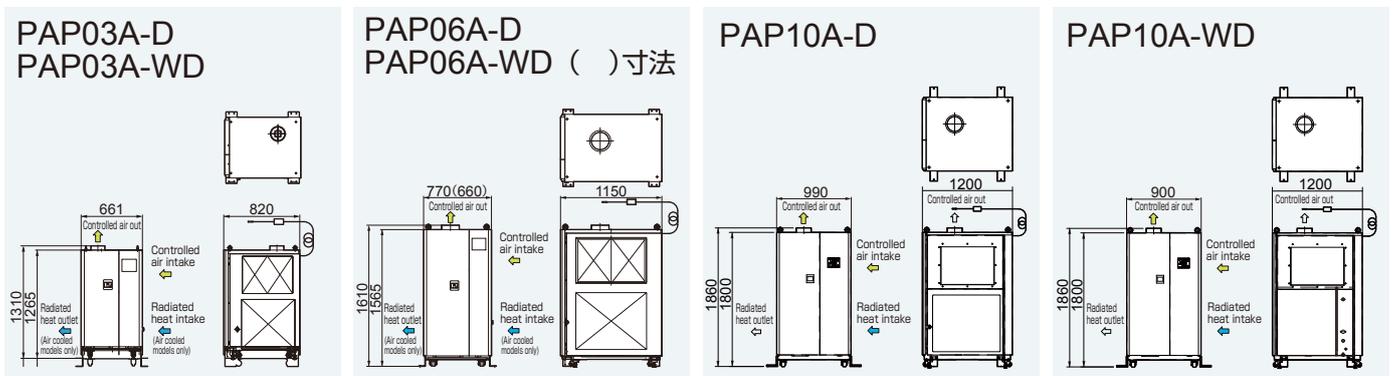


## Specifications

Model		Air cooled			Water cooled				
		PAP03A-D	PAP06A-D	PAP10A-D	PAP03A-WD	PAP06A-WD	PAP10A-WD		
Performance	Possible temperature and humidity setting ranges ※1	18~30, 20~40							
	Temperature and humidity control accuracy ※2	±0.2, ±2(Does not support humidification.)							
	Attainable control air dew point (lower limit) ※3	3.5							
	Maximum cooling output ※4	(3.7)	(6.6)	(10.5)	(4.1)	(6.8)	(11.0)		
	Heating capacity ※5	(0.3)	(0.7)	(1.1)	(0.3)	(0.7)	(1.1)		
	Rated processing airflow	3~5	6~8	10~12	3~5	6~8	10~12		
Environmental conditions	Surrounding temperature and humidity range	17~35, 30~70							
	Temperature gradient at intake	Within ±1							
	Humidity gradient at intake	Within ±5							
	Cooling water temperature gradient	—			Within ±3				
Cooling water	Outside dimensions (H×D×W) ※6	mm	(1310×820×661)	(1610×1150×770)	(1860×1200×990)	(1310×820×661)	(1610×1150×660)	(1860×1200×900)	
	Mass	kg	(210)	(330)	(450)	(210)	(300)	(450)	
	Controlled air outlet port	mm	φ150	φ200	φ200	φ150	φ200	φ200	
	Rate of supply	m <sup>3</sup> /h	—			2.0	2.7	3.0	
	Supply temperature range	°C	—			5~32			
	Supply pressure	MPa	—			0.69 or higher			
	Inlet/outlet pressure difference	MPa	—			0.2 or higher			
	Connection port size		—			Rc3/4		Rc1	
	Power specifications	Power source ※7	V(Hz)	Three-phase 200V ±10%, 50/60Hz					
		Power consumption ※8	kW	0.8~2.9	1.3~4.1	1.6~5.3	0.7~2.6	1.1~3.9	1.5~4.7
Electric current ※9		A	11.3	17.2	20.2	10.7	16.6	19.6	
Power capacity ※10		kVA	4.7	6.6	7.2	4.2	6.3	6.9	
Operation control method			Heat Pump Balance Control (incorporates waste heat utilization)						
Refrigerant		R410A							
Compressor output		1.7	3.0	3.0	1.7	3.0	3.0		

※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 accuracy 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 Height includes outlet port. ※7 Source voltage phase unbalance should be less than ±3%. ※8 Minimum and maximum specified values for the specified operating range.  
 ※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.

## External Dimensions



# PAP<sup>®</sup> L Series **Low Temperature**

## Models

PAP05A-L

Air processing capacity **5~7m<sup>3</sup>/min**

Temperature setting range **8~18°C**

Temperature control accuracy **±2°C**



<Special order model>

For more information on special order models ▶ 24P

- 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.



## All fresh air cooling to 8°C from 35°C air.

### Typical Applications

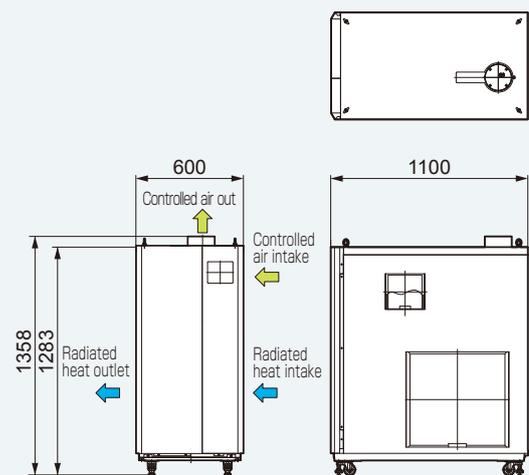
- Quick cooling of heated product.
- Precooling for desiccant air processors, etc.

### Specifications

Model		PAP05A-L	
Performance specifications	Configurable temperature range ※1	°C	8 ~ 18
	Temperature control accuracy ※2	°C	±2
	Cooling capacity ※3	kW	5.9 / 7.0
	Rated processing airflow	m <sup>3</sup> /min	5 ~ 7
Environmental conditions	Surrounding temperature and humidity range	°C,%	15 ~ 35, 30 ~ 70
	Temperature gradient at intake	°C/h	Within ±1
	Outside dimensions (H×D×W) ※4	mm	(1358×1100×600)
Power specifications	Mass	kg	(185)
	Controlled air outlet port	mm	φ150
	Power source ※5	V(Hz)	Three-phase 200V ±10%, 50/60Hz
	Power consumption	kW	(4.7)
	Electric current	A	(17)
	Power capacity	kVA	(6.5)
	Operation control method		Inverter speed control + hot gas bypass control
	Refrigerant		R410A
Compressor output	kW	1.7	

### External Dimensions

PAP05A-L



※1 Cooling only (Set temperature is lower than intake air temperature.) 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 accuracy is based on measurement by the internal controller at a single air outlet point. Not including times when the compressor load is small and the compressor is cycling ON and OFF. ※3 Conditions for the rated cooling capacity: intake temperature and humidity: 35°C / 70%, airflow: 5 m<sup>3</sup>/min. ※4 Height includes outlet port. ※5 Source voltage phase unbalance should be less than ±3%.

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

# ORION Precision Air Processing For Every Application

## PAP<sup>®</sup> Series Special Order Equipment



**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**

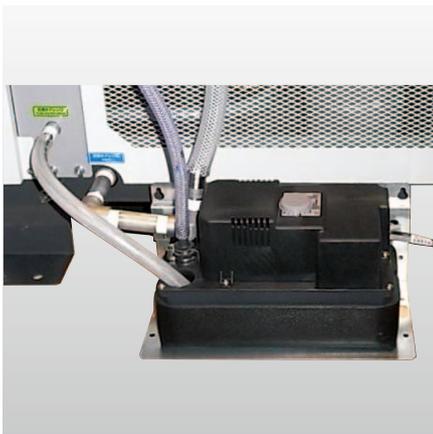
PAP Temperature Control Type  
 PAP Temperature And Humidity Control Type  
 PAPmini Series



**3** Duct set

**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

**Applicable models**

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



**6** Built-in drain tank

**Applicable models**

PAP03B

**7** Vibration reducing base



## Other Special Order Equipment

**8** Steam humidification

**Applicable models**

PAP Temperature And Humidity Control Type

**9** Humidity display

**Applicable models**

PAP Temperature Control Type

**10** HEPA differential pressure gauge

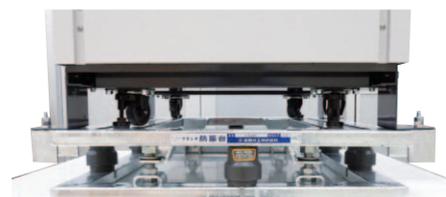
**Applicable models**

PAP Temperature Control Type  
 PAP Temperature And Humidity Control Type

**11** Low ambient temperature cooling water specification

**Applicable models**

PAP Temperature Control Type  
 PAP Temperature And Humidity Control Type



Base installation example

Options

# Air Processor (Circulation Type) Air cooled Patented

## Models

AP-750M-E / AP-750MV-E

AP-750MVK-E / AP-1500M-E

AP-1500MV-E / AP-1500MVK-E

Air processing capacity 4~15m<sup>3</sup>/min

Humidity setting range 30~90%

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 replace 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.



AP1500MVK-E

## Specifications

Model		AP-750M-E	AP-750MV-E	AP-750MVK-E	AP-1500M-E	AP-1500MV-E	AP-1500MVK-E	
Performance specifications*1	Temperature control range	°C	5 ~ 35	5 ~ 70	5 ~ 70 (During humidity control: 15 ~ 70)	5 ~ 35	5 ~ 70	5 ~ 70 (During humidity control: 15 ~ 70)
	Humidity control range *2	%	—		30 ~ 90 (When at 40 ~ 60 °C)	—		30 ~ 90 (When at 40 ~ 60 °C)
	Control accuracy *3	°C, %	± 0.5		± 0.5, ± 3	± 0.5		± 0.5, ± 3
	Control method		Digital setting, Digital display, Heater PID control					
	Cooling capacity *1	kW	1.5/1.75			3.25		
	Processed air flow (50/60 Hz)	m <sup>3</sup> /min	4 ~ 6 / 4 ~ 7			10 ~ 13 / 10 ~ 15		
Ambient temp. range	°C, %	15 ~ 35						
Outlet connection port		Air outlet φ 100 (incl. companion flange)			Air outlet φ 150 (incl. companion flange)			
Power specifications	Power source	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					
	Refrigerant		R407C					
	Mass	kg	120		130	190		200
Outside dimensions (H x D x W)	mm	1044 × 548 × 660			1374 × 618 × 753			

\* 1 Maximum air flow, control temp.: 25 °C, ambient temp.: 25 °C (Not the case for humidity control.)

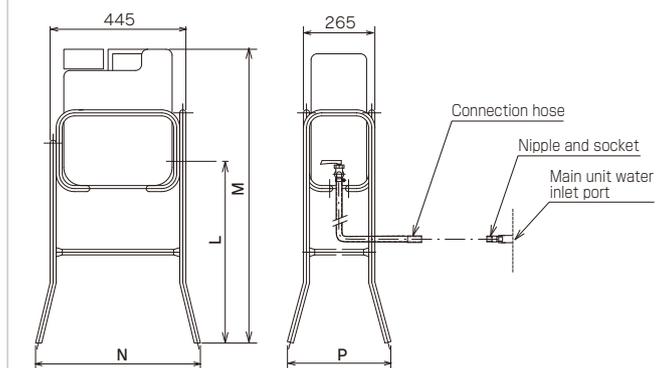
\* 2 When under temperature and humidity control, refer to the "Temperature and humidity control range" chart shown in the next page.

\* 3 No load, no sample, specified voltage, temperature (humidity) taken of air at unit air outlet port for a short time.

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

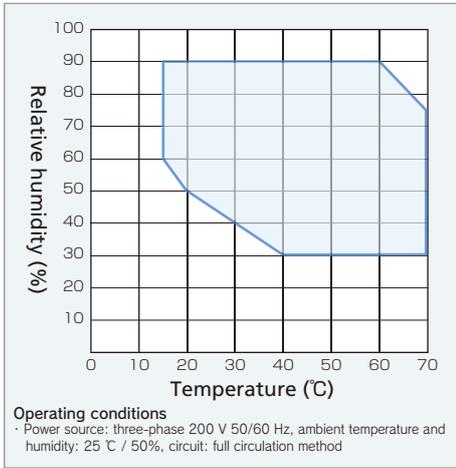
\* Install in a location free from the effects of corrosive gases (especially those harmful to copper and stainless steel.)

### Water supply tank (optional equipment) outside dimensions

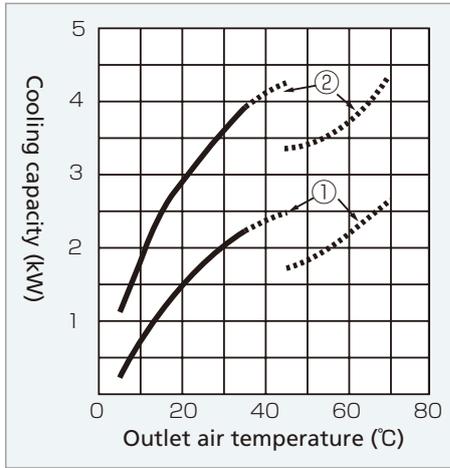


Model	L	M	N	P
AP-750MVK-E	850	1230	535	370
AP-1500MVK-E	1170	1560	660	480

### Temperature and Humidity Control Range



### Cooling Capacity Curves

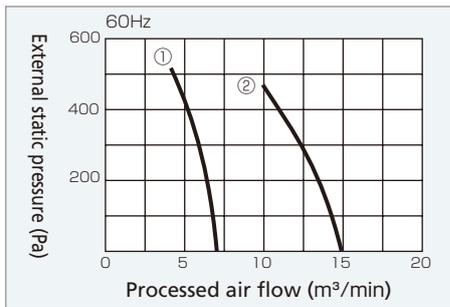
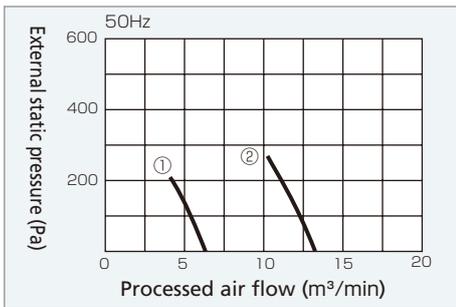


No.	Solid line applicable models
①	AP-750M-E
②	AP-1500M-E
No.	Solid line applicable models
①	AP-750M-E
②	AP-1500M-E

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

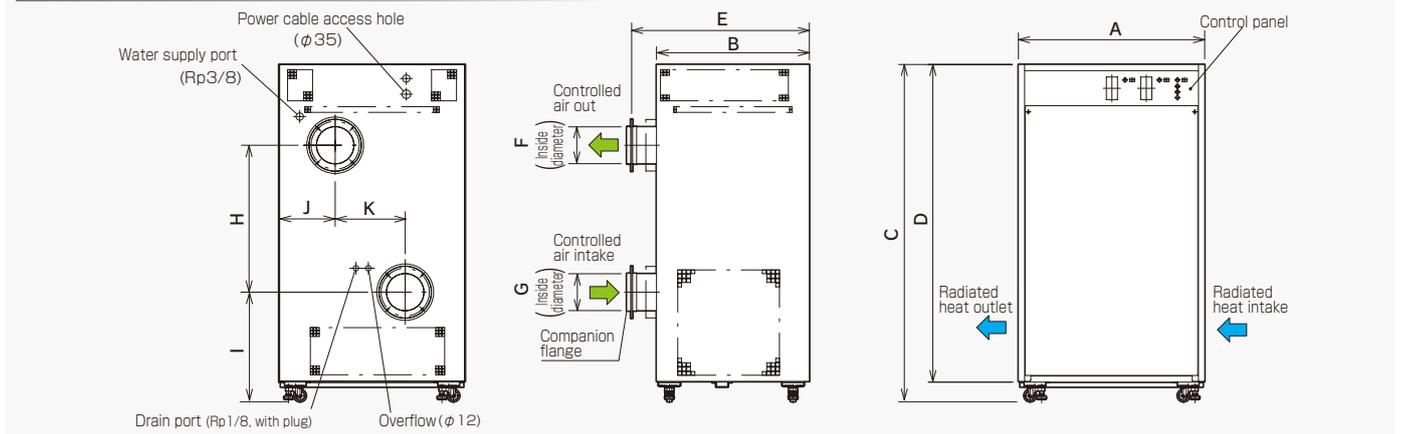
**Cooling capacity compensation value**  
**Note 1:** Power source of 50 Hz will be 85% of 60 Hz. (AP-1500 is same value for 50 or 60 Hz.)  
**Note 2:** Cooling capacity curve during temperature control. The power curve will be different during humidity control.

### Processed Air Flow Performance Charts



① AP-750M-E · MV-E · MVK-E  
 ② AP-1500M-E · MV-E · MVK-E  
 ※ Do not operate at Processed air flows outside what is listed in these charts.

