AIRSYS
Balance the Environment

OPTIMA2 Precision Air Conditioners for Data Centers

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Intertek

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PRODUCT INTRODUCTION

OPTIMA2 is a next generation product which combines the advantages of inverter precision air conditioning with modular design technology, specially designed for medium to big data center applications.

This series incorporates cutting edge features, such as options for direct free cooling and refrigerant pump to maximize efficiency and reliability.

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UNIT IDENTIFICATION

1	2	3	4	5	6	7	8	9	10	11	12	13	14
OPTIMA2	-	DFC RPU	.	O U	.	DXA	40	X0	R410	.	460/3/60	.	XXX

No.		Description
1	OPTIMA2	Product Type OPTIMA2: OPTIMA2 precision air conditioner, abbr. as OPT2
2	·	Separator Character “.”
3	DFC RPU	Default—Standard configuration DFC—Direct free cooling RPU—Refrigerant pump unit
4	·	Separator Character “.”
5	OVER UNDER	Air Supply Scheme OVER – Up flow, abbr. as “O” UNDER – Down flow, abbr. as “U”
6	·	Separator Character “.”
7	DXA	Heat-Rejection DXA—Direct expansion with air cooled condenser
8	40	Nominal Cooling Capacity： kW
9	X0	Cabinet Size Code :X0
10	R410	Refrigerant R410=R410A
11	·	Separator Character “.”
12	460/3/60	Power source Voltage/Phase/Frequency
13	·	Separator Character “.”
14	XXX	Code for Custom Design

For example： OPTIMA2-DFC.U.DXA40X0R410.460/3/60

Stands for OPTIMA2 Precision Air Conditioner with direct free cooling; air supply scheme is down flow; heat-rejection via direct expansion with air cooled condenser; cooling capacity is 40kW; cabinet size is X0; R410A refrigerant; the input power supply is 460V/3Ph/60Hz.

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ENERGY SAVING TECHNOLOGIES

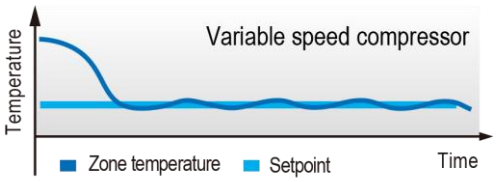
INVERTER COMPRESSOR

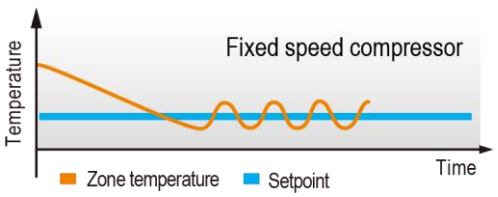
OPTIMA2 inverter series precision air conditioners adopt energy-efficient DC inverter scroll compressors that can achieve stepless speed and on-demand cooling capacity adjustment to achieve the greatest efficiencies.

The inverter system manages the compressor speed with infinitely variable control according to the actual cooling demand;. When the difference between room and setpoint temperatures is high, the compressor operates at a high speed (and greater cooling capacity). As the temperature difference reduces, the compressor speed gradually reduces to more accurately maintain room temperature (a subsequently conserving energy).

More Precise Temperature Control

Compared to a fixed-frequency compressor, an inverter compressor can achieve more precise temperature control through maintaining the room temperature closer to the setpoint temperature. The control accuracy can be as close as ±0.5°C(±0.9°F), even when the load is constantly changing. The comparison between fixed-frequency and inverter compressor temperature control accuracy is shown on the right picture.

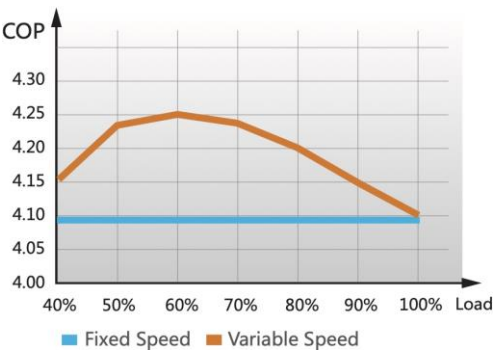




High Efficiencies, Lower Noise

Compared to the on/off operation of fixed-speed compressors, inverter compressors have stepless speed changes which, through intelligent control, consistently aim to run at the most efficient operating point . This variable frequency operation can save nearly 30% on operating costs.

