

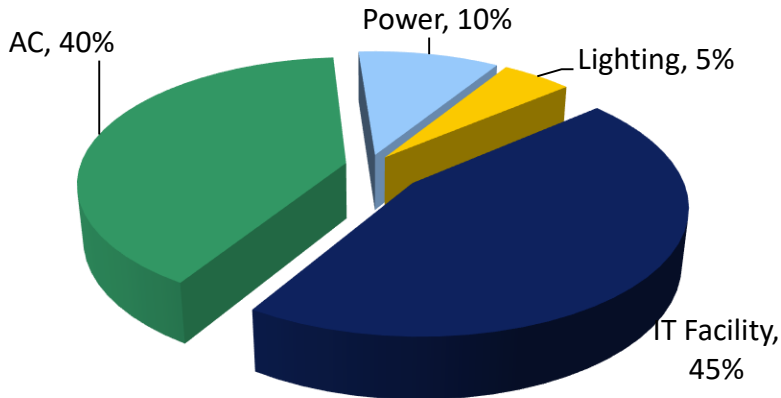
Introduction of Compressors For Precision Cooling

Data Center Status and Development Trends

Data centers are high-energy industries

- Expected to account for 3% of the country's annual power consumption in 2020
- Electricity costs account for 1/3 of data center operating costs
- Air conditioning power consumption accounts for 30-40% of the total data center power consumption

Data Center Energy Consumption



Data source: ICT research 2018-2019 China Computer Room Air Conditioning Product Market Report, Ministry of Industry and Information Technology "13th Five-Year Plan" & "China Data Center Cooling Technology Annual Development Report 2017"

