# TOYO

## Air Condition JAPAN


Japanese Industrial Standard

CE

ISO9001

# Water-cooled screw chiller

## (High cop model)


## Application

School

Colleges &Universities

Shopping

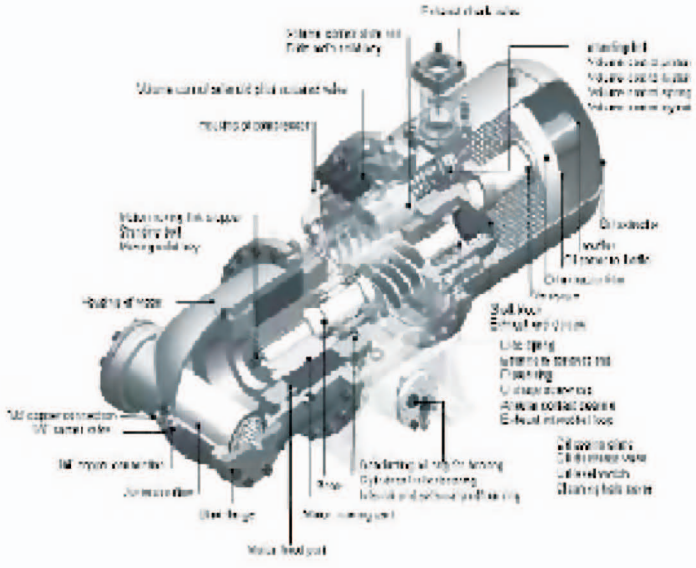
Government

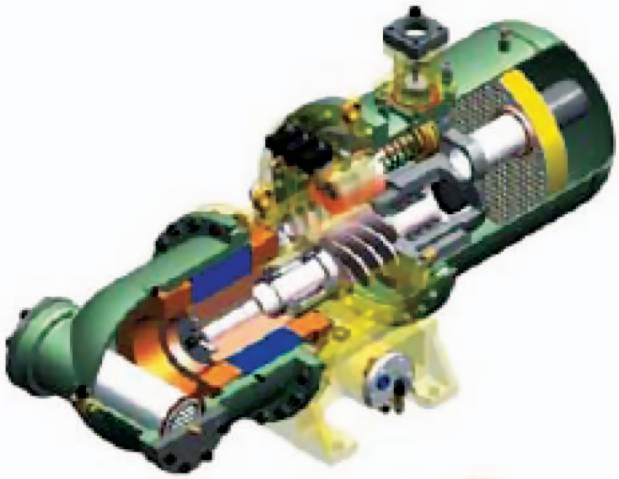
Commercial

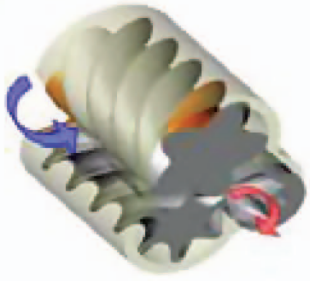
hotel

# Introduction

## COMPRESSOR High efficiency twin screw compressor



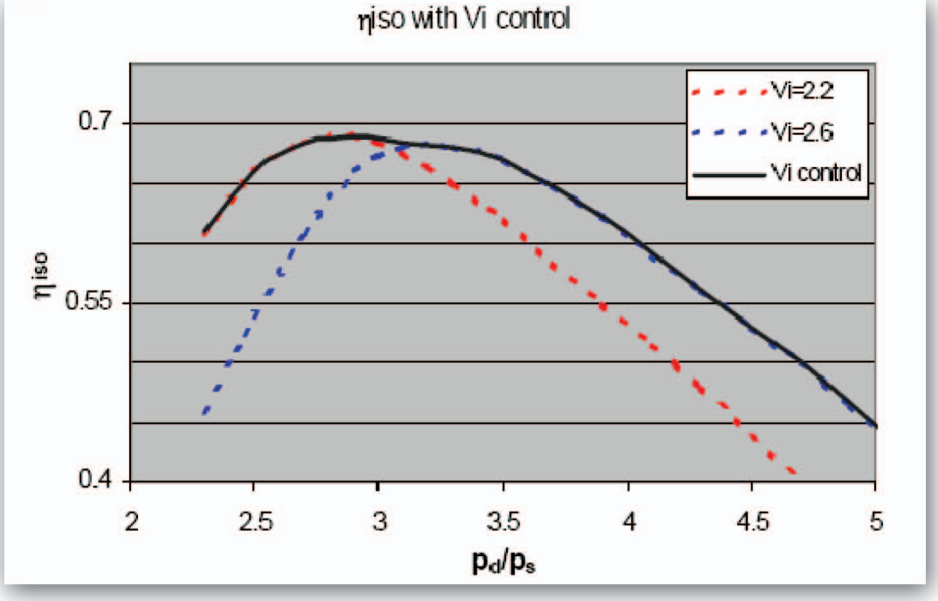




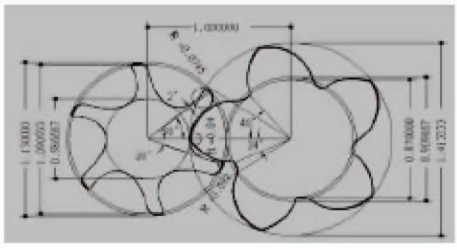
**1. Adopt international famous brand twin-screw compressor, 5:6 unsymmetrical Structure, specially made slide valve structure, can save 10% energy comparing with Common screw compressor;**

**2. Star-Delta start method, reduce the start current;**

**Capacity control is infinitely variable enabling Capacity requirements to be closely matched by modulating the sliding valve position.**
**According to the chilled water control condition.**



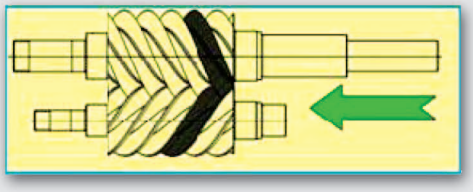
This semi-hermetic twin-screw compressor is developed especially for applications in air-conditioning and refrigeration. With a built-in high operating load design, each compressor is high efficiency and reliability in all working conditions such as thermal storage, and heat pump system. Each compressor has the latest and advanced 5 to 6 Patented Profile design

## Compressor working:

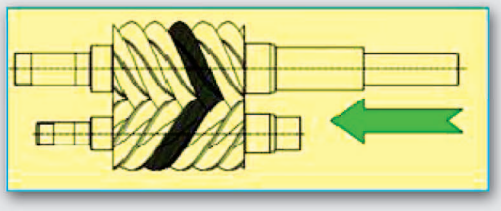
### 1-Suction:

While the rotors rotating, the refrigerant is sucked inside from the lower position of the rotors.



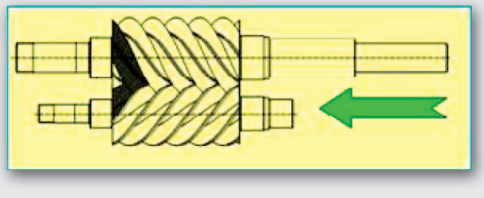
### 2-Compression:

Since the rotors running, the room between the gears (V room) reduces because of the mating , which makes the gas compressed and the pressure increased.



### 3-Discharge

The V room connects to the discharge port, which start the discharge process.
This process continues until the gas gets out completely.



## Multinational patents of high-efficiency screw rotors

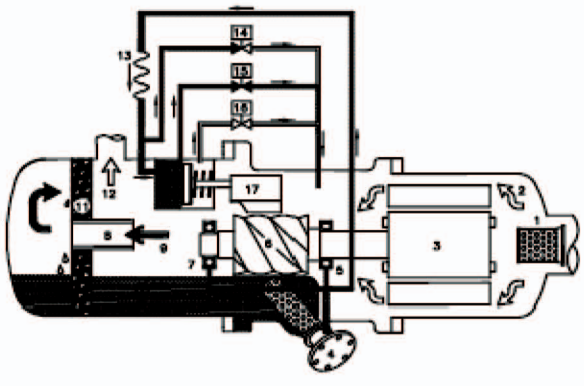
The new 5:6 high efficiency screw rotor profile is patented in Japan ,Taiwan, Italy, UK and US. This new large-volume, high-efficiency rotor profile is designed especially for modern refrigerant characteristics.

High - efficiency screw rotors are accomplished by using precision CNC machining centers, rotor milling machines, rotor grinding machines. Strict ISO 9001 process controlling and the application of precise inspection equipments, such as ZEISS 3D coordinate measuring machines, ensure high-efficiency, high-quality, low noise and low-vibration HANBELL RC2 series screw compressors.

## Capacity control system

### 1-3 or 4-step capacity control system:

There are two (For RC2-100, RC2-140, RC2-180) or three (for the rest 23 models) solenoid valves equipped on the compressor that control the compressor capacity from minimum capacity to full load (100%). There are two / three normally closed (NC) solenoid valves that are used to control the various required capacity. For the compressor with 3-step / 4-step capacity control system, it is usual to use the sequence of min.%-66%-100% / min.%-50%-75%-100% to load the capacity of compressor and to use the sequence of 100%-66%-min.%/100%-75%-50%-min% to unload the capacity. If min% capacity is kept for a long time, the problem of oil return, motor cooling, high discharge temperature should be solved by adding accessories such as oil level switch for monitoring the oil level, liquid injection devices for cooling motor coil and reducing discharge temperature.. Min% is recommended for start and stop only, not for long-termed operation.



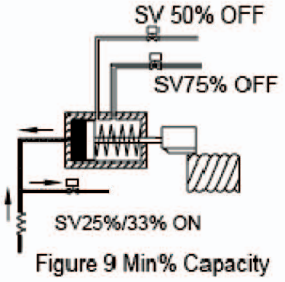


Figure 9 Min% Capacity

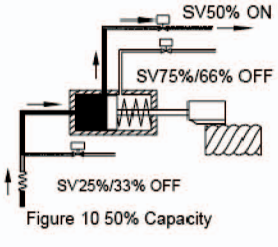


Figure 10 50% Capacity

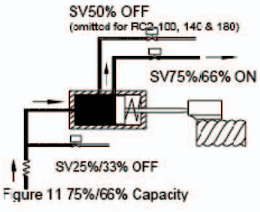


Figure 11 75%/66% Capacity

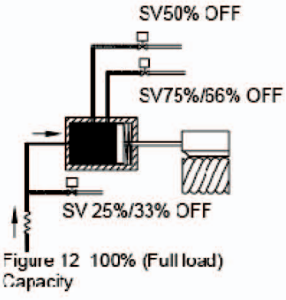


Figure 12 100% (Full load) Capacity

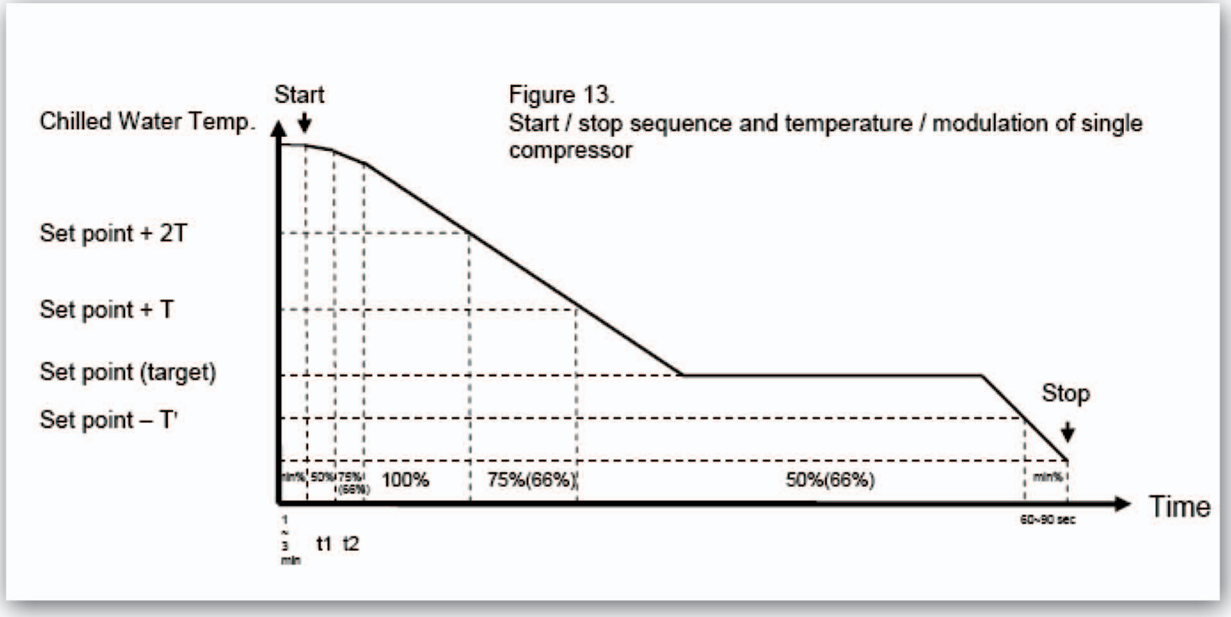
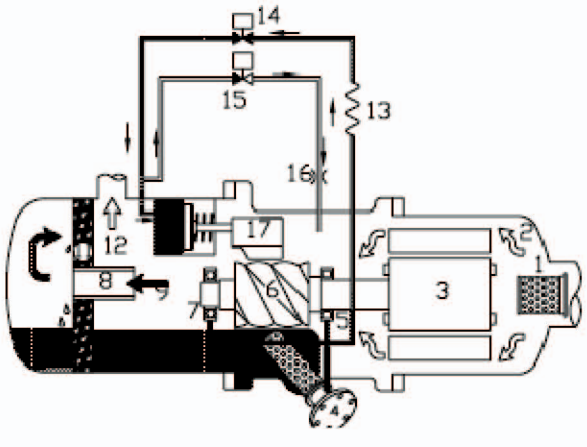


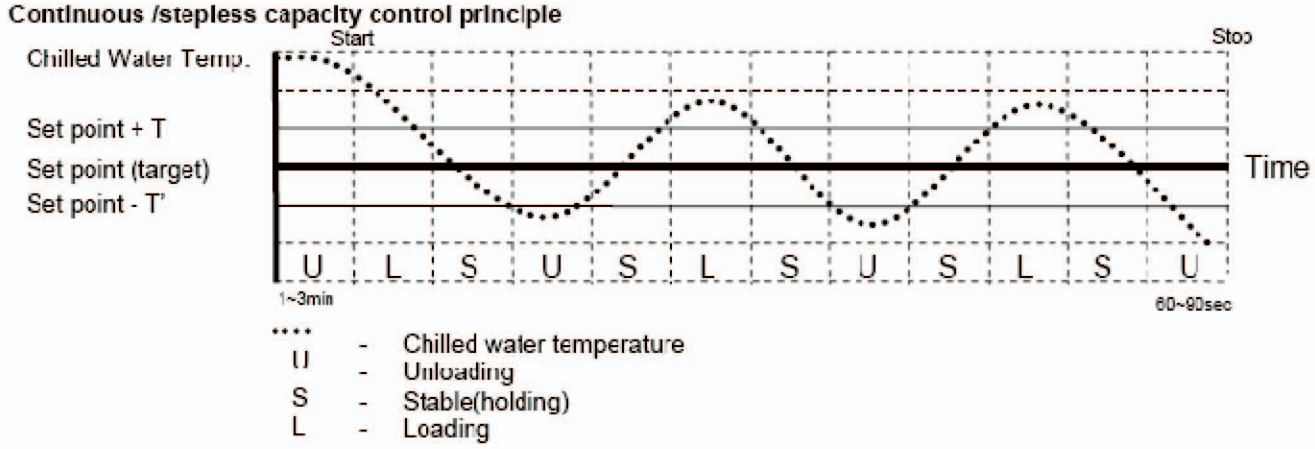

Figure 13.
Start / stop sequence and temperature / modulation of single compressor

## 2-Continuous (stepless) capacity control system:

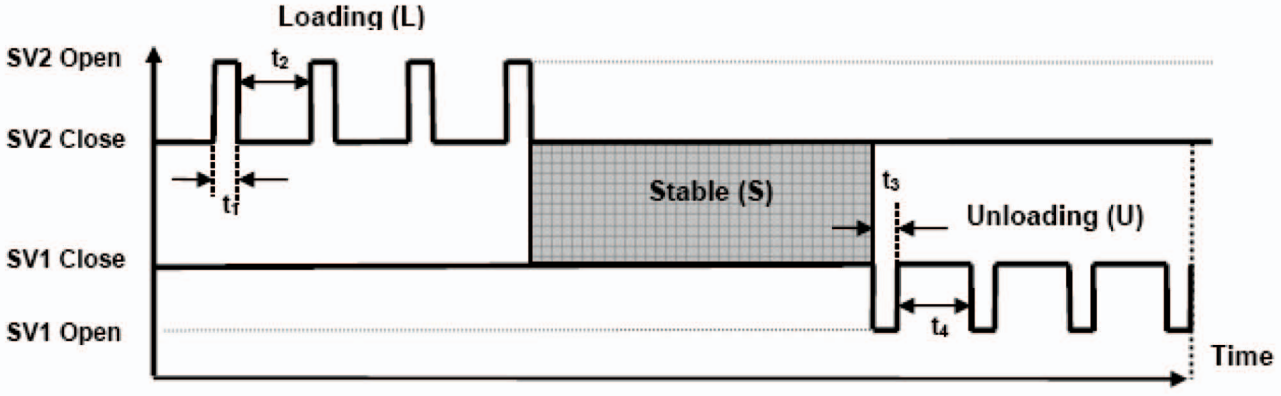
**In continuous (stepless) capacity control system, solenoid valve SV2 (for loading) and solenoid valve SV1 (for unloading) are equipped to inlet and outlet of piston cylinder respectively. These two solenoid valves are controlled by chiller temperature controller or micro controller so refrigeration capacity hence can be modulated anywhere within min% ~ 100%. Min% is recommended for start and stop only, not for long-termed operation. It is very important for any controller to control loading and unloading in stable condition. For a smooth modulation, HANBELL installs a capillary in loading oil line and an additional orifice valve in unloading oil line to avoid too fast loading and unloading.**



**Continuous /stepless capacity control principle**



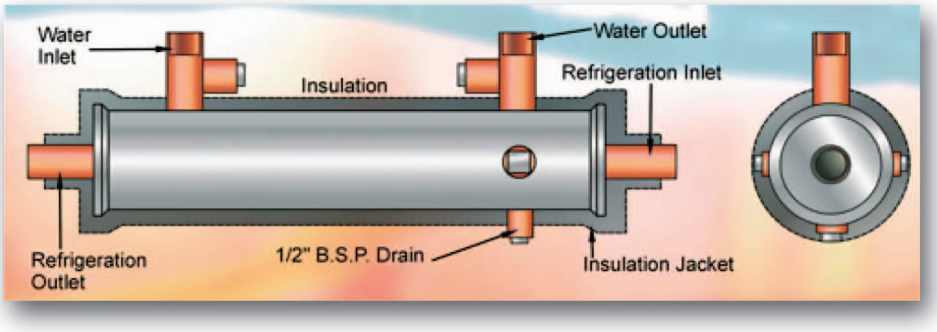

**Loading/unloading functions**

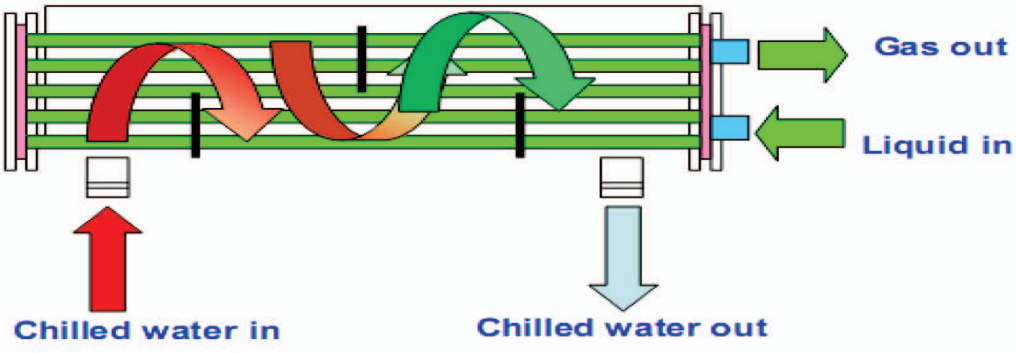



## EVAPRATOR

### DRY TYPE:

**A typical arrangement of a dry type or direct expansion shell and tube chiller is shown in Fig 1. It is a more common arrangement for the refrigerant inlet and outlet to be at the same end as shown in the cutaway illustration in Fig. These are normally used with positive displacement compressors such as reciprocating, rotary or screw machines.**





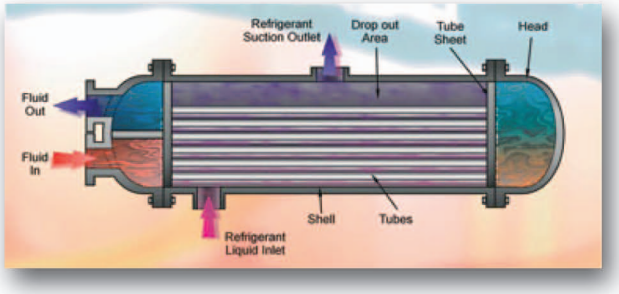

Dry type evaporator screw chiller is equipped with high efficiency shell and tube evaporator that are constructed by seamless steel tube with anti-corrosive treatment. The evaporator is a direct expansion type with refrigerant inside the copper tubes and water on the outside. The copper tubes are roll expanded into carbon steel tube plates.

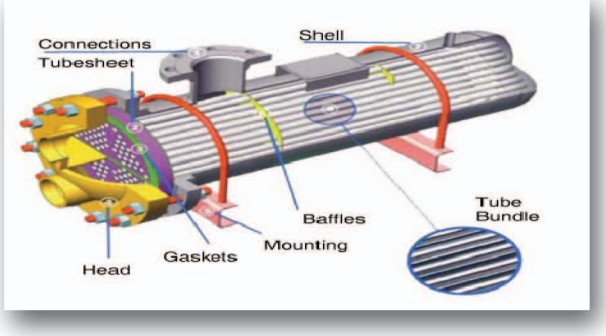
Constructed with seamless integrally finned copper, the water pipe system makes the evaporator attain optimal heat exchange efficient. Two return passages of water flow and the straight water pipe is easy for cleaning and maintenance. Both end covers are made of iron and attached with protection valve and snuffle valve. Also they are removable, which makes it available for altering water piping arrangement.

The design working pressure for both evaporator and condenser are 1.0MPa, higher pressure

## FLOODED TYPE:

