HYUNDAI
AIR CONDITIONER

Pre-conditioned Air UnitLorem ipsum

GENUINE PRODUCT OF
HYUNDAI CORPORATION

International Airport

Products or services provided by Hyundai:

Pre-conditioned Air Unit
Air-Cooled Chiller (Heat Pump) Unit
Evaporative Cooling Chiller Unit
High Pressure Fresh Air Handling Unit

In the 21st century, the demand for environmental protection drives the continuous optimization of aircraft air conditioning systems, using environmentally friendly refrigerants and ground support equipment (such as aircraft ground air conditioning) to achieve environmental protection.

GPUs emerged in the mid-20th century to provide power to aircraft on the ground, supporting onboard systems, reducing reliance on APU, and lowering fuel consumption and noise. However, GPUs can only provide power, and aircraft air conditioning still needs to operate through onboard systems, resulting in certain energy conversion losses and complexity.

With the popularity of commercial jet aircraft, APU has begun to be widely used in commercial aviation. APU not only provides power for ground operations, but also serves as an important part of the air conditioning system, backup power source, and device for starting the main engine during flight.

In the 1950s, there were significant improvements in aircraft air conditioning systems, and airlines began using more efficient air conditioning systems to more accurately control the cabin temperature and improve comfort.

With the improvement of aircraft structure and performance, flight altitude and speed continue to increase. At the same time, with the danger of low temperature, low pressure and oxygen deficiency at high altitude, life support requires the cabin to be changed to an airtight cabin. The air conditioning system on the aircraft has emerged to ensure the normal operation of people and onboard equipment.

For a period of time since the Wright brothers manufactured their first airplane in 1903, open cockpits were used on airplanes, making it impossible to control the cabin environment.

PCA

Pre-conditioned Air Unit

- High energy efficiency and low maintenance requirements, lower long-term operational costs.
- Low noise and low emissions, green solution for airport.
- Low energy consumption, better economic benefits.
- Repid cooling with fresh air, better passenger comfort, short cabin preparation waiting.

GPU

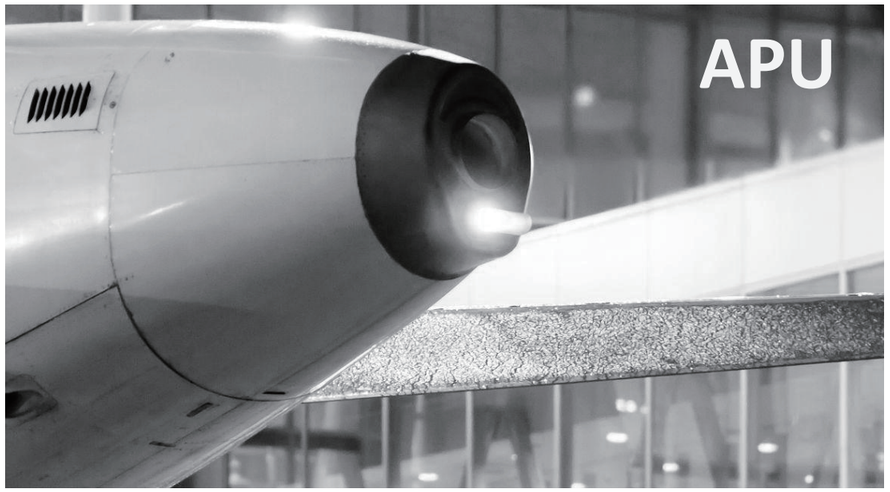
Ground Power Unit

- Power only for aircraft lighting, electric and electronic appliances.
- Unable to drive APU or PCA, unable to deal with the cabin cooling.
- Diesel engine has low efficiency, high cost, and most importantly air pollution.

APU

Auxiliary Power Unit

- Powered by aviation fuel, running cost is very high.
- Cooling through air compressing and condensing, cooling effect is poor.
- Generates noise, affecting cabin comfort.
- Generates emissions(CO_2, NOX, etc) during operation, causing negative environmental impacts.
- Maintenance cost is high and easy to cause safety risks.



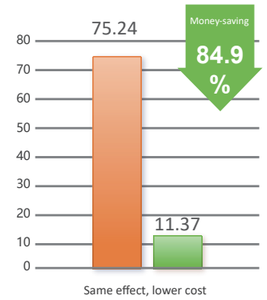
Auxiliary Power Unit (APU) is a small engine on an aircraft that provides essential power and pneumatic support when the main engines are off. During flight, the APU is typically not used for primary power but can serve as a backup emergency power source if needed, ensuring continued operation of critical systems in the event of a main engine failure. On the ground, it supplies electricity to the aircraft's systems, and the air conditioning in the cabin through air compressing and condensing.