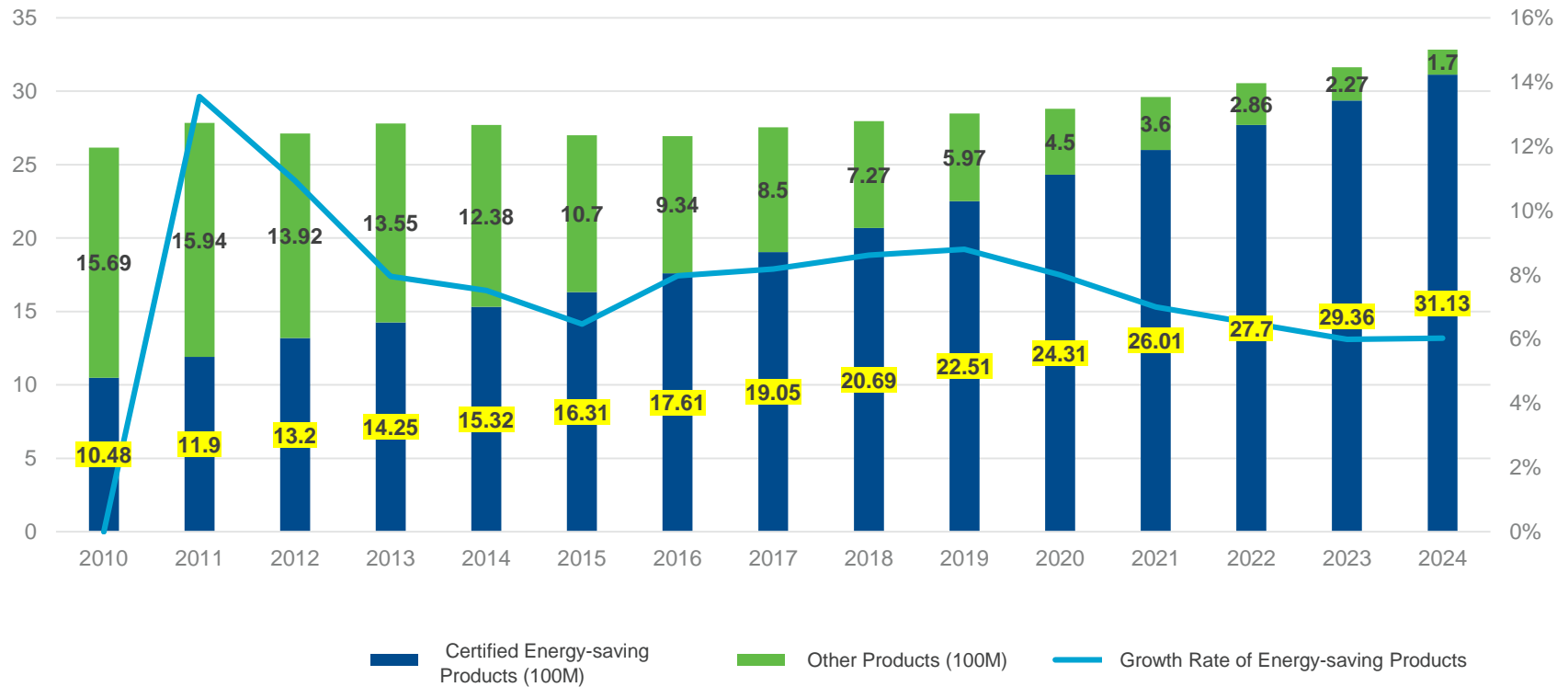
Development trends

- PUE value keeps decreasing
 - National standards 1.5, Beijing 1.4, Shanghai 1.3, Shenzhen is even below 1.25. The world advanced level can reach to 1.2.
- Larger and larger switch rooms
 - It is estimated that in recent years, the number of 3,000-10,000 square meter switch rooms and above will remain stable
- East China, South China and North China markets are the absolute main markets for switch room air conditioners. However, in recent years, policies have encouraged the transfer of data centers from Beijing, Shanghai, Guangzhou, and Shenzhen to western regions.
- During the Coronavirus disease epidemic this year, big data and cloud economies have risen rapidly, playing a decisive role in preventing and controlling the epidemic and ensuring normal life and work. At the same time, the Standing Committee of the Political Bureau of the CPC Central Committee held a meeting in March to speed up the construction of new infrastructure such as 5G networks and data centers.

Trend of Precision Cooling Industry



2010-2024 Precision AC Sales Forecast



Source: ICT Research 2019-2020 China Computer Room Air Conditioner Product Market Report

The Overall Market For Precision AC Is Steadily Growing, and The Growth Rate of Energy-saving AC Is Higher Than The Overall Market Growth Rate.

Relevant Standards For Precision Cooling Industry



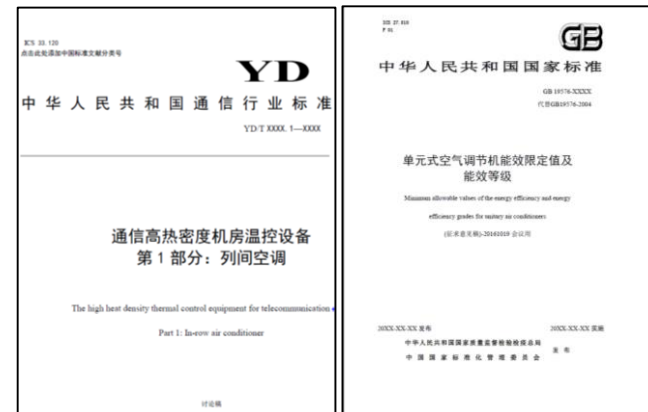
Unit air conditioner for computer room: AEER energy efficiency standard

Type	GBT19413-2010	CQC3126	GB19576 -2019		
	Minimum energy efficiency requirements	准入最低值	L1	L2	L3
Air-cooled	3.0	3.5	4.0	3.6	3.0
Water-cooled	3.5	3.6	4.2	4.0	3.5
Ethylene glycol economic cooling	3.2	-	3.9	3.7	3.2
Air-cooled dual cold source	2.9	-	3.6	3.4	2.9
Water-cooled dual cold source	3.4	-	4.1	3.9	3.4

* The computer room air conditioner has been fully converted from COP to AEER energy efficiency evaluation index in May 2016

GB19576-2019 will be officially implemented in 2020-5-1

- In Row air conditioning: Ministry of Industry and Information Technology takes the lead in formulating YD standards for the communications industry
 - The return air temperature under rated working conditions is increased from the traditional 24 °C to 35/30 °C
 - The return air temperature of the maximum load refrigeration working condition is increased from the traditional 30 °C to 40 °C
 - Increased return air temperature places higher demands on the compressor operating range and reliability