### External dimensions (units: mm)

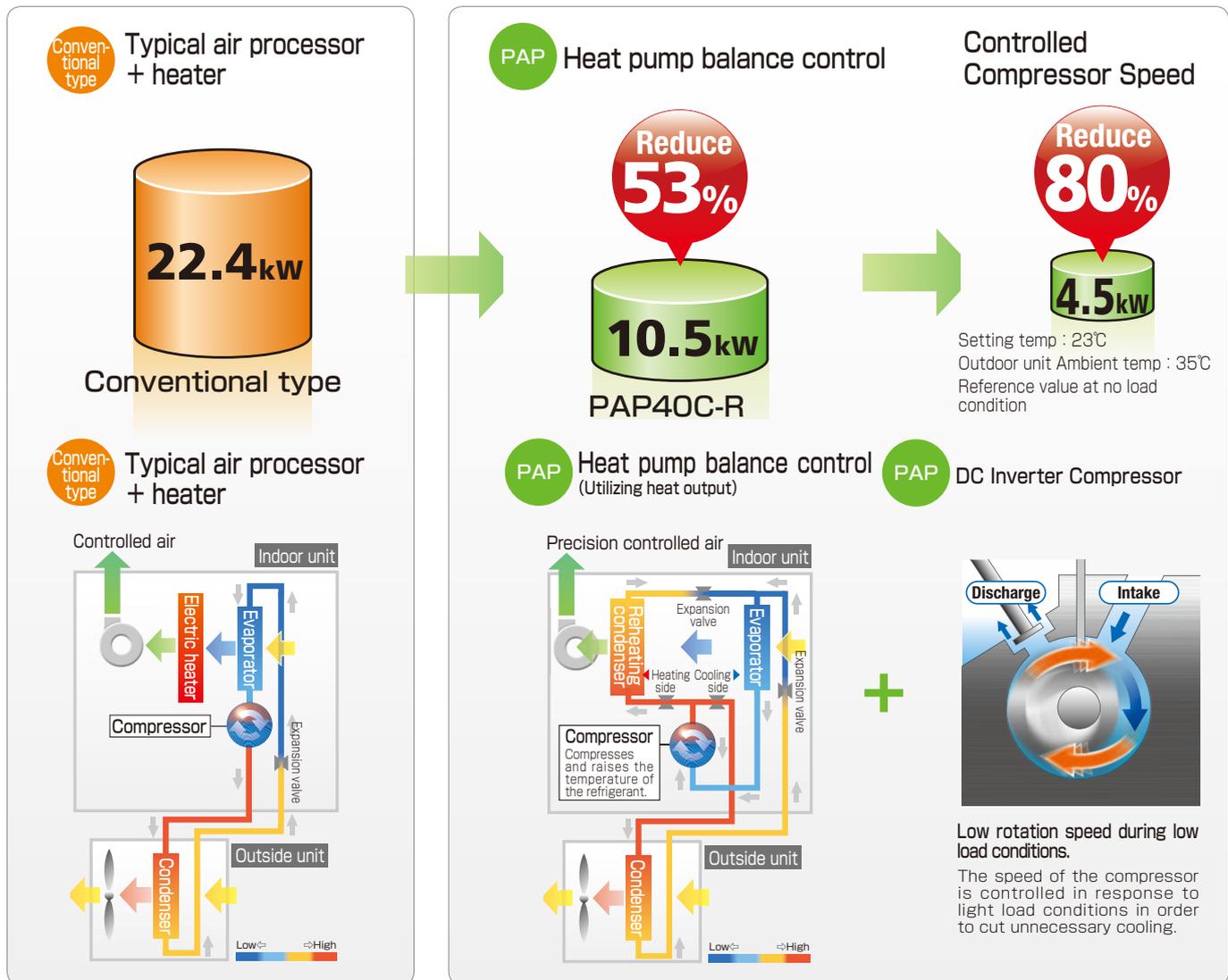


Model	A	B	C	D	E	F	G	H	I	J	K
AP-750M-E / MV-E / MVK-E	660	548	1044	964	(647)	φ 100	φ 100	425	319	185	279
AP-1500M-E / MV-E / MVK-E	753	618	1374	1294	(719)	φ 150	φ 150	598	446	227	283

# For Cleanrooms And Precision Measurement Rooms

## Constant Temperature (Constant Humidity) Equipment **R**Series

Thanks to ORION's heat pump balance control (incorporates waste heat utilization) we now offer...  
**Ultra Energy Savings & High Accuracy Temperature Control!**



PAP R Series

**Improved energy savings achieved thanks to ORION's heat pump balance control (utilizing heat output)**

When the temperature has risen to the set temperature, the auxiliary heater is shut off, thus preventing wasted electric power. **Patented pending**

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,

**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.

**Inverter fan built into both the indoor and outdoor units.**

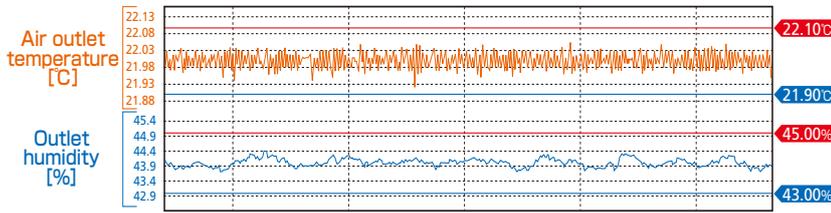
This, combined with our newly developed special controller results in ORION's original, optimized refrigeration cycle control operation.

# High Accuracy Temperature Control Air Processing



ORION has implemented high accuracy temperature control air processing not possible from other air processors.

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

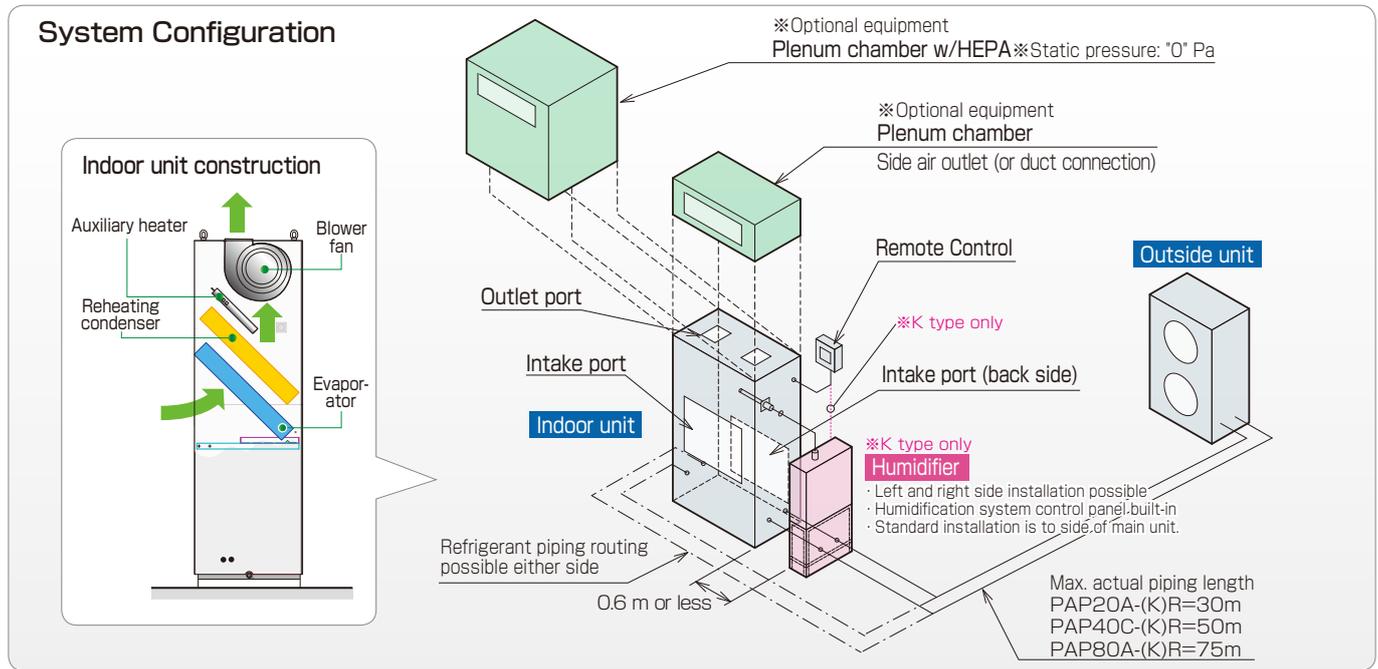


[Temperature setting: 22 °C , humidity setting: 44%, stable load]