Results from an AIRSYS performance test of fixed-frequency vs. inverter compressors can be seen in the graph; the stark difference between compressor COPs is easily seen.



Additionally, an inverter compressor starting current is only about 10% of that of a fixed-frequency compressor, they typically have a higher reliability and the noise generated at part load is approximately 5-10 dB lower.

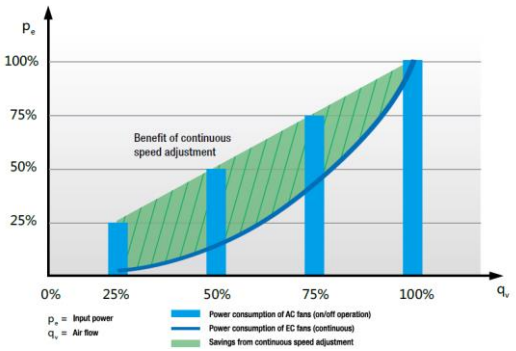
EC FAN

An EC fan refers to a centrifugal fan that utilizes an Electronically Commutated motor (or brushless DC motor).
EC fans have numerous benefits including:

Energy Efficiency

EC fans have brushless DC motors and integrated control modules. Motor efficiencies of 85-90% are achievable; 30% to 50% higher than traditional AC fans.

The difference in energy efficiency between variable speed EC fan control and traditional on/off fixed speed AC fans can be seen in the graph; the bars show the power consumption of fans which are switched in gradually as required while the blue curve shows the power consumption with infinitely variable speed control.

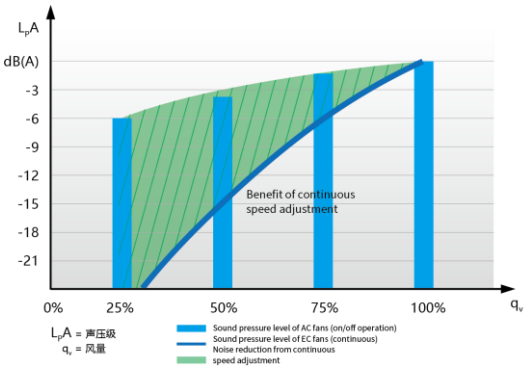


Lower Noise

EC fans are able to operate across an infinitely controllable speed range, which in turn effectively avoids electromagnetic and rectifier noise (generated by other traditional motor and speed control devices), thus reducing the overall noise level.

In the graph, the bars indicate the sound pressure level of fans which are switched in gradually as required and the blue curve shows the sound pressure level with infinitely variable speed control.

As can be seen from the picture EC fan sound pressure level is 12dB lower compared to the traditional AC fan.



Compact, Integrated Electronic Control System

All EC fans have dedicated speed control modules and filters built into the motor assembly, making for a compact and self-contained solution. All that is required is to connect the main power supply and the sensor signals to the controller for complete speed control of between 10% and 100%. EC fans provide a simple, convenient solution and can also support group control and remote monitoring.

ELECTRONIC EXPANSION VALVE

OPTIMA2 Inverter Series precision air conditioners utilize electronic expansion valves to regulate the refrigerant flow entering the evaporator and match it to the running speed of the compressor. Compared to thermal expansion valves, electronic expansion valves control much more accurately and efficiently. They are also able to control system evaporation temperature and superheat more effectively and lead to an overall higher system efficiency.