PCA improves cabin comfort during aircraft parking by its good cooling efficiency and good cooling effect. It also reduces economic costs through high energy efficiency and low maintenance costs, with good environmental benefits by reducing noise and significantly reducing carbon dioxide emissions.
Comparison of APU and PCA as below.

Comparison		APU	PCA
Running Cost	Power source	Aviation fuel	Electricity
	Maintenance cost	High	Low
Comfort	Service lifetime	Short	Long
	Cooling speed	Slow	Rapid cooling
	Cooling effect	Poor	Good
Environmental Care	Noise	Large	Small
	CO_2 emissions	Heavy	None

Pre-conditioned Air Unit (PCA) is a specialized air conditioning device on the ground designed to provide fresh air that has been filtered, pressurized, dehumidified, and cooled (or heated) for aircraft cabins parked on the ground. These devices provide a comfortable cabin environment for passengers and crew members from the time the aircraft docks at the boarding bridge to the time it leaves the bridge.

Project	Noise dB(A)	CO_2 emissions (kg/h)	Aviation fuel consumption (kg/h)	Cost ($/h)
APU	94.7	369.7	116.0	75.24
PCA	78.0	-	-	11.37



Same effect, lower cost

Remarks:

1. When APU is running, the noise levels of B757 and B767 at 5 meters away from the tail is 94.7dB(A) and 89.4 dB(A) respectively. *APU noise data comes from Hangjia Technology.* The PCA noise of AC215 model is 78 dB(A), tested in the laboratory.
2. APU emission per ton of aviation kerosene consumed: CO_2: 3187kg, SO_2: 0.98kg, CO: 0.56kg, NOX: 21.12kg.
Data sourced from the International Air Transport Association.
3. The fuel consumption and cost data of APU comes from Honeywell in the United States. Calculated based on an average of 648.6$/ton of aviation fuel, the hourly fuel consumption cost of APU (with air conditioning) is 0.116 tons/h * 648.6$/ton =75.2$. The cost of PCA is calculated based on industrial electricity consumption of 0.14 USD/kWh, and the cooling power consumption of AC215 model PCA is 81kW·h.

know HOW, know WHY

With robust technical strength of research and innovation as well as application experience, Hyundai drafted over 30 standards of professional and special air conditioning, and joined in compilation of almost all national and industry standards related to industrial and commercial central air-conditioning products, acting as a technical benchmark to promote standardized development and advocate low carbon and environmental protection.

No.	Name
1	Dehumidifiers
2	Air conditioning unit for clean operating room
3	The Minimum Allowable Values of the Energy Efficiency and Energy Efficiency Grades for Water Chillers
4	Explosion-proof dehumidifiers and air conditioners
5	Rooftop air conditioning unit
6	Water chilling(heat pump) packages using the vapor compression cycle
7	Central-station Air Handling Units
8	Screw refrigerant compressors
9	Heat pump water heater for commercial & industrial and similar appication
10	Unitary air conditioners
11	Unitary air-conditioners for computer and data processing room
12	***Aircraft pre-conditioned air units***
13	Design Code for Heating, Ventilation and Air Conditioning of Hydropower Station
……	……

PCA Industry Standards

Scope of application

Technical requirements

01 Adaptation to the environment

- Temperature & humidity
  - T1: high temperature drying
  - T2: high temperature & low humidity
  - T3: high temperature & moderate humidity
  - T4: high temperature & high humidity
- Wind speed
  - C-5500m³/h A318、A319、A320、A737
  - D-8100m³/h A300、A310、A757、A676
  - E1-15860m³/h A330、A340、A747、A777、A787
  - E2-12000m³/h A380

02 Performance requirements

03 Electrical requirements

Safety & reliability

01 Material requirements

02 Corrosion resistance

03 Mechanical strength

04 Operating lifespan

Testing method

01 Test conditions

- Dry bulb temperature on the evaporator side
- Relative humidity on the evaporator side
- Dry bulb temperature on the condenser side
- Power supply
- Air volume
- Static pressure

02 Test project

- Start operation
- Air tightness of refrigeration system
- Airflow, external static pressure, input power
- Customized cooling capacity
- Maximum cooling operation
- Minimum cooling operation
- Noise