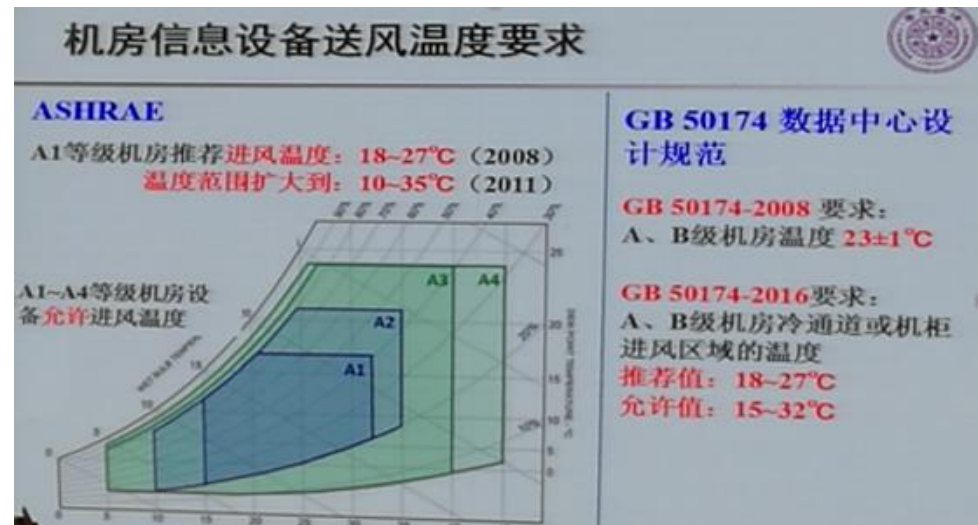
The New Standard Promotes The Continuous Upgrade of The Energy Efficiency of Precision AC, And Also Provides New Ideas For The Future Product Development And Planning of OEM.

Relevant Standards For Precision Cooling Industry



- GB50174-2017 《Data Center Design Specifications》
 - The air inlet temperature of Class A and B switch rooms is increased, allowing a maximum of 32 °C.

GB50174	Ver 2008	Ver 2017
	Ambient temperature	
Recommended value	23 ± 1°C	18°C-27°C
Allowance value		15°C-32°C



- ASHRAE:
 - IT equipments: heat dissipation - heat resistance
 - The inlet air temperature is increased, allowing a maximum of 35 ° C

Increasing The Return Air Temperature And Improving Energy Efficiency Are The General Trend

Copeland™ Fixed Speed Compressor For Precision Cooling



HP	1 - 2.5	2 - 4.5	5 - 7.5	9 - 12	7.5 - 15	20 - 25	20 - 40	60
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R22/R407C



R410A



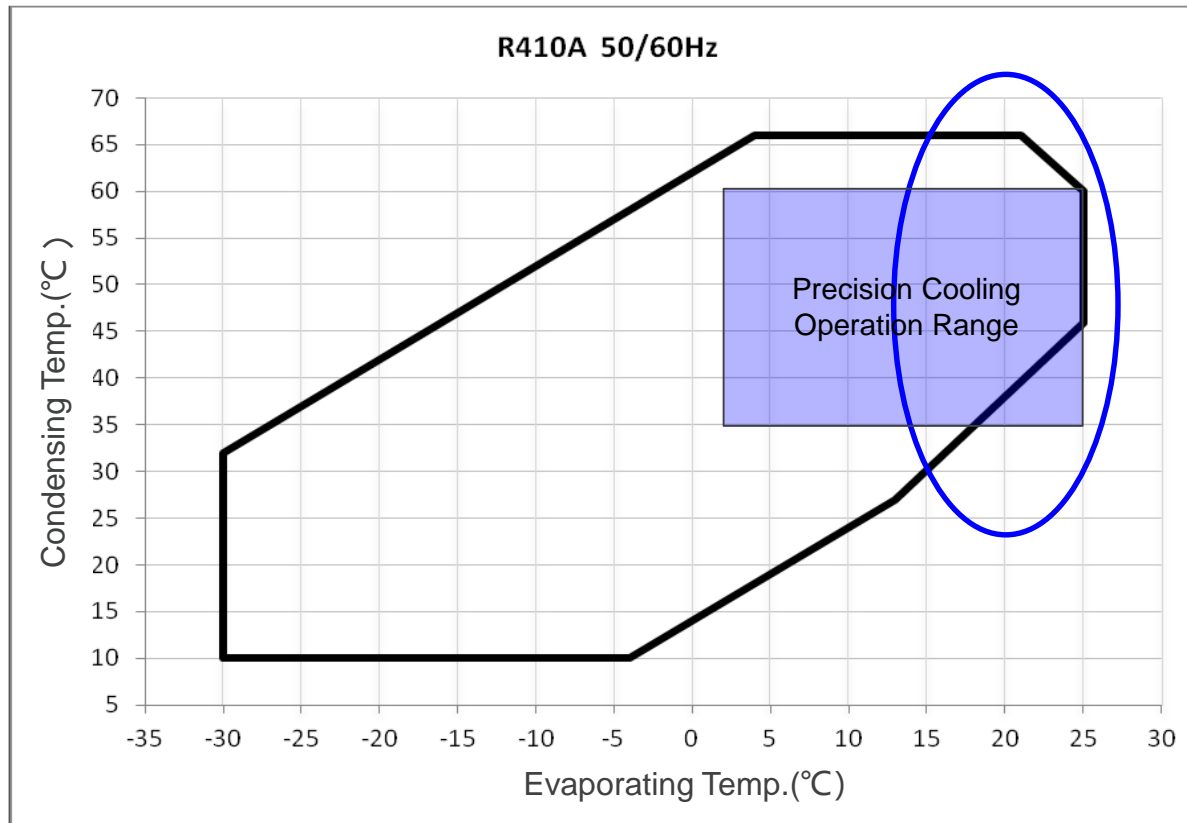
R32



Emerson Provides A Full Range of Product Solutions For Precision Cooling Industry

Copeland™ Fixed Speed Compressor For Precision Cooling

- Compressor operating range expansion of high evaporation temperature area:
 - R22 series: maximum 20°C
 - R410A series: maximum 25°C



*Summit VP Series

Copeland™ Variable Speed Compressor For Precision Cooling



Light Commercial



Commercial



Variable Speed Compressor

Model
(Displacement)

30cc

38cc

50cc

4HP

5HP

8HP

66cc

80cc

96cc

10HP

12HP

15HP

Single Unit

Single + Rack

R410A

Mass Production

Mass Production

Mass Production

Mass Production

Mass Production

Mass Production

Emerson
EVD Drive

Single phase 8.0kW (mass production)

3PH, 380V
8.0kW

3PH, 380V
11.0kW

3PH, 380V
15.0kW

3PH, 380V
18.0kW

Drive

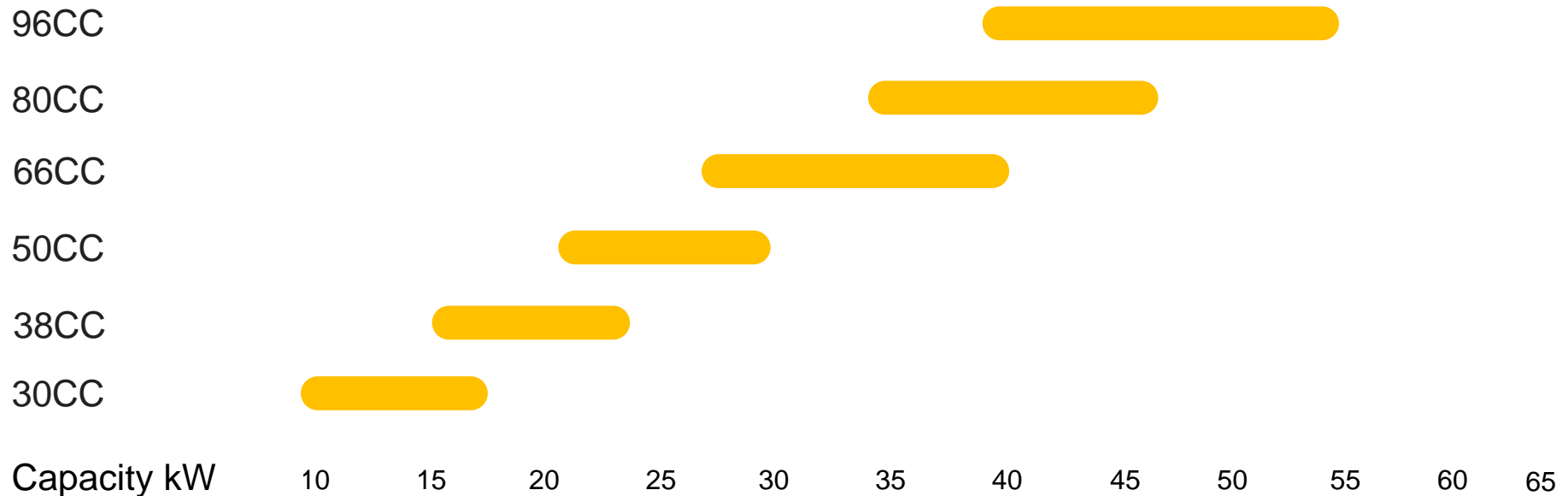
Emerson Has Developed a Full Range of 4HP ~ 15HP Compressors And Matching Drive