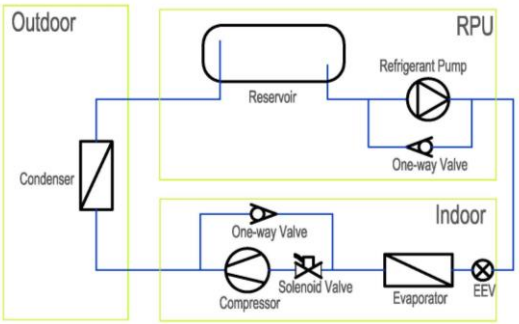
ENERGY SAVING OPTIONS

Data center power consumption is generally divided between four major sources; IT equipment, cooling systems, backup power and lighting systems. The specific proportions are different in each data centers, however a typical split is presented here.

As the data show, the energy consumption of the cooling system is second only to the actual IT equipment; i.e. the air conditioning systems account for a large portion of the total energy consumption of the data center. Therefore, by taking advantage of direct free cooling solutions or refrigerant pump unit (and hence reducing the run hours of the compressors) large energy savings are potentially achievable. AIRSYS has developed both direct free cooling systems, as well as refrigerant pump units which can significantly reduce the overall energy consumption of a data center. Options are available or configurable to suit any and all installation requirements.

Refrigerant Pump Unit (RPU)

To reduce the energy consumption of the cooling system, an integrated system, which combines refrigerant pump unit with mechanical cooling unit, is developed by AIRSYS. This system can work in three modes: pump mode, compressor mode and hybrid mode. During periods of lower outdoor temperature, the system automatically switches to economizer operation to reduce or eliminate compressor running time, significantly improve data center efficiency without bring in outside air and without using water. The schematic diagram showing the principle of operation is as follows:



Take 40kW CRAC unit for example, the following figures show the economization hours in New York and Beijing, and the comparison of annual energy consumption of 40kW units with and without pumped refrigerant economizer.

