





ORION

POGA-WI

### **Precision Air Processor**

# PRECISION AR PROCESSOR PROCESSOR

Capacity Control From The Industry Leader

The evolution of Orion high spec air processor

ORION

D-VED4

### **Energy Saving Precision Air Processor**



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





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Teres.





Energy Saving Precision Air Processing Equipment

PAGE 15

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



Temperature And Humidity Control Type 💆 PAGE

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



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vings of 50% or Better (compared with previous models) ecoupy means Economy (energy savings) and Ecology (environmental protection) and reduced C0<sub>4</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 PAGE 21 Air Processors for Dehumidification PAP® R Series Facility Targeted Energy Saving Precision Air Processors PAGE 21



PAP® L Series Energy Saving Precision PAGE 23 Air Processors for Low Temperature



Air Processor Circulation Type Temperature PAGE 25 And Humidity Control Equipment



Energy Saving Dry Room PAGE 31 or Safety / Technica

# 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 reheat 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℃ 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.

is impossible to achieve with constant-speed compressors.





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. Effective energy savings from compressor speed control \* Graph showing PAP10A-(F)W

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



### Freeze-prevention circuit unnecessary

Cooling unit frost is prevented thanks to compressor speed control. Cooling possible right down to just nearly 0  $^\circ\!\!\!C$  .

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





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



### **PAP**<sup>®</sup> Series Main Features

### Temperature settings as high as $7^{\circ}$ 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  $\sim$  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:  $18 \sim 30^{\circ}$ C, humidity setting range:  $40 \sim 75^{\circ}$ . (Vapor humidification is used in the humidity setting range of  $65 \sim 75^{\circ}$ . The humidity setting range for the PAPmini is  $45 \sim 75^{\circ}$ .)

### Temperature control accuracy: ±0.1℃

### (during periods of stable load)

All-Fresh guarantees  $\pm$  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. Builtin 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 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

6

### **Controller Details**

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

 RUN/STOP button
 RUN lamp
 ALARM RESET button
 Temperature PV / PS display
 Heating / cooling indicator
 Function setting buttons
 Humidity PV / PS display (only on units that have humidity and temperature control)

**3** Temperature / humidity input select key (only on units that have humidity and temperature control)

### 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)

### Energy savings



Power source capacity and power consumption comparison

humidification method by Air 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 ± 0.1 °C are possible. All combined, ORION offers extremely high quality processed air.



Two-fluid nozzle water mist humidification configuration diagram



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



Max. 80% energy savings

	Power consum	nption values (k	Wh), at 60 Hz	Difference in	Amount of	
Model	Other companies' previous method (A)	ORION's new method (B)	Difference in power $(C)$ A - B	yearly power consumption (kWh)	reduced CO₂ (kgCO₂ ∕ year)	
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	

der previous method, pormal operation does not aximum nowe the value is calculated as the rated power consumption imes 0.85

\*2 \*3 Calculated at 24 hr/day, 300 days/year. Reduction in CO₂ 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.





### 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.

### 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.

### 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 is 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.

<u>For</u> Local Area



#### 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  $100 \sim 300$  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 submicron order are the norm, and there is a demand nano-unit scales. The smallest changes in temperature can result in expansion and contraction of equipment and the target work, so there is always the desire for absolute temperature control precision.



### Localized Air Processing For All Kinds Of Equipment



### Printed circuit board stocker

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



Electron microscope 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  $\sim$  0.00001 mm. Improvement of measurement accuracy, demands a stable installation environment.

<u>For Local</u> Area



### 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<sup>15</sup>), 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® MINI –Light Duty Series – Air cooled





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				
ω —	Possible temperature and humidity setting range * 1	°C,%	18~30	18~30,45~75	18~30	18~30,45~75				
per	Temperature and humidity control accuracy %2	°C,%	± 0.1	$\pm$ 0.1, $\pm$ 1.0	± 0.1	$\pm$ 0.1, $\pm$ 1.0				
fifi	Cooling / heating output (50/60Hz)	kW	0.33 / 0.39	0.77 / 0.84	1.44 / 1.6	1.8 / 2.12				
ma	(Maximum cooling output)	(kW)	(0.22 / 0.26)	(0.37 / 0.44)	(0.94 / 1.1)	(1.2 / 1.42)				
ion	Rated processing airflow	m³∕min	0.7 ~	~ 1.0	2.0 ~	~ 4.0				
ົພ	Maximum external static pressure #3	Pa	120/130	120/160	100	110				
envi	Surrounding (intake air) temperature and humidity range $\gg 1$	°C,%		15~35,	30~70					
nditi	Temperature gradient at intake	℃/h		Withir	n ± 1					
ental ons	Humidity gradient at intake	%/h		Within ± 5						
	Outside dimensions (H $\times$ D $\times$ 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	ø 75	φ 100	<i>ф</i> 100	ø 100				
Hu	Water quality		—	Deionized water (electrical conductivity: 1~10 $\mu\rm{S/cm})$	—	Deionized water (electrical conductivity: 1~10 $\mu$ S/cm)				
nidi <sup>;</sup>	Maximum moisture output *5	kg/h	—	0.8	—	2.3				
ficat ter	Supply temperature range	Ĉ	—	10~40	_	10~40				
lion	Connection port size		—	Rc1/4	—	Rc1/4				
spe	Power source *6	V(Hz)	Single phase 100	V ± 10% (50/60)	Three-phase 200'	√ ± 10% (50/60)				
Po	Power consumption	kW	0.32/0.34	1.2/1.2	0.6/0.7	3.0/3.5				
ver	Electric current *7	А	4.0/3.9	13/13	2.8/2.8	12/13				
ons	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.



