TOYO-AC Co. Ltd

TOYO AC
Air Condition Co. LTD

# Air cooled scroll


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FEEL FRESH

jis Japanese Industrial Standard

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# Air cooled scroll compressor
# Digital scroll compressor
# reduce energy cost 25%


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Application

School

Colleges &Universities

Shopping

Government

Commercial

hotel

# Company profile

Japanese TOYO-AC Company was established in Japan seeking for making the best use of energy and developing the knowledge in that country. One of the most important goals of this company is to reduce energy consumption and to elevate efficiency by presenting the best products.

Accordingly this company has presented a lot of its new products including modular heat pump cool air. Using the most up to date technology of the world, this company has produced a new generation of these heating pumps.

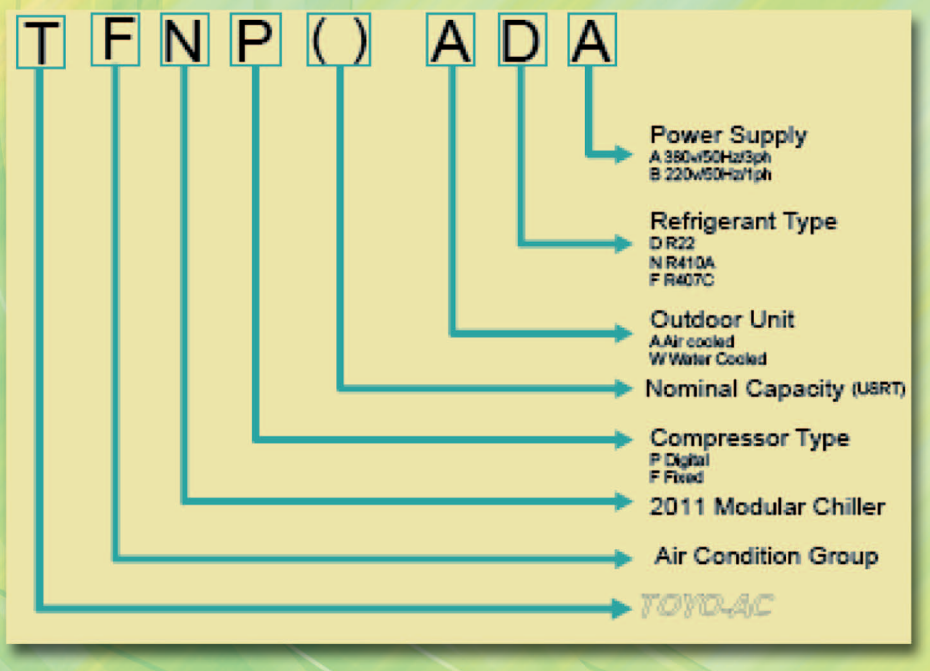
Since these products have variety of some digital scroll compressors, the electricity consumption in these units has been reduced to 30% to 40% compared to their similar units and the capacity has become variable from 10% to100%.

In these pumps plate heat exchange has been used instead of shell and tube which leads to elevation of the efficiency and reduction of the size of the unit. Also in these units usual expansion valve has been used instead of electro expansion valve which makes the liquid return impossible and causes the unit to run in the coldest areas.

All parameters of the unit are controlled by a micro control which makes its function convenient. Being able to produce warmth and coldness, TOYO-AC heat pumps do not need cooling towers, pumps and pertinent piping. Also they reduce the engine room space which provides this opportunity for the users to install them in unused spaces in the buildings. These units are used in residential and commercial edifices, hotels, hospitals, and factories. Furthermore a great many of these units are sold in industry section due to their high safety.

For increasing the refrigeration capacity it is possible to join these units in a modular way as the picture shows. This modular way of joining not only can increase the refrigeration capacity of the unit but also can elevate the security of the unit and increase the number of the engines which leads to apparently low consumption of electricity.