Temperature control accuracy :  $\pm 0.2^{\circ}\text{C}$

Humidity control accuracy :  $\pm 2.0\%$

## Easy to use all-in-one system design.



### 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.

### A Wealth Of Optional Equipment

### System Configuration Chart

Model	Air flow (m <sup>3</sup> /min)	Indoor unit	Outside unit	Humidifier	Remote control (for temperature)	Remote control (for temperature and humidity)	Temperature sensor	Temperature and humidity sensor
PAP20A-R	23	● Common unit	● Common unit	—	●	—	●	—
PAP20A-KR		—	—	●	—	●	—	●
PAP40C-R	45	● Common unit	● Common unit	—	●	—	●	—
PAP40C-KR		—	—	●	—	●	—	●
PAP80B-R	80	● Common unit	● Common unit	—	●	—	●	—
PAP80B-KR		—	—	●	—	●	—	●
PAP120A-R	120	● Common unit	● Common unit	—	●	—	●	—
PAP120A-KR		—	—	●	—	●	—	●

### 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.

# For Cleanrooms And Precision Measurement Rooms

## Constant Temperature (Constant Humidity) Equipment **R** Series

### Models

#### Temperature Control Type

PAP20A-R

PAP40C-R

PAP80B-R

PAP120A-R



Temperature control

Intelligent monitor

Flow control

#### Temperature and Humidity Control Type

PAP20A-KR

PAP40C-KR

PAP80B-KR

PAP120A-KR



Temperature control

Humidity control

Intelligent monitor

Flow control



Air processing capacity **23~80m<sup>3</sup>/min**

Temperature control accuracy **±0.2°C**

Temperature setting range **18~30°C**

Humidity control accuracy **±2%**

Humidity setting range **45~60%**

※ "Humidity control accuracy" and "Humidity setting range" specifications are for the following models only: PAP20A-KR, PAP40C-KR, PAP80B-KR.

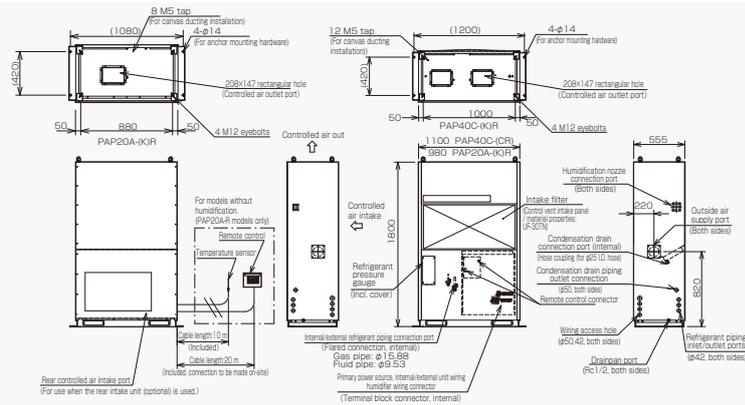


PAP20A-KR (temperature and humidity control type)

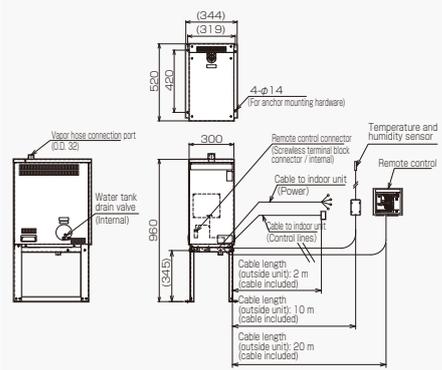
Model		PAP20A-R	PAP40C-R	PAP80B-R	PAP120A-R	PAP20A-KR	PAP40C-KR	PAP80B-KR	PAP120A-KR
Performance specifications	Possible setting range ※1	18 ~ 30 , -				18 ~ 30 , 45 ~ 60			
	Control accuracy ※2	± 0.2 , -				± 0.2 , ± 0.2			
	Cooling capacity (50/60Hz) ※3	8	12	25	38	8	12	25	38
	Heating capacity (50/60Hz) ※4	3	5	13	14.5	3	5	13	14.5
Environmental conditions	Indoor unit installation temperature conditions	5 ~ 35							
	Outdoor unit installation temperature conditions	- 5 ~ 43							
	Temperature gradient at intake	Within ± 2							
	Humidity gradient at intake	Within ± 5							
Outside dimensions	Indoor unit, outside dimensions (H × D × W) ※5	1800 × 555 × 980	1800 × 555 × 1100	1800 × 600 × 1500	1870 × 790 × 1900	1800 × 555 × 980	1800 × 555 × 1100	1800 × 600 × 1500	1870 × 790 × 1900
	Outdoor unit, outside dimensions (H × D × W) ※5	824 × 420 × 810	1160 × 420 × 810	1420 × 800 × 870	1420 × 800 × 870 × 2#	824 × 420 × 810	1160 × 420 × 810	1420 × 800 × 870	1420 × 800 × 870 × 2#
Mass	Indoor unit	(240)	(260)	(400)	(700)	(240)	(260)	(400)	(700)
	Outdoor unit	(65)	(80)	(130)	(130 × 2)	(65)	(80)	(130)	(130 × 2)
Power source	V(Hz)	Three-phase 200 ± 10% (50/60)							
Power specifications	Operating current (50/60 Hz) [when auxiliary heater is off] ※6	23 [18]	40 [31]	60 [42]	122 [93]	35 [30]	58 [49]	104 [86]	193 [165]
	power consumption (50/60 Hz) [when auxiliary heater is off] ※6	6.6 [4.8]	10.5 [7.5]	17 [11]	31.5 [22.5]	11 [9.2]	16.5 [13.5]	32 [26]	54 [45]
Blower fan	Power capacity	8	14	23	40	14	20	38	66
	Air flow (50/60Hz)	23	45	80	120	23	45	80	120
	Motor output (50/60Hz)	0.4		2.2	3.75	0.4	0.4	2.2	3.75
	External static pressure (50/60Hz) ※7	200		400		200		400	
Outdoor unit fan	Air flow (50/60Hz)	65	90	165	165 × 2	65	90	165	165 × 2
	Motor output (50/60Hz)	0.2	0.1 × 2	0.75	0.75 × 2	0.2	0.1 × 2	0.75	0.75 × 2
Refrigerant piping connections	Gas pipe	φ 15.88		φ 19.05	φ 25.4	φ 15.88		φ 19.05	φ 25.4
	Liquid pipe	φ 9.53		φ 12.70	φ 15.88	φ 9.53		φ 12.70	φ 15.88
Refrigerant piping	Max. length (one way)	30	50	75		30	50	75	
	Max. difference in height	10							
Refrigerant		R410A			R407C	R410A			R407C
Compressor output	kW	1.7	3.0	4.6	7.5	1.7	3.0	4.6	7.5
High pressure gas safety act classification		Not required							
Noise level	Indoor unit (50/60Hz)	68	69			68	69		
	Outdoor unit (50/60Hz)	59							
Humidifier	Water quality	Deionized water (electrical conductivity: 1 ~ 10 μ S/cm)							
	Outside dimensions (H × D × W)	—			960 × 520 × 300		960 × 520 × 300	960 × 590 × 500	960 × 790 × 550
	Humidification capacity ※8	—			5		8	20	30
	Mass	—			(35)		(35)	(60)	(90)

※ 1 The temperature and humidity control range noted does not necessarily indicate the actual controllable range possible. The range of control depends on the condition of the air supplied at the intake. ※ 2 When the intake air temperature and humidity, and outdoor ambient temperature are stable. Noted accuracy is based on measurement by the internal controller at a single air outlet point. ※ 3 When operating according to JIS B 8616. The displayed performance will be at least 80% when the intake air temperature of the outdoor unit is at least 35 °C. ※ 4 When operating according to JIS B 8616. The displayed performance will be at least 75% when the intake air temperature of the indoor unit is below 20 °C. The compressor will stop, and exclusive operation of the auxiliary heater may occur if the control air intake temperature drops to approx. 15 °C or lower. ※ 5 Outside dimensions do not include miscellaneous protrusions such as eyebolts, etc. ※ 6 Maximum value within the range of unit specifications. Starting current is equal to or less than the operating current. ※ 7 The noted external static pressure is when the controlled air is regulated at the outlet to produce the maximum rated processing air flow. ※ 8 The figure noted is when the equipment is operating at the highest level of humidification operating at the highest capacity of its normal operating range. ※ 9 Noise level can be decreased by installing a noise reducing duct.

