

Emerson Integrated Solutions For Air Source Heat Pump





Challenges and opportunities





Coal-fired central heating is traditionally one of the most common methods for indoor heating. It is also generally associated with adverse impacts to health and to the environment. To address this, Europe has widely adapted air source heat pump technology as a cleaner and more sustainable method for comfort heating. And now more countries around Asia are starting to design air source heat pump applications to deliver outstanding comfort and low operating cost.

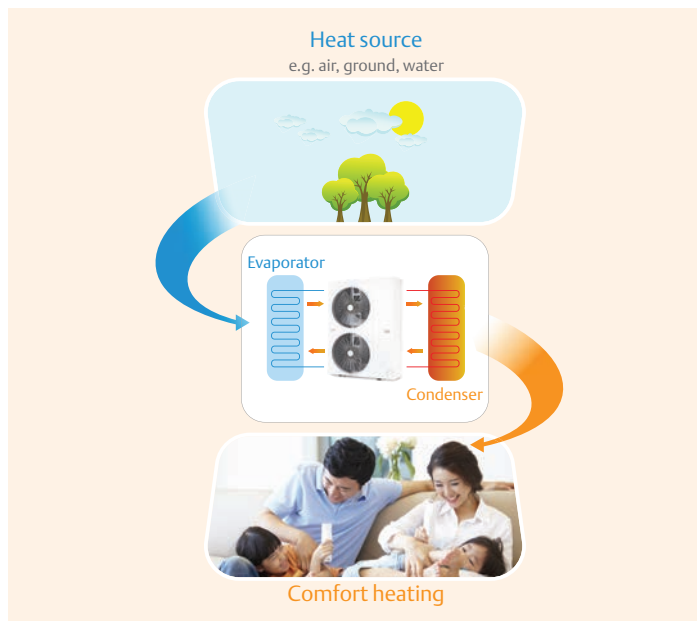
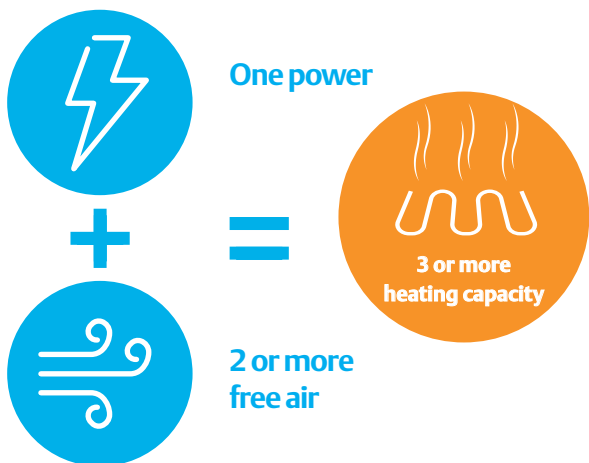
Air source heat pump technology

Highly efficient, environmental friendly, comfortable, and precise control

Requiring only a relatively small amount of energy to drive the compressor, air source heat pump technology delivers hot water to floor heating, radiators and sanitary water applications. Comfort temperatures during harsh winters are easily and efficiently reached, contributing to significant energy savings.

The advantages of variable speed technology

			
Higher part load efficiency	Better low temperature heating capacity	Wide voltage operation	R410A Compatible eco-friendly refrigerant



Benefits of Emerson solutions

System manufacturers challenges

Emerson solutions

Need to coordinate with various compressor and electronics suppliers for system development



One-stop shop

Capability to supply all core components in variable speed systems including compressors, drives, controllers, temperature sensors, valves etc.

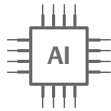
Lack of adequate technical support



Dedicated integrated solution team

Providing customers with 24/7 end to end technical support

Long development cycle and uncertain reliability



Smart control, reliable performance

High Emerson design standards verify all solutions. Control logic, system protection, parameter optimization, full integration

Substantial reduction of low-temperature heating capacity



ZWW series ultra-low temperature solution

The newly developed ZWW series variable speed compressors are equipped with EVD series drives to solve the problem of low-temperature heating shortage

Cost-effective solution for low temperature heating



VPW series low temperature solution

Economical, energy-saving and worry-free maintenance with a robust and well recognized VPW series variable speed compressors

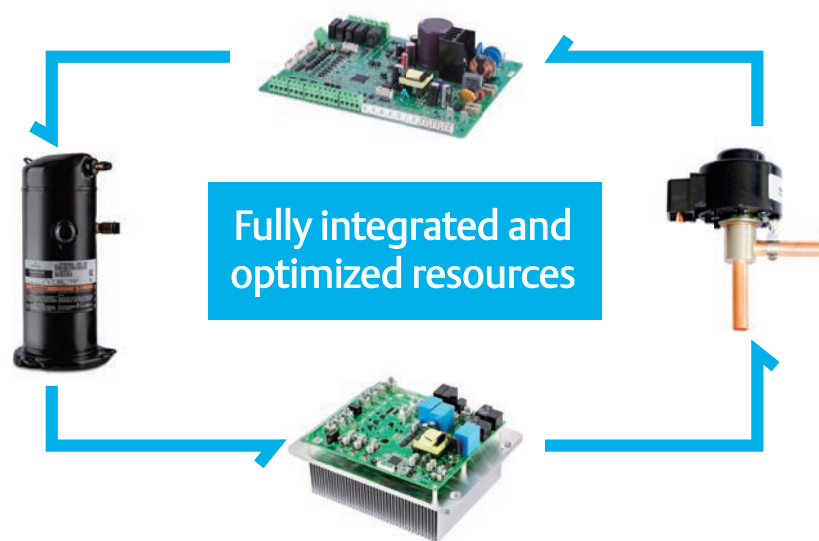


Compressor, Drive, Controller, Electronic Expansion Valve, Temperature Sensor

Emerson integrated solutions group

Emerson strives to be the leader in integrated solutions for air conditioning, heating and refrigeration industries

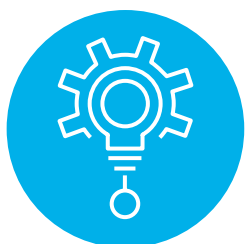
Emerson is fully committed to developing innovative solutions for the HVACR industry and to help customers reach their human comfort goals. Emerson responds quickly to the market changes and listens attentively to the voice of customers. With Emerson, you can consider your heating challenges solved.



Our service offerings:

- Provides customers with full technical support services
- Coordinates with internal resources and Emerson laboratories to fully validate solutions
- Delivers safe and reliable product solutions for the market
- Continues to expand system simulations and system lab capabilities

Value for customers



Market-leading system performance



Trusted Emerson brand with decades of heating solutions experience



Helping customers respond quickly to market demands



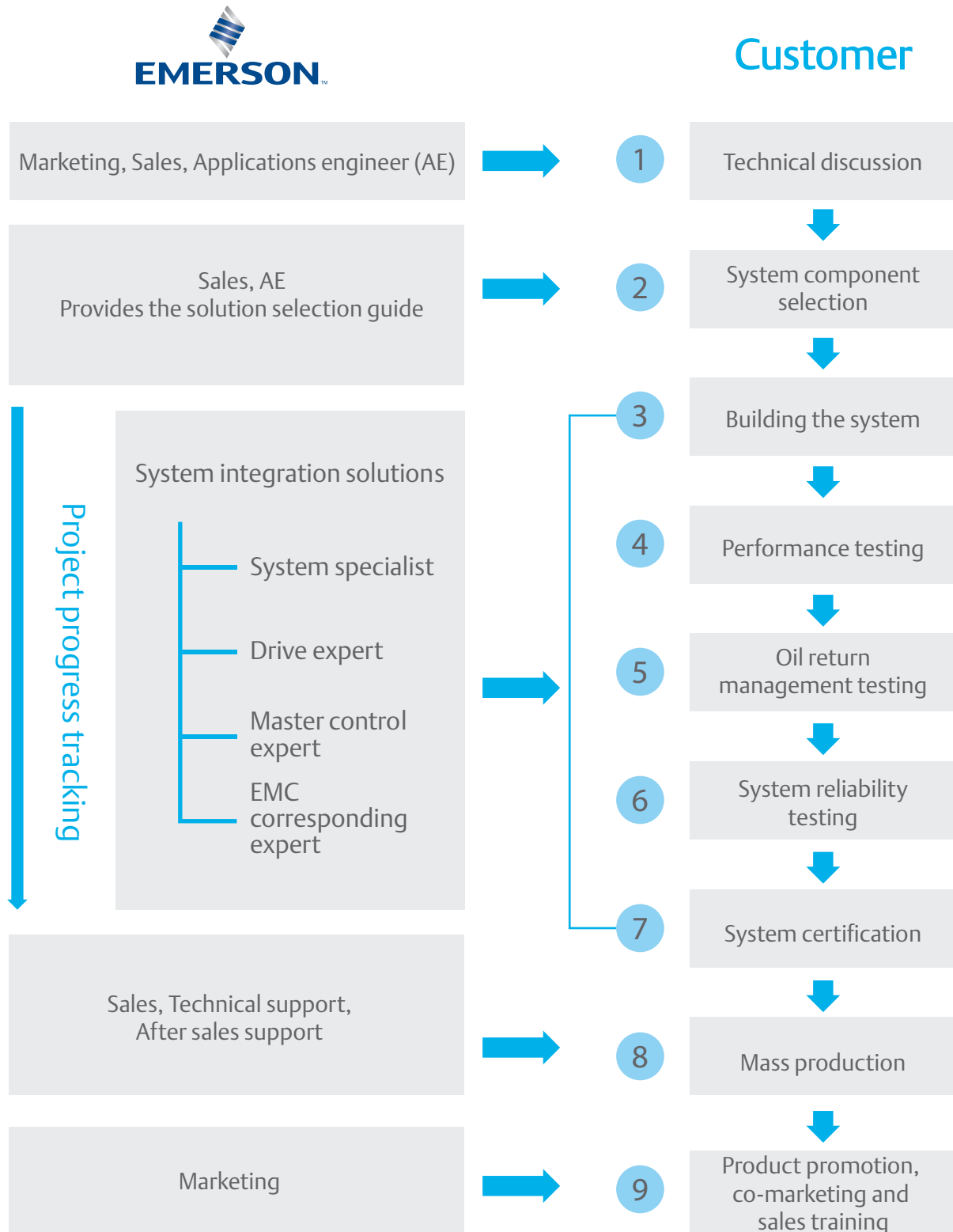
Higher unit reliability



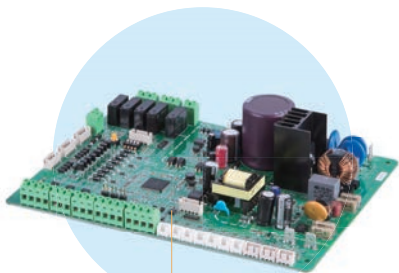
On-site monitoring continuously tracks real-time performance

Technical support and services

Emerson provides its customers with a skilled technical team and expert lab support. These benefits put the customer at the cutting edge of technology and design.



Technical features of integrated solutions



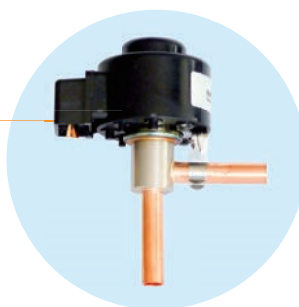
System main control board

- Integrated Dual EXV Drive
- Integrated double BLDC fan drive
- Built - in optimized control logic for optimal performance and reliability
- More than 150 parameters can be configured to achieve a fully customized solution



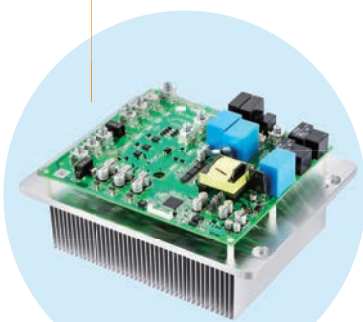
Temperature, pressure sensor

For precise system control



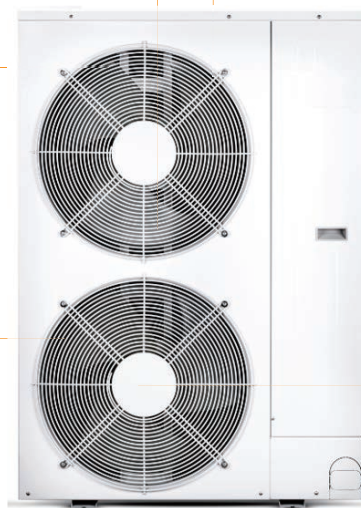
Double electronic expansion valve

- Complete line up that meets various system configuration needs
- Accurate control of refrigerant pressure
- Outstanding dependability



Drive

- Optimized for Copeland Scroll™ Compressors with customized parameter settings
- Plug and play compressor compatibility
- Built-in compressor protection further enhances reliability



Variable speed compressor

- Vapor injection designed for robust heating capacity
- High COP and IPLV
- Low operating noise
- Wide operating range with ambient temperature -30°C
- High reliability design

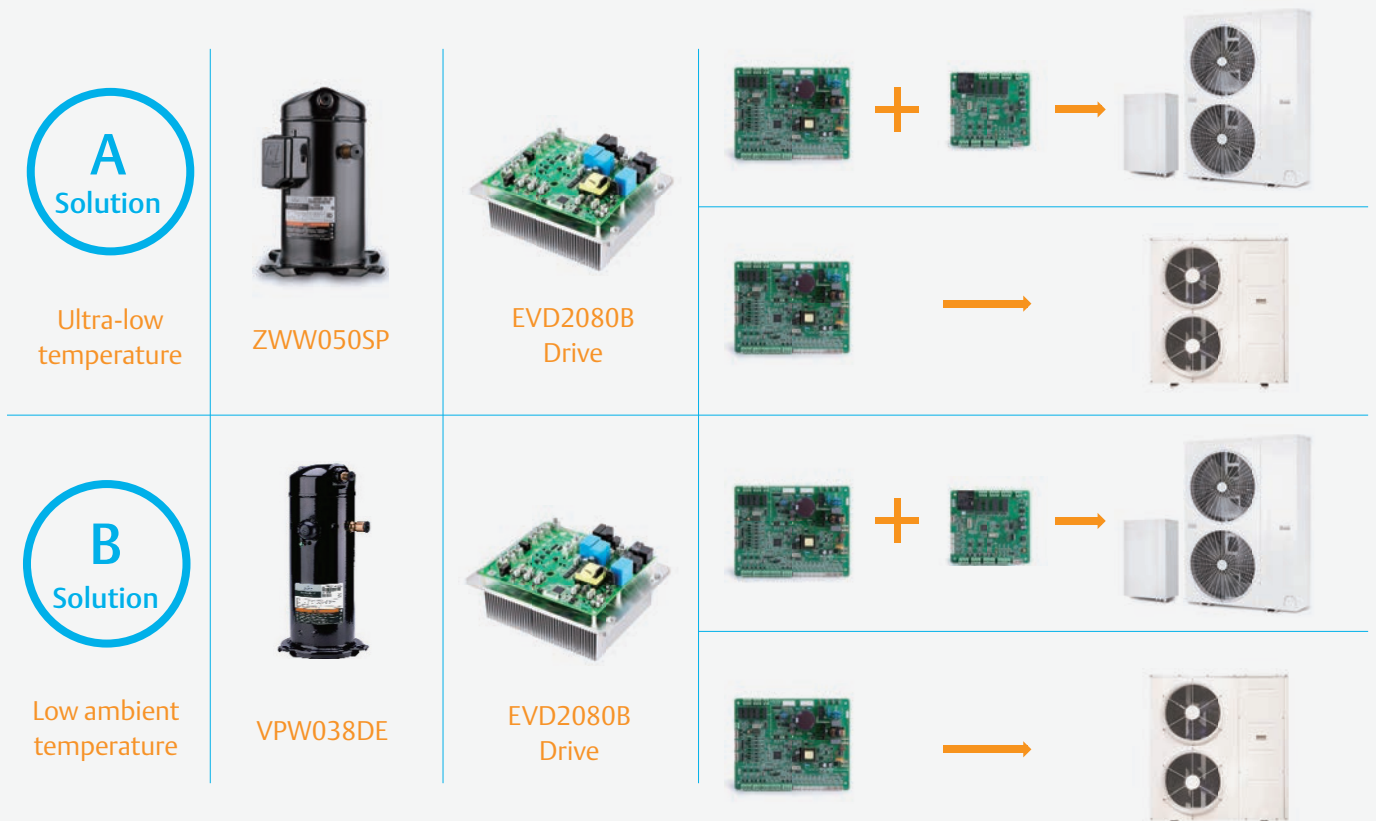


During air-source heat pump system development, Emerson conducted an in-depth study on the possible issues affecting its customers and designed a full suite of solutions to address the market and its pain points. Emerson integrated solutions for heat pumps can solve the harshest heating challenges with flexible and various combinations.