Copeland™ Variable Speed Compressor For Precision Cooling

Total of 6 displacements cover the cooling range of precision cooling

<=50kW: Single loop variable speed compressor

>50kW: Double loop dual variable speed compressor, or fixed speed compressor for the second loop



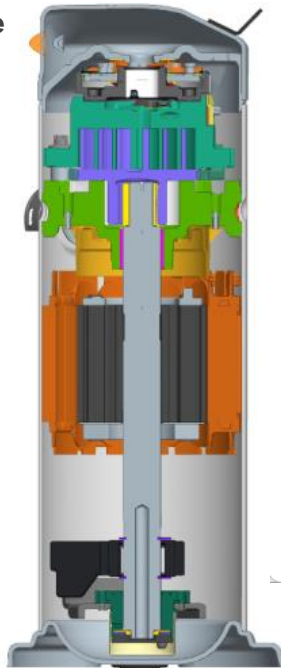
Remarks: The above configuration are for reference only, and manufacturers need to adjust according to their own requirements. Performance based on 10°C / 45°C operating condition simulation.



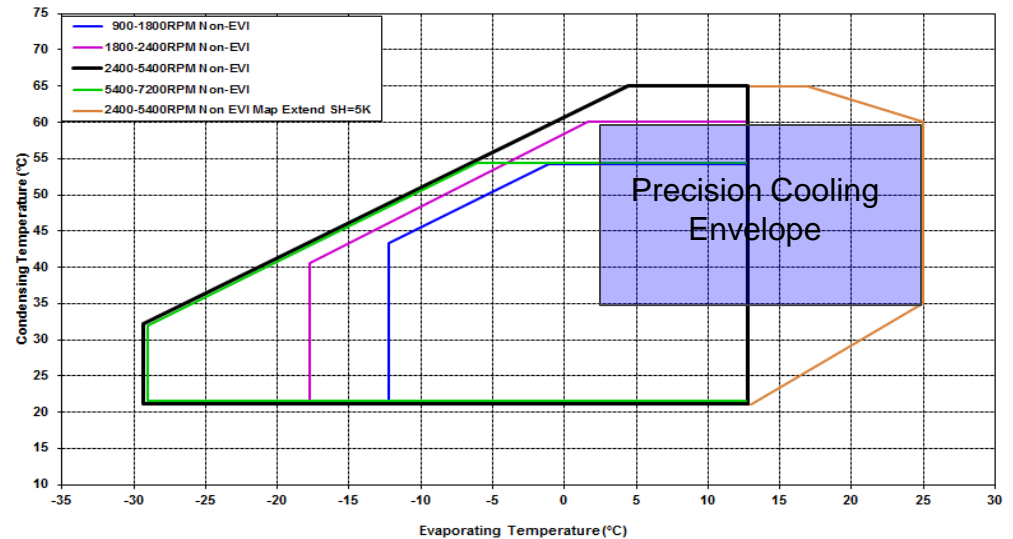
Continue To Improve The Performance of 5HP Copeland Scroll™ Variable Speed Compressor

