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About Shenling

Guangdong Shenling Eco-Thermal System Co., Ltd. (Shenling ETS), a subsidiary of Shenling Corporation, is located in Shunde, the centre of the Pearl River Delta in China. Shenling ETS is committed to providing customers with eco-thermal systems for space heating, energy storage, and energy management through renewable energy. For space heating, Shenling ETS provides a full range of air to water heat pumps with cutting-edge technologies and excellent craftsmanship.

Shenling ETS has experienced R&D, testing and evaluation, and QC expertise equipped with professional labs and facilities to promise high-efficiency and reliable products. Shenling’s digital Lighthouse Factory with fully automatic production lines and specialized procurement and PMC teams can promise an effective output and stable leadtime. Meanwhile, service technicians are always there for technical and service supports.

Shenling Corporation, stock code 300616.SZ, founded in 2000, is a modern enterprise that concentrates on air conditioning and refrigeration, solutions for environmental treatment, and energy consumption management. It integrates R&D, design, manufacturing, marketing services, engineering installation, operation and maintenance together. Shenling has professional HVAC expertise in various fields, including data service industry, industrial production and research, professional specialized application and high-end public building indoor environment. Shenling provides integrated and vertical HVAC solutions for clients all over the world.

▼ Headquarter

▼ Production base I

▼ Production base II
2000
Shenling Corporation founded

2002
Won the international bid of the Three Gorges Hydropower Project

2003
Shenling Postdoctoral Programme established

2006
The first supplier of the United Nations procurement in Guangdong

2008
2010 FIFA World Cup S.A FNB Stadium AC supplier

2012
New H.Q launched
National Enterprise Technology Center

2014
Production Base I launched
High-tempg multi-stage heating type heat pump developed & used in White Swan Hotel

2017
China Patent Excellent Enterprise Award
Bid winner of Beijing Daxing International Airport PCA heat pump

2018
National Technology Innovation Model Enterprise Award

2019
National Intellectual Property Advantage Enterprise Award

2021
I.P.O.
4-pipe screw air/water heat pump developed & used in Binzhou Hospital

2022
Production Base III launched
Shenling ETS established
Why is Shenling

Experiences accumulated over the past 20+ years have enabled Shenling a professional HVAC supplier. Now Shenling provides end-to-end integrated HVAC solutions for global customers, integrating HVAC consultation, system design, equipment R&D, integrated implementation, commissioning and acceptance, intelligent control, as well as IoT operation and maintenance.
Technological research

Innovation mode of Shenling

Shenling relies on the state-level technical center to develop high-grade, precision, advanced and specialized HVAC products, through which, Shenling has successfully attracted and trained thousands of talents, realizing independent innovation, and established long-term technical exchange and cooperation with professional design institutes, research institutions and universities globally. With industry oriented application, Shenling persists in the R&D direction of efficient use of energy, low carbon, environmental protection, new energy and circular economy, and integrates techniques of different fields and disciplines to construct a competitive technical system and to realize continuous innovation.

Level 1
- Application of universal technology
  - A 1G3 platform, energy management system, PCB and software R&D, renewable energy study and application
  - Include: 3 province-level technical centers

Level 2
- Exploratory study on cross categories of foundational technology
  - Include:
    - Shenling R&D Academy
    - 1 state-level postdoctoral research station
    - 1 state-certified technical center
    - 20+ cooperative research institutes

Level 3
- Individual product development
  - Include: 10 product development laboratories

Level 4
- Exclusive technology of each product category
  - Include:
    - 8 research institutes
    - 13 state-level laboratories

Science & technology achievements

01 Ultra-high energy efficiency
  - Flow field optimization & heat transfer enhancement
  - Free cooling technology
  - Variable-flow control technology
  - Comprehensive utilization technology of natural cold and heat sources
  - Condensation heat recovery technology

02 VOCs treatment technology
  - -40°C ultra-low temperature cascade refrigeration
  - Oil and gas chemical process treatment
  - Safety technology of stainless steel pressure vessel
  - Multistage condensation+adsorption+thermal oxidation technology

03 Smart control
  - High precision temperature and humidity control
  - Multi-mode automatic conversion technology
  - Remote monitoring technology

04 Extreme environment application
  - 65°C high temperature refrigeration
  - -40°C ultra-low temperature refrigeration

05 Explosion proof and anti-corrosion
  - Class C5 anti-corrosion design
  - Class B5 explosion-proof design
  - Self-spray environment design of offshore platform

06 Shock resistance
  - Collision avoidance
  - Anti-impact technology
  - Anti-acoustic (Protection) technology
Production system

Shenling has leading technical advantages, excellent management team, first-class production facilities, and comprehensive management system, which build up a solid foundation for Shenling's reputation in HVAC field. Currently, Shenling has built up research and manufacturing bases with modern equipment of over 150,000 square meters. The production capacity of the manufacturing base exceeds 1 billion USD, which can satisfy the needs of consumers within the lead time.

- Manufacturing base covering an area over 150,000m²
- Modernized production plants equipped with first-class processing and testing equipment
- ISO 9001 quality management system
- ISO 14001 environmental management system
- ISO 45001 Occupational health and safety management system
- ECQ QC 080000 hazardous substance process management system
- Enterprise of Work Safety Standardization
- Audited green factory of clean production
- Certified Measurement Assurance System in compliance with ISO 10012.1

Manufacturing system overview

- Through rigorous and unified quantitative performance assessment, Shenling ETS selects the best domestic and international suppliers to create an efficient and collaborative supply chain system.