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

### Simple and easy installation

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

### As much as 70% cut in heat output\*

Extremely low heat output means less burden on the insides of the room, as well as the air processor. \*\* Compared with sustained compressor operation + heater reheat method.





An answer for each of your temperature control needs. Our dealers are happy to provide further information.







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



⟨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	PAP05A1-F	PAP10A1	PAP10A1-F	PAP20A	PAP20A-F		
ω	Possible temperature setting range ** 1	C			18~	- 30				
per	Temperature and humidity control accuracy *2	Ĉ			± (	D.1				
Sif	Cooling / heating output (50/60Hz)	kW	2.3 / 2.6		4.7 /	<sup>7</sup> 5.3	9.4 /	10.5		
ma	(Maximum cooling output)	(kW)	(1.6) /	(1.8)	(3.2) /	(3.6)	(6.5) /	/ (7.2)		
ion	Rated processing airflow r		3 ~	- 5	7~	10	13-	~ 20		
ωw	Maximum external static pressure(50/60Hz) * 3	Pa	110	620	250	560	250	690		
Envii	Surrounding (intake air) temperature and humidity range $\gg 1$	°C,%		15 ~ 35, 30 ~ 70						
nditic	Temperature gradient at intake	℃/h	Within ± 1							
ental Ins	Humidity gradient at intake %/h				Withi	n ± 5				
	Outside dimensions (H $\times$ D $\times$ W) *4		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	<i>ф</i> 100	Ø 100 HEPA filter built in	¢ 150	Ø 150 HEPA filter built in	φ 200	\$		
spe	Power source *6	V(Hz)			Three-phase 200 ± 10% (50/60)					
Po	Power consumption *7	kW	1.	.4	1.	.8	3	.9		
wer catio	Electric current *7	Α	6	.2	7	.5	]2	1.9		
ons	Power capacity *8	kVA	2.	.2	2	.6	5	.2		
	Noise level (50/60Hz) *9	dB	66/66	71/71	68/68	73/73	69/69	76/76		
	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<sub>R</sub> Temperature Control Type Water cooled

### Models **PAP05A1-W** Air processing capacity 3~40m/min PAP05A1-FW Temperature control accuracy ±0.1°C PAP10A1-W Temperature setting range PAP10A1-FW PAP20B1-W PAP20B1-FW PAP40B-W PAP40B-FW



(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
(0 _	Possible temperature setting range * 1	Ĉ				18~	~ 30		•	
sper	Temperature and humidity control accuracy *2	C				± (	D.1			
cifi fi	Cooling / heating output (50/60Hz)	kW	3.2	/3.2	6.5	6.5/6.5		/13.0	22.0,	/22.0
ma	(Maximum cooling output)	(kW)	(2	.0)	(4	.0)	(8	.0)	(16	6.0)
ion	Rated processing airflow	m³∕min	3 -	~ 5	7~	- 10	13 -	~ 20	25 ~	~ 40
ົດ	Maximum external static pressure(50/60Hz) *3	Pa	410/660	300/620	870/870	560/560	650/1000	300/690	300/300	1000/1000
0 5	Surrounding (intake air) temperature and humidity range $pprox$ 1	°C,%				15~35	, 30 ~ 70		•	
ond /iror	Temperature gradient at intake	℃/h				Withi	n ± 2			
itior	Humidity gradient at intake	%/h				Withi	n ± 5			
ntal IS	Cooling water temperature gradient	℃/h				Withi	n ± 5			
	Outside dimensions (H $\times$ D $\times$ W) $*4$	mm	1489 × 5	i86 × 538	1703×763×655	2135×763×655	1842×973×653	2291×973×653	1800×1200×900	2323×1200×900
	Mass	kg	120	130	215	260	220	290	440	540
	Controlled air outlet port	mm	φ100	$\phi$ 100 HEPA filter built in	φ150	$\phi$ 150 * 5 HEPA filter box included	φ 200	$\phi$ 200 HEPA filter box included	□ 350	350 × 5 HEPA filter box included
_	Rate of supply *6	m³∕h	1	.0	1	.5	2	.2	3	.0
Cooli	Supply temperature range	°C			15~32					
ng v	Supply pressure	MPa			0.69 or less					
Nate	Inlet/outlet pressure difference	MPa				0.2 or	greater			
4	Connection port size		Rc	1/2	Rc	3/4	Rc	3/4	Ro	51
spe	Power source *7	V(Hz)			Th	ree-phase 200	) ± 10% (50/6	60)		
Po	Power consumption (50/60Hz) *8	kW	1.2	/1.3	1	.7	3.0,	/3.2	6	.0
wer	Electric current *8	Α	4.5	/5.2	7	.1	12.0	/12.5	24	1.0
ons	Power capacity *9	kVA	1	.8	2	.5	4	.4	8	.3
	Noise level(50/60Hz) *10	dB	68	/ 71	73.	/73	73,	/76	75/75	83/83
	Operation control method				-	Heat pump ba	balance control			
	Refrigerant					R4	10A			
	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 Values We in the temperature control repersons on the constant with the temperature and humidity, and supply water temperature and supply water flow rate are stable. Noted accuracy is based on measurement by the internal controlled aris regulated at the outlet to produce the maximum rated 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 aximum air flow and at the highest cooling capacity, the difference between the cooling water inlet and outlet ports is 6.5 °C. \* 5 Store 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<sub>®</sub> Temperature And Humidity Control Type Air cooled

ORION



(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.

<u>88.88</u> , 	с <mark>фн</mark>			AIR		°C	
Intelligent	Heat pump	Flow	HEPA filter	Air Cooled	Water	Temperature	Humidity control



### Specifications

ope									
	Model		PAP05A1-K	PAP05A1-FK	PAP10A1-K	PAP10A1-FK	PAP20A-K	PAP20A-FK	
ω	Possible temperature and humidity setting range $\approx$ 1	°C,%			18~30,40	)~65 (75)			
per	Temperature and humidity control accuracy *2	°C,%			± 0.1,	± 1.0			
ĘĘ	Cooling / heating output (50/60Hz)	kW	2.3 /	2.6	4.7 /	× 5.3	9.4 /	10.5	
Cat	(Maximum cooling output)	(kW)	(1.6) /	(1.8)	(3.2) /	(3.6)	(6.5) /	/ (7.2)	
	Rated processing airflow	m³∕min	3~	~ 5	7~10		13-	~ 20	
ົພ	Maximum external static pressure(50/60Hz) * 3	Pa	110	620	250	560	250	690	
e Envi	Surrounding (intake air) temperature and humidity range	°C,%			15~35,	30~70			
nditic	Temperature gradient at intake	℃/h			Withi	n ± 1			
ental ons	Humidity gradient at intake	%/h			Withi	n ± 5			
	Outside dimensions (H $\times$ D $\times$ W) $*4$	mm	1589×800×650	1810×800×650	1798×940×664	2203×940×664	1863×1150×820	2263×1150×820	
	Mass	kg	(190)	(215)	(235)	(280)	(370)	(445)	
	Controlled air outlet port	mm	<i>ф</i> 100	Ø 100 HEPA filter built in	¢ 150	$\phi$ 150 $*5$ HEPA filter box included	φ 200	$\phi$ 200 $*5$ HEPA filter box included	
Т	Water quality			Deionized	water (electrical c	onductivity: 1 $\sim$ 1C	) μ S/cm)		
lumidific wate	Maximum moisture output *6	kg/h	2.	.5	5	.0	10	).0	
	Supply temperature range	C							
atic	Supply pressure range	MPa	0.1 ~ 0.5						
Ы	Connection port size				Rc	1/4			
Hu	Maximum air consumption *7	NL/min	2	3	3	8	8	0	
nidii	Supply temperature range	C			20 ~	~ 40			
iicat	Supply pressure range	MPa			0.40 ~	~ 0.93			
lion	Connection port size				Rc	1/4			
spe	Power source **8	V(Hz)			Three-phase 200	) ± 10% (50/60)			
Öfi	Power consumption *9	kW	1.	.6	2	.2	4	.5	
ver	Electric current *9	A	6.	.6	8	.0	16	6.0	
ons	Power capacity *10	kVA	2.	.3	2	.8	5	.6	
	Noise level (50/60Hz) *11	dB	66/68	73/73	70/70	75/75	72/72	78/78	
	Operation control method				Heat pump ba	alance control			
	Refrigerant				R4	10A			
	Compressor output	kW	0.	.7	1.	.7	3	.0	

\*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 that 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 at the highest capacity of its normal operating range. \* 11 Noise level can be decreased by installing a noise reducing duct.

## PAP<sub>®</sub> Temperature And Humidity Control Type Water cooled

#### Models PAP05A1-KW Air processing capacity 3~40m/min PAP05A1-FKW Temperature control accuracy $\pm 0.1$ PAP10A1-KW 18-Temperature setting range **30**° PAP10A1-FKW PAP20A1-KW Humidity control accuracy ±1% PAP20A1-FKW Humidity setting range 40~65% (75) \* PAP40A-KW PAP40A-FKW (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										
	December terrographics and burnielity contributions are a	°C %	TAPOSAT-KW	TAPUSATINW	TATIOATION	18 ~ 20.40	rar 20 a r k	TAFZUATTIKW	r Ar 40A-KW	TAT40A-TRW	
spe	Temperature and humidity control accuracy 20	°C %				+ 0 1	+10				
čif	Cooling / beating output (50/60Hz)	EW	30	/3.2	65	/65	130	/130	220	/220	
ic: m	(Maximum cooling output)	(kW)	(2	0)	(4	.0)	10.0.	0	(16	30)	
and	Rated processing airflow	m²/min	3.	~ 5	7~	- 10	13	~ 20	25 -	~ 40	
ns ce	Maximum external static pressure w 3	Pa	110	620	200	560	250	690	300	1000	
Ξ	Surrounding (intake aid temporature and humidity range 34.1	°C %	110	020	200	15~35	30~70	000	000	1000	
con	Temperature gradient at intake	°C/h				Withi	n + 1				
ditic	Humidity gradient at intake	%/h				Withi	n ± 5				
ent: ons	Cooling water temperature gradient	°C/h				Withi	n ±3				
<u> </u>	Outside dimensions (H X D X W) &4	mm	1610×750×610	1830×750×610	1670×940×664	2076×940×664	1831×973×773	2209×973×773	1800×1300×1084	2323 × 1300 × 1084	
	Mass	kø	180	205	235	280	300	370	540	640	
		10	100	φ 100	200	φ 150		\$ 200			
	Controlled air outlet port	mm	φ 100	HEPA filter built in	φ 150	HEPA filter box included	φ 200	HEPA filter box included	□ 350	HEPA filter box included	
C	Rate of supply *6	m³∕h	1	.0	1	.5	2	.2	3	.0	
oli	Supply temperature range	poply temperature range C 15~32									
ng ∕	Supply pressure	MPa				0.69 (	or less				
Nate	Inlet/outlet pressure difference	MPa				0.2 or	greater		-		
đ	Connection port size		Rc	1/2	Rc	3/4	Rc	3/4	R	51	
폰	Water quality				Deionized wat	ter (electrical c	onductivity: 1 ·	$\sim$ 10 $\mu$ S/cm)			
y Inic	Maximum moisture output *7	kg/h	2	.5	5	.0	10	0.0	20.0		
dific ate	Supply temperature range	C				10 -	~ 40				
" äti	Supply pressure range	MPa				0.1 ~	~ 0.5				
В	Connection port size					Rc	1/4				
Hun	Maximum air consumption *8	NL/min	2	3	Э	8	8	30	20	00	
nidit a	Supply temperature range	°C				20 ~	~ 40				
iica:	Supply pressure range	MPa			0.40 -	~ 0.93			0.45 ~	~ 0.93	
tion	Connection port size					Rc	1/4				
spe	Power source *9	V(Hz)			Th	ree-phase 200	$0 \pm 10\% (50/6)$	60)			
ĊĦ	Power consumption *10	kW	1	.5	2	2	3	.8	6	.6	
ver	Electric current *10	А	6	.3	7	.8	13	3.5	26	3.0	
ons	Power capacity *11	kVA	2	.2	2	.8	4	.7	9	.0	
	Noise level(50/60Hz) *12	dB	68/68	73/73	70/70	75/75	72/72	78/78	75/75	83/83	
	Operation control method					Heat pump ba	alance control				
	Refrigerant					R4	10A				
	Compressor output	kW	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 controllable 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 cutter point. \* 3 The noted external static pressure is when the controlled air is regulated at the roulet to produce the maximum rated processing air flow. \* 4 Height includes outlet port \* 5 The HEPA filter box is shipped in a sparate package from the main unit and must be instaled on sist. \* 6 When processing at the maximum air flow and at the highest cooling caacity, the difference between the cooling water inter and outs is 650. \*\* 7 The figure noted is when the equipment is operating at the highest level of humidification. \* 8 Supply compressed air tath has been cleaned through filter and/or other processing. The cleanliness of the compressed air supply should match the air cleanlines standard of the target area to which the controlled air will be supplied. \* 9 Source voltage phase unblance should be less than ± 3%. \* 10 Maximum value within the range of unit specifications. \* 11 The figure noted is operating at the highest capacity diverse in the flag noise-about the diverse in the maximum reader processing at the highest capacity of its normal operating range. \* 12 The noise level may be lowered by installing noise-about the diverse of the normal operating range. \* 12 The noise level may be

### PAP<sub>®</sub> Series external dimensions

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

### Temperature Control Type PAP05A1



Temperature Control Type **PAP20A** 





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



Temperature Control Type **PAP05A1-F** 

#### CCTU CCTU

Temperature Control Type **PAP20A-F** 



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





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



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



Temperature Control Type PAP10A1-F



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



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



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

#### Temperature Control Type **PAP05A1-W** Temperature Control Type **PAP05A1-FW**





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



#### Temperature Control Type PAP40B-W





Temperature Control Type PAP20B1-W Temperature Control Type PAP20B1-FW



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



(2076)

### Temperature Control Type PAP40B-FW







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



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



#### Temperature Control Type PAP10A1-W Temperature Control Type PAP10A1-FW



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



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



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



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





### Instant Dehumidification From 27℃ / 70% to 23℃ / 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.



### 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

	Madal			Air cooled			Water cooled		
	IVIUUEI		PAP03A-D	PAP06A-D	PAP10A-D	PAP03A-WD	PAP06A-WD	PAP10A-WD	
	Possible temperature and humidity setting ranges $$\gg1$$	°C,%			18~30,	20~40			
spe	Temperature and humidity control accuracy *2	°C,%		±0.2,	±2(Does not s	upport humidific	cation.)		
forr	Attainable control air dew point (lower limit) *3	°C			З	.5			
nan cati	Maximum cooling output *4	kW	(3.7)	(6.6)	(10.5)	(4.1)	(6.8)	(11.0)	
ce	Heating capacity *5	kW	(0.3)	(0.7)	(1.1)	(0.3)	(0.7)	(1.1)	
	Rated processing airflow	m³ /min	3~5	6~8	10~12	3~5	6~8	10~12	
SШ	Surrounding temperature and humidity range	°C,%			17~35,	30~70			
nditi	Temperature gradient at intake	°C/h			Withi	n±1			
Imer	Humidity gradient at intake	%/h		Within ±5					
Ital	Cooling water temperature gradient	°C/h	_			Within ±3			
	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	¢150	φ200	φ200	<i>ф</i> 150	φ200	φ200	
0	Rate of supply	m³/h				2.0	2.7	3.0	
ooli	Supply temperature range	°C				5~32			
ng v	Supply pressure	MPa		—			0.69 or higher		
vate	Inlet/outlet pressure difference	MPa					0.2 or higher		
щ	Connection port size					Rc	3/4	Rc1	
Po spe	Power source *7	V(Hz)		Th	ree-phase 200\	/ ±10%, 50/60	DHz		
ver	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	
catio	Electric current *9	А	11.3	17.2	20.2	10.7	16.6	19.6	
suc	Power capacity %10	kVA	4.7	6.6	7.2	4.2	6.3	6.9	
	Operation control method		F	leat Pump Bala	nce Control (inc	orporates wast	e heat utilizatio	n)	
	Refrigerant				R4	10A			
	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 point. 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<sub>®</sub> L Series Low Temperature