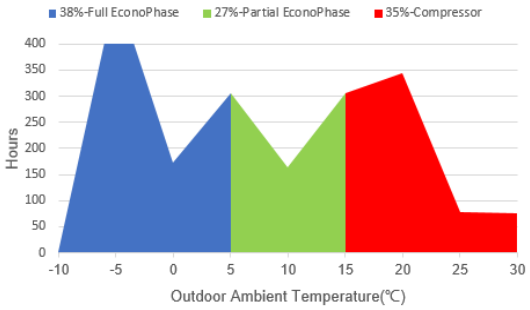


Fig1. Economization Hours in New York

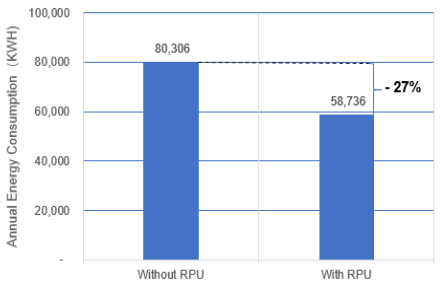


Fig2. Annual Energy Consumption in New York

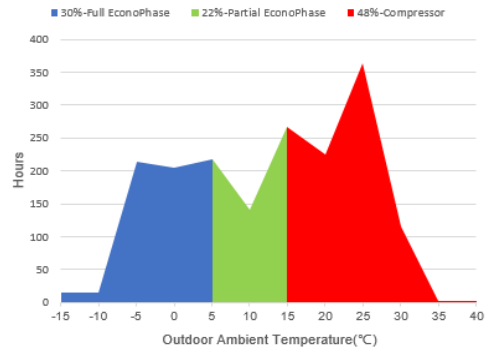


Fig3. Economization Hours in Beijing

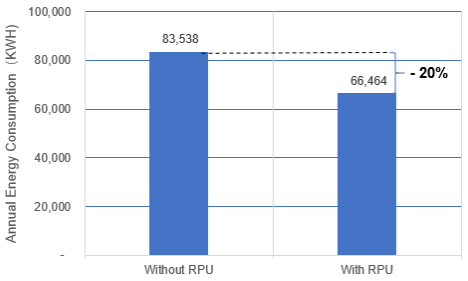
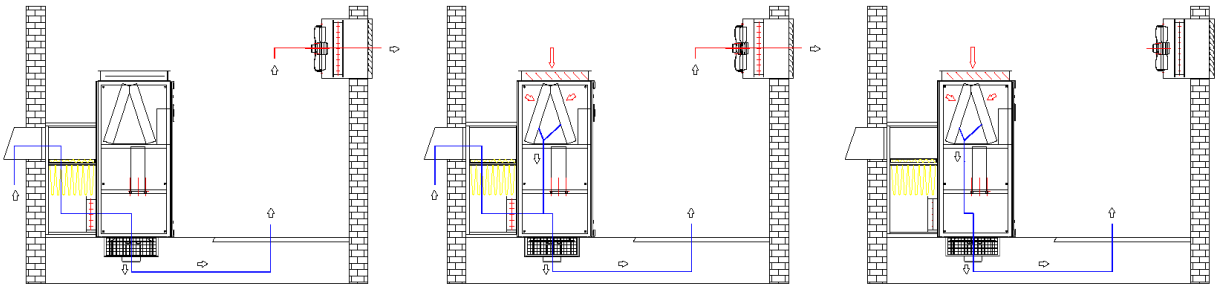


Fig4. Annual Energy Consumption in Beijing

Note: All the above calculations are based on a data center with 40kW stable heat load and the return air temperature is always 24℃(75.2°F).

Direct Free Cooling(DFC)

For installations where outdoor temperatures are commonly lower than indoor temperature, fresh air can be introduced directly into the room to cool the equipment; this is known as direct free cooling (DFC). A well designed and integrated DFC system can greatly reduce the dependency on other cooling systems and save energy through minimizing their run hours. DFC systems can be integrated with OPTIMA2 units, with up flow and down flow configurations. The corresponding series names are OPTIMA2-DFC. The diagram showing the arrangement and principle for direct free cooling options is as follows:



Free Cooling Mode | Free Cooling + Mechanical Cooling | Mechanical Cooling Mode

OPTIMA2 systems include mechanical (DX) cooling and free cooling modes, together with the intelligence to switch between the modes to ensure the most efficient operation. When utilizing direct free cooling, the DX system compressor stops, which has a significant impact on the energy consumption.

In recent years, energy-efficient data centers have attracted greater attention and many data centers are now able to achieve significant energy savings through both increasing the IT equipment tolerance temperatures and expanding the considered geographical scope to exploit direct free cooling (which is not only limited to regions of extreme cold).

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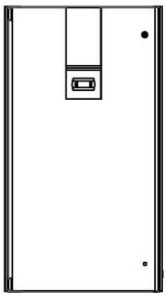
MODULAR DESIGN

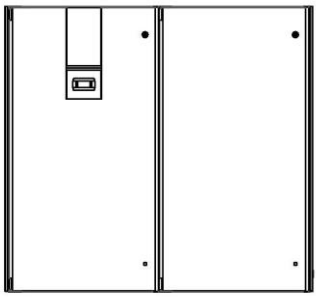
The OPTIMA2 adopt product level modular design, the basic model with all the components. can work independently. Basic models can be easily added and integrated, to adapt to project-specific room size and different site conditions.

Flexible Layout

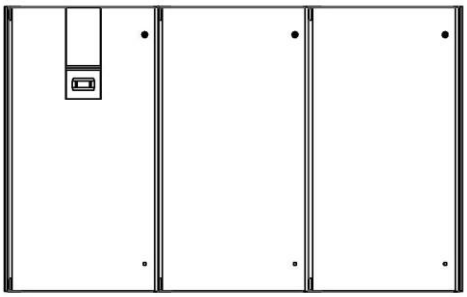
Modules can be deployed horizontally to make product fast to meet customer requirements. When the user has a demand for 80kW cooling capacity or even greater cooling capacity, only the number of basic models needs to be determined according to the cooling capacity demand, and the basic models can be simply assembled.



15-40kW



30-80kW



45-120kW

Scalability

Easy to expand the cooling capacity gradually. The OPTIMA2 allows scalability for future growth, as well as the ability to efficiently add redundant units for maximum reliability in the most mission-critical applications.

Convenience

Modular design units can be quickly unpacked and connected to convenience to transportation, installation and service, optimizing the entire installation process and reducing installation costs.