- The use of automated production lines and advanced processing equipment, laying the foundation for efficient production, single production line on average 72.5% to complete a product output.

- Rapid production switching of multiple batches of products, rapid response to multiple customer demand orders, production switching of different batches of product models takes only 3 minutes.

- Electronic information management, automatic logistics distribution, information monitoring and dispatching command of the whole production process.

Automatic production line
Faulklin inspection line
Manipulating robot
AGV
Shenling Testing Center

Shenling Testing Center is an accredited laboratory by China National Accreditation Service for Conformity Assessment (CNAS) and the assessed laboratory by National Compressor Refrigeration Equipment Quality Inspection and Testing Center (GMPF), The Air-conditioning, Heating, and Refrigeration Institute (AHRB), etc., with a leading management system and testing devices in the HVAC industry.

Shenling Testing Center covers about 8000m², with over 20 sets of medium and large equipment, all built with the concept of digitalization by leading institutes and equipped with top brand instruments and meters. The testing scope covers performance, reliability, structure, safety, cleanliness and other aspects of air conditioning products. Shenling Testing Center has industry-leading air conditioning performance test capabilities, including 12000m³/h air volume, 750kW enthalpy difference, 1500kW air-cooled direct evaporative cooling unit, 1500RT water-cooled unit, -40°C~60°C ambient temperature range, etc.

Shenling Testing Center has been focusing on providing high quality testing services through the improvement of personnel capabilities and the expansion of testing capabilities, and the quality policy of "objective, scientific, accurate, and efficient" has deeply rooted in its spirit.
### Quality control

Sherling has established a sound quality management system, always focusing on customers, by identifying and controlling the whole process of quality planning, quality assurance, quality control and quality improvement. Sherling integrates professional tools in product manufacturing process, advanced methods and means of quality management, and combines quality data statistical analysis and quality awareness education into **DO IT RIGHT AT THE FIRST TIME**, to create every high-quality product.

#### Incoming components problem screening

**Parts laboratory**

As the quality verification platform for technical evaluation and quality improvement of parts and components, parts laboratory provides incoming material inspection, systematic analysis of relevant test data, environmental adaptability/reliability verification and material failure analysis.

**Primary tasks**

- **Quality inspection and supervision of incoming parts**
  - Identify potential risks of key materials, and establish corresponding equipment, detection capability, inspection and inspection mechanism of the incoming to improve customer satisfaction.

- **Environmental adaptability and reliability verification of parts**
  - Carry out environmental adaptability and reliability verification for new materials, identify/improve potential defects of materials, and reduce the maintenance rate of complete products.

- **Analysis, verification & improvement of material defects/failures**
  - Analyze the root cause of material failure in the manufacturing process and market, and promote a series of activities of technology zeroing and management zeroing.

- **Statistical analysis, monitoring, warning and improvement of bad material application**
  - By data analysis, monitoring, early warning and improvement based on bad data of various materials in MES/ERP background.

- **The main equipment includes:** EDX spectrum detector, ROHS 2.0 detector, hardness tester, vacuum helium detector, metallographic microscope analyzer, high and low temperature dump heat test chamber, valley comprehensive performance test bench, parts blasting test bench, salt spray test chamber, cleanliness test equipment, thermostatic water tank, chemical test instrument, safety tester, needle flame test bench, burning test bench, etc.

- **Reliability test items are formulated according to product failure risk, covering all key components such as refrigeration devices, electrical components and structural components.**

- **The test frequency shall be strictly implemented according to the annual test plan.**

### Manufacturing process quality control

Through the establishment of product QCP, combined with the manufacturing execution system(MES), the key control points in the manufacturing process are controlled, the quality data is displayed explicitly, the quality of the manufacturing process is stable and reliable, and the quality data tracing in the whole process of production is realized.

### Quality improvement

Sherling has established quality management platform for continuous improvement. By focusing on VOC and YOB according to product demands and PDCA principles, and carrying regular specific activities such as QCC and quality projects, Sherling promotes continuous product quality improvement.

### Process equipment

- **Welding robot**
- **Vacuum helium detector**
- **High frequency welding machine**
- **Automatic welding machine**
- **Vacuum drying system**
- **Vacuum helium detector**
Technical and service support

Objective

Shenling provides diversified training courses to our partners for better understanding and technical mastery of the products, such as the selling points introduction for sales personnel, design and application training for technical teams, maintenance and service training for service personnel, and etc.

Training Centers

The training centers provide hands-on experiences with various systems, components and controls to refresh and enhance the skills of your sales, design and installation and service teams.

Shenling ETS Training Center
Address: No. 29, East Shunde Rd, Xingtian High-Tech Park, Shunde, Guangdong, P.R. China
Products: air source heat pump, PVT, energy storage, specialized AC

Shenling HQ Training Center
Address: Xinglong 10 Rd, Chencun Machinery Equipment Park, Shunde, Guangdong, P.R. China
Products: centrifugal chiller, screw/scroll chiller and terminals, system design and engineering, IOT/Smart control

Design & Application Trainings

The design and application trainings for various products are basically for the sales personnel selling products in order to give them basic understanding about the main features.

After Sales-Service Trainings

These trainings are dedicated for the after-sales/service personnel in order for them to better carry out the installation, commission and maintenance of the products. In Shenling training rooms, the trainees have chances to solve malfunctions on real products, delicately prepared for each training.