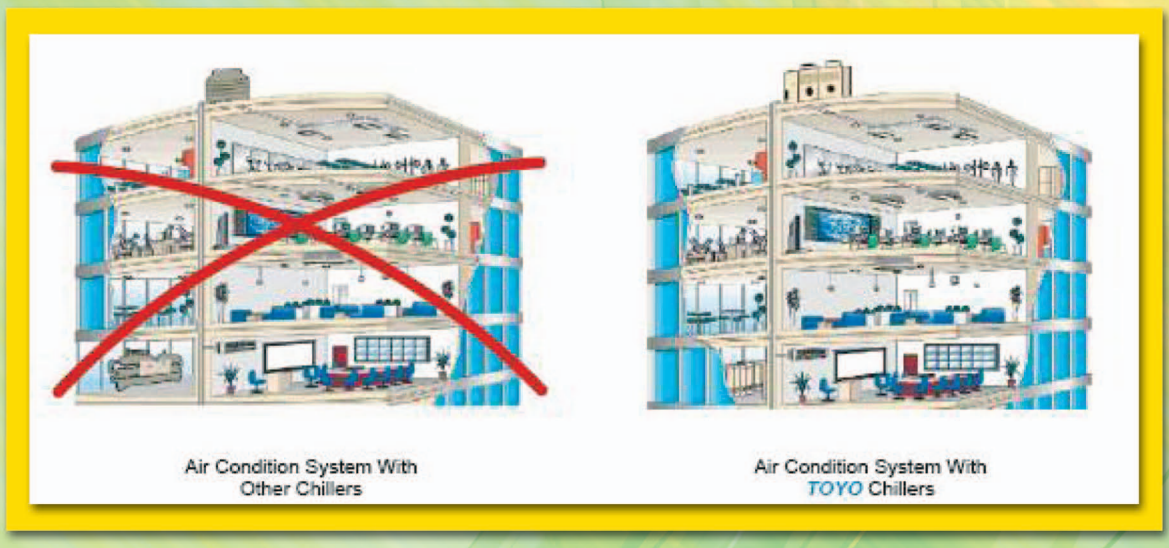
## How to read?




## Introduction

## Modular design

Modular design conception has been adopted in this series of product. Maximum 8 units can be combined into 1 controlling system, which consists of 1 master unit and 15 slave units. In case that one of the units failed, the other units still are running normally.



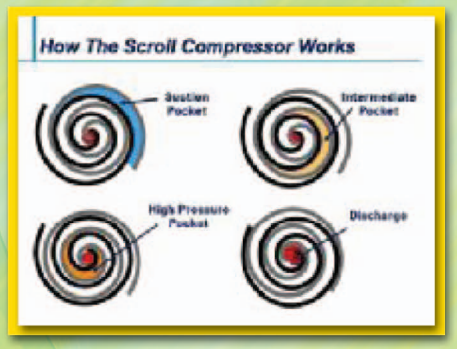

# COMPRESSOR

## High efficiency digital scroll compressor

The Scroll Digital™ compressor increases HVAC system efficiency by precisely matching compressor output to your heating or cooling needs. Because capacity modulation between 10% and 100% can be achieved using one compressor, Copeland Scroll Digital is perfect for buildings or rooms which experience widely varying loads or where tight temperature and humidity control are needed.

Copeland Scroll Digital compressors are available from 3–15 HP and can be applied in configurations using multiple compressors offering capacity ranges from 10–30 HP.

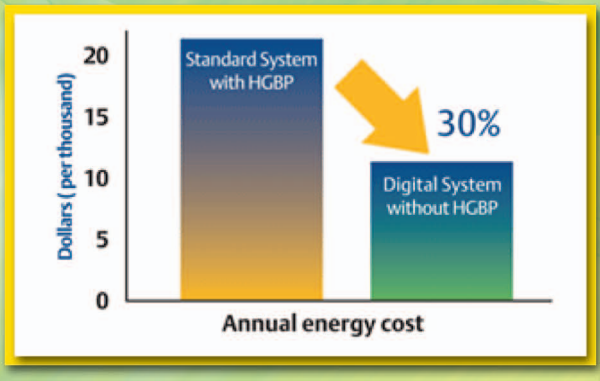
# How digital scroll compressor work:

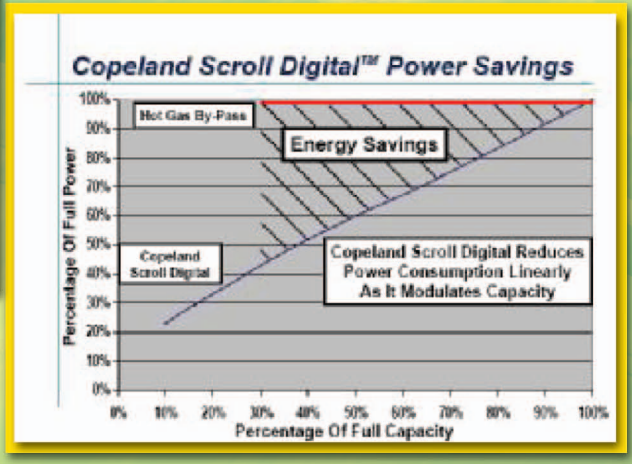




Digital scroll technology is up to 30% more efficient than traditional methods of compressor modulation. When maximum cooling is needed to maintain complete comfort, Scroll Digital compressors are there to cool at 100% capacity. But comfort is needed at off-peak hours too.

When less cooling is needed, the Scroll Digital compressor can cool in as little as 10% capacity. So, a constant temperature can be easily maintained within +/- 0.5°F in every room, at any time of day, whether the room is empty or at capacity. Plus, the Scroll Digital compressor doesn't just lower the temperature, it brings down the humidity too, offering levels of comfort never before achieved by a compressor.

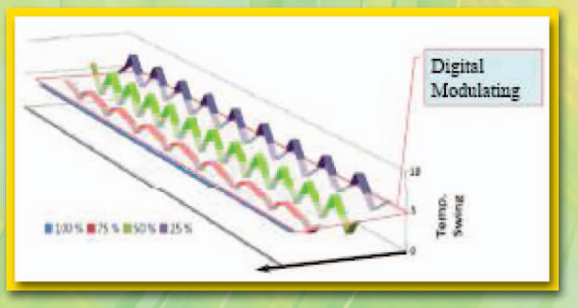
By offering a capacity range of 10%–100%, the Scroll Digital compressor doesn't need to start-stop as often as a traditional compressor. That means enhanced reliability and less maintenance because of the reduced wear and tear on the compressor.



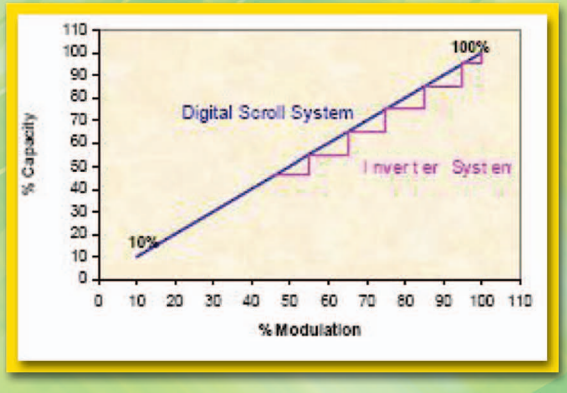



## Direct Expansion System & Copeland Scroll Digital

Full Modulation (10~100%) mediate Load Adjustment Step Less Modulation Close Temperature Control (+/- 1K)




## Digital Scroll: Capacity Output Range




# Plate type heat exchanger:

Heat pump technology answers modern society's urgent need for efficient, environmentally friendly heating systems. And as our efforts to save energy intensify, the demand for heat pumps just keeps on growing. This situation means new challenges for heat pump manufacturers. Competition is fierce than ever, raw material prices fluctuate, customers want lighter, slimmer products, and increasingly strict environmental legislation drives the need to reduce the refrigerant charge.

Now stainless steel plate heat exchanger concept that addresses all these needs, starting with heat transfer itself. Find out how we can help you develop tomorrow's heat pumps, to keep your customers comfortable and your business competitive in the future.

## -High Efficiency

Because of the pressed patterns in the plates and the relative narrow gaps, very high turbulence is achieved at relative low fluid velocity. This combined with counter directional flow results in very high heat transfer coefficients.

## - Compact Size

As a result of the high efficiency, less heat transfer area is required, resulting in a much smaller heat exchanger than would be needed for the same duty using other types of heat exchangers. Typically a plate heat exchanger requires between 20-40% of the space required by a tube & shell heat exchanger.

## - Close Approach Temperature

The same features that give the plate heat exchanger its high efficiency also makes it possible to reach close approach temperatures which is particularly important in heat recovery and regeneration applications. Approach temperatures of 1ºF are possible.