Quick Response

Product structure modularization and parts generalization, same basic models can be concurrently produced and have short production cycles, ensuring a quick response in all situations.

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ENGINEERED FEATURES

Modular design

Modular design, easy to extend the cooling capacity, applied for newly or upgraded data center.

High Efficiency

OPTIMA2 units incorporates numerous energy saving technologies with compact structure. Under the same cooling capacity, the units can save more space for user. The energy saving technologies allows OPTIMA2 rated for 12.1 EER.

Small Size and Quick Installation

OPTIMA2 units are smaller than more traditional room air conditioning, making them significantly easier to transport in freight elevators and with standard equipment. Once at the installation site, a unit can be quickly unpacked and connected, optimizing the entire installation process and reduce installation costs.

V-shaped Condenser

V-shaped condenser coil design provides better heat rejection with smaller footprint and lower weight, solving the problem of congestion in the air-cooled outdoor installation area. Special structure design allows combined installation, provides easy access to installment and maintenance.

High Reliability

Strong adaptability for the harshest environments, operation rang -40℃(-40°F) ~ +55℃(131°F).

Precise Control

The control accuracy for temperature is ±1℃(±1.8 °F) and for Relative humidity is ±5%.

Easy Maintenance

The technical compartment housing the compressor, humidifier, control and safety devices is separates from the air flow, enabling ordinary service and preventive maintenance to occur during operation.

Scroll Compressor

OPTIMA2 units are equipped with a scroll inverter compressor which can vary speed continuously according to the cooling demand.

EC Fan

Highly efficient EC fans are supplied with OPTIMA2 products.

Air Filter

A washable, easy maintainable and durable G4 class air filter is a standard configuration for the OPTIMA2 range. With optional air pressure switch, a clogged filter alarm can be triggered when the filter is dirty.

Environmentally Friendly Refrigerant

R410a is used in OPTIMA2 units, which meets the requirements of environmental protection refrigerants.

Self-diagnosis

All the microprocessor-connected components are continuously monitored and controlled and, in case of malfunction, the unit is shut down and the fault is shown on the display.

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TECHNICAL PARAMETERS

OPTIMA2(-DFC/RPU).DXA

Unit Model		40X0
Air Flow Scheme(1)		O/U
Refrigerant Type		R410A
Unit Cooling Capacity(2)	kW(BTU/h)	43(146,760)-20(68,260)
Air Volume	m3/h	11,170
Outdoor Condenser		
Normal Configuration		VME60*1
High Efficiency Configuration(Optional)		VME80*1
Direct Free Cooling(Optional)		
Model		DFC-X0
Refrigerant Pump Unit(Optional)		
Model		RPU12
Power	kW	0.5
Rated flow	m3/h	0.6
Electric Heater(Optional)		
Type		Stainless steel
Electric heater capacity	kW	6
Current	A	7.5
Humidifier(Optional)		
Type		Electrode type
Humidification capacity	kg/h (lb/hr)	5(11)
Power	kW	3.8
Current	A	4.8
Unit Piping Connection		
Humidifier water supplyΦ	in	1/2”
Condensate water drainageΦ	in	3/4”
Refrigerant discharge	in	1"
Refrigerant liquid	in	5/8"
Power Supply		
Power source		460V/3Ph/60Hz
Unit max. operating power	kW	26.3
Unit max. operating current	A	36.5

(1)- O: Up flow, U:Down flow;
(2)- Return dry-bulb temperature 29.4°C (85°F), RH45%, outdoor ambient temperature 35°C (95°F).

TECHNICAL PARAMETERS

VARIABLE SPEED COMPRESSOR OF UNIT CAPACITY

Model	Return Temp. DB/DP ℃(℉)	Total Capacity kW(BTU/h)	Sensible Capacity kW(BTU/h)	EER (BTU/h/kW)
OPTIMA2.DXA 40X0 (1)	29.4℃/11.1℃ (85℉/52°F)	40.8(138,200)	40.0(134,800)	10.2
		32.7(111,600)	32.1(109,556)	12.1
	23.9℃/11.1℃ (75℉/52°F)	35.5(121,160)	35.4(120,820)	9.3
		31.8(108,530)	31.7(108,190)	10.3

(1)- All Data given at 35℃(95°F) outdoor temperature.