Maintenance & overhaul

The Aircraft Type & Product Code

One Set HPAC215X

Class C

A318 A319 A320 B737

One Set HPAC315X

Class D

A300 A310 B757 B767

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Two Set HPAC315X

Class E1

B747

One Set HPAC385X

Class E2

A330 A340 B777

Two Set HPAC385X

Class F

A380

Multiple application

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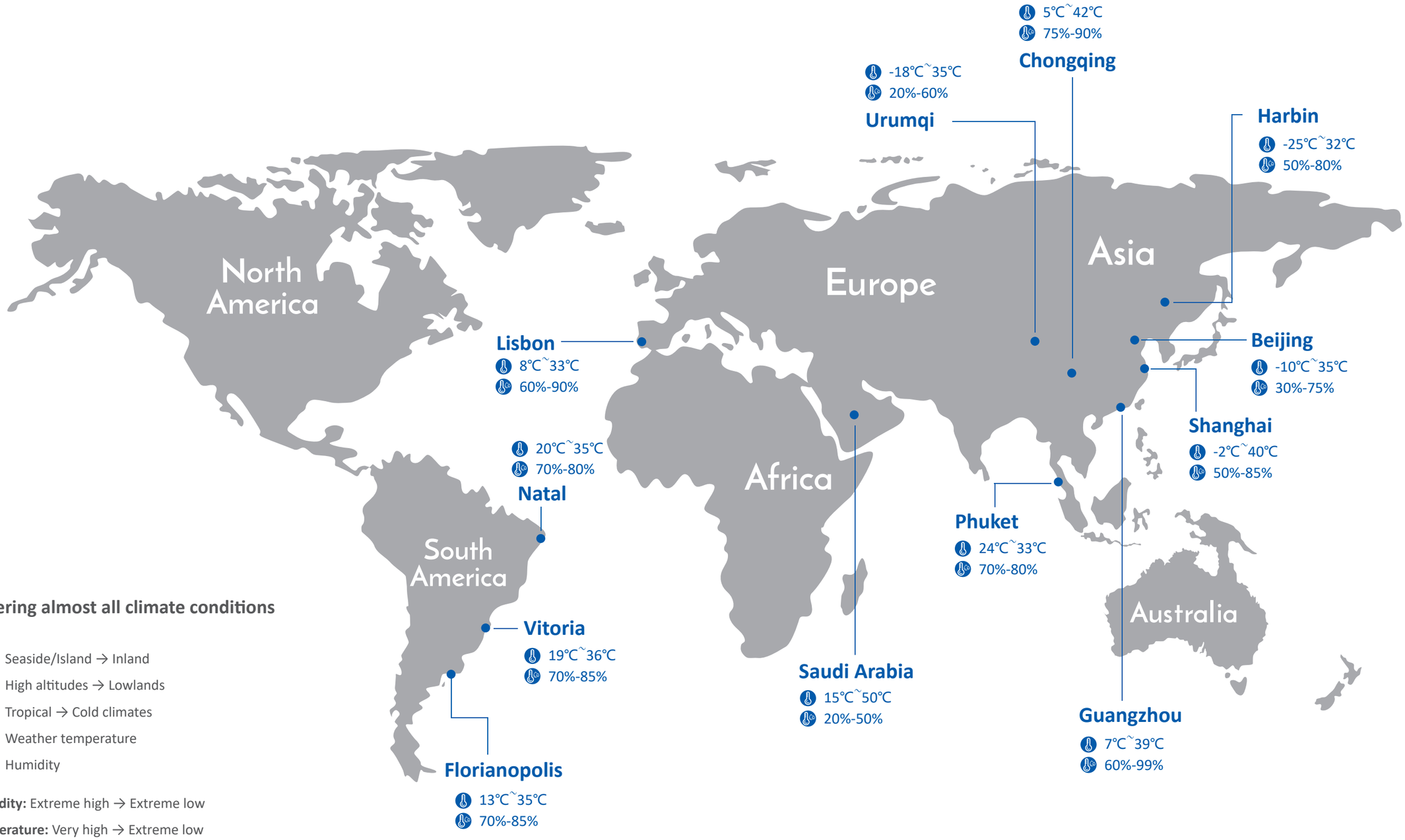


Covering almost all climate conditions

- Seaside/Island → Inland
- High altitudes → Lowlands
- Tropical → Cold climates
- Weather temperature
- Humidity

Humidity: Extreme high → Extreme low

Temperature: Very high → Extreme low

Continuous R&D

Revolution of Hyundai PCA Technology.

2023~Now

- DC inverter PCA, the 1st in the industry
- Variable frequency control (fan + compressor)
- PCB refrigerant cooling technology
- Frost inhibiting technology
- ±1℃ temperature control
- Higher energy efficiency

2019~Now

- Cold storage PCA
- COP ≥ 3.95
- Continuous technological innovation to serve green airport

2017~Now

- Low-temp. evaporative chiller +high-pressure fresh air AHU
- COP > 3.5, highest in the industry
- Innovative energy-saving applications in the industry

2017~Now

- 2nd generation of DX PCA
- COP > 2.15, the highest in the industry
- With comprehensive performance optimization & improvement

2006~2016

- 1st generation of DX PCA
- The 1st PCA manufaturer in China
- COP is appr. 1.6

01. Rapid cooling

In the typical condition, PCA can reach full output within 30s after startup and cool down the cabin in 3 min, which can largely shorten the traditional cooling time and improve passenger comfort.

02. Energy saving

The unit contains 4 to 6 of compressors and refrigerant circuits, which can more precisely adjust the running load based on the air supply situation, thereby improving the energy efficiency ratio.

03. Smart control

The unit can be equipped with an IoT platform, connecting the unit with the management system to enable remote monitoring, intelligent billing, real-time data updates.

04. High adaptability

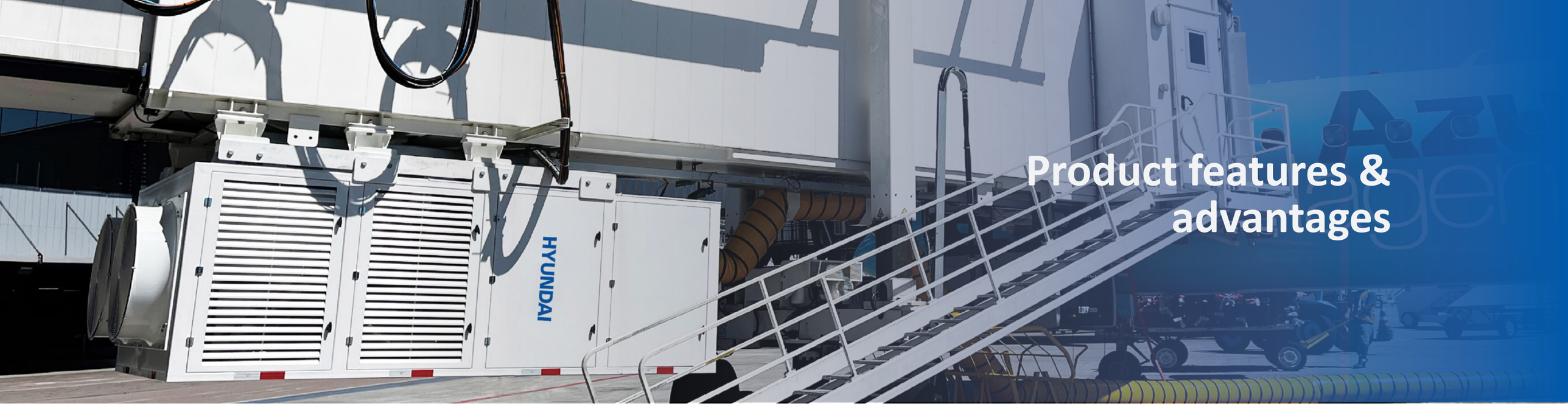
The unit offers customized services to handle various operating conditions such as high altitude, high salt spray, and high temperature and humidity environments.

05. Easy maintenance

The unit is designed with 3-dimensional piping and wiring layout, with strong sense of keeping maintenance space inside. It can facilitate maintenance, avoiding the need to disassemble the unit before repairs and reducing maintenance time.

06. High reliability

The entire product line adheres to the highest quality standards, with reliable core components to avoid frequent replacement and reduce maintenance costs.



Product features & advantages

Rapid cooling

Four-stage rapid cooling

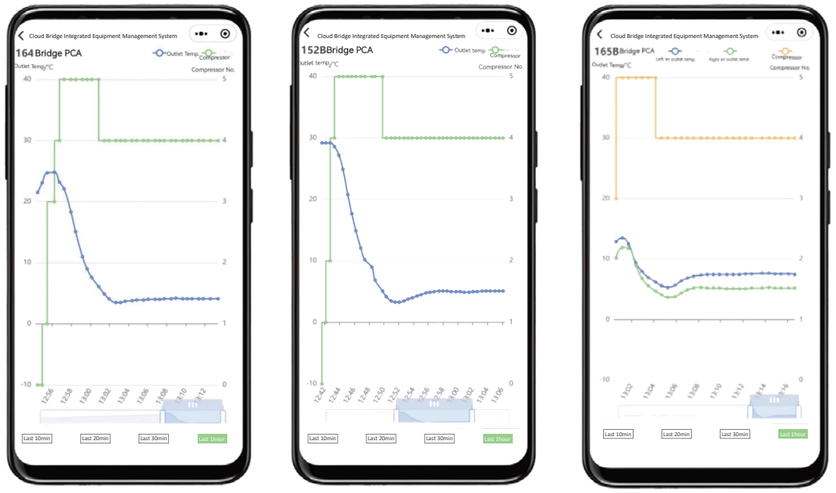
- Aircraft not air-conditioned yet

Startup to fully loading 30s
Cool down to set temp.2℃ 3min
Cabin temp. to 18~24℃ 15min

- Aircraft already air-conditioned

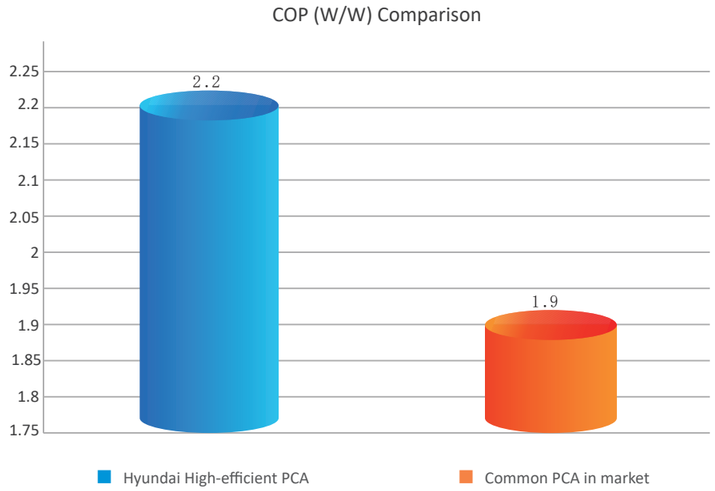
Cabin Temp 18~24℃, switching to PCA
Startup to normal cooling 3min

Guangzhou Baiyun Airport T2 Real Data
Ambient temp. 37℃, Humidity 75%, Jul.12, 2023



2 Efficient & energy-saving

Hyundai PCA excels in energy efficiency and performance, leading the industry with its high-efficiency, stable and reliable operation precise control, quiet and comfortable operation, and environmental and health benefits.



3 High adaptability

- **Flexible applicable climate**

  Hyundai PCA offers products tailored to various climate conditions worldwide, including high-temperature and high-humidity environments, extreme cold environments, high-altitude and windy environments, and coastal areas prone to salt corrosion.

- **Multiple power supply**

  The power supply can be selected based on the usage location, including 380V/50Hz, 380V/60Hz, 400V/50Hz, 400V/60Hz, 415V/50Hz, 460V/60Hz, etc.

- **Flexible working temperature**

  Hyundai PCA is available in a standard temperature range, and we also offer specialized products for low-temperature environments to meet the requirements of different regions.

- **Various installation type**

  Hyundai PCA available in various installation modes, including bridge mounted, floor standing, mobile, vehicle-mounted, etc. It can be installed below passenger boarding bridges or placed directly on the apron. For remote parking positions, mobile type can be used.

4 Easy maintenance

Large inside which can allow the engineer have internal checking and maintenance.

Most of the troubles (over 90%) are small and easy to repair or maintain. If engineer can go inside to operate, troubleshooting can be easily showed on site, no need to disassemble a lot, save much time for the operators.

5 Automatic hose reel (optional)

- Automatic winding and rewinding
- Romote control
- Fast and easy hose reclaim, labor saving
- Interlocking control for fully extending and retracting the air supply hose
- Interlocking function with the boarding bridge and PCA;
- Motor power ≤ 0.55kW.

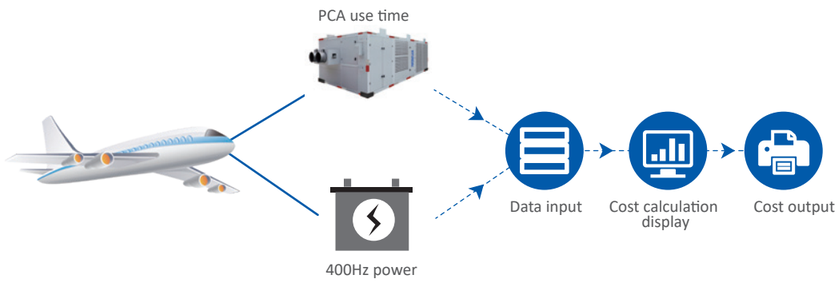
Floor-mounted

Bridge-mounted

6 Online Diagnosis

● Online Diagnosis

Intelligent and interconnected billing system
Automatic cost calculation through computer control
Enhanced humanized operations to make data more objective.