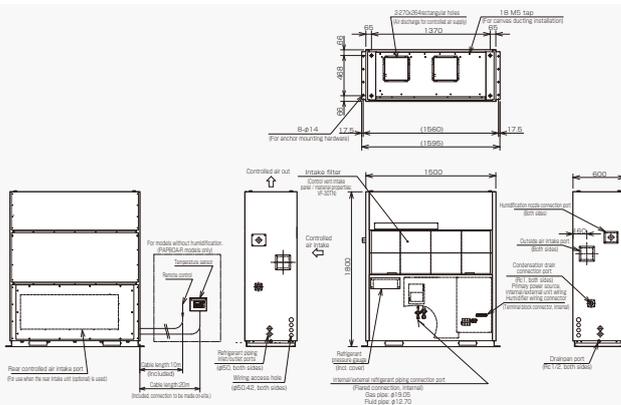
### Indoor unit [PAP20A-(K)R / PAP40C-(K)R]



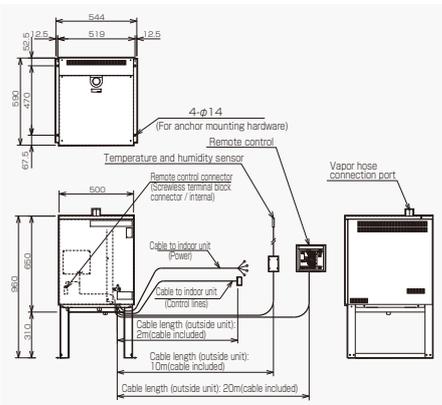
### Humidifier [PAP20A-KR / PAP40C-KR]



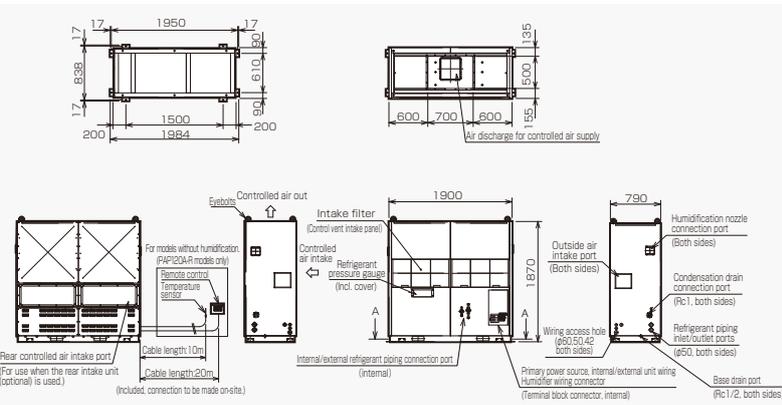
### Indoor unit [PAP80B-(K)R]



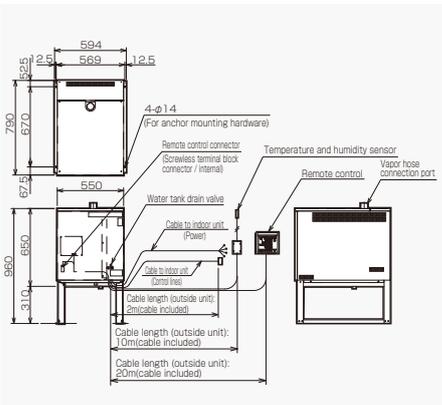
### Humidifier [PAP80B-(K)R]



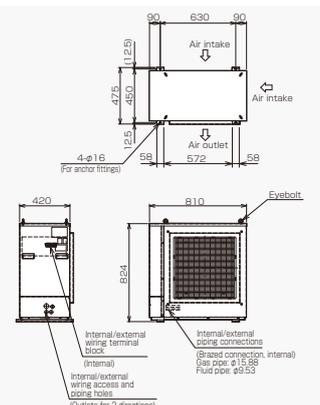
### Indoor unit [PAP120A-(K)R]



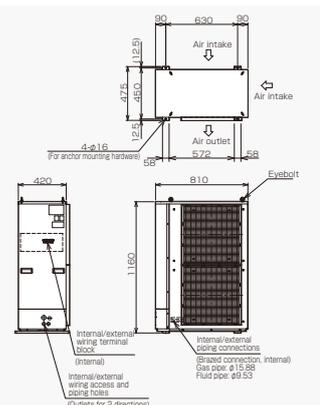
### Humidifier [PAP120A-(K)R]



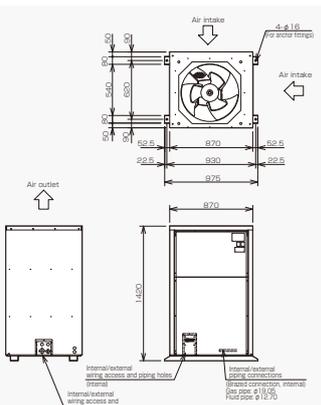
### Outside unit [PAP20A-(K)R]



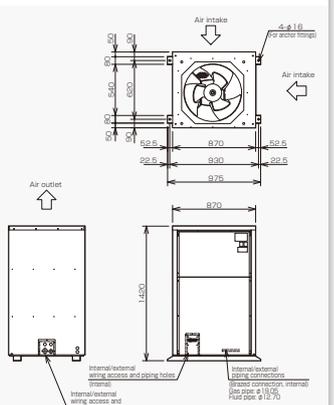
### Outside unit [PAP40C-(K)R]



### Outside unit [PAP80B-(K)R]



### Outside unit [PAP120A-(K)R]



- When installing the outdoor unit, have the air intake side facing the wall, and leave a space of at least 0.5 m.
- Refrigeration piping length: PAP20A-(K)R=30 m, PAP40C-(K)R=50 m, PAP80A-(K)R=75 m (all are 1-way)
- When there is a difference in height between the indoor and outdoor units: When the external unit is higher: 10 m. When the external unit is lower: 10 m.
- Cables and piping going between the indoor and outdoor units are not included.

# ORION's Energy Saving Air Processing System Proposal

## Energy Saving Dry Room System



Stable supply for a dry air space at dewpoint temperature of  $-60^{\circ}\text{C}$ .

From lithium ion battery and capacitor production to medical supply production and manufacturing processes, a strict low-humidity environment is required. In answer to the needs of such manufacturing processes, ORION brings to the table its original dehumidifying system that offers a waste-free, energy saving, ultra-low humidity environment.

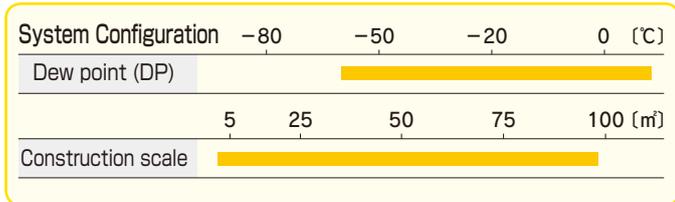
### Typical Applications That Can benefit From This Technology

- Lithium-ion battery production
- Capacitor manufacturing process
- Medical supply manufacturing process
- Precision electronic components manufacturing process
- Precision electronic components anti-rust and condensation-prevention
- Humidity management of powder manufacturing process.

### Compact design

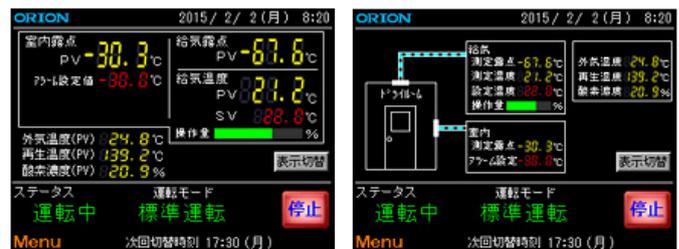
#### Pre-cooling + desiccant dehumidifier modular design

Inter-unit ducting unnecessary thanks to our modular design  
Offers space savings and lower construction cost.  
(30% reduction in required installation floor space (compared with our previous models))