Direct Free Cooling Performance

Model	DT between Indoor and Outdoor ℃	Free Cooling Capacity kW(BTU/h)
OPTIMA2-DFC.DXA 40X0 (1)	6℃	23(78,011)
	8℃	30(104,014)
	10℃	38(130,018)
	12℃	45(156,021)

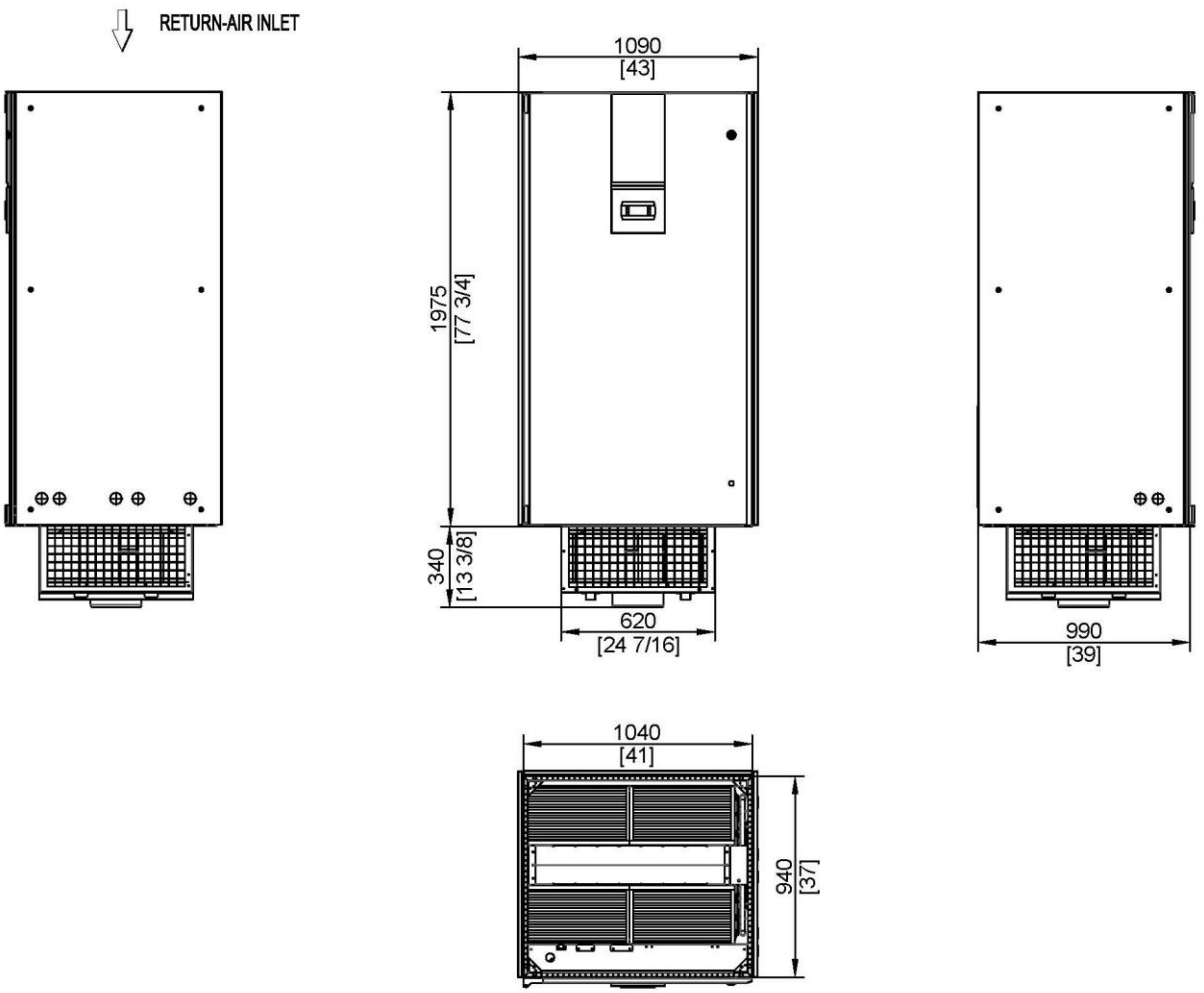
Refrigerant Pump Performance

Model	Outdoor Temp. ℃(℉)	EER (BTU/h/kW)
OPTIMA2-RPU.DXA 40X0 (1)	5℃(41℉)	22.8
	0℃(32℉)	24.8
	-5℃(23℉)	30.2