● WIFI control

Real-time data monitor and diagnosis remotely through laptop or mobile phone
Quick response and shorter troubleshooting time

7 Patented Low-loss Hose

Traditional air supply hoses have high air leakage rates and significant temperature rises, resulting in significant losses in PCA cooling capacity and airflow during transport. Hyundai uses proprietary air supply hoses with superior performance to improve energy efficiency.

● Low leakage rate

Hyundai air hose leakage rate ≤0.1%
Traditional hose leakage rate 15-20%
Heat loss rate 0.05℃/m
Previous rate 0.3℃/m

● Length adjustable

Zipper designed hose, with adjustable

8 Pre-cooling & heating

● PCA Pre-cooling&heating supply

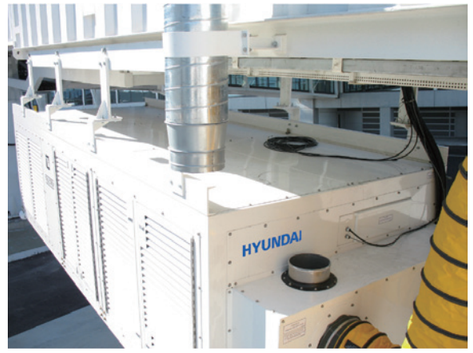
Bypass valve (Optional fuction)
Prestart PCA to save startup time to full loading. Bypass valve will be closed after the aircraft is connected and air valve to aircraft is opened.

● Bridge pre-cooling&heating supply

Cooled/heated air can be sent to the bridge through bypass valve before aircraft connected.

● Benefits:

Fast cooling for the aircraft.
Pre-cooling/heating for the boarding bridge, reduce AC investment for boarding bridges.



Products Category

Bridge-mounted type

Floor-standing type

Mobile type

Vehicle-mounted type:
Self-powered

Hybrid type (Chiller+Terminal)

Specifications

Working Condition		T1	T2	T3	T4	T1	T2	T3	T4
Model		HPAC215				HPAC315			
Cooling Capacity	kW	132	157	175	193	225	250	275	300
Heating Capacity (Optional)	kW	0~130	0~130	0~130	0~130	0~190	0~190	0~190	0~190
Rated Air Supply Volume	m³/h	4500~6000	4500~6000	4500~6000	4500~6000	4200~8100	4200~8100	4200~8100	4200~8100
External Static Pressure	Pa	0~7400	0~7400	0~7400	0~7400	0~7400	0~7400	0~7400	0~7400
Cooling Air Supply	℃	⩽2℃							
Heating Air Supply	℃	20~60							
Working Condition	℃	−40~50							
Power Input	kW	65	73	81	89	102	115	127	138
Dimension	L(mm)	4050	4050	4050	4050	4500	4500	4500	4500
	W(mm)	2400	2400	2400	2400	2400	2400	2400	2400
	H(mm)	1340	1340	1340	1340	1680	1680	1680	1680
Air Supply Outlet Size	Inch	14"	14"	14"	14"	14"	14"	14"	14"
Noise Level	dB(A)	78	78	78	78	81	81	81	81
Net Weight	kg	2900	2900	2900	2900	3600	3600	3600	3600

Note:

1. Power supply: 3N~380V 50Hz.
2. The unit above is the electric heating type. For cooling only type, simply remove the electric heating device.
3. The weight does not include the weight of the trailer or vehicle chassis.
4. AC385A series consists of two units of 315 series.
5. The above parameters represent the standard product data and can be customized based on specific requirements of the project or engineering.
6. This product adopts refrigerant R410a.