### Intelligent Touch Panel

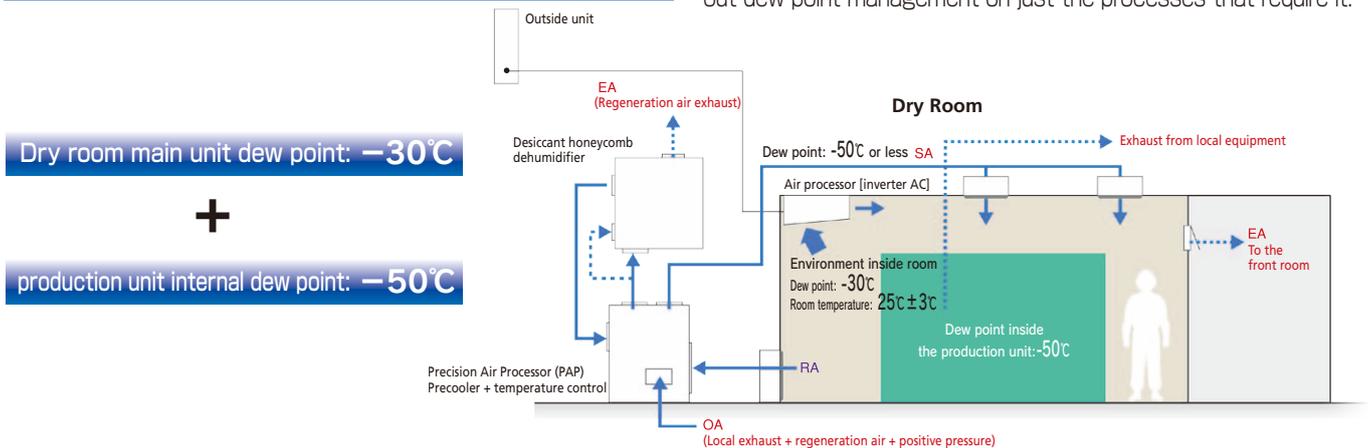
With the touch panel display, various settings and information can be accessed, and current operating conditions can be easily checked.



## ORION's Proposal For A Process-Localized Dew Point Energy Saving System

### Energy Saving Dry Room System Configuration Example

Cost reductions and energy saving can be achieved by carrying out dew point management on just the processes that require it.



### Examples Of Installation

A system design not limited to dry rooms.



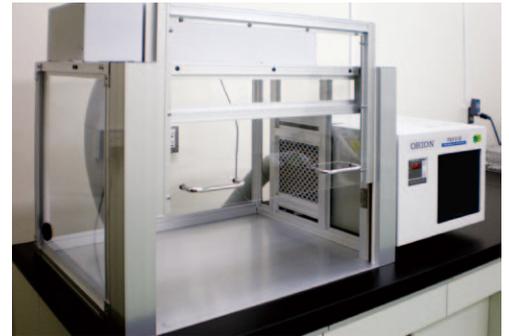
# ORION Has System Proposals Built Around The PAP® Series To Meet All Of Your Needs.

## Compact Panel System

System proposals that fit in the range of about 33m<sup>2</sup>.



Chromatograph



Compact tabletop chamber



Constant temperature, constant humidity room



Example of internal air discharge



Example of internal air discharge



3-D measurement room



Example of external air intake

# ORION Has System Proposals Built Around The PAP® Series To Meet All Of Your Needs.

## Clean Booth

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

ORION's original functionality for 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 air flow) 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	MAC-IIA-10	MAC-IIA-30	MAC-IIA-50 MAC-IIA-50-21	MAC-IIA-100 MAC-IIA-100-21	MAC-IIA-150 MAC-IIA-150-21	MAC-IIA-250 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 Air Flow (m <sup>3</sup> /min)	Approx. 1.0/0.8	Approx. 3.0/3.5	Approx. 5.0	Approx. 10.0	Approx. 15.0	Approx. 25.0
Air Flow Wind Speed (m/sec)	Avg.: 0.36/0.29	Avg.: 0.38/0.44	Avg.: 0.39	Avg.: 0.51	Avg.: 0.37	Avg.: 0.61
Noise (dBA)	Approx. 51/49	Approx. 53/56	Approx. 55/56	Approx. 56/57	Approx. 56/57	Approx. 59/59
Power Source	Single-phase AC 100V, 50/60 Hz		Single-phase AC 100V, 50/60 Hz or Single-phase AC 200V, 50/60 Hz			
Power Consumption (W)	35/40	28/36	43/46	98/114	141/157	190/230
Blower Fan	AC Motor					
Number of Blower Fans	1	1	1	1	1	2
Mass (kg)	Approx. 4	Approx. 6.5	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.					

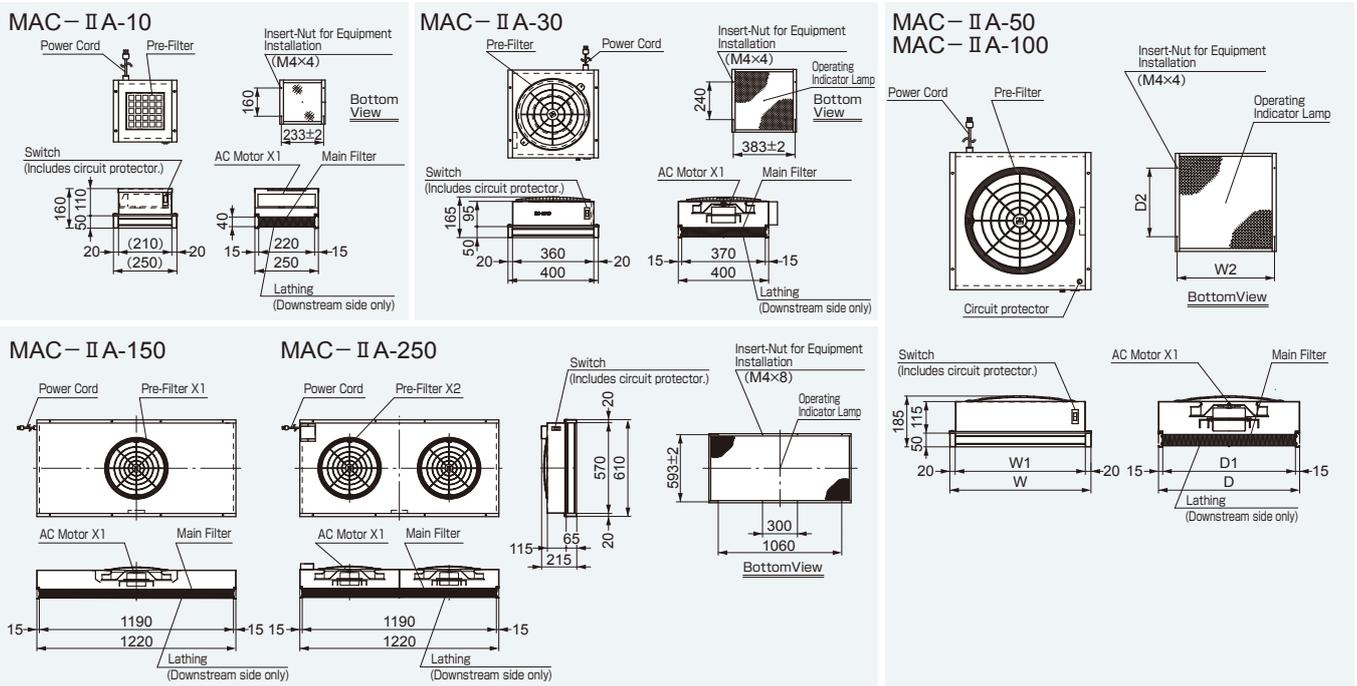
\* Noise level measured at 1 m from the air outlet port in an anechoic room.

S Series: Models that include a chamber box for duct connections are available. Please ask an ORION distributor for details.



Chamber Box for Duct Connections

## External Dimensions



# 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.

 **Warning 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.)

 **Prohibited 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.)

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

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 unit could come into contact with wind, rain, or water.**  
Exposure to water splash or rain could lead to electric shock or fire.

 **Operate the unit on a level and stable surface that can fully withstand the weight of the unit.**  
Failure to use the unit 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 unit 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 unit, could lead to unit breakdown. And if by some chance there were a flammable gas leakage and the gas accumulated near the unit, 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 unit 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 unit, be sure to also include this operating manual.**  
The operating manual should be included with the unit in the event that it is sold or transferred so that the new owner can also refer to in order to safely operate the unit.

 **Operate the unit 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.

 **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 unit and consult with your dealer or a qualified repair person.**  
Continued operation when the unit is performing abnormally can lead to electric shock or fire.

 **Before use, be sure that the safety of this unit and all related equipment is confirmed by someone sufficiently knowledgeable and experienced.**

 **Always carry out proper inspections and cleaning as indicated in the operating 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 unit 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

! Make sure that primary cooling water (cooling water for the condenser of a compressor unit and/or heat dissipating water for an electronic peltier cooling unit), water for a constant temperature circulating water temperature controller, and deionized water for humidification, meet the water quality standards listed below.

○ 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.

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

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.