(1)- All Data given at 29.4℃(85°F) return dry-bulb temperature and 11.1℃(52℉) return dew-point temperature.

UNIT DIMENSION DRAWING

X0 UNIT CABINET DIMENSION DRAWING FOR UNDER FLOW UNIT



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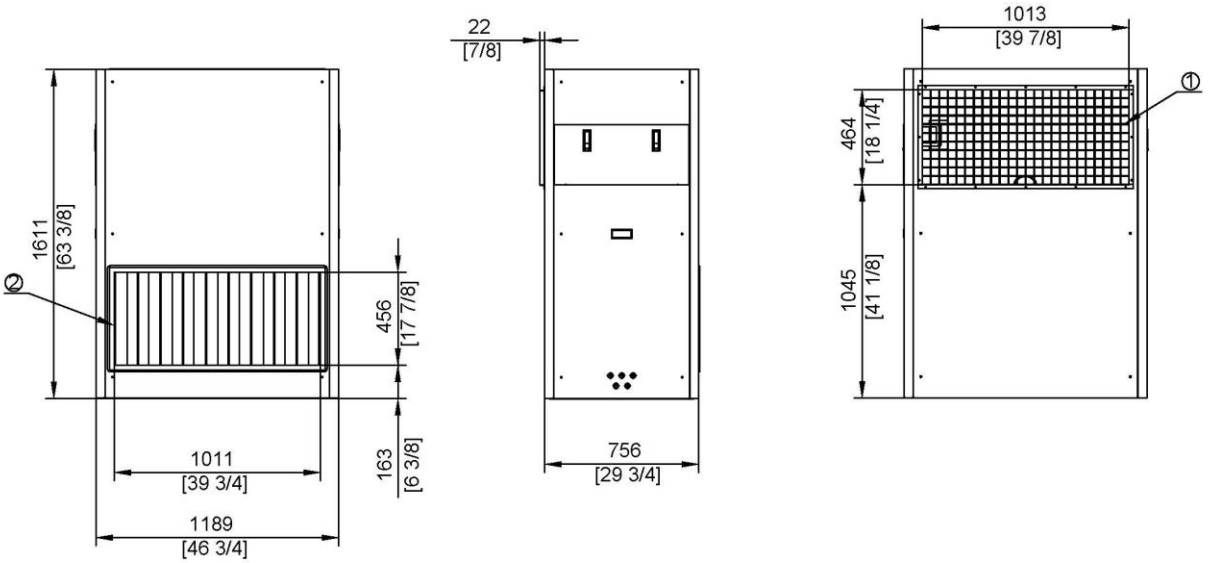
UNIT DIMENSION DRAWING

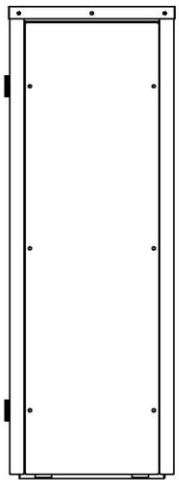
OPTIMA2-DFC FRESH AIR INLET BOX DIMENSION DRAWING