Performance Parameters

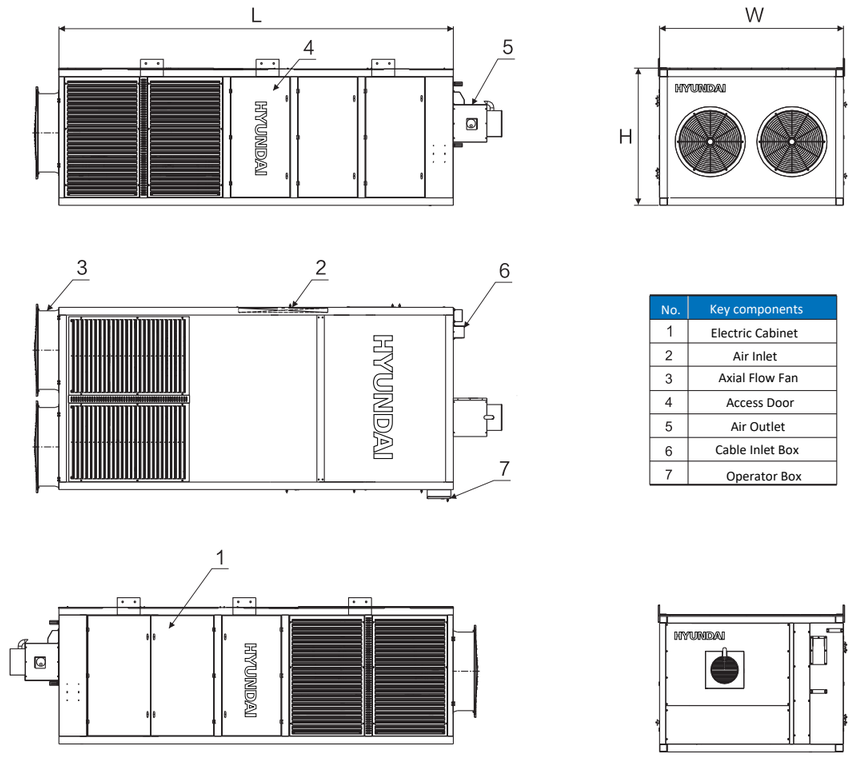
Working Condition		T1	T2	T3	T4	T1	T2	T3	T4
Model		HPAC385				HPAC385A			
Cooling Capacity	kW	280	320	350	380	450	500	550	600
Heating Capacity (Optional)	kW	0~260	0~260	0~260	0~260	0~380	0~380	0~380	0~380
Rated Air Supply Volume	m³/h	4200~12000	4200~12000	4200~12000	4200~12000	4200~15860	4200~15860	4200~15860	4200~15860
External Static Pressure	Pa	0~7400	0~7400	0~7400	0~7400	0~7400	0~7400	0~7400	0~7400
Cooling Air Supply	℃	≤2℃							
Heating Air Supply	℃	20~60							
Working Condition	℃	−40~50							
Power Input	kW	138	151	162	176	102×2	115×2	127×2	138×2
Dimension	L(mm)	5350	5350	5350	5350	4500×2	4500×2	4500×2	4500×2
	W(mm)	2450	2450	2450	2450	2400×2	2400×2	2400×2	2400×2
	H(mm)	1680	1680	1680	1680	1680	1680	1680	1680
Air Supply Outlet Size	Inch	14"×2	14"×2	14"×2	14"×2	14"×2	14"×2	14"×2	14"×2
Noise Level	dB(A)	84	84	84	84	85	85	85	85
Net Weight	kg	4700	4700	4700	4700	3600×2	3600×2	3600×2	3600×2

Note:

1. Power supply: 3N~380V 50Hz.
2. The unit above is the electric heating type. For cooling only type, simply remove the electric heating device.
3. The weight does not include the weight of the trailer or vehicle chassis.
4. AC385A series consists of two units of 315 series.
5. The above parameters represent the standard product data and can be customized based on specific requirements of the project or engineering.
6. This product adopts refrigerant R410a.