### Models

PAPUJA-L	Air processing capacity	∕ 5~7m/min
	Temperature setting ra	nge <b>8∼18℃</b>
	Temperature control ac	curacy ±2℃
(Special order m	nodel>	ORION
For more information on spe	pecial order models > 24P	
Noise reducing inta	ake duct 🔳 Circulation inta	ake chamber
Exhaust chamber	Includes humidity displation	У
Please contact ORIO outside the ranges list	ON regarding custom built sted herein.	models of specifications
Intelligent Heat pump F monitor balance control co	Flow HEPA filter Air Cooled ontrol (F type)	Water Temperature Humidity control



# 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 Mode PAP05A-L Performance specifications $8 \sim 18$ Configurable temperature range \*1 °C ±2 Temperature control accuracy \*2 °C 5.9 / 7.0 kW Cooling capacity ж3 $5 \sim 7$ Rated processing airflow mª /min 15~35, 30~70 Surrounding temperature and humidity range ℃,% Within $\pm 1$ ℃/h Temperature gradient at intake (1358×1100×600) Outside dimensions (H×D×W) \*4 mm (185)Mass kg ø150 Controlled air outlet port mm specifications Three-phase 200V ±10%, 50/60Hz Power source \*5 V(Hz) (4.7)Power consumption kW (17)Electric current А (6.5)kVA Power capacity nverter speed control + Operation control method hot gas bypass control R410A Refrigerant Compressor output kW 1.7

### External Dimensions



\*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.

### PARP SERIES CON AIR PROCESSOR

# ORION Precision Air Processing For Every Application **PAP**<sub>®</sub> 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

IApplicable 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

IApplicable 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

### Other Special Order Equipment

8 Steam humidification

Applicable models PAP Temperature And Humidity Control Type

### 10 HEPA differential pressure gauge

Applicable models PAP Temperature Control Type PAP Temperature And Humidity Control Type 9 Humidity display

Applicable models PAP Temperature Control Type

### Low ambient temperature cooling water specification Applicable models

PAP Temperature Control Type PAP Temperature And Humidity Control Type

Base installation example

### High Accuracy Temperature And Humidity Control Equipment

### 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 4~15m³/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.



### Specifications

	Model		AP-750M-E	AP-750MV-E	AP-750MVK-E	AP-1500M-E	AP-1500MV-E	AP-1500MVK-E
ds L	Temperature control range	°C	5~35	$5 \sim 70$	$5 \sim 70$ (During humidity control: $15 \sim 70$ )	5~35	5~70	$5 \sim 70$ (During humidity control: $15 \sim 70$ )
ēer	Humidity control range #2	%	-	_	$30 \sim 90$ (When at $40 \sim 60$ °C)	-	_	30~90 (When at 40~60°C)
ific	Control accuracy #3	°C,%	±	D.5	± 0.5, ± 3	±	0.5	± 0.5, ± 3
ati:	Control method				Digital setting, Digital di	splay, Heater F	PID control	
Dng	Cooling capacity *1	kW		1.5/	1.75	3.25		
<u>ه</u> ۳	Processed air flow (50/60 Hz)	m³∕min		10~13/10~15				
	Ambient temp. range	°C,%			15~	~ 35		
	Outlet connection port		Air ou	itlet <i>ø</i> 100 (ind	cl. companion flange)	Air ou	tlet <i>ø</i> 150 (ind	cl. companion flange)
spec	Power source	V(Hz)						
Dowe	Maximum operating current	А	1	8	27	Э	7	58
tions	Maximum operating power consumption	kW	5	.7	9.0	1.	1.5	19.0
Circuit breaker Bu							-	
	Refrigerant		R407C					
	Mass	kg	12	20	130	19	90	200
	Outside dimensions (H x D x W)	mm		1044 × 5	48 × 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	М	Ν	Р
AP-750MVK-E	850	1230	535	370
AP-1500MVK-E	1170	1560	660	480

#### Temperature and Humidity Control Range







 No.
 Solid line applicable models

 ①
 AP-750M-E

 ②
 AP-1500M-E

 No.
 Solid line applicable models

 ①
 AP-750M-E

 ②
 AP-750M-E

 ②
 AP-750M-E

Operating conditions

- · Power source: Three-phase, 200V 60 Hz
- · Ambient temperature and humidity : 25℃ /50%

 $\cdot$  Processed air flow: rated air flow (external pressure: O 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.



Model	Α	В	С	D	E	F	G	Н	I	J	K
AP-750M-E / MV-E / MVK-E	660	548	1044	964	(647)	<i>ф</i> 100	<i>ф</i> 100	425	319	185	279
AP-1500M-E / MV-E / MVK-E	753	618	1374	1294	(719)	φ150	φ150	598	446	227	283

# For Cleanrooms And Precision Measurement Rooms Constant Temperature (Constant Humidity) Equipment

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



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.