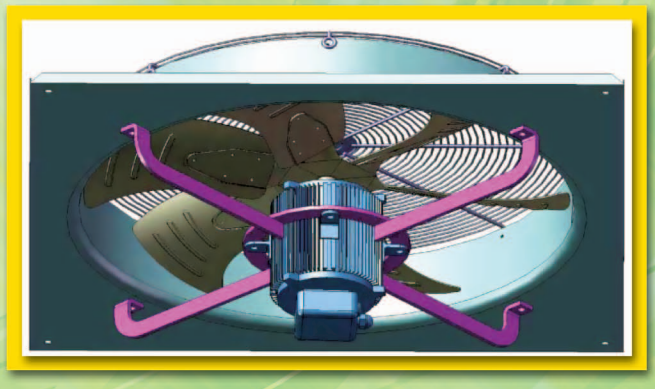
# V Type Condenser:

Condenser adopts the Copper tube & hydrophilic aluminum fin (blue fin) coil type structure, the appearance is V type, this design increase the heat exchange area , reduce the temp. difference thus increase the heat exchange efficiency 10%.

## Low noise Condenser fan motor

Condenser Fans with low noise, full airfoil cross section for maximum efficiency, statically and dynamically balanced for low vibration operation, and positioned in extended, fo rmed steel orifices for low sound and maximum efficiency.

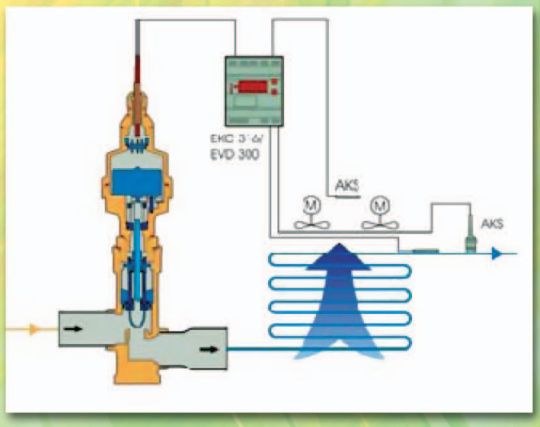
Condenser fan motors are high efficiency, direct drive, 6-pole, 3-phase, Class-“F”insulation and IP55 protection, current overload protected, totally enclosed type with double sealed, permanently lubricated, ball bearings.



## Electronic expansion valve

Micro processor control do the actual calculation according to collecting data of degree of superheat, adjust the expansion valve degree with the method of PID ,thus make the equipment work at the best state and increase unit’s IPLV and real energy efficiency. The Electronic expansion valve chiller by minimizing superheat in the evaporator and allowing the chiller to run at reduced condensing pressures.

The electronic expansion valve is actuated by a stepper motor. The exact valve position is permanently known by the Unit Control Module.Quick response To operate the valve from fully closed tofully open position requires less than 30 seconds. This is to compare with thermo-electric devices which have no stable position and require up to several minutes to fully close.




# Electronic control

The units output part have special connection wire ,can realize inter-lock control with the cooled water pump ,every controller have R485 communication interface and software convenient for the customer.

- easy to program flexible control to user
- Temperature control with ±0,5°C tolerance
- powerful control function, user can use PID method to control the operation, adjust the Operation status according to heat load to realize optimized operation; 。
- Current limiting and demand function
- Lead-Lag control of compressors
- System protection functions, unit can stop to enter protection when malfunction Happens, display the malfunction code and alarm to the operator;
- Dual set point option
- Alarm & predictive maintenance history
- Minimum heat load start, the unit can check the last time operation condition and supply Minimum start method, reduce the impact to the electricity network and improve the system stability;
- PLC can check and supply different solutions to different system (Piping or system) malfunction;
- DIII Net possibility for use with I-manager (Option)
- Remote monitoring through AirNet (Option)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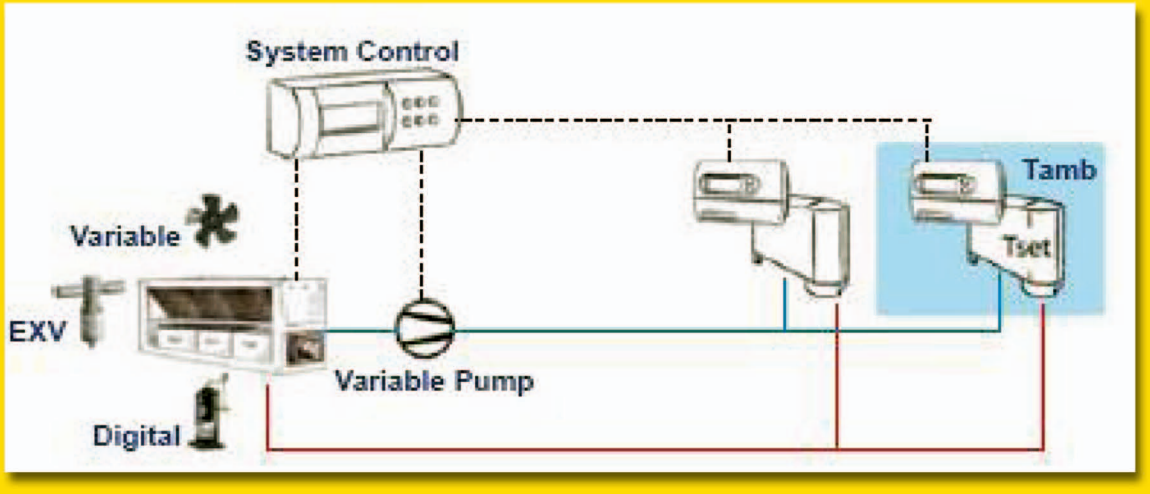
F3
F4
F5
F6