○ Constant temperature circulating water ..... Operate with water that meets the following water quality.

		Standard level
Standard components	PH(25°C)	6.8~8.0
	Conductivity (μS/cm) (25°C)	1~400
	Chloride ion (mgCl <sup>-</sup> /L)	Max. 50
	Sulphate (mgSO <sub>4</sub> <sup>2-</sup> /L)	Max. 50
	Acid consumption (pH4.8) (mgCaCO <sub>3</sub> /L)	Max. 50
	Total hardness (mgCaCO <sub>3</sub> /L)	Max. 70
	Calcium hardness (mgCaCO <sub>3</sub> /L)	Max. 50
Reference components	Silica ion (mgSiO <sub>2</sub> /L)	Max. 30
	Iron (mgFe/L)	Max. 1.0
	Copper (mgCu/L)	Max. 1.0
	Sulfide ion (mgS <sup>2-</sup> /L)	Not detected
	Ammonium ion (mgNH <sub>4</sub> <sup>+</sup> /L)	Max. 1.0
	Residual chlorine (mgCl/L)	Max 0.3
	Free carbon dioxide (mgCO <sub>2</sub> /L)	Max. 4.0

From JRA GL-02-1994 (water circulation for water cooled systems)

※ If the quality of water to be used for constant temperature circulating water does not fall within the prescribed guidelines, it may result in corrosion in the circulation or refrigeration sections of the equipment, clogging, etc. Please confirm water quality prior to use. Also, periodically replace the water to help prevent deterioration of the water quality.

※ Compatible models ..... PEC, RKE

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

**Water quality (electrical conductivity) 1~10μS/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 \* FK · FSK · MVK · APS · LLKP, PAP \* K · KW · KR

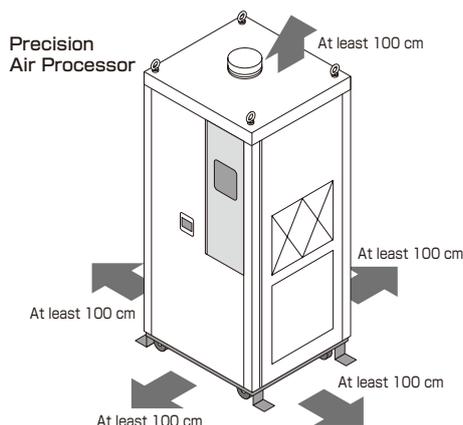
**Do not apply excessive force to the temperature (or humidity) sensor.**  
Doing so can result in unit breakdown.

## 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 unit to facilitate optimum unit performance as well as a working space for maintenance tasks.



## Technical Data

### Making The Right Model Choice (temperature and humidity control types)

※ Please see page 5 for temperature-only control types.

#### Determining Air Flow

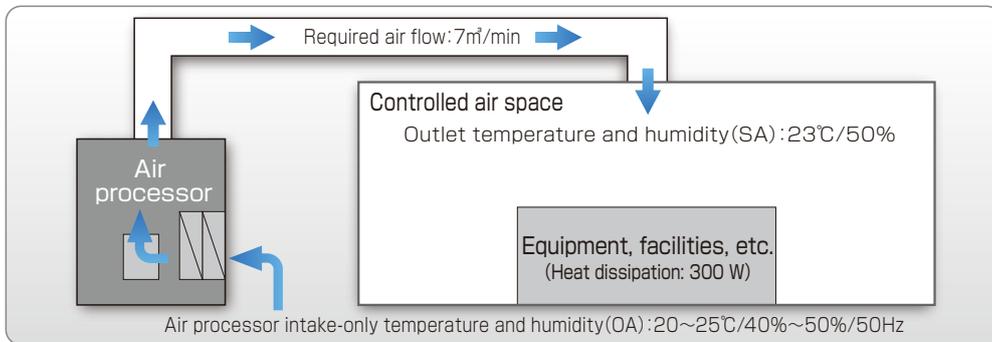
Required air flow is based on temperature accuracy and air ventilation frequency.

**Calculation:**  $F=(V \times N) \div 60$  F: Air flow (m<sup>3</sup>/min), V: Volume of air space (m<sup>3</sup>), N: Ventilation frequency (ventilation cycles/h)

[Ventilation frequency estimate chart] ※Note that these values are only offered as a rough estimate as actual results will vary greatly based on the surrounding environment and the insulation specifications of the booth itself.

Temperature accuracy	±2°C	±1°C	±0.5°C	±0.25°C
Air exchange rate	15 ventilation cycles/h	30 ventilation cycles/h	60 ventilation cycles/h	120 ventilation cycles/h

#### [Sample calculation]



**Conditions:** Temperature accuracy of around ±0.5°C for a room of the following dimensions: width: 1.8m, depth: 1.8m, height: 2m...

**Calculation:** In order to achieve a temperature accuracy of ±0.5 °C for this room, the ventilation frequency should be at least 60 ventilation cycles/h, and the required air flow would be ...

$$F=(V \times N) \div 60=1.8 \times 1.8 \times 2 \times 60 \div 60=6.48 \text{ m}^3/\text{min}$$

The model that could adequately provide this air flow would be the PAP10 Series.

※Please use the information in the table below.

Volume of space [m <sup>3</sup> ]	10	20	30	40	50	60	70	80	90	100
±2°C: 15ventilation cycles/h	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	25.0
±1°C: 30ventilation cycles/h	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
±0.5°C: 60ventilation cycles/h	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0
±0.25°C: 120ventilation cycles/h	20.0	40.0	60.0	80.0	100.0	120.0	140.0	160.0	180.0	200.0

#### Find the required 『cooling+heating power』

**Calculation:**  $Q=Q_1+Q_2$  Q: Cooling + heating power (kW) Q1: Cooling power (kW) Q2: Reheating power (kW)

**Conditions:** Intake air into the PAP:20~25°C/40~50% environment, and desired control of 23°C/50% ...

##### 1) Confirm the cooling capacity

$$\text{Formula: } Q_1 = \frac{(i_2 - i_1) \times 1.2 \times F \times 60}{860}$$

$Q_1$ : Cooling power kW (1 kW = 860 kcal/h),  $i_2$ : Intake air enthalpy (kcal/kg)

$i_1$ : Enthalpy at the set air dew point temperature / 100% (kcal/kg),

1.2: Specific gravity of air kg/m<sup>3</sup>, F: Flow rate (m<sup>3</sup>/min)

① According to the "Enthalpy chart" (page 41), the enthalpy for the high temperature and humidity intake air of 25 °C / 50% is  $i_2=12.01$ .

② The dew point temperature for the set temperature and humidity of 23 °C / 50%, according to the "Dew Point Temperature Chart" (page 40) is 12°C\*1.

The enthalpy value for 12°C / 100% according to the "Enthalpy Chart" (page 41) is  $i_1=8.14$ .

If we take the flow rate of the PAP10A1-K, which has a rated processing air flow of 7~10 m<sup>3</sup>/min, to be 7 m<sup>3</sup>/min ...

$$Q_1 = \frac{(i_2 - i_1) \times 1.2 \times F \times 60}{860} = \frac{(12.01 - 8.14) \times 1.2 \times 7 \times 60}{860} \approx 2.3 \text{ kW}$$

※1 The possible setting range of dewpoint will be from 8 °C or higher.

2) Confirm the reheating power

$$\text{Formula: } Q_2 = \frac{(i_3 - i_1) \times 1.2 \times F \times 60}{860}$$

Q<sub>2</sub>: Reheating power kW (1 kW = 860 kcal/h), i<sub>3</sub>: Set air enthalpy (kcal/kg)  
 i<sub>1</sub>: Enthalpy at the set air dew point temperature / 100% (kcal/kg),  
 1.2: Specific gravity of air kg/m<sup>3</sup>, F: Flow rate (m<sup>3</sup>/min)

- ① The enthalpy value for 23°C / 50% according to the "Enthalpy Chart" (page 41) is i<sub>3</sub>=10.84.  
 ② The heating power for conditions of 12°C / 100%, i<sub>1</sub>=8.14 is ...

$$\text{Formula: } Q_2 = \frac{(i_3 - i_1) \times 1.2 \times F \times 60}{860} = \frac{(10.84 - 8.14) \times 1.2 \times 7 \times 60}{860} \doteq 1.6 \text{ kW}$$

3) Find the cooling + heating power

From the results from 1) and 2), Q=Q<sub>1</sub>+Q<sub>2</sub>=2.3+1.6=3.9kW

4) Find the cooling + heating power

Q'="Cooling + heating power" × the power correction coefficient.

