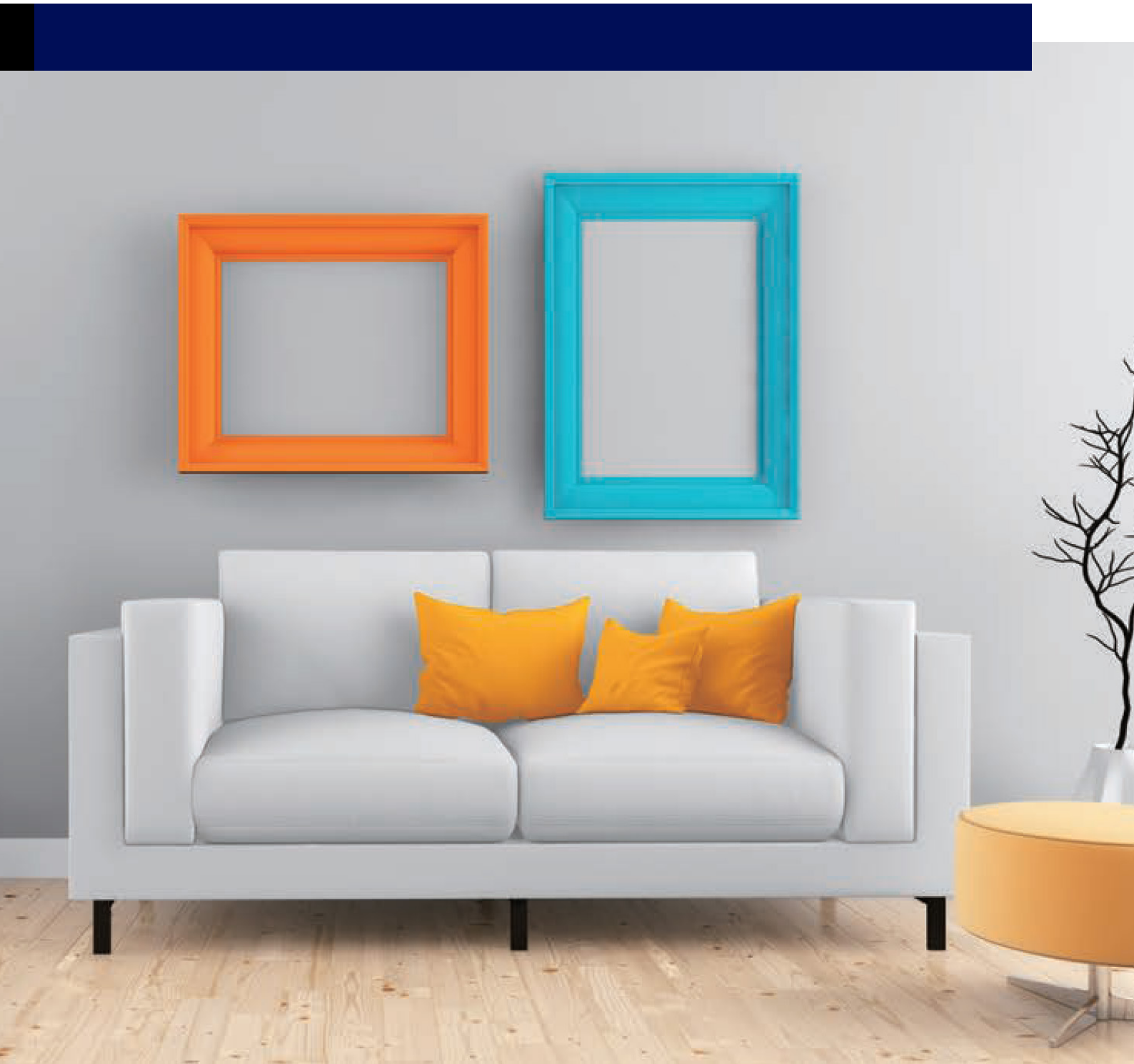


# Copeland integrated solutions for air source heat pump



# 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



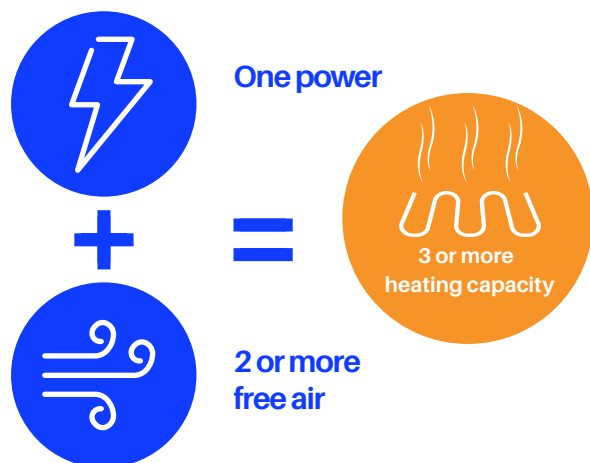
Better low temperature heating capacity



Wide voltage operation



R410A Compatible eco-friendly refrigerant



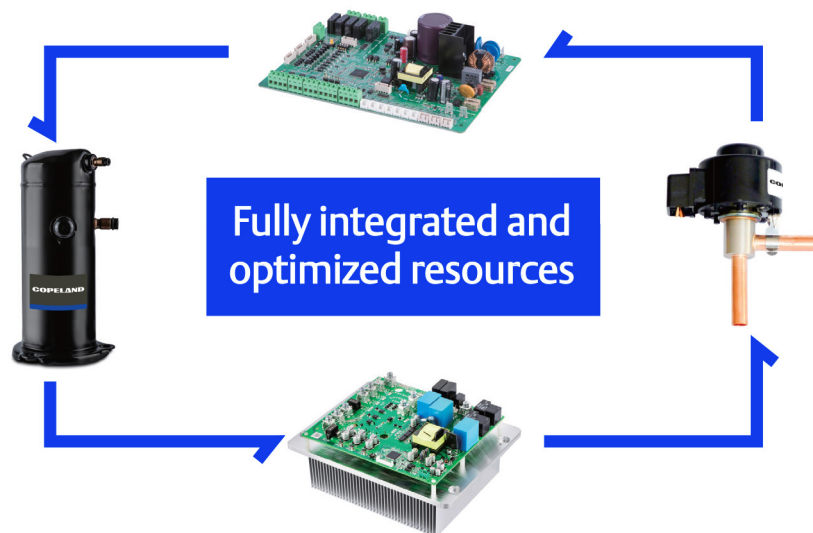
Customer pain points	Copeland solutions
Need to coordinate with various compressor and electronics suppliers for system development	<b>One-stop shop</b> Capability to supply all core components in variable speed systems including compressors, drives, controllers, temperature sensors, valves etc.
Lack of adequate technical support	<b>Dedicated integrated solution team</b> Providing customers with 24/7 end to end technical support
Long development cycle and uncertain reliability	<b>Smart control, reliable performance</b> High Copeland design standards verify all solutions. Control logic, system protection, parameter optimization, full integration
Substantial reduction of low-temperature heating capacity	<b>ZWW series ultra-low temperature solution</b> 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	<b>VPW series low temperature solution</b> 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

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

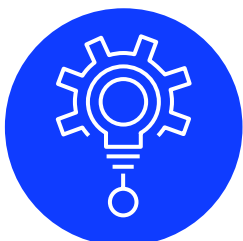
Copeland is fully committed to developing innovative solutions for the HVACR industry and to help customers reach their human comfort goals. Copeland responds quickly to the market changes and listens attentively to the voice of customers. With Copeland, you can consider your heating challenges solved.



### Our service offerings:

- Provides customers with full technical support services
- Coordinates with internal resources and Copeland 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:



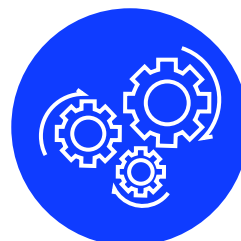
Market-leading system performance



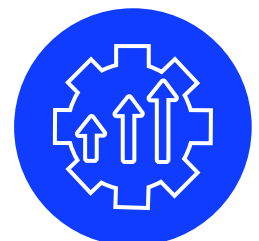
Trusted Copeland brand with decades of heating solutions experience



Helping customers respond quickly to market demands

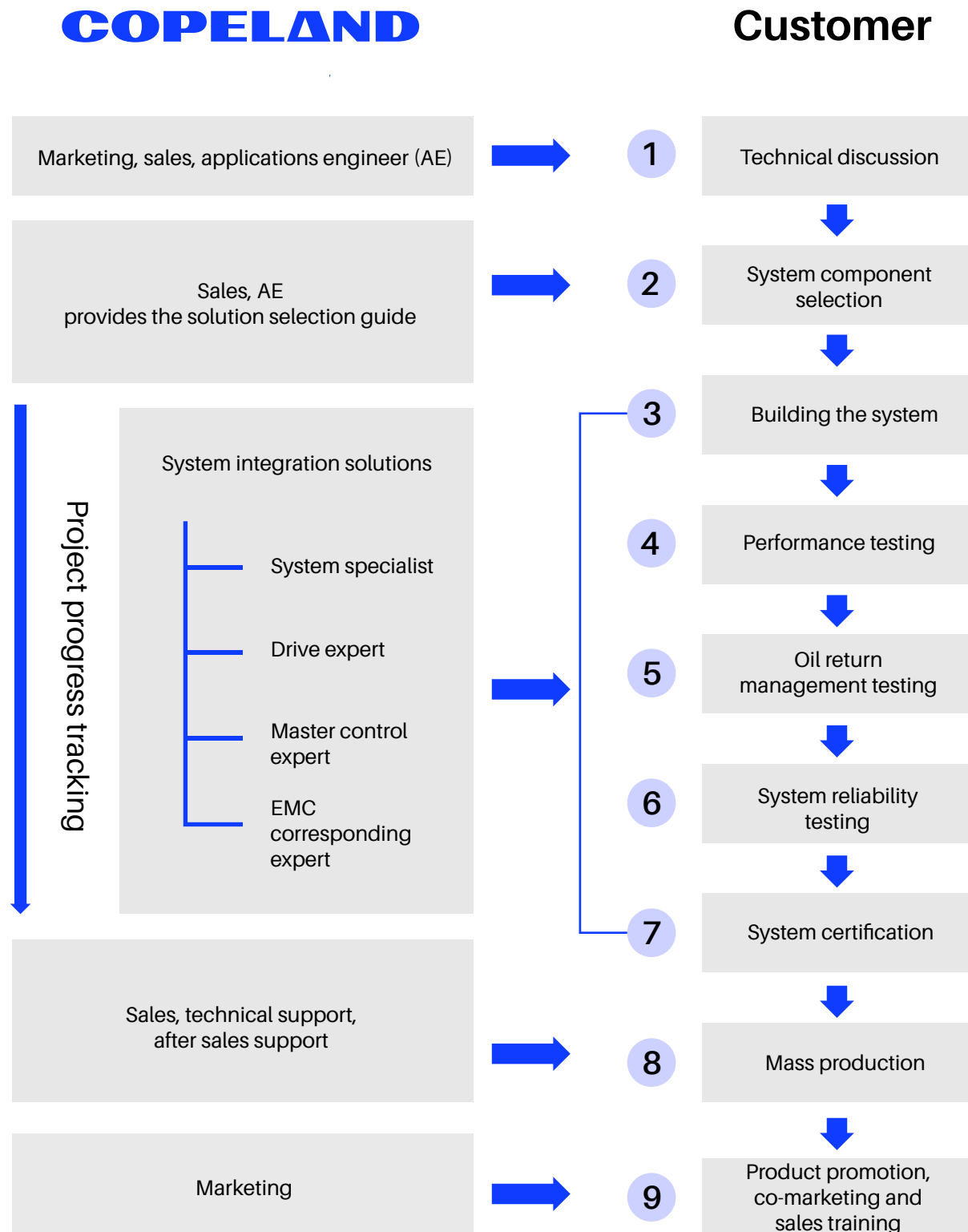


Higher unit reliability



On-site monitoring continuously tracks real-time performance

Copeland 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.





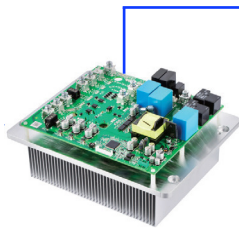
### System main control board

- 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



### Drive

- Optimized for Copeland scroll compressors with customized parameter settings
- Plug and play compressor compatibility
- Built-in compressor protection further enhances reliability

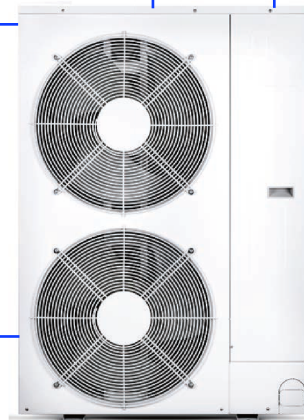
### Variable speed compressor

- 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



### Double electronic expansion valve

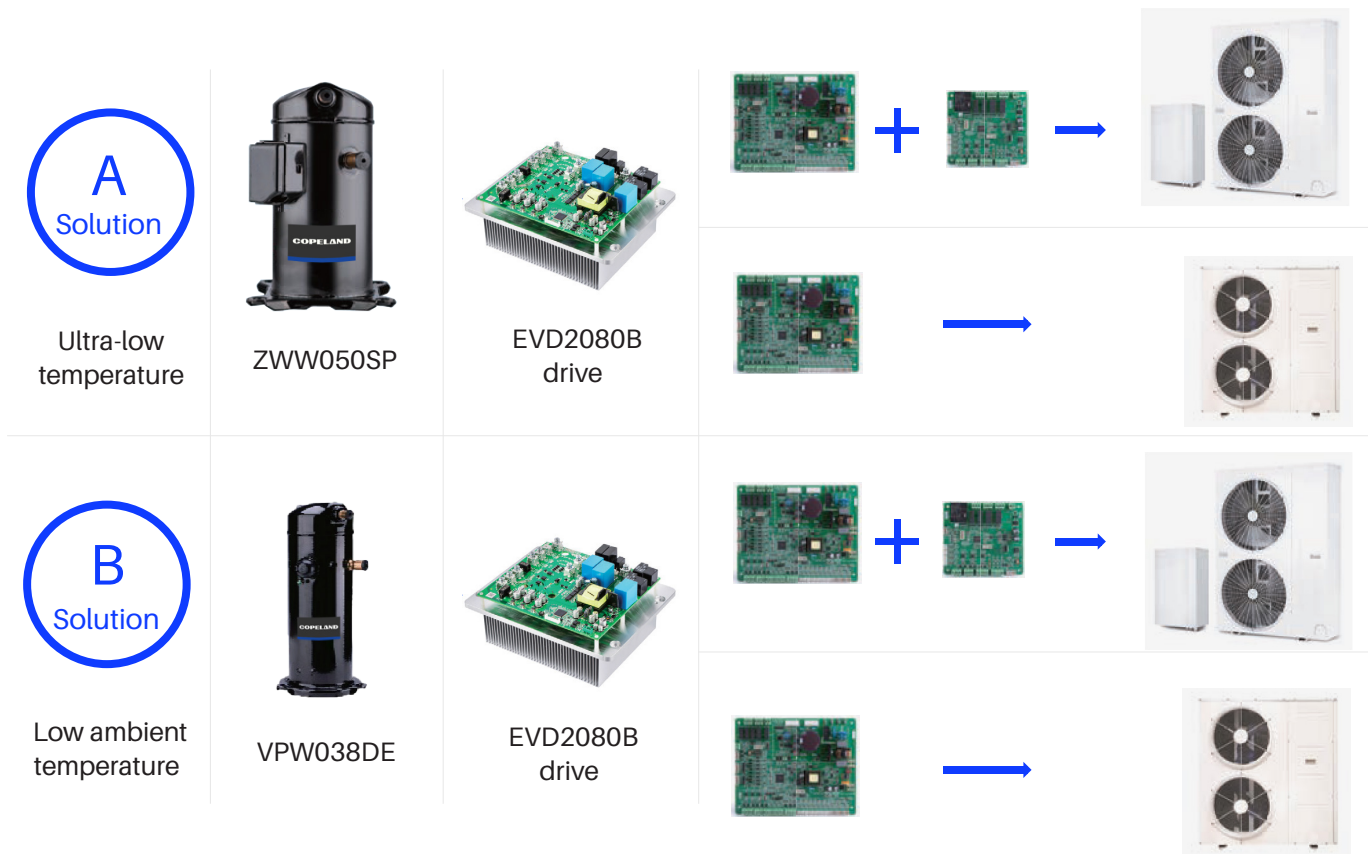
- Complete line up that meets various system configuration needs
- Accurate control of refrigerant pressure
- Outstanding dependability



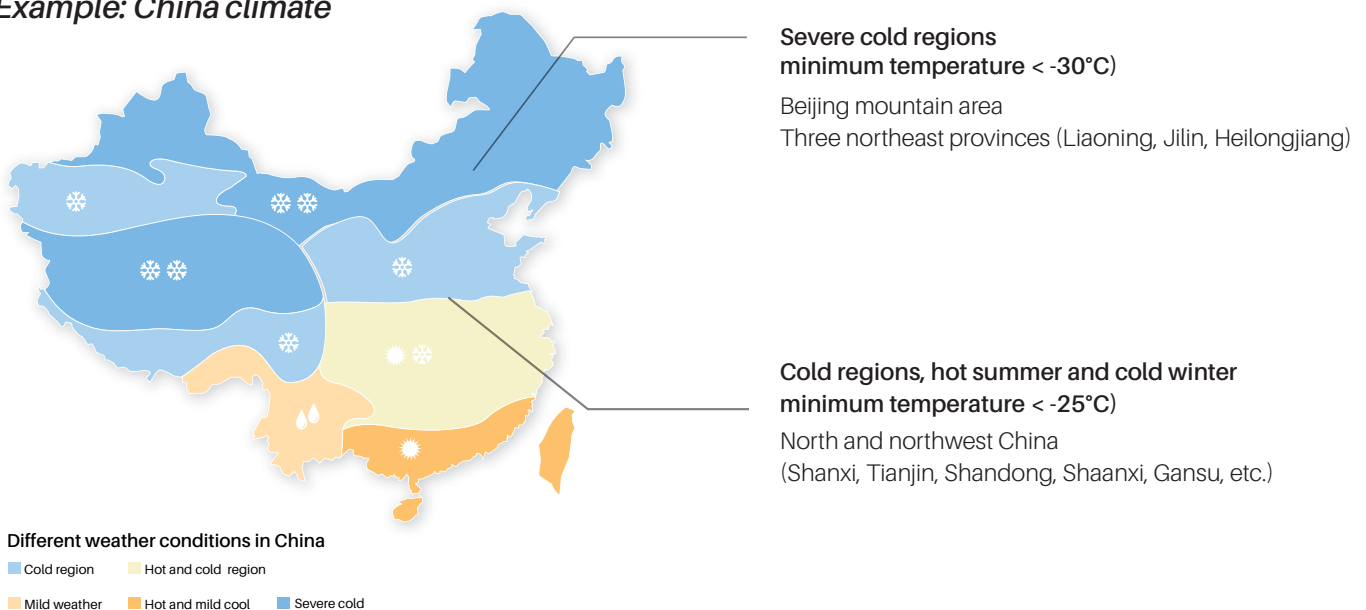
During air-source heat pump system development, Copeland conducted an in-depth study on the possible issues affecting its customers and designed a full suite of solutions to address the market and its pain points. Copeland integrated solutions for heat pumps can solve the harshest heating challenges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

## Configuration options of the heat pump systems

- Solution A – adapts to the ultra-low temperature environments (up to  $-30^{\circ}\text{C}$ ), with core components of the Copeland brand, designed for the applications in extreme cold regions.
- Solution B – adapts to the low temperature environments (up to  $-25^{\circ}\text{C}$ ), with core components of the Copeland brand, designed for the application in cold regions.



## Example: China climate



## Advantages of ZWW series variable speed compressor

### Excellent performance

Enhanced vapor injection technology

Improved heating performance

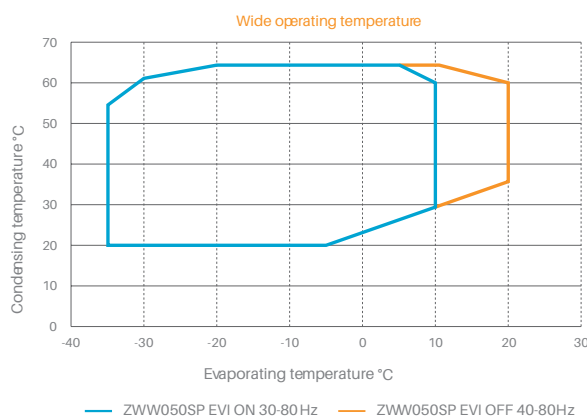
**20%**

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**

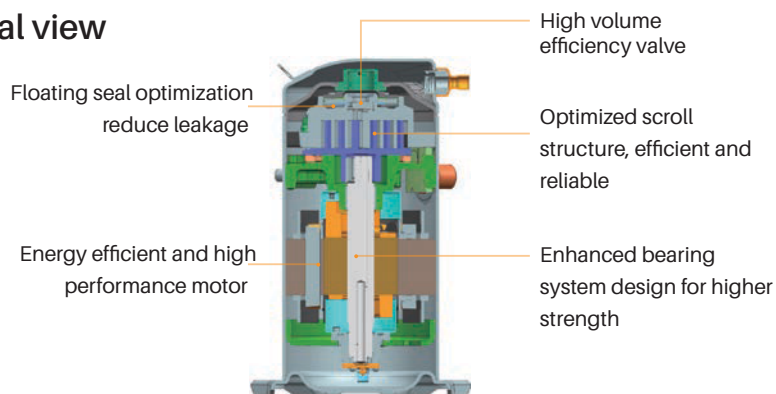
Stable heating in icy weather

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

Suitable for multiple heating applications

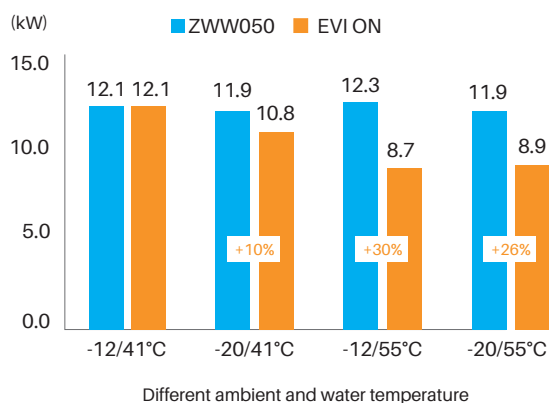
Radiator, floor heating, domestic hot water, and fan coil

### Sectional view

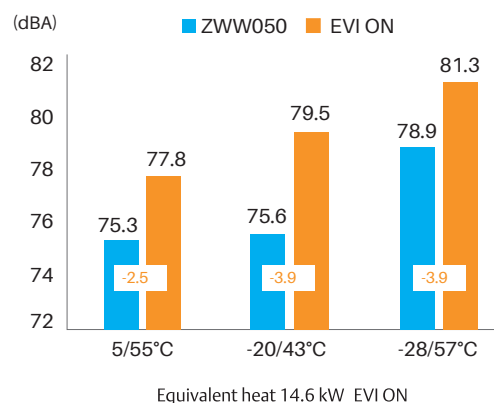


## ZWW excellent performance of ZWW series frequency conversion compressor

### Temperature heating capacity



### Quiet and comfortable operation



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%.

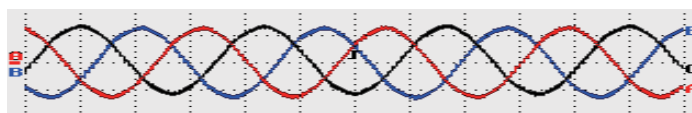
In the case of equivalent heating, the EVI is turned on. The ZWW050 has a noise advantage of 2-4 dBA under the operating conditions of the H company's EVI, which can avoid the noise reduction measures of the compressor, help to reduce the noise of the air source heat pump and improve user satisfaction.



## 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.

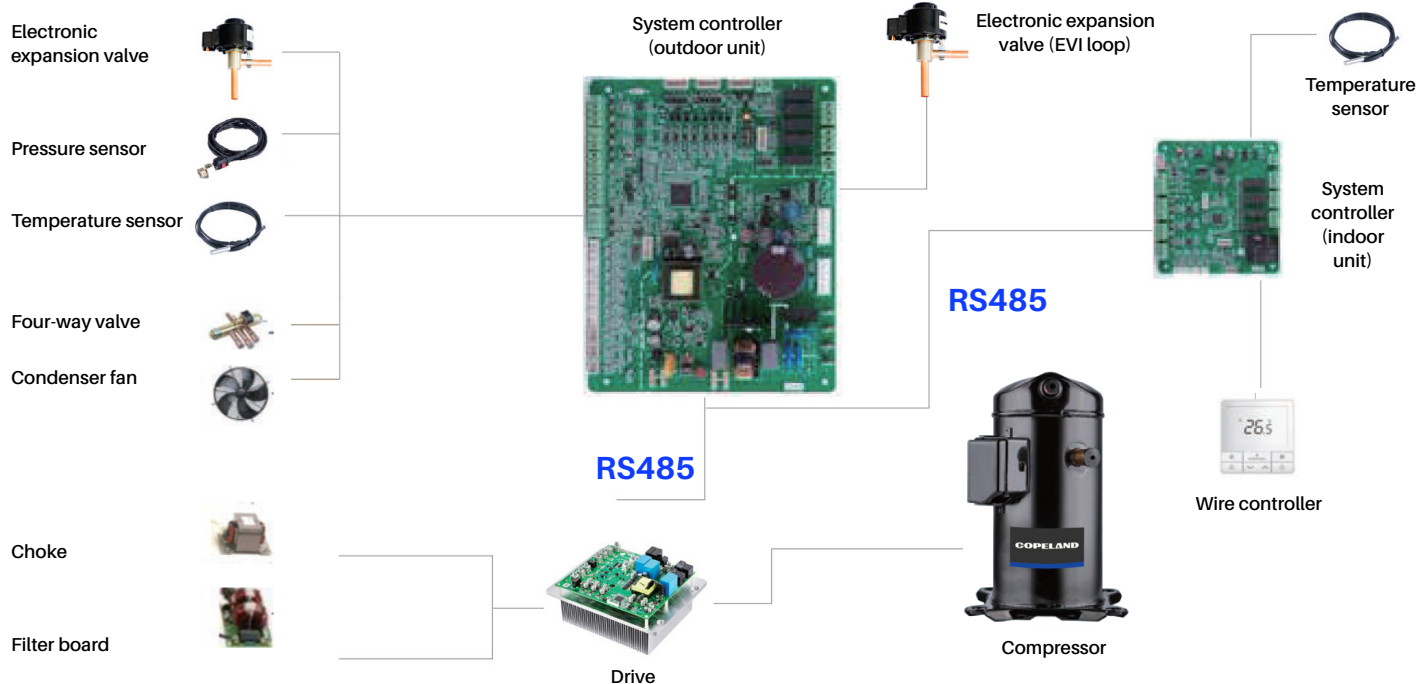


## System controller

### 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

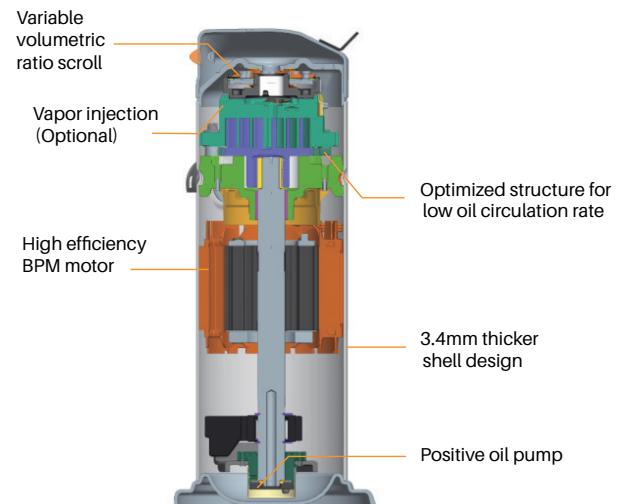
- Excellent performance and low noise design
- Concentrated winding motor for higher efficiency
- Wide speed range of 900-7200 rpm for more flexible system designs
- Variable volume ratio scroll significantly improves energy efficiency at low pressure ratio conditions
- Better debris & liquid handling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

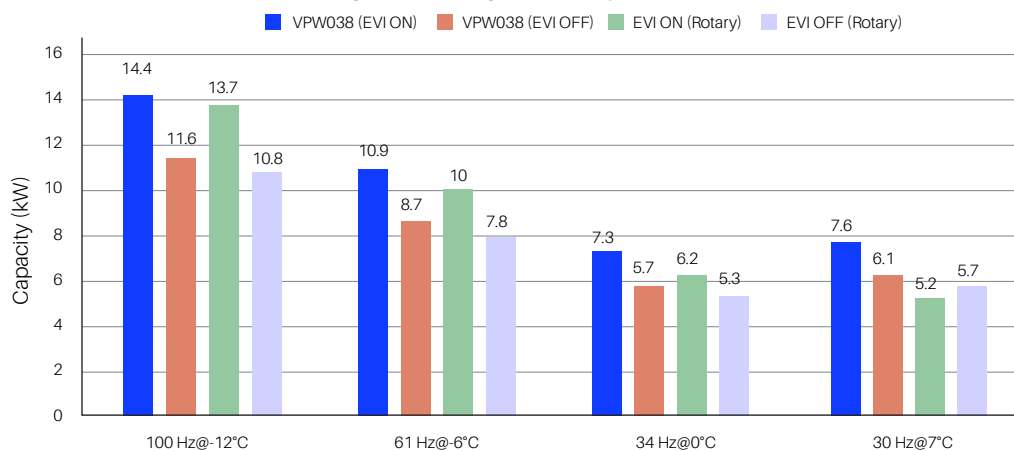


#### Sectional view

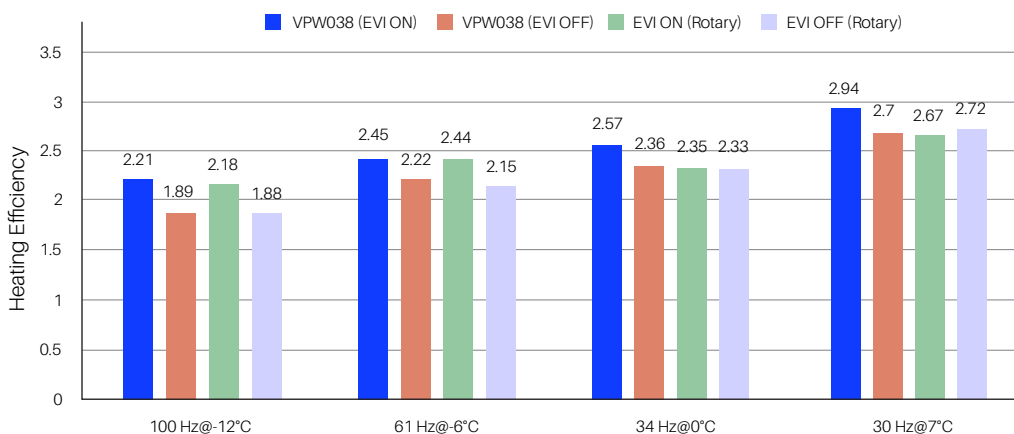


### System performance of VPW series variable speed compressor

#### Stronger heating capacity at low temperatures



#### Higher heating efficiency at low temperatures



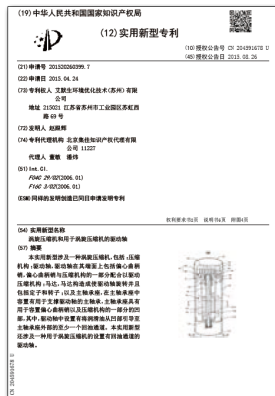
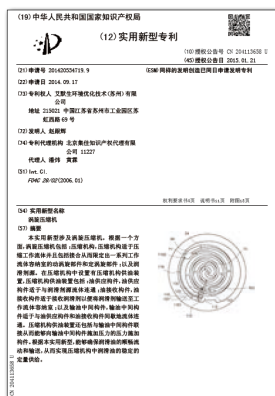
IPLV comparison test on 14 kW low-temperature air source heat pump system with below zero ambient temperature, vortex air enrichment technology can effectively increase the system heating capacity. Above zero ambient temperature, vortex air enrichment technology can still increase system capacity, but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

## Winning with excellent products and solid partnerships

Industry associations and experts highly valued the use of Copeland jet enhancement and frequency conversion technology systems. At the same time, the Copeland frequency conversion low-temperature air source heat pump solution is widely accepted by customers.



### Variable speed compressor technology patent



### Awards

Innovation Product Award  
China Refrigeration 2015



### Collaborations with Copeland



Tica



Tenesun



Hisense

### Success stories



Moganshan Naked Valley



Successful packaged installations  
in Daxing district, Beijing

## 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
EI1AVNB-AJ-101	Indoor unit control panel	1	EI1AVNB-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
EI1AVNB-AJ-101	Indoor unit control panel	1	EI1AVNB-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
EI1AVNB-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

Notes



## Notes

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## Notes

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## *About Copeland*

Copeland is a global leader in sustainable heating, cooling, refrigeration and industrial solutions. We help commercial, industrial, refrigeration and residential customers reduce their carbon emissions and improve energy efficiency. We address issues like climate change, growing populations, electricity demands and complex global supply chains with innovations that advance the energy transition, accelerate the adoption of climate friendly low GWP (Global Warming Potential) and natural refrigerants, and safeguard the world's most critical goods through an efficient and sustainable cold chain. We have over 18,000 employees, with feet on the ground in 50 countries - a global presence that makes it possible to serve customers wherever they are in the world and meet challenges with scale and speed. Our industry-leading brands and diversified portfolio deliver innovation and technology proven in over 200 million installations worldwide. Together, we create sustainable solutions that improve lives and protect the planet today and for future generations. For more information, visit [copeland.com](https://copeland.com).



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