Online Trainings

Online training is an alternative way of quick response and easy access for global customers. With the help of our technical team, the customers do not need to be physically present for the training. Amid the COVID-19 pandemic, we have conducted a lot of online trainings.
Reference project

- **Guangzhou Baiyun Airport**
  Location: Guangzhou, China
  Product: PCA heat pump, rooftop, precision AC

- **Beijing Capital International Airport**
  Location: Beijing, China
  Product: PCA heat pump, evaporative chillers

- **FedEx Asia Pacific Hub**
  Location: Guangzhou, China
  Product: Evaporative chillers

- **IKEA**
  Location: Various of places in China
  Product: Rooftop, engineering

- **Three Gorges Hydropower Project**
  Location: Yangtze River, China
  Product: Air-cooledBwater-cooled screw chillers, AHU

- **Soccer City, 2010 FIFA World Cup**
  Location: Johannesburg, South Africa
  Product: Water source heat pump, AHU
The White Swan Hotel
Location: Guangzhou, China
Product: High-temp multi-stage heating type heat pump, FCU

Zhujiang Hospital
Location: Guangdong, China
Product: Thermostatic & humidistatic clean AC

Grand Epoch City
Location: Hebei, China
Product: Polestar A/W heat pump

CSPC Central Institute of Pharmaceutical Research
Location: Hebei, China
Product: Combined AC unit, thermostatic & humidistatic AC, HRV

Changqing Grand Theatre
Location: Changqing, China
Product: Thermostatic & humidistatic AC
What can Shenling provide

To help solve the heating requirement due to Europe’s energy shortage and promote renewable electrical heating, Shenling, as the professional HVAC supplier with sound and solid foundation, is now providing to markets high efficient and environment-friendly air-to-water/air source heat pump systems for space heating, cooling and water heating.
**ThermaX**

Full-DC Inverter Air Source Heat Pump

**Mono Series**

<table>
<thead>
<tr>
<th>Capacity (kW)</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
</tr>
</thead>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>380 - 40V/3Ph/50Hz</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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</table>

**Split Series**

<table>
<thead>
<tr>
<th>Capacity (kW)</th>
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<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
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<tr>
<td>220 - 40V/3Ph/60Hz</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>380 - 40V/3Ph/50Hz</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

- **Aesthetic industrial design**
  - Easy to integrate with the architectures
- **Mould shaped shell and structure**
  - Higher processing precision;
  - Higher reliability and consistency;
  - Higher production efficiency and guaranteed delivery date
- **Single fan & compact design**
  - Smaller floor area
  - Higher installation freedom
  - Larger container loading quantity

**Overview**

- Energy class: A+++
- R32 refrigerant
- Space heating+Cooling+DHW
- Min operation ambient temp. -25°C
- Max outlet water temp. 65°C
- Full colour LCD display controller
- WiFi smart control
- Smart grid
- Disinfection
- Power consumption counting

**Modes**

- Space heating mode
- DHW mode
- Cooling mode
- Space heating & DHW mode
- Cooling & DHW Mode
- Auto mode
Ultra-Silence

ThermaX operates as low as 35 dB(A) sound pressure level at 3 meters.

32 dB (A)  The noise of falling leaves
35 dB (A)  Noise from sleep
46 dB (A)  Noise in the library

Biomimetic fan design

- **Concave design of suction surface**
  - Maximize the wake vortex shedding from suction surface
  - Optimize the flow field on the surface of blade
  - Reduce the weight and improve the efficiency

- **Thickening design of leading edge**
  - Improve the strength of the blade
  - Reduce the noise of low frequency

- **Notch design of trailing edge**
  - Optimize the pressure distribution of the blade trailing edge
  - Reduce the noise of wake vortex shedding from the blade

ODE sound proof design

- **Full set of plate and plastic mould**
  - Precision manufacturing based on mould die stamping
  - Better fit of sheet metal parts, lower vibration noise

- **Simulation at different frequencies**
  - Compressor vibration simulation
  - CFD and flow simulation

- **3 layers of sound insulation**
  - Compressor sound insulation to reduce the compressor noise
  - Sheet metal insulation to reduce the system noise
  - Environment-friendly sound-absorbing materials

Silent mode

When silent mode selected, ThermaX will lower down the frequency of compressor and fan motor. In this mode, the operating sound will be effectively decreased, while the capacity be decreased slightly.
High-Energy efficiency

ERP Directive

Seasonal space heating energy efficiency

<table>
<thead>
<tr>
<th>Efficiency</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+++</td>
<td>Average up to 35°C</td>
</tr>
<tr>
<td>A++</td>
<td>Average up to 55°C</td>
</tr>
</tbody>
</table>

It represents the highest level of Thermex product. Please refer to the product for specific grade of different models.

High Efficiency Components

- **DC inverter compressor**
  - Wide working frequency
  - High efficiency operation in different frequency

- **Electronic expansion valve**
  - High efficiency/branded famous brand
  - High precision regulation of different loads and flows, max 500 steps

- **DC Inverter fan motor**
  - Stepless control
  - Different speed in different loads
  - Low power consumption

- **DC inverter circulation pump**
  - Famous brand
  - High efficiency pump for heating application
  - High delivery head, small size, low noise

- **Plate heat exchanger**
  - Famous brand
  - Better efficiency and smaller size than tube-in-tube type or high-efficiency tank
Wide operation range

a. Space heating
   - Min ambient temperature for space heating is ~25°C.
   - Outlet water can reach 60°C at ~15°C ambient temperature.

b. Space cooling
   - Start cooling at ~5°C, ambient temperature.

c. DHW
   - Min ambient temperature for DHW is ~25°C.

Power limitation

Power limitation design is to limit the max access current to let the equipment become suitable for a variety of current supplies.