- ① According to the "Enthalpy Chart" (page 41), the enthalpy intake air of 25°C / 50% is i<sub>2</sub>=12.01. The power correction coefficient at this time, according to the "«Cooling + Heating Power» Correction Coefficient Graph" (page 39), is 0.85. Supposing the PAP10A1-K was chosen, the "Cooling + Heating Power Chart" below indicates 4.7 kW (50Hz), therefore..

$$Q' = 4.7 \text{ kW} \times 0.85 \doteq 4.0 \text{ kW}$$

- ② Q=3.9kW, therefore Q' ≥ Q

※ According to the above, the PAP10A1-K satisfies the required specifications.

**[Cooling + Heating Power Chart (kW)] 50/60Hz**

	PAP05		PAP10		PAP20		PAP40	
Air Cooled	2.3	2.6	4.7	5.3	9.4	10.5	—	—
Water Cooled	3.2	3.2	6.5	6.5	13.0	13.0	17.0	17.0

■ Confirm Power During Heating

Confirm the power for heating from the low intake air temperature and humidity, from 20°C / 40% to 23°C. According to the "Enthalpy Chart" (page 41), the 20°C / 40% enthalpy is 8.32, therefore the heating power to get to an enthalpy of 10.84, for 23°C / 50%, is...

$$Q = \frac{(10.84 - 8.32) \times 1.2 \times 7 \times 60}{860} \doteq 1.48 \text{ kW}$$

The enthalpy of the intake air of 20°C / 40% is 8.32, therefore, according to the "«Cooling + Heating Power» Correction Coefficient Graph" (page 39), the power coefficient is 0.77. Supposing the PAP10A1-K was chosen, the "Cooling + Heating Power Chart" above indicates 4.7 kW, therefore...

$$Q' = 4.7 \text{ kW} \times 0.77 \doteq 3.6 \text{ kW}$$

$$Q = 1.48 \text{ kW}, \text{ therefore } Q' \geq Q$$

※ According to the above, the PAP10A1-K satisfies the required specifications.

# Technical Data

## Making The Right Model Choice (continued from the previous page)

### Confirm Humidification Power

**Formula :  $X=(x_1-x_2) \times 1.2 \times F \times 60$**

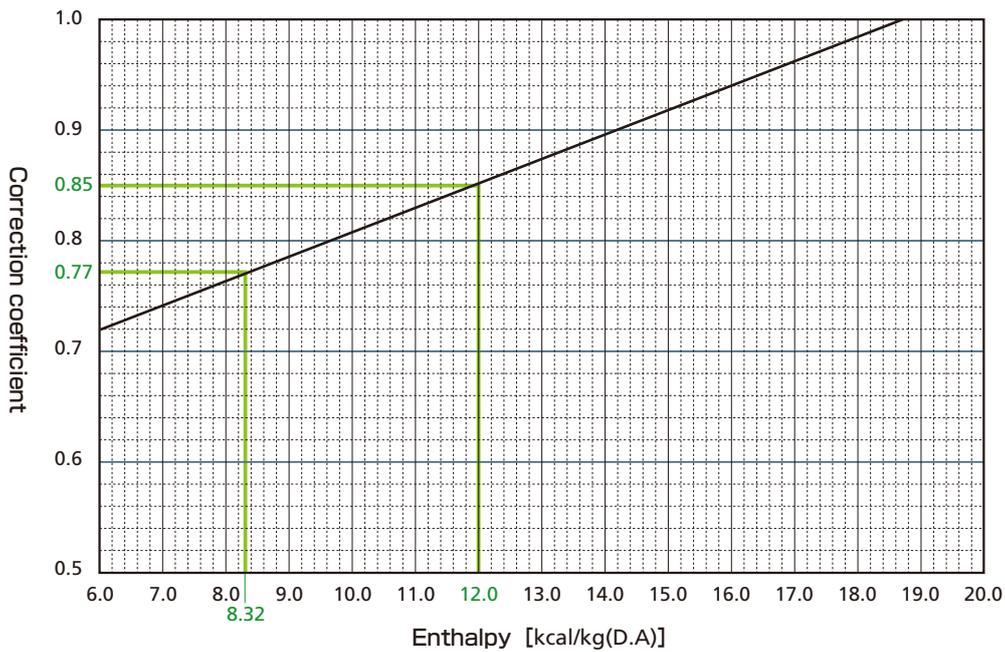
X: Humidification power (kg/h), x<sub>2</sub>: Intake air specific humidity (kg/kg),  
 x<sub>1</sub>: Set air specific humidity (kg/kg), 1.2: Specific gravity of air (kg/m<sup>3</sup>), F: Air flow (m<sup>3</sup>/min)

According to the "Specific Humidity Chart" (page 42), the specific humidity at 20°C/40% is 0.00580 kg/kg. Also according to the "Specific Humidity Chart", the specific humidity at 23°C/50% is 0.00875 kg/kg. Therefore...

**$X=(0.00875-0.00580) \times 1.2 \times 7 \times 60=1.4868\text{kg/h}$**

※The maximum humidification capacity of the PAP10A1-K is 5.0 kg/h, and therefore it satisfies the required specifications.

## 《Cooling+Heating Power》Correction Coefficient Graph



Dew point Temperature Chart (°C)  Possible Setting Range

Temperature (°C)	Relative Humidity															
	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	
5												1	2	3	4	
6												2	3	4	5	
7										1	2	3	4	5	6	
8										2	3	4	5	6	7	
9								1	2	3	4	5	6	7	7	
10								1	3	4	5	6	7	8	8	
11								2	4	5	6	7	8	9	9	
12							2	3	5	6	7	8	9	9	10	
13						1	3	4	5	7	8	9	10	10	11	
14						2	4	5	6	7	9	10	11	11	12	
15					2	3	5	6	7	8	10	11	12	12	13	
16				1	2	4	6	7	8	9	11	12	13	13	14	
17				1	3	5	7	8	9	10	12	12	14	14	15	
18				2	4	6	7	9	10	11	12	13	15	15	16	
19			1	3	5	7	8	10	11	12	13	14	16	16	17	
20			2	4	6	8	9	11	12	13	14	15	16	17	18	
21			3	5	7	9	10	12	13	14	15	16	17	18	19	
22		1	4	6	8	9	11	12	14	15	16	17	18	19	20	
23		2	5	7	9	10	12	13	15	16	17	18	19	20	21	
24		3	5	8	10	11	13	14	16	17	18	19	20	21	22	
25	1	4	6	8	11	12	14	15	17	18	19	20	21	22	23	
26	1	4	7	9	11	13	15	16	18	19	20	21	22	23	24	
27	2	5	8	10	12	14	16	17	19	20	21	22	23	24	25	
28	3	6	9	11	13	15	17	18	20	21	22	23	24	25	26	
29	4	7	10	12	14	16	18	19	20	22	23	24	25	26	27	
30	5	8	10	13	15	17	18	20	21	23	24	25	26	27	28	

# Technical Data

## Enthalpy Chart (kcal/kg)

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	8.08	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	0.00652	0.00792	0.00925	0.01060	0.01196	0.01331	0.01467	0.01604	0.01742	0.01879	0.02017	0.02157



## Orion Products -- Service and Safety

### ● Safety Notes

- Before using this equipment, read the operating manual thoroughly and operate the equipment correctly as directed.
- Consult with a qualified professional or your ORION dealer for product installation and wiring.
- Please select a product that is suitable for the desired application. Do not use for other than intended purposes. Use for other than intended purposes can lead to accidents or unit breakdown.

### ● Air-Cooled Spec. 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 Spec. 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

- Please contact your dealer for any repairs required after using this unit.
- Costs will be incurred by the customer 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. Spare parts are items necessary to maintain the proper function and operating specifications of the equipment. 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

- After having used the unit for a long time, actual performance may drop due to the effects of dirt or wear, etc. 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 with your dealer or contact ORION directly.

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.



ISO 9001  
ISO 14001 (Main Factory)

ORION Machinery Co., Ltd is an ISO Certified, Quality Management and Environmental Management company.

—What is the ISO certification system?—

ISO (International Organization for Standardization) is an established body that stipulates and certifies ISO9001 and ISO14001 directives. ISO9001 stipulates a system of Quality Management that ensures customer satisfaction and trust in a company's products and services it provides. ISO14001 stipulates a system of Environmental Management whereby production and business activities are carried out in an environmentally conscious manner.

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This catalogue contains product specifications as of Dec, 2012.

- Actual product colors may vary slightly from catalogue.
- The structure or specifications of products contained in this catalogue are subject to change without prior notice.