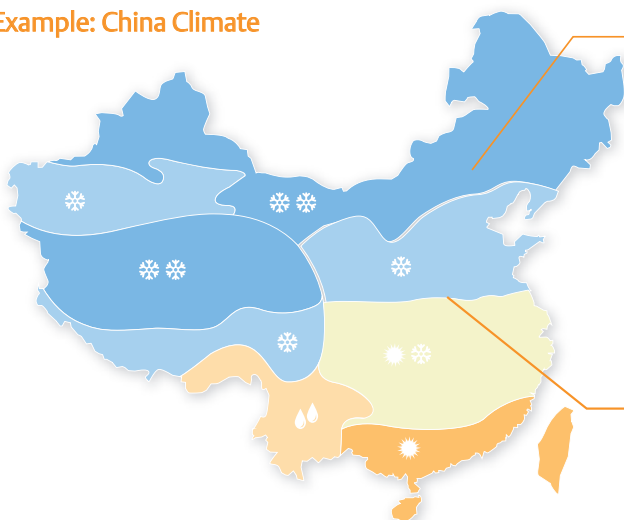
Air source heat pump systems

Configuration options of the heat pump systems

- Solution A – adapts to the ultra-low temperature environments (up to -30°C), with core components of the Emerson brand, designed for the applications in extreme cold regions.
- Solution B – adapts to the low temperature environments (up to -25°C), with core components of the Emerson brand, designed for the application in cold regions.



Example: China Climate



Severe cold regions

Minimum temperature $< -30^{\circ}\text{C}$

Beijing mountain area

Three Northeast Provinces (Liaoning, Jilin, Heilongjiang)

Cold regions, hot summer and cold winter

Minimum temperature $< -25^{\circ}\text{C}$

North and Northwest China

(Shanxi, Tianjin, Shandong, Shaanxi, Gansu, etc.)

Different weather conditions in China

- Cold region
- Hot and cold region
- Mild weather
- Hot and mild cool
- Severe cold

Ultra-low temperature solution for severe cold weather



Advantages of ZWW series variable speed compressor

Excellent performance

Enhanced vapor injection technology

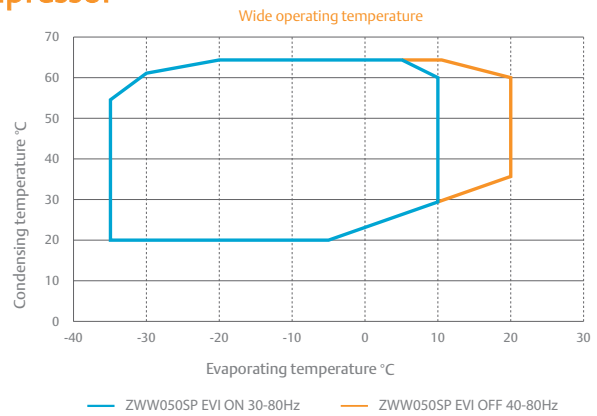
Improved heating performance

20%

Heating COP up to 3.5

Optimized for R410A
Copeland™ two-way flexible vortex technology

Operating envelope



A wide range of applications

at **-30°C**

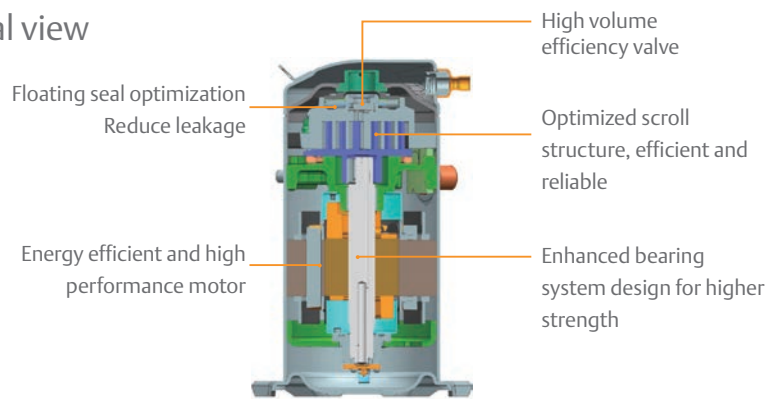
Stable heating in icy weather

The outlet water temperature can reach above **50°C**

Suitable for multiple heating applications

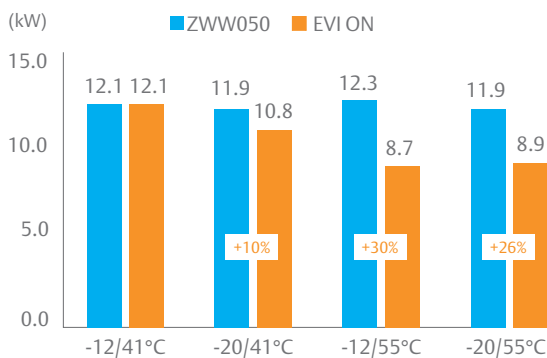
Radiator, floor heating, domestic hot water, and fan coil