System Control
Variable
EXV
Variable Pump
Digital
Tamb
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# Models

| Model | unit | TFNP(10)ADA | TFNP(12)ADA | TFNP(15)ADA | TFNP(20)ADA | TFNP(25)ADA | TFNP(30)ADA |
|---|---|---|---|---|---|---|---|
| capacity | BTU/hr | 96,000 | 115,200 | 144,000 | 192,000 | 240,000 | 288,000 |
| Max.power input | kw | 8 | 9.6 | 12.3 | 16.1 | 21.2 | 24.1 |
| Power supply | 380V/3PH/50Hz | | | | | | |
| Compressor | High efficiency digital scroll compressor | | | | | | |
| Quantity | Nr. | 2 | | | 4 | | |
| Energy adjustment | % | 10 ~ 100 | | | | | |
| Evaporator | stainless steel plate heat exchanger | | | | | | |
| Flow rate | M3/hr | 4.3 | 5.2 | 6.5 | 8.7 | 10.9 | 13.3 |
| Water pressure drop | kpa | 29 | 29 | 29 | 29 | 29 | 29 |
| Water pipe connection | DN | DN40 | | | 2 x DN40 | | |
| Condenser | Hydrophilic fins + high efficiency inner grooved copper tubes | | | | | | |
| Fan type | High efficiency axial fan | | | | | | |
| Fan quantity | Nr. | 1 | 1 | 1 | 2 | 2 | 2 |
| Refrigerant | R22 | | | | | | |
| Refrigerant charge | kg | 2 x 4 | 2 x 4.8 | 2 x 6 | 4 x 4 | 4 x 4.8 | 4 x 6 |
| Sound level | dB | 57 | 57 | 59 | 60 | 62 | 65 |
| Net weight | kg | 400 | 430 | 450 | 600 | 700 | 750 |
| Operation weight | kg | 420 | 450 | 475 | 640 | 750 | 810 |
| Dimension | (H) mm | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| | (W) mm | 900 | 900 | 900 | 900 | 900 | 900 |
| | (D) mm | 1600 | 1600 | 1600 | 2500 | 2500 | 2500 |

* The performance values refer to the following conditions:

Cooling: ambient air temperature 35°C; evaporator water in/out temperature 12/7 °C;

** Sound pressure measured at a distance of 1 m and a height of 1.5 m above the ground in a dear field.

# Models

| Model | unit | TFNP(60)ADA | TFNP(80)ADA | TFNP(100)ADA | TFNP(120)ADA |
|---|---|---|---|---|---|
| capacity | BTU/hr | 576,000 | 768,000 | 960,000 | 1,152,000 |
| power input | kw | 48 | 65 | 80 | 95 |
| Power supply | 380V/3PH/50Hz | | | | |
| Compressor | High efficiency hermetically scroll compressor | | | | |
| Quantity | Nr. | 4 | 6 | | |
| Energy adjustment | steps | 4 | 6 | | |
| Evaporator | High efficiency shell & tube heat exchanger | | | | |
| Flow rate | M3/hr | 26.2 | 34.9 | 43.6 | 52.3 |
| Water pressure drop | kpa | 12 | 16 | 18 | 21 |
| Water pipe connection | DN | DN80 | DN100 | DN125 | DN125 |
| Condenser | Hydrophilic fins + high efficiency inner grooved copper tubes | | | | |
| Fan type | High efficiency axial fan | | | | |
| Fan quantity | Nr. | 4 | 6 | 8 | 8 |
| Refrigerant | R22 | | | | |
| Refrigerant charge | kg | 4 X 12 | 6 X 10.5 | 6 X 13.5 | 6 X 16 |
| Sound level | dB | 65 | 68 | 70 | 70 |
| Net weight | kg | 1300 | 2100 | 2600 | 2900 |
| Operation weight | kg | 1470 | 2300 | 2850 | 3200 |
| Dimension | (H) mm | 1900 | 2100 | 2130 | 2200 |
| | (W) mm | 2200 | 2500 | 2000 | 2500 |
| | (D) mm | 2200 | 3300 | 3800 | 3800 |