-ZPV038DE Copeland Scroll™ Commercial Variable Speed Compressor

- Flat top seal technology
 - Reduce leakage, increase efficiency
- Variable volume ratio scroll technology
 - Greatly improve low pressure specific energy efficiency
- Increase the oil guide pipe to reduce the oil discharge rate at high speed
- Light commercial
 - Reliable performance
- Efficient concentrated winding permanent magnet motors
- Flexible liquid brake
 - Reduce noise when reversing to protect the drive
- Positive displacement oil pump
 - The pump oil volume does not change with the oil level, providing reliable lubrication in various situations



ZPV038SE Envelope 11K SH, R410A Dew Point (2015-11-07)



Copeland™ Variable Speed Compressor Solutions

-10HP/15HP Copeland Scroll™ Commercial Variable Speed Compressor

- Capacity / Energy efficiency ratio @ 5400RPM @ 10/45° C (including the drive power)

- ZPV0662E: capacity 40,500 W / COP energy efficiency ratio 4.61
- ZPV0962E: capacity 59,800 W / COP energy efficiency ratio 4.65

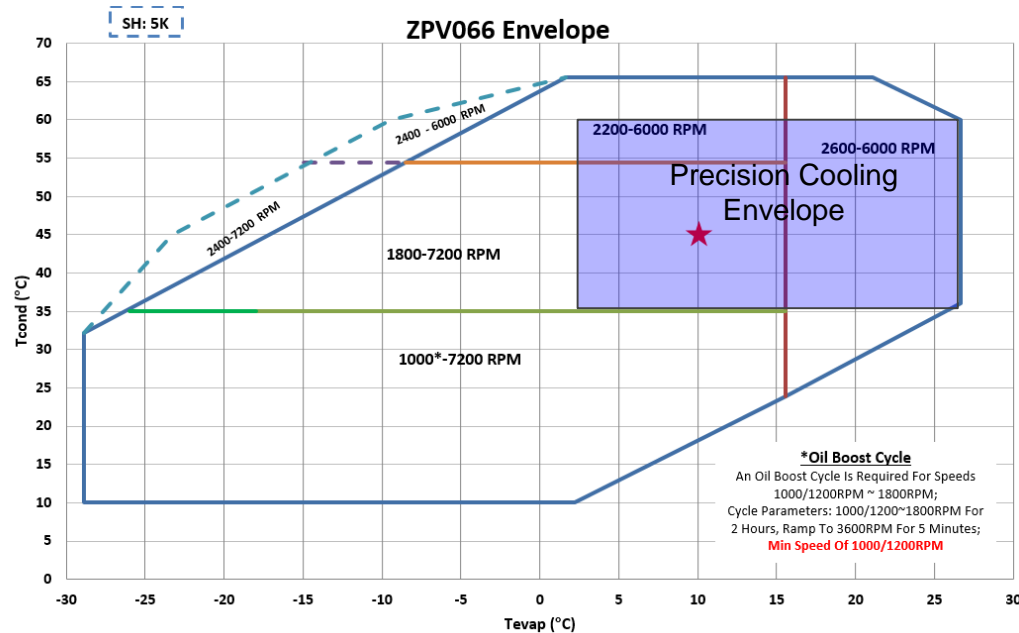
- Range of rotation

- ZPV0662E: 1,000 – 7,200 RPM (17→120Hz)
- ZPV0962E: 1,200 – 7,200 RPM (20→120Hz)

- High efficiency DC brushless permanent magnet motor

- 380V-575V, 200V-240V, 460V-575V

- Extended high evaporation temperature operation



Copeland™ Variable Speed Compressor Solutions

-12HP Copeland Scroll™ Commercial Variable Speed Compressor

- **Basic Specification**

- Displacement 80cc
- Motor model: 4X9 / 5X9
- Rotating speed: 1200-7200RPM

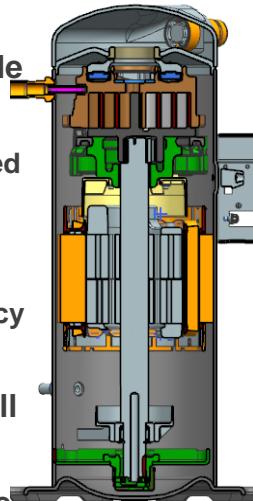


- **Low pressure cavity**

- Hi reliability, strong liquid hammer tolerance

- **Optimum scroll and VVR variable volume ratio technology**

- The scroll profile design is based on the optimized conditions for precision cooling
- Variable volume ratio design improves AEER energy efficiency at multiple operating points