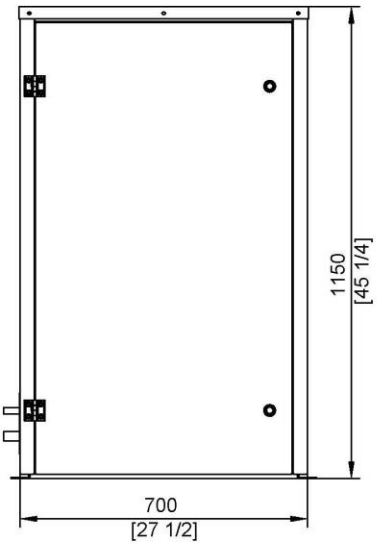


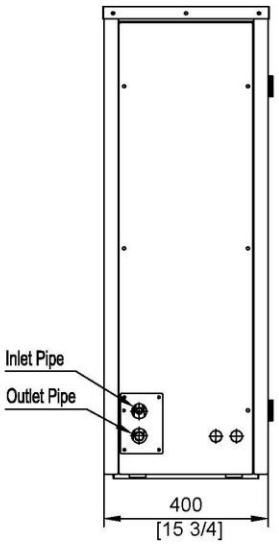
① Connected to the outdoor side
② Connected to the unit

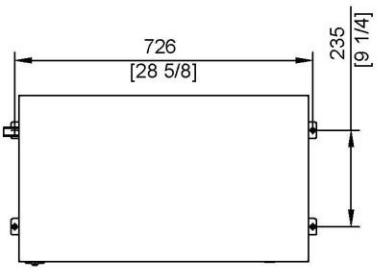
UNIT DIMENSION DRAWING

RPU12 DIMENSION DRAWING



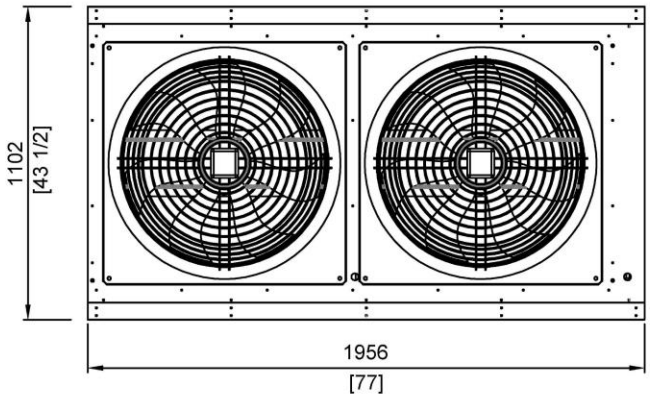


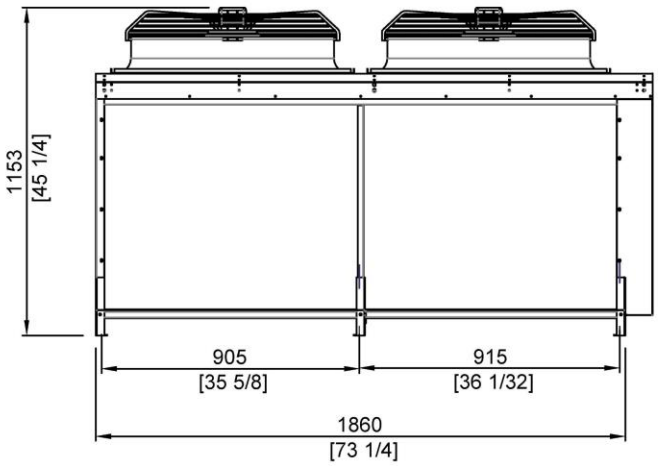


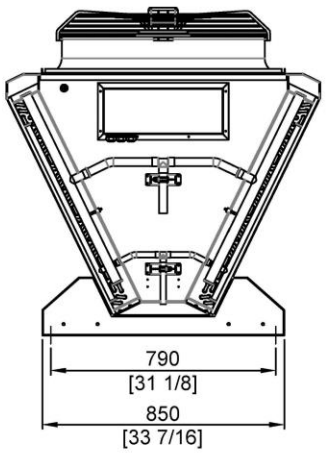


UNIT DIMENSION DRAWING

VME60 & VME80 DIMENSION DRAWING







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