The user need only choose from the set configurations on the wired controller, then the unit will be able to suit different application.

Floor preheating

For initial heating, if the floor has a higher water content, it might be warped or even ruptured during floor heating. The drying up mode is designed to be used before the initial heating of newly installed floor loops and the pre-heat- ing mode designed for the first heating of a new seasonal heating to protect the floor. In these modes, the water temperature will gradually increased during the operation.

Holiday mode

Holiday mode is a function to improve system reliability and energy saving. The user can select this mode and set the schedule before going on holiday away home. ThermaX will work with low water temperature in space heating and/or DHW mode in order to avoid water from freezing in winter. Before the users back, ThermaX will start disinfection automatically to ensure germ free water available. The user can also turn it off manually.

Alternative operation

ThermaX supports modular installation for an extension of capacity. To promise the running time of different modules are balanced, ThermaX will check the running time of each module during startup and will start the modules from the minimum running time to the maximum according to the capacity demand.

Multiple system protection

Multiple antifreeze protection
Multiple air return control
High voltage protection
Low voltage protection
High temperature protection
Efficient intelligent defrosting

Quality parts

DC inverter compressor
- CE certification
- Widely working frequency
- Twin eccentric cams
- 2 balance weights
- Better balance
- Low vibration

Mould stamping structure
- High processing precision
- Highly robust bearings
- Highly stable moving parts

Heat exchanger aluminum foil
- Standard products: 200/° of neutral salt mist
- Heavy anti-corrosion products: 1000/° of neutral salt mist
- 150/° of acid salt mist

Heat exchanger copper pipe
- Standard products: 240/° of neutral salt mist
- Heavy anti-corrosion products: 150/° of neutral salt mist for OGU
Intelligent control

Wired controller

- **Function**
  - Standard wifi function for remote control
  - SD card program upgrade, easy for maintenance
  - User-friendly interface, easy to operate

- **Appearance**
  - Aesthetic design, simple but not easy
  - Obsidian black colour, high-end and elegant
  - 14mm ultra-thin design, small and exquisite

- **Installation**
  - With installation backplane, installed independently, or compatible with 86 threading box

APP control

- Easy to read and set
- Dual temperature zone control
- Schedule function and weekly/daily timer
- Silent mode
- Holiday mode
- Remote monitoring technology
- 5 language control

Convenient program upgrade

**Mini USB upgrade**

No need to carry any other heavy equipment but only a laptop and a Mini USB cable can realize program upgrade of indoor unit and outdoor unit automatically.

Parameter setting transmission between wired controllers.

Dual temperature zone control

ThermaX offers a choice to control dual temperature zones simultaneously by supplying different water temperature for fan coil and floor heating at realizing the best comfort. The user needs simply make a choice by a touch on the wired controller, ThermaX will run the mode automatically. The user can also set his favourite temperature for each zone accordingly. This function includes floor heating only, fan coil only, floor heating + fan coil, etc.

Smart Weather adaptation

With the help of weather temperature curve, water temperature will automatically change as outside air temperature changes. When outdoor air temperature increase/decrease, the heating load will decrease/increase.

Quick hot water outlet

Install the DHW pipe pump (Code 7) to the water system, under the control logic of ThermaX, the water will be heated and circulated in pipeline, so that the users don’t have to wait for the cold water released and wasted, but can use hot water directly.

Smart grid

ThermaX heat pump can recognize different electrical signals from the grid and adjust accordingly. By recognizing the peak and valley of urban electricity supply, ThermaX will give priority to produce domestic hot water during low price period, and set maximum operation limit in the high price period.

Weekly/Daily timer

The user can set different temperature for different time periods in a day or different time periods every day within a week through the wired controller. The unit can operate according to the mode and temperature set after being started.

Power consumption counting

ThermaX has preserved a statistical counting function of the power consumption of the unit itself. The user needs only connect an electricity meter to read and collect the statistics. This function may have difference with the other measurement and only for reference.
**Easy installation**

**Key components built-in**

ThermaX has built-in most of the key components of the refrigerant circuit and water pipeline, by which the installers can take an easy way during the installation.

**Compact design**

Single fan design enables ThermaX easier transportation and more flexible installation.

- Container loading quantity
  - Mono 68K (68kW 61.9Q, 81 units)
  - Mono 130K (130kW 61.9Q, 82 units)
  - Split 90K (90kW 41.9Q, 31 units, SDD/SDG)
  - Split 130K (130kW 41.9Q, 71 units, SDD/SDG)

**Flexible installation**

- Flexible installation, installed whether independently without 86 threading box, or compatible with 86 box.
- Integrated structure design, with its own installation backbone, easy for disassembly, convenient for installation.

**Electrodeless communication for modular installation**

The design of modular combination is for capacity extension in certain case when large cooling/heating capacity is required. In modular combination, one controller can control up to 6 units in group. Between modules, electrodeless communication is accepted and ThermaX will detect the signal and shift the internal recognition automatically. This design can greatly simplify the installation.

**Typical application**

**One-stop solution – Heating, cooling and DHW in one system**

ThermaX provides one-stop solution for space heating, cooling and sanitary hot water for households. It can be combined with floor loops, FCU, radiators, and domestic water tank.

ThermaX offers a comprehensive, all-year round solution and can be connected to solar panels, gas boiler and other heat sources to build up a hybrid system. Even more conveniently, it can also be connected to your smart home system.

**Air exhaust function of water system**

When the installation of the whole heating system finished, the installer may exhaust the air remained in the water pipeline through the function of air exhaust in the wired controller. In this function, ThermaX will keep low power consumption and not start the compressor.
**Typical application**

### Single temperature zone

**Domestic hot water + Auxiliary heat source**

![Diagram of single temperature zone](image)

*Note: Auxiliary heat source and domestic hot water shall be installed according to the actual use requirements.*

### Cascade system

**Dual temperature zone + Domestic hot water + Auxiliary heat source**

![Diagram of cascade system](image)

*Note: Auxiliary heat source and domestic hot water shall be installed according to the actual use requirements.*

### Double temperature zone

**Domestic hot water + Auxiliary heat source**

![Diagram of double temperature zone](image)

*Note: Auxiliary heat source and domestic hot water shall be installed according to the actual use requirements.*

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**Table of assembled units:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Assembled unit</th>
<th>Code</th>
<th>Assembled unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Main unit</td>
<td>12</td>
<td>Filter (accessory)</td>
</tr>
<tr>
<td>2</td>
<td>User interface</td>
<td>13</td>
<td>Check valve (field supply)</td>
</tr>
<tr>
<td>3</td>
<td>SVT 3 way valve (field supply)</td>
<td>14</td>
<td>Shutoff valve (field supply)</td>
</tr>
<tr>
<td>4</td>
<td>Balance tank (field supply)</td>
<td>15</td>
<td>Filling valve (field supply)</td>
</tr>
<tr>
<td>4.1</td>
<td>Automatic air purge valve</td>
<td>16</td>
<td>Drainage valve (field supply)</td>
</tr>
<tr>
<td>4.2</td>
<td>Drainage valve</td>
<td>17</td>
<td>Collector/distributor (field supply)</td>
</tr>
<tr>
<td>5</td>
<td>P_CS (outside circulation pump/field supply)</td>
<td>18</td>
<td>Hot water return (field supply)</td>
</tr>
<tr>
<td>6</td>
<td>P_CP (Solar pump/field supply)</td>
<td>19</td>
<td>Bypass valve (field supply)</td>
</tr>
<tr>
<td>7</td>
<td>P_CAD (pump) (field supply)</td>
<td>20</td>
<td>SVT 3 way valve (field supply)</td>
</tr>
<tr>
<td>8</td>
<td>SVT 3 way valve (field supply)</td>
<td>21</td>
<td>P_CS (inside circulation pump/field supply)</td>
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<td>9</td>
<td>Solar panel (field supply)</td>
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<td>AHS</td>
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<td>Expansion vessel (field supply)</td>
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<td>PHG</td>
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<td>11</td>
<td>Domestic hot water tank (field supply)</td>
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<td>FCV</td>
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<td>11.1</td>
<td>Cell I, heat exchanger for heat pump</td>
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<td>RAD</td>
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<tr>
<td>11.2</td>
<td>Cell II, heat exchanger for Solar energy</td>
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### Mono Series

<table>
<thead>
<tr>
<th>Power Supply</th>
<th>Voltage</th>
<th>Frequency</th>
<th>Current (A)</th>
<th>Efficiency</th>
<th>Sound Power Level</th>
<th>EER</th>
<th>COP</th>
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</thead>
<tbody>
<tr>
<td>Single Phase</td>
<td>230V</td>
<td>60 Hz</td>
<td>6.5 A</td>
<td>1.4</td>
<td>100 dB</td>
<td>10</td>
<td>12</td>
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<tr>
<td>Single Phase</td>
<td>230V</td>
<td>50 Hz</td>
<td>7.2 A</td>
<td>1.5</td>
<td>110 dB</td>
<td>11</td>
<td>13</td>
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### Split Series

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Outdoor Temperature</th>
<th>Indoor Temperature</th>
<th>Power Supply</th>
<th>Voltage</th>
<th>Frequency</th>
<th>Current (A)</th>
<th>Efficiency</th>
<th>Sound Power Level</th>
<th>EER</th>
<th>COP</th>
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<tbody>
<tr>
<td>1.5 kW</td>
<td>-15°C to 43°C</td>
<td>7°C to 26°C</td>
<td>Single Phase</td>
<td>230V</td>
<td>60 Hz</td>
<td>4.5 A</td>
<td>2.5</td>
<td>120 dB</td>
<td>12</td>
<td>14</td>
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<tr>
<td>2.0 kW</td>
<td>-15°C to 43°C</td>
<td>7°C to 26°C</td>
<td>Single Phase</td>
<td>230V</td>
<td>60 Hz</td>
<td>5.5 A</td>
<td>2.8</td>
<td>130 dB</td>
<td>13</td>
<td>15</td>
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</tbody>
</table>

**Note**
- Outdoor air temperature: -15°C to 43°C, Water inlet 35°C, Water outlet 30°C.
- Indoor air temperature: 7°C to 26°C.
- Power supply: Single Phase, 230V, 60 Hz.
- Efficiency: 2.5 to 2.8.
- Sound power level: 120 dB to 130 dB.
- EER: 12 to 13.
- COP: 14 to 15.
Energy saving & environment-friendly

Excellent energy efficiency

Polestar EVI, EVI Pro and INV series all exceed China national energy efficiency Class-I

COP

IPLV

IPLV(n)

Al learning

Graded startup
Polestar can realize graded startup, reduce the startup current of the unit and reduce the impact on the power grid.

Optimal starting up
Through a detection and Al-learning function, the compressor and the unit with the best performance are searched and identified each start up, so as to reduce the system wear and prolong its service life cycle of the unit and to ensure the best performance and reliability of the unit.

Low consumption and energy saving

Multistage operation regulation
Polestar E, EVI and EVI Pro series can realize 25%-50%-75%-100% four-stage regulation in single unit, and 16 modular combination can realize 1.5%-100% stepless regulation, which can realize accurate output in partial load and reduce system energy consumption.

Green and environment-friendly

R410a environmental protection refrigerant
R410a refrigerant is used in the unit. R410a is a new type of environment-friendly refrigerant, which is non-toxic, non-flammable, and zero ODP value. It does not destroy the ozone layer, has high refrigeration (heat) efficiency, and has the characteristics of high efficiency and environment-friendly.
**Anti-freezing & trouble-free operation**

**Quadruple detection:**
- temp., pressure, temp. difference & pressure difference

Equipped with temperature and pressure sensors through real-time detection of temperature, pressure, temperature difference and pressure difference to analyze the water flow of the unit.

**Triple soft design:**
- water pressure difference sensor

Equipped with water pressure difference switch; when the water flow is too low, the water pressure difference switch is turned off, and the unit stops, so as to avoid freezing and cracking of evaporator caused by too low water temperature.

**Triple soft design:**
- water pump linkage control

Through linkage control of the water pump, when the water temperature is detected too low in standby status, the water pump is started finally to circulate water to prevent the pipeline from freezing.

**Triple soft design:**
- compressor

In standby status, if the water temperature is still low after the water pump is turned on, the compressor will start until the water reaches the set temperature point.

**Quadruple detection and triple design anti-freezing**

Real-time detection of quadruple hardware of temperature, pressure, pressure difference and temperature difference, and all-round anti-freezing protection of evaporator through triple soft design of water flow sensor, water pump and automatic operation of compressor to prevent frost crack, which is reliable and guaranteed.

---

**Intelligent defrosting & constant water temperature**

- **Multiple choice**
  Automatic defrosting or manual defrosting can be selected.

- **Intelligent judgment**
  The unit can accurately judge the frosting situation through multi-variable comprehensive evaluation so as to defrost when needed. At low ambient temperature, it can achieve no defrosting for up to 180 minutes, bringing longer heating time and higher comfort.

- **Heating and defrosting without shutdown**
  In a system with multiple compressors or modular combination, the defrosting unit is less than 1/2 of the total number of systems, which can realize defrosting and heating simultaneously, so as to avoid fluctuation of water temperature, and avoid cold air blowing.

---

**Intelligent protection, stable and reliable**

- Temperature protection
- Overload protection
- Motor overload protection
- Unit frequent startup protection
- Corrosion protection
- Sensor fault protection
- Balanced run of compressor
- Anti-freezing protection
- Power failure protection
- Overload protection of compressor
- Overheating protection
**Flexible application**

**Flexible installation**

- **Transport**
  Compact design enables a minimum floor area of 1.37m², which is 35% less than that of ordinary modular units in the market. Single system units can be transported by elevator instead of crane, which reduces installation and transportation costs.

- **System**
  Air cooling system does not need cooling water system, cooling tower and cooling pump. With the simple design, convenient construction and short installation period, the investment cost is reduced.

- **Space**
  It can be installed indoors, on the roof or other opening spaces without the necessity of special equipment rooms.

- **Place**
  It can be widely used in hospitals, schools, hotels, office buildings and other places.

**Module mutual backup**

- **System mutual backup**
  Different systems of the same unit are independent of each other. And the failure of any one system does not affect the operation of other systems.

- **Module mutual backup**
  Different units in the same water system are independent from each other, and the failure of any one unit does not affect the use of the other units, and the stable cooling/heating capacity is uninterrupted.

- **Master and slave modules backup**
  In modular combination, any unit can be operated as a master. And the failure of the master does not affect the stable operation of other slaves.

- **Applicable to variable flow water system**
  Two-way valve in water system, can be automatically opened or closed based on the load change of terminals, which supports the operation of DC water pump and saves energy during operation.

**Flexible configuration**

- **Modular combination**
  Modular design, offers the customer choice to invest and install in batches according to projects or funds, thus reducing initial investment costs. The modular combination of up to 10 units can be realized to meet the refrigerating demand of different projects.

- **Interconnection control**
  Modular combination can be realized among different models within the same series or models between different series, such as Polestar E, EV, PL, series.

**Complete lineup**

**Wide range operation**

- Refrigeration can cover the ambient temperature of 5~+40°C, and heating can cover the ambient temperature of -22~+30°C. Polestar series is applicable for different ambient temperature areas.

**Application at different terminals**

- The heating outlet water temperature can cover 30~+62°C, which can meet the needs of different terminals such as floor heating, fan coil & radiator.

---

Polestar E, EV, PL series

Outlet water temperature: 30°C~+55°C

Polestar EV Pro series

Outlet water temperature: 30°C~+62°C
Reliable design

- Control technology of dual electronic expansion valves
  A single system of the unit is equipped with multiple electronic expansion valves, which not only can avoid the shutdown risk caused by failure of the single electronic expansion valve, but also can realize the rapid and accurate adjustment of refrigerant according to the load demand and improve the heat exchange efficiency.

- Intelligent detection and control technology
  The pressure sensor and temperature sensor can detect the system temperature and pressure in time and automatically adjust the system to ensure the safe and efficient operation of the unit.

- Advanced liquid hammer prevention technology
  Equipped with electric heating baffle for compressor crankcase and design of large-capacity gas-liquid separator to avoid a large amount of liquid refrigerant directly entering the compressor.

- Optimized design of electric control
  Separation of strong and weak current, which is safe and reliable; toughening design makes winding tidy and safe; anti-reverse connection design to avoid damage due to reverse connection of unit power cord; overload protection can automatically power off when current is too high; overall waterproof design with higher safety.

Easy maintenance

- Balanced layout for easy maintenance
  Components of the unit are evenly distributed around the unit, and the lower half metal plate of the unit is fully enclosed and the unit can be inspected and maintained by disassembling the panel.

- Intelligent diagnosis and quick positioning
  Automatically analyze the cause of the fault according to the operating parameters of the system, which can guide the quick solution of the unit malfunction.

Enhanced vapor injection technology

- High efficient enhanced vapor injection compressor
  Through injection of the medium pressure vapor and remixing with the partially compressed refrigerant for recompression, Polestar EVI series can realize two-stage compression with a single compressor, which can increase the refrigerant flow in the condenser and close the enthalpy difference of the main cycle circuit, and thus greatly improve the efficiency of the compressor.

- Efficient economizer
  On the one hand, it can increase the degree of undercooling of the main circuit refrigerant in front of the valve; on the other hand, it can increase the degree of superheat of the auxiliary circuit refrigerant injection to the compressor, increase the system circulation and improve the performance of the auxiliary circuit.

- Auxiliary circuit electronic expansion valve control
  The auxiliary circuit is also controlled by high-precision electronic expansion valve, with advantages of wider adjustment range, higher precision, faster reaction speed and more stable system.

3 key design for reliable defrosting

- First design: One-way valve is set at the bottom of the heat exchanger. When heating, the snowavalve is closed without refrigerant passing through the one-way valve. When defrosting, the high-temperature pure refrigerant passes through the one-way valve to defrost quickly.
- Second design: Heat exchanger suspended from the bottom tray. Set a certain height distance difference between the bottom of the heat exchanger and the water tray to avoid excessive instability, and quickly remove the condensed water during defrosting.
- Third design: Water valve and electricity heating coil in heat exchanger chassis. Automatically open or close temperature to prevent heat accumulation in water tray and ensure smooth drainage.
Polestar EVI Pro series

New stable and reliable design

- Furn heat exchanger
  - Unit 440 adopts plate pattern heat exchanger with air inlet from outside. Heat exchange capacity is about 95% higher than that of two C-type units.

- Unibody dry wet tube heat exchanger
  - Unit 440 adopts plate pattern heat exchanger with air inlet from outside. Heat exchange capacity is about 95% higher than that of two C-type units.

- Ventilation column
  - Ventilation column is designed to increase heat transfer and enhance heat transfer performance. The ventilation column is made of 304 heat-resistant stainless steel.

- Side removable panel
  - Components are evenly arranged around the machine, and removable panels can be used to facilitate the add or remove of components, which can reduce the noise of the unit end and prolong the life of components.

- Compact structure & small floor space
  - Unit 440 covers only 24 cubic meters, which is only 75% of the floor space of 440 units. The combined heat and installation cost is low.

One-stop solution

In the system, space heating, cooling and domestic hot water can be realized.

In heating mode, the outlet water temperature can cover 30-62°C, which can meet the needs of different terminals such as floor heating, fan coil and radiator.

Low noise operation, better application experience

Low-noise components and safe control are adopted to optimize the structure of the unit, and realize low-noise operation of the unit. In the mute mode, the noise can be reduced by 6~10dB(A), providing customers a high-quality experience.

Polestar INV series

Beyond China national energy efficiency Class-I

- Polestar INV series uses R410A environment-friendly refrigerant.
- IPIV is as high as 4.50, exceeding China national energy efficiency Class-I by 12.5%.

Adaptive Requirements

DC inverter compression can adjust the operating frequency according to the actual load demand of the building to reduce energy consumption. Through frequency stepless adjustment, it can stabilize the outlet water temperature and keep more stable indoor temperature.

Intelligent distribution and efficient operation

The unit carries out the capacity calculation and makes the optimal allocation according to the terminal load demand, so that each unit can be operated in the high efficiency area to reduce the loss during full-load operation which is efficient and can save energy.
### Polestar E Series

<table>
<thead>
<tr>
<th>Model</th>
<th>LSQEF10EPSE</th>
<th>LSQEF15EPSE</th>
<th>LSQEF20EPSE</th>
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<td></td>
</tr>
<tr>
<td>Capacity (KW)</td>
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<td>288</td>
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<td>42.6</td>
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<td><strong>Cooling (nominal)</strong></td>
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<tr>
<td>Capacity (KW)</td>
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<td>208/240V</td>
<td>208/240V</td>
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<td>50/60Hz</td>
</tr>
<tr>
<td><strong>Maximum operating current</strong></td>
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<td></td>
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</tr>
<tr>
<td>A</td>
<td>154</td>
<td>174</td>
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<tr>
<td><strong>Refrigerant</strong></td>
<td>R410A</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Twinning device</strong></td>
<td>Electronic expansion valve</td>
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<td></td>
</tr>
<tr>
<td><strong>Compressor</strong></td>
<td>Type</td>
<td>Full-enclosed scroll compressor</td>
<td></td>
</tr>
<tr>
<td><strong>Water-side heat exchanger</strong></td>
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</tr>
<tr>
<td><strong>Power cord</strong></td>
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<tr>
<td>Wire section area (mm²)</td>
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<tr>
<td>Voltage</td>
<td>208/240V</td>
<td>208/240V</td>
<td>208/240V</td>
</tr>
<tr>
<td>Frequency</td>
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<td>50/60Hz</td>
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<tr>
<td>A</td>
<td>154</td>
<td>174</td>
<td>258</td>
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<tr>
<td><strong>Refrigerant</strong></td>
<td>R410A</td>
<td></td>
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<tr>
<td><strong>Twinning device</strong></td>
<td>Electronic expansion valve</td>
<td></td>
<td></td>
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<tr>
<td><strong>Compressor</strong></td>
<td>Type</td>
<td>Full-enclosed scroll compressor</td>
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<tr>
<td><strong>Water-side heat exchanger</strong></td>
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</tr>
<tr>
<td><strong>Power cord</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Wire section area (mm²)</td>
<td>21.7</td>
<td>23.2</td>
<td>48.4</td>
</tr>
</tbody>
</table>

**Note:**
- Nominal cooling capacity test conditions: rated water flow rate of 0.70m³/h (73.0 L/min), outlet water temperature at 40°C and outdoor ambient dry bulb temperature at 35°C.
- Nominal heating capacity test conditions: rated water flow rate of 0.70m³/h (73.0 L/min), outlet water temperature at 55°C and outdoor ambient dry bulb wet bulb temperature at 19°C.
- Low-temperature heating capacity test condition: rated water flow rate of 0.70m³/h (73.0 L/min), outlet water temperature at 40°C and outdoor ambient dry bulb wet bulb temperature at 19°C.
- The performance may be adjusted due to product improvement without prior notice. Please refer to the nameplate for specific parameters.

### Polestar EVI Series

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<tr>
<th>Model</th>
<th>LSQEF07SPLU</th>
<th>LSQEF10SPLU</th>
<th>LSQEF15SPLU</th>
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<tbody>
<tr>
<td><strong>Heating (nominal)</strong></td>
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<td></td>
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</tr>
<tr>
<td>Capacity (KW)</td>
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<td>180</td>
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<td>Power input (KW)</td>
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<td><strong>Cooling (nominal)</strong></td>
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<tr>
<td>Capacity (KW)</td>
<td>80</td>
<td>164</td>
<td>180</td>
<td>320</td>
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<tr>
<td>Power input (KW)</td>
<td>22.5</td>
<td>44.1</td>
<td>44.8</td>
<td>89.5</td>
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<tr>
<td><strong>Power supply</strong></td>
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<td>380V/200V</td>
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<td><strong>Twinning device</strong></td>
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<tr>
<td><strong>Compressor</strong></td>
<td>Type</td>
<td>Full-enclosed scroll compressor</td>
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<tr>
<td><strong>Water-side heat exchanger</strong></td>
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<tr>
<td><strong>Power cord</strong></td>
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<tr>
<td>Wire section area (mm²)</td>
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</table>

**Note:**
- Nominal cooling capacity test conditions: rated water flow rate of 0.70m³/h (73.0 L/min), outlet water temperature at 40°C and outdoor ambient dry bulb wet bulb temperature at 35°C.
- Nominal heating capacity test conditions: rated water flow rate of 0.70m³/h (73.0 L/min), outlet water temperature at 55°C and outdoor ambient dry bulb wet bulb temperature at 19°C.
- Low-temperature heating capacity test condition: rated water flow rate of 0.70m³/h (73.0 L/min), outlet water temperature at 40°C and outdoor ambient dry bulb wet bulb temperature at 19°C.
- The performance may be adjusted due to product improvement without prior notice. Please refer to the nameplate for specific parameters.
### Polestar EVI Pro Series

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<td>/</td>
<td>R410A</td>
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### Polestar INV Series

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<td>/</td>
<td>R410A</td>
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<tr>
<td>Neutral wire sectional area</td>
<td>mm²</td>
<td>2.5</td>
</tr>
<tr>
<td>Neutral wire quantity</td>
<td>/</td>
<td>1</td>
</tr>
<tr>
<td>Earth wire sectional area</td>
<td>mm²</td>
<td>2.5</td>
</tr>
<tr>
<td>Earth wire quantity</td>
<td>/</td>
<td>1</td>
</tr>
<tr>
<td>Net dimension</td>
<td>L x W x H</td>
<td>mm</td>
</tr>
<tr>
<td>Net weight</td>
<td>kg</td>
<td>440</td>
</tr>
<tr>
<td>Wired controller</td>
<td>/</td>
<td>P3AC-X-A301X</td>
</tr>
<tr>
<td>Container loading quantity(40HQ)</td>
<td>pcs</td>
<td>20</td>
</tr>
</tbody>
</table>

### Note
- Low ambient temp. heating capacity test condition: rated water flow rate of 0.75m³/h (9 KW), outdoor ambient dry bulb temperature at -20°C/40%, and outdoor water temperature at 5°C.
- Nominal heating capacity test condition: rated water flow rate of 0.75m³/h (9 KW), outdoor ambient dry bulb temperature at 25°C/40%, and outdoor water temperature at 5°C.
- Nominal cooling capacity test condition: rated water flow rate of 0.75m³/h (9 KW), outdoor ambient dry bulb temperature at 35°C and outdoor water temperature at 5°C.
- The performance may be adjusted due to product improvement without prior notice. Please refer to the nomenclature for specific parameters.
What is Shenling looking forward to

Alongside air source heat pump, Shenling has been studying in the field of renewable energy and an independent energy system of “energy supply – energy storage – energy use”, and will soon provide European and global users packaged green solution with clean heating, clean energy and energy management.
In the future

Shenling Smart Eco Energy System

Energy Supply

Cloud Analytics

Shenling App

Thermostats/HVAC/Heating/Cooling

Lighting/Switches/Outlets

Smart Appliances

Batteries/Electric Cars/Solar Rooftops