Unit Outline Drawing

01. Bridge-mounted Unit Outline Diagram

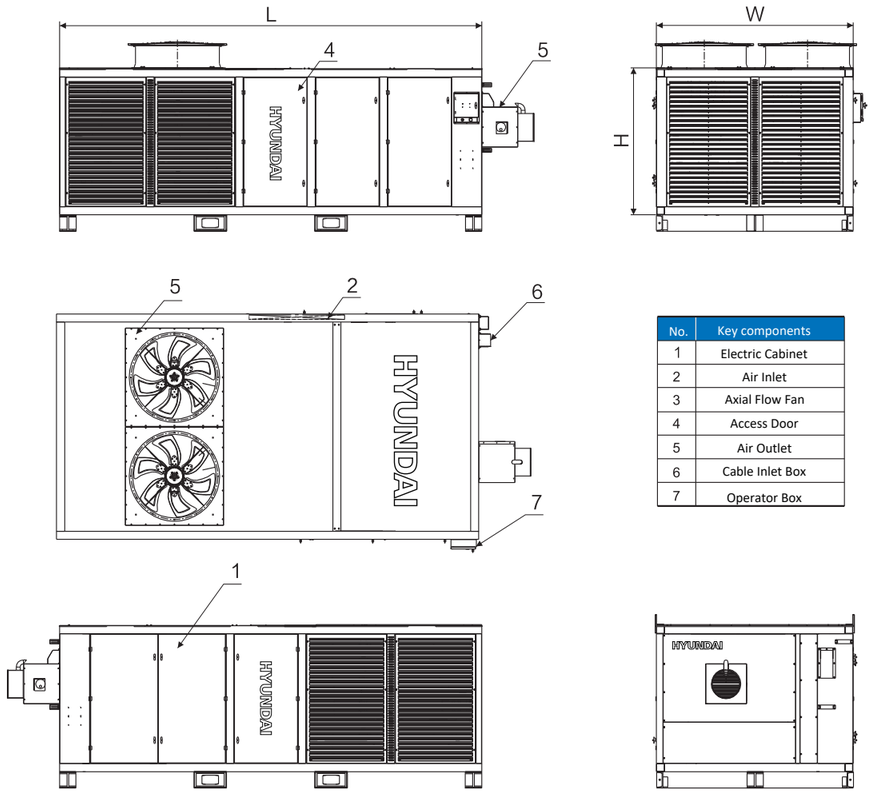


No.	Key components
1	Electric Cabinet
2	Air Inlet
3	Axial Flow Fan
4	Access Door
5	Air Outlet
6	Cable Inlet Box
7	Operator Box

Dimension(mm) / Model	L	W	H	Corresponding Type
HPAC215	4050	2400	1340	C
HPAC315	4500	2380	1680	D/C
HPAC385	5350	2450	1680	E2/D/C
HPAC385A	4500×2	2380×2	1680×2	E1/E2/D/C

Unit Outline Drawing

02. Floor-standing Unit Outline Diagram

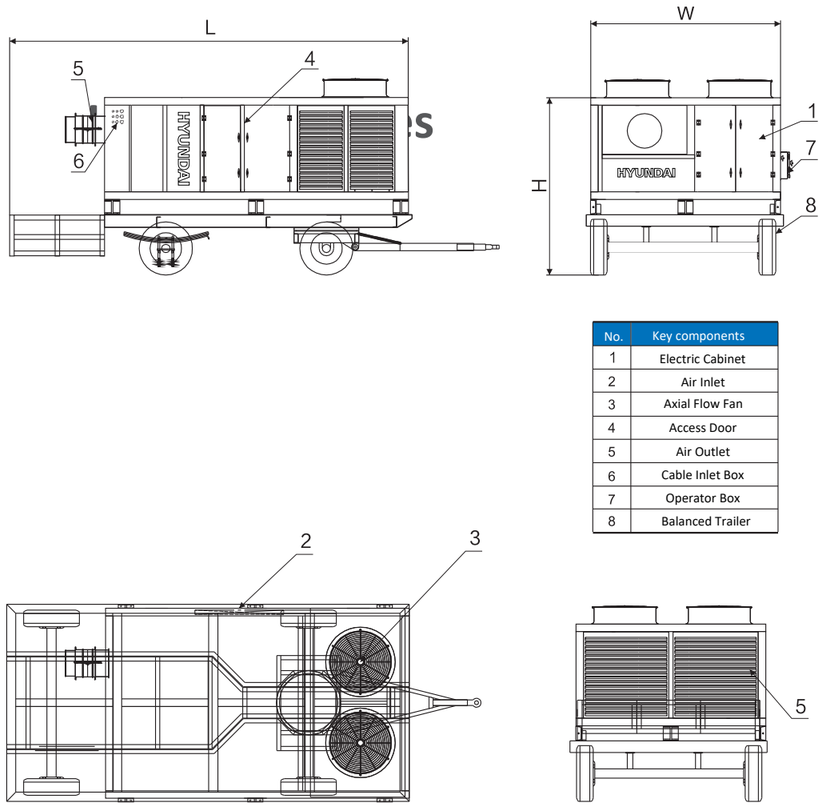


No.	Key components
1	Electric Cabinet
2	Air Inlet
3	Axial Flow Fan
4	Access Door
5	Air Outlet
6	Cable Inlet Box
7	Operator Box

Dimension(mm) / Model	L	W	H	Corresponding Type
HPAC215	4050	2400	1340	C
HPAC315	4500	2380	1680	D/C
HPAC385	5350	2450	1680	E2/D/C
HPAC385A	4500× 2	2380× 2	1680 × 2	E1/E2/D/C

Unit Outline Drawing

03. Mobile Unit Outline Diagram



No.	Key components
1	Electric Cabinet
2	Air Inlet
3	Axial Flow Fan
4	Access Door
5	Air Outlet
6	Cable Inlet Box
7	Operator Box
8	Balanced Trailer

Dimension(mm) / Model	L	W	H	Corresponding Type
HPAC215	5250	2400	1840	C
HPAC315	5700	2380	2180	D/C
HPAC385	6550	2450	2180	E2/D/C
HPAC385A	5700 × 2	2380× 2	2180× 2	E1/E2/D/C