Sectional view



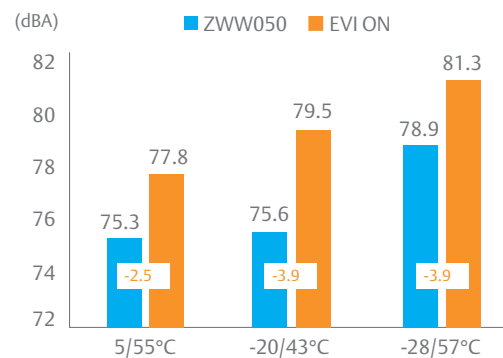
ZWW Excellent performance of ZWW series frequency conversion compressor

Temperature heating capacity



Different ambient and water temperature

Quiet and comfortable operation



Equivalent heat 14.6 kW EVI ON

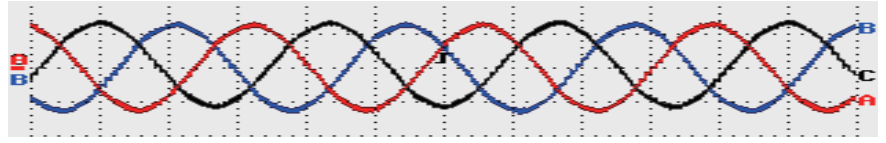
The comparison test was carried out on a 12 kW low-temperature air source heat pump system. The ZWW050 can achieve a non-attenuation of heat at an ambient temperature of -20°C and a water temperature of 55°C, while the EVI decays by nearly 30%.

In the case of equivalent heating, the EVI is turned on. The ZWW050 has a noise advantage of 2-4 dBA under the operating conditions of the H company's EVI, which can avoid the noise reduction measures of the compressor, help to reduce the noise of the air source heat pump and improve user satisfaction.

Drive

Technical features

- Drive firmware specifically designed for HVAC applications
- Optimum combination of compressor and drive delivers maximum efficiency
- Best in built-in-class protection / Control features for reliable operation
- Sine wave vector control



Current specifications

Drive model	Input current	Output current
EVD2080B-C1-113	35 Arms	25 Arms

*The maximum current is based on the ambient temperature of the driving plate at 60 °C and the outlet wind speed of the cooling fins at 3m/s.