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

### 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

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.

### System Configuration Chart

Model	Air flow (m²/min)	Indoor unit	Outside unit	Humidifier	Remote control (for temperature)	Remote control (for temperature and humidity)	Temperature sensor	Temperature and humidity sensor
PAP20A-R				-		—		-
PAP20A-KR	20				—		—	
PAP40C-R	45			-		—	•	-
PAP40C-KR	40				_		—	
PAP80B-R	00			-		—	•	-
PAP80B-KR	80				—		—	
PAP120A-R	100				•	—		-
PAP120A-KR	120				_		—	

### For Cleanrooms And Precision Measurement Rooms Constant Temperature (Constant Humidity) Equipment Reries

								0	0		<u> </u>		
		Models											
		Temperature Control Type		Temperature a	nd Humidity Cont	rol Type							
		PAP20A-R		PAP20	A-KR		SUPER						
						(	eco	2 0.001					
				PAF40			ORION	ORI		RPROCESSOR			
		PAP80B-R		PAP80	B-KR		•						
		PAP120A-R		PAP120	0A-KR								
											1.0		
		Temperature Intelligent Flow control		Temperature control	dity Intelligent monitor	Flow ontrol	(						
		Air processing capacity 23~	80m	ỉ/min	0 1	Q	DN 225544			The other	-		
		Temperature control accuracy $\pm 0.2$	2°C		ORION MARKAR								
		Temperature setting range $18\sim$	30 C				-			An Add			
										<u>L_18</u>			
		Humidity control accuracy $\pm 2\%$	)	_	1					and the second s			
		Humidity setting range 45~	60%	_									
	}	"Humidity control accuracy" and	"Humia	dity									
		setting range" specifications ar following models only: PAP20A	e for th -KB PA	P40C-							10		
		KR, PAP80B-KR.				PAP20	DA-KR (temperat	ure and humidity o	control type)				
		Model		ΡΔΡ2ΩΔ-Β	PAP40C-R	PAP80B-R	<b>ΡΔΡ120Δ-</b> R	ΡΔΡ2ΟΔ-ΚΡ	ΡΔΡ406-ΚΒ	PAP80B-KR	PAP120A-KR		
а В Р	Possible	setting range	°C.%		18~3	30 . —			18~30	45~60			
erfor	Control ad	ccuracy %2	℃,%		± 0.2	2,—			± 0.2 ,	± 0.2			
man catic	Cooling c	apacity (50/60Hz) %3	kW	8	12	25	38	8	12	25	38		
00 S	Heating c	capacity (50/60Hz)	kW	3	5	13	14.5	З	5	13	14.5		
Envi	Indoor unit	t installation temperature conditions	°C				5~	35					
nditi	Outdoor un	nit installation temperature conditions	°C "		- 5~43								
ons	Lumidity	gradient at intake	06/h				Withi	n ± 2 n + 5	-	-			
<u></u>	ide	Inside unit outside dimensions (H X D X W) & 5	mm	1800 x 555 x 980	1800 x 555 x 1100	1800 × 600 × 1500	1870 x 790 x 1900	1800 x 555 x 980	1800 x 555 x 1100	1800 x 600 x 1500	1870 × 790 × 1900		
dime	ensions	Outside unit, outside dimensions (H × D × W) * 5	mm	824 × 420 × 810	1160 × 420 × 810	1420 × 800 × 870	1420×800×870×2台	824 × 420 × 810	1160 × 420 × 810	1420 × 800 × 870	1420×800×870×2台		
		Indoor unit	kg	(240)	(260)	(400)	(700)	(240)	(260)	(400)	(700)		
Mas	S	Outside unit	kg	(65)	(80)	(130)	(130×2)	(65)	(80)	(130)	(130×2)		
	Power so	urce	V(Hz)			Thre	ee-phase 200	$\pm 10\% (50/$	60)				
specit	Operating curr	rent (50/60 Hz) [when auxiliary heater is off] $st$ 6	А	23 [18]	40 [31]	60 [42]	122 [93]	35 [30]	58 [49]	104 [86]	193 [165]		
ower ficatio	power consum	ption (50/60 Hz) [when auxiliary heater is off] ※6 	kW	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]		
B	Air flow	pacity 50/6047)	KVA m³/min	22	14	23	40	14	20	38	120		
lowe	Motor out	tout (50/60Hz)	kW	23	40 	22	3.75	0.4	40	22	3.75		
r far	External s	static pressure (50/60Hz) %7	Pa	20	00	40	00	20	0.1	4(	0.70		
Outo	loor	Air flow (50/60Hz)	m³∕min	65	90	165	165×2	65	90	165	165×2		
unit	fan	Motor output (50/60Hz)	kW	0.2	0.1 × 2	0.75	0.75 × 2	0.2	0.1 × 2	0.75	0.75×2		
Refri	gerant piping	Gas pipe	mm	Ø 15	5.88	φ 19.05	¢ 25.4	φ 1	5.88	φ 19.05	φ 25.4		
conne	connections Liquid pipe			φ 9	9.53	φ 12.70	¢ 15.88	φ 9	.53	φ 12.70	φ 15.88		
Refr	Refrigerant Max. length (one way)			30	50	7	5	30	50	7	5		
Piping Max. difference in height			m							B4070			
	Refrigerant		k/M	17	841UA	46	75	17	80 H4 I UA	46	75		
	High pressure gas safety act classification			1.7	0.0	4.0	Not re	auired	0.0	4.0	7.0		
High pressure gas safety act classification			dP	68 69 89 69									
		INUUUI UNIL (SU/OUHZ) I	u D	00	59								

Water quality Deionized water (electrical conductivity: 1  $\sim$  10  $\mu$  S/cm) Humidifier Outside dimensions (H  $\times$  D  $\times$  W) 960 × 520 × 300 960 × 520 × 300 960 × 590 × 500 mm 960 × 790 × 550 Humidification canacity 5 8 20 30 \*8 kg/h (35) (35) Mass kg (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 80% when the intake air temperature of the outdoor 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 range. \* 11 Noise level on be decreased by installing a noise reducing duct.

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1. When installing the outdoor unit, have the air intake side facing the wall, and leave a space of at least 0.5 m. 2. Refrigeration piping length: PAP20A-(K)R=30 m, PAP40C-(K)R=50 m, PAP80A-(K)R=75 m (all are 1-way)
 3. 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.
 4. 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 $-60^{\circ}$ 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))

#### 

### lintelligent 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



### 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



3-D measurement room

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Example of internal air discharge



### Example of internal air discharge



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



### Section Clean Fan Filter Unit

### Light duty to heavy duty (high air flow) models available for every application.





### Made with mirror polished stainless steel for excellent chemical and corrosion resistance.

Wide ranging applications include electronics, biotechnology, food service, optics, experimentation and research.



Conditions. (Not available on MAC·IIA-10 models.) Full Lineup S Series: Chamber box for duct connection available.

### Specifications

Mode	el	MAC-IIA-10	MAC-IIA-30	MAC-IIA-50	MAC-IIA-100	MAC-IIA-150	MAC-IIA-250				
				MAC-IIA-50-21	MAC-IIA-100-21	MAC-IIA-150-21	MAC-IIA-250-21				
Dust Collection E	fficiency	Over 99	.99 % of partic	ulate of 0.3 $\mu$	m or larger (at	t atmospheric	pressure)				
Dust Collection	Main Filter			HEPA	filter						
Filter Elements	Pre-filter	Non-woven fabric filter		Pro	cessed saran	net					
Rated Processing Air	Flow (m³/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 Spe	ed (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	i Approx. 56/57 Approx. 56/57 Approx. 59/5						
Power Source		Single-phase AC	100V, 50/60 Hz	Single-phase AC	100V, 50/60 Hz o	r Single-phase AC	200V, 50/60 Hz				
Power Consumpt	ion (W)	35/40	28/36	43/46	98/114	141/157	190/230				
Blower Fan		AC Motor									
Number of Blowe	r 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			B	ody: SUS430	with mirror fini	sh					
Operating Indicat	or Lamp		High lun	ninosity LED	With Illumina	ted filter					
Accessories		Includes sponge gasket to seal the perimeter of the air outlet port.									
* Noise level mea	sured at 1 m	from the air outlet port in an anechoic room.									





\* Noise level measured at 1 m from the air outlet port in an ar

### External Dimensions



### Important Safety Guidelines



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.

Asymbols 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.)



lsymbols indicate actions which must be taken. The illustration within the triangle shows the nature of the precaution. (For example, the symbol at the shows the nature of the action which is prohibited. (The example to the left indicates that user disassembly is prohibited.) Please note that items noted in  $\triangle$  CAUTIONS can result in very serious

igtrianglesymbols indicate prohibited actions. The illustration within the circle

left indicates that the unit must be grounded.)

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.

### 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





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



Operate the unit within its specified operating rangesOperate 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.



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.





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



outlet vents..

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.

Do not stick fingers or other objects into the air intake or

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







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.

#### 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.

	1 + 0 - 72	Cooling W	later Type	Has Tenden	cy Towards:
	11011	Circulating water	Make-up Water	Corrosion	Scaling
	PH(25℃)	6.5~8.2	6.5~8.2 6.0~8.0		0
	Conductivity (µS/cm) (25°C)	Max. 800	Max. 300	0	$\bigcirc$
Stan	Chloride ion (mgCl <sup>-</sup> /L)	Max. 200	Max. 50	0	
dard	Sulphate (mgSO4 <sup>2-</sup> /L)	Max. 200	Max. 50	$\bigcirc$	
Comp	Acid consumption (pH4.8) (mgCaCO <sub>3</sub> /L)	Max. 100	Max. 50		$\bigcirc$
oner	Total hardness (mgCaCO <sub>3</sub> /L)	Max. 200	Max. 70		$\bigcirc$
Its	Calcium hardness(mgCaCO <sub>3</sub> /L)	Max. 150	Max. 50		$\bigcirc$
	Silica ion (mgSiO <sub>2</sub> /L)	Max. 50	Max. 30		$\bigcirc$
	Iron (mgFe/L)	Max. 1.0	Max 0.3	0	$\bigcirc$
Refe	Copper (mgCu/L)	Max 0.3	0.1 or less	0	
erenc	Sulfide ion (mgS <sup>2-</sup> /L)	Not detected	Not detected	0	
e cor	Ammonium ion (mgNH4 <sup>+</sup> /L)	Max. 1.0	Max. 1.0	0	
npon	Residual chlorine (mgCl/L)	Max 0.3	Max 0.3	0	
ents	Free carbon dioxide (mgCO2/L)	Max. 4.0	Max. 4.0	0	
	Ryznar Stability Index	6.0~7.0		0	0
	E 17 IDA 01 00 100 0	(T)   D ()		and a second second	

 $\bullet$  Within the "Tendency toward" column, items marked with a  $\bigcirc$  indicate this component can lead to corrosion or scaling as indicated.

 ${\ensuremath{\bullet}}$  The 15 items listed above are the primary components that can lead to corrosion or scaling.

### **Regarding Inspection and Maintenance**



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

 $\bigcirc$  Constant temperature circulating water  $\cdots\!\cdots\!\cdots$  Operate with water that meets the following water quality.

			Standard level
	PH(25℃)		6.8~8.0
Sta	Conductivity	(µS/cm) (25°C)	1~400
Inda	Chloride ion	(mgCl <sup>-</sup> /L)	Max. 50
rd c	Sulphate	(mgSO4 <sup>2-</sup> /L)	Max. 50
qmp	Acid consumption	(pH4.8) (mgCaCO <sub>3</sub> /L)	Max. 50
one	Total hardness	(mgCaCO3/L)	Max. 70
nts	Calcium hardness	(mgCaCO3/L)	Max. 50
	Silica ion	(mgSiO2/L)	Max. 30
Ref	Iron	(mgFe/L)	Max. 1.0
erer	Copper	(mgCu/L)	Max. 1.0
ICE (	Sulfide ion	(mgS <sup>2-</sup> /L)	Not detected
gunoc	Ammonium ion	(mgNH4 <sup>+</sup> /L)	Max. 1.0
one	Residual chlorine	(mgCl/L)	Max 0.3
nts	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

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

Water quality (electrical conductivity)  $1 \sim 10 \mu S / cm$ 

\* 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.

Κ	
C	V
· ·	_

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



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.



# PAPErseries Contraction of the c

### 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×N)÷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℃	±0.25℃
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×N)÷60=1.8×1.8×2×60÷60=6.48m<sup>3</sup>/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]	10	20	30	40	50	60	70	80	90	100
±2℃ 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

Formula:Q<sub>1</sub>=  $\frac{(i_2-i_1) \times 1.2 \times F \times 60}{860}$ 

 $Q_1$ :Cooling power kW (1 kW = 860 kcal/h), i2:Intake air enthalpy (kcal/kg)

i1: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)

①According to the **"Enthalpy chart"** (page 41), the enthalpy for the high temperature and humidity intake air of 25  $^{\circ}$  C / 50% is i2=12.01.

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

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 ...

$$Q_{1} = \frac{(i_{2} - i_{1}) \times 1.2 \times F \times 60}{860} = \frac{(12.01 - 8.14) \times 1.2 \times 7 \times 60}{860} \doteqdot 2.3 kW$$

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st1 The possible setting range of dewpoint will be from 8  $^\circ \!\! C$  or higher.



#### 2) Confirm the reheating power

### Formula:Q<sub>2</sub>= $\frac{(i_3-i_1) \times 1.2 \times F \times 60}{860}$

Q2:Reheating power kW (1 kW = 860 kcal/h), i3:Set air enthalpy (kcal/kg)

i1:Enthalpy at the set air dew point temperature/100% (kcal/kg),

1.2: Specific gravity of air kg/m³, F: Flow rate (m³/min)

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

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

#### 3) Find the cooling + heating power

From the results from 1) and 2), Q=Q1+Q2=2.3+1.6=3.9kW

#### 4) Find the cooling + heating power

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

①According to the **"Enthalpy Chart"** (page 41), the enthalpy intake air of  $25 \degree / 50\%$  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'=4.7kW×0.85≒4.0kW

②Q=3.9kW, therefore Q'≧Q

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

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

	PA	P05	PA	P10	PA	P20	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  $^{\circ}$ C/40% to 23  $^{\circ}$ C. According to the **"Enthalpy Chart"** (page 41), the 20  $^{\circ}$ C/40% enthalpy is 8.32, therefore the heating power to get to an enthalpy of 10.84, for 23  $^{\circ}$ C/50%, is...

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

The enthalpy of the intake air of 20  $^{\circ}$ /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...

 $Q'=4.7kW\times0.77$  ⇒ 3.6kW Q=1.48kW, therefore  $Q' \ge Q$ \*According to the above, the PAP10A1-K satisfies the required specifications.

# PAPErseries Technical Data

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

### Confirm Humidification Power

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

 $\begin{array}{l} X: \mbox{Humidification power (kg/h), $x_2$: Intake air specific humidity (kg/kg), $x_1$: Set air specific humidity (kg/kg), $1.2$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>), $F: \mbox{Air flow (m<sup>3</sup>/min)} $x_1$: Specific gravity of air (kg/m<sup>3</sup>/min) $x_1$: Specifi$ 

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)×1.2×7×60=1.4868kg/h

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





Dev	Dew point Temperature Chart (°c) Possible Setting Range														
Temper-						R	elativ	/e Hu	imidi	ty					
(℃)	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

# For Safety / Technical Data

### PAPERISION AIR PROCESSOR SERIES

### **Technical Data**

### Enthalpy Chart (kcal/kg)

Temper-						Rela	ative	Humi	dity					
(°C)	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)

Temper-	Relative Humidity												
(°C)	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	0.00526	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.





### For Orders and Inquiries:



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

What is the ISO certification system?

So (International Organization for Standardization) is an established body that stipulates and certifies ISO4001 and ISO14001 directives. ISO4001 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.