* The performance values refer to the following conditions:

Cooling: ambient air temperature 35°C; evaporator water in/out temperature 12/7 °C;

** Sound pressure measured at a distance of 1 m and a height of 1.5 m above the ground in a dear field.

# Models

| Model | unit | TFNP(2.6)ANB | TFNP(4)ANB | TFNP(5)ANB |
|---|---|---|---|---|
| capacity | BTU/hr | 24,940 | 38,400 | 48,960 |
| power input | kw | 2.1 | 3.2 | 4.2 |
| Power supply | 220V/1PH/50Hz | | | |
| Compressor | High efficiency hermetically scroll compressor | | | |
| Quantity | Nr. | 1 | | |
| Energy adjustment | % | 10 ~ 100 | | |
| Evaporator | stainless steel plate heat exchanger | | | |
| Flow rate | M3/hr | 1.1 | 1.7 | 2.22 |
| Water pressure drop | kpa | 22 | 25 | 28 |
| Water pipe connection | DN | DN25 | DN25 | DN25 |
| Condenser | Hydrophilic fins + high efficiency inner grooved copper tubes | | | |
| Fan type | High efficiency axial fan | | | |
| Fan quantity | Nr. | 1 | | |
| Refrigerant | R 410a | | | |
| Refrigerant charge | kg | 2.3 | 3.2 | 4 |
| Sound level | dB | 45 | 50 | 55 |
| Net weight | kg | 83 | 94 | 140 |
| Operation weight | kg | 87 | 110 | 149 |
| Dimension | (H) mm | 996 | 996 | 996 |
| | (W) mm | 340 | 340 | 340 |
| | (D) mm | 990 | 990 | 990 |

* The performance values refer to the following conditions:
Cooling: ambient air temperature 35°C; evaporator water in/out temperature 12/7 °C;
** Sound pressure measured at a distance of 1 m and a height of 1.5 m above the ground in a dear field.

# Models

| Model | unit | TFNP(5)ANA | TFNP(6)ANA | TFNP(6.8)ANA | TFNP(9)ANA |
|---|---|---|---|---|---|
| capacity | BTU/hr | 48,000 | 57,600 | 65,280 | 86,400 |
| power input | kw | 4 | 4.9 | 5.5 | 7.1 |
| Power supply | 380V/3PH/50Hz | | | | |
| Compressor | High efficiency digital scroll compressor | | | | |
| Quantity | Nr. | 1 | | | |
| Energy adjustment | % | 10 ~ 100 | | | |
| Evaporator | stainless steel plate heat exchanger | | | | |
| Flow rate | M3/hr | 2.1 | 2.6 | 2.9 | 3.9 |
| Water pressure drop | kpa | 28 | 29 | 30 | 31 |
| Water pipe connection | DN | DN25 | DN25 | DN25 | DN25 |
| Condenser | Hydrophilic fins + high efficiency inner grooved copper tubes | | | | |
| Fan type | High efficiency axial fan | | | | |
| Fan quantity | Nr. | 1 | 2 | 2 | 2 |
| Refrigerant | R 410a | | | | |
| Refrigerant charge | kg | 4 | 4.8 | 5.44 | 7.2 |
| Sound level | dB | 55 | 57 | 58 | 58 |
| Net weight | kg | 131 | 137 | 145 | 150 |
| Operation weight | kg | 142 | 143 | 157 | 162 |
| Dimension | (H) mm | 1250 | 1250 | 1250 | 1350 |
| | (W) mm | 340 | 340 | 340 | 340 |
| | (D) mm | 940 | 940 | 940 | 940 |

* The performance values refer to the following conditions:

Cooling: ambient air temperature 35°C; evaporator water in/out temperature 12/7 °C;

** Sound pressure measured at a distance of 1 m and a height of 1.5 m above the ground in a dear field.

# Notes

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# Air cooled scroll

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