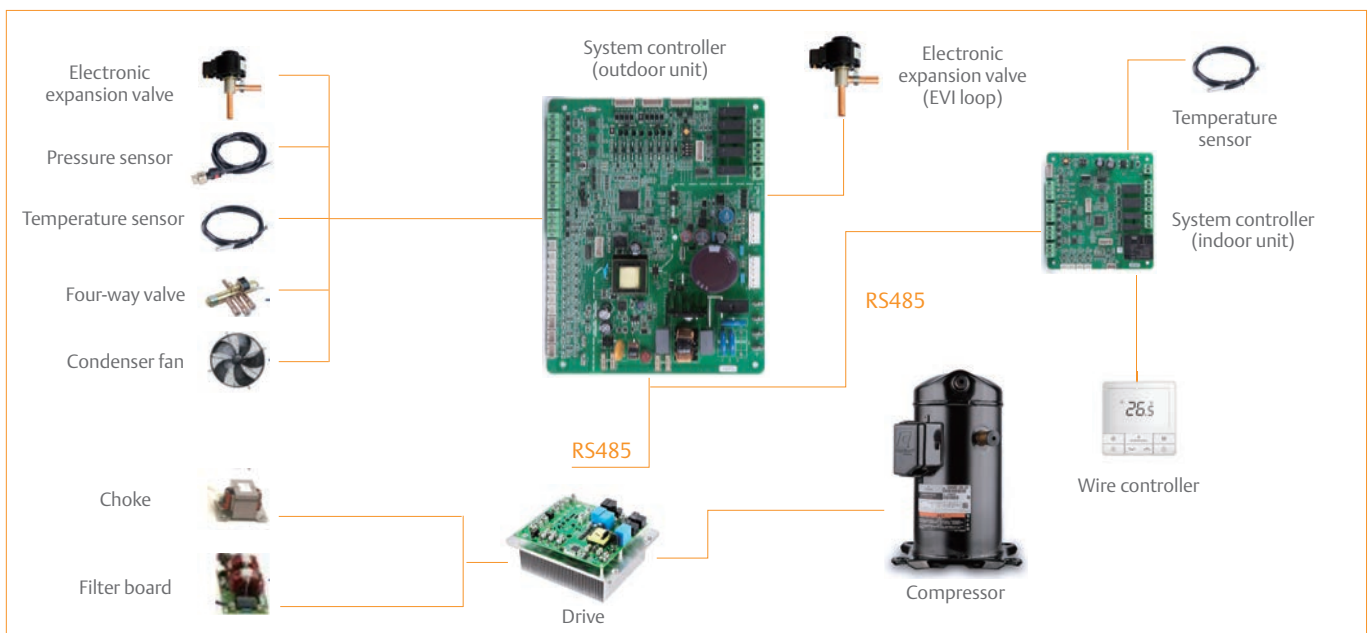


System controller

Technical features

- Protection of compressor envelope
- Compressor running speed control
- Integrated expansion valve control
- Superheat control
- Defrosting control
- Control of vapor injection circle
- Compressor oil return management

	3 HP	5 HP	6 HP	8 HP
Mono block	Mass production	Mass production	Mass production	
Split systems	Mass production	Mass production	Mass production	Mass production



Low temperature solution for cold regions



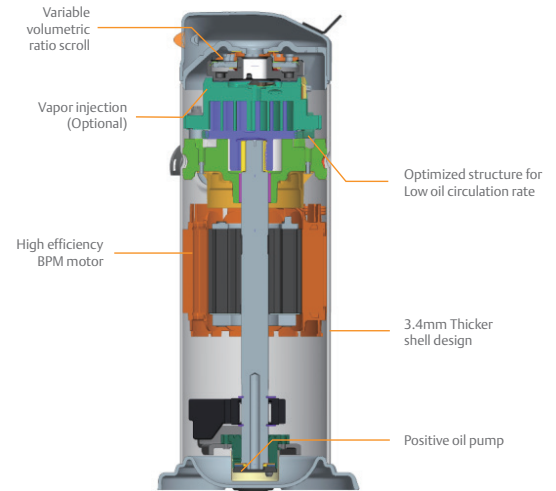
Advantages of VPW series variable speed compressor

- Excellent performance and low noise design
- Concentrated winding motor for higher efficiency
- Wide speed range of 900-7200 rpm for more flexible system designs
- Variable volume ratio scroll significantly improves energy efficiency at low pressure ratio conditions
- Better debris & liquid handling capability

(EVI) Technical features

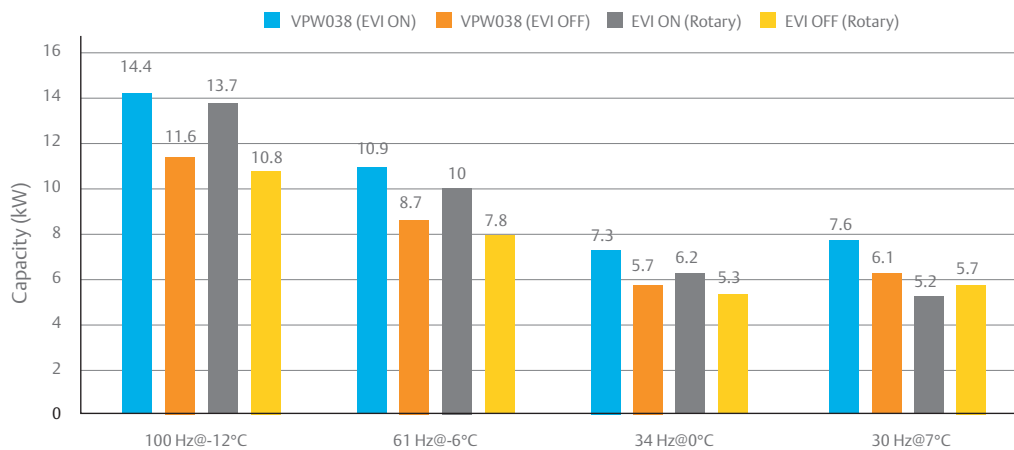
- Patented EVI design structure
- Capable to expand operating envelope to enable low ambient heating
- Injection solutions to control discharge line temperature with R32 refrigerant
- EVI technology can help to replace system auxiliary electric heating

Sectional view

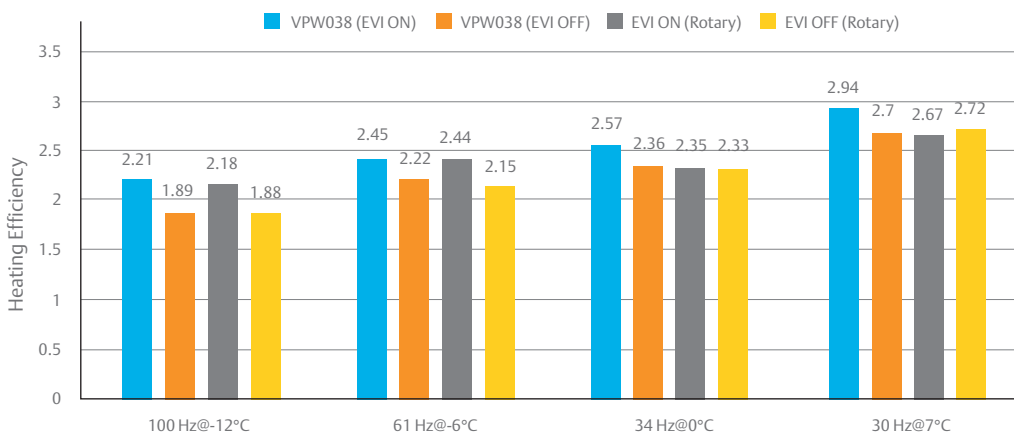


System performance of VPW series variable speed compressor

Stronger heating capacity at low temperatures



Higher heating efficiency at low temperatures



IPLV comparison test on 14 kW low-temperature air source heat pump system with below zero ambient temperature, vortex air enrichment technology can effectively increase the system heating capacity. Above zero ambient temperature, vortex air enrichment technology can still increase system capacity, but rotor compressors have reduced energy efficiency.

Key integrated solution kit number and combination

Product model 998-S001-01			Product model 998-S001-02		
3 HP Split system			5 HP Split system		
Parts number	Parts name	Qty	Parts number	Parts name	Qty
ZWW050SP-3X9-522	Compressor	1	ZWW050SP-3X9-522	Compressor	1
EVD2080B-C1-113	Drive	1	EVD2080B-C1-113	Drive	1
143-0030-00	Filter board	1	143-0030-00	Filter board	1
037-0063-00	Choke	1	037-0063-00	Choke	1
543-0233-00	Remote controller	1	543-0233-00	Remote controller	1
E11AVNB-AJ-101	Indoor unit control panel	1	E11AVNB-AJ-101	Indoor unit control panel	1
EO1AVNB-CJ-101	Outdoor unit control panel	1	EO1AVNB-CJ-103	Outdoor unit control panel	1
099304	High-pressure sensor	1	099304	High-pressure sensor	1
099303	Low-pressure sensor	1	099303	Low-pressure sensor	1
099302	Sensor discharge temperature sensor	1	099302	Sensor discharge temperature sensor	1
099301	Temperature sensor	7	099301	Temperature sensor	7

Product model 998-S001-03			Product model 998-S001-04		
6 HP Split system			8 HP Split system		
Parts number	Parts name	Qty	Parts number	Parts name	Qty
ZWW050SP-3X9-522	Compressor	1	ZWW050SP-3X9-522	Compressor	1
EVD2080B-C1-113	Drive	1	EVD2080B-C1-113	Drive	1
143-0030-00	Filter board	1	143-0030-00	Filter board	1
037-0063-00	Choke	1	037-0063-00	Choke	1
543-0233-00	Remote controller	1	543-0233-00	Remote controller	1
E11AVNB-AJ-101	Indoor unit control panel	1	E11AVNB-AJ-101	Indoor unit control panel	1
EO1AVNB-CJ-105	Outdoor unit control panel	1	EO1AVNB-CJ-107	Outdoor unit control panel	1
099304	High-pressure sensor	1	099304	High-pressure sensor	1
099303	Low-pressure sensor	1	099303	Low-pressure sensor	1
099302	Sensor discharge temperature sensor	1	099302	Sensor discharge temperature sensor	1
099301	Temperature sensor	7	099301	Temperature sensor	7

Product model 998-S001-05		
3 HP~6 HP Split system		
Parts number	Parts name	Qty
VPW038DE-3X9-571	Compressor	1
EVD2080B-C1-113	Drive	1
143-0030-00	Filter board	1
037-0063-00	Choke	1
543-0233-00	Remote controller	1
E11AVNB-AJ-101	Indoor unit control panel	1
EO1AVNB-CJ-105	Outdoor unit control panel	1
099304	High-pressure sensor	1
099303	Low-pressure sensor	1
099302	Sensor discharge temperature sensor	1
099301	Temperature sensor	7

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