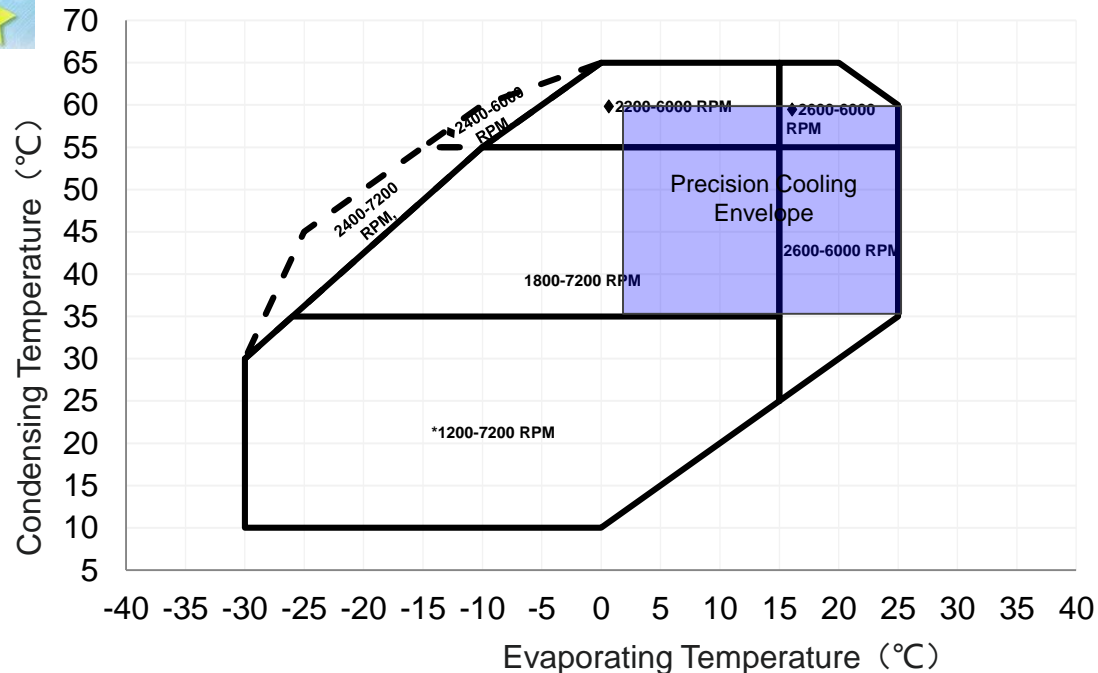


- **Copeland's unique flexible scroll design**

- Superior reliability, resistance to liquid shock and tolerance to impurities

- **Hi efficiency BPM motor**

- Optimum design helps energy efficiency improvement



Best Practice (Precision Cooling Air Conditioning)

Air-cooled Precision Cooling Procurement Project

Project Background

- An operator recently released the results of centralized purchasing nearly 2,000 sets of air-cooled precision air conditioning from 2019 to 2020, some successful bidders of which use Emerson compressor solutions.

打印预览

中国移动2019年至2020年风冷型机房专用空调集中采购_中标结果公示

中国移动2019年至2020年风冷型机房专用空调集中采购：

标1/包段的中标人为德康技术有限公司、依米康科技股份有限公司、南京佳力图机房环境科技股份有限公司、广东海信科技有限公司、北京斯泰尔空调制冷设备有限公司；

标1/包段的中标人为华为技术有限公司、广东海信科技有限公司、依米康科技股份有限公司、德康技术有限公司。

采购人/招标代理机构：中国移动通信有限公司/中国电器材料集团有限公司

2019年12月9日

Customer Values

- Emerson's integrated Solutions can reduce system design cycle through sufficient testing and verification
- Create high energy efficient precision cooling system and be more environment friendly
- Provide customers with full technical support

Successful Application Cases



Emerson Successfully Wins The Bid For An Operator's Centralized Procurement Project With Our Integrated Solutions On Precision Cooling.

EMERSON
CONSIDER IT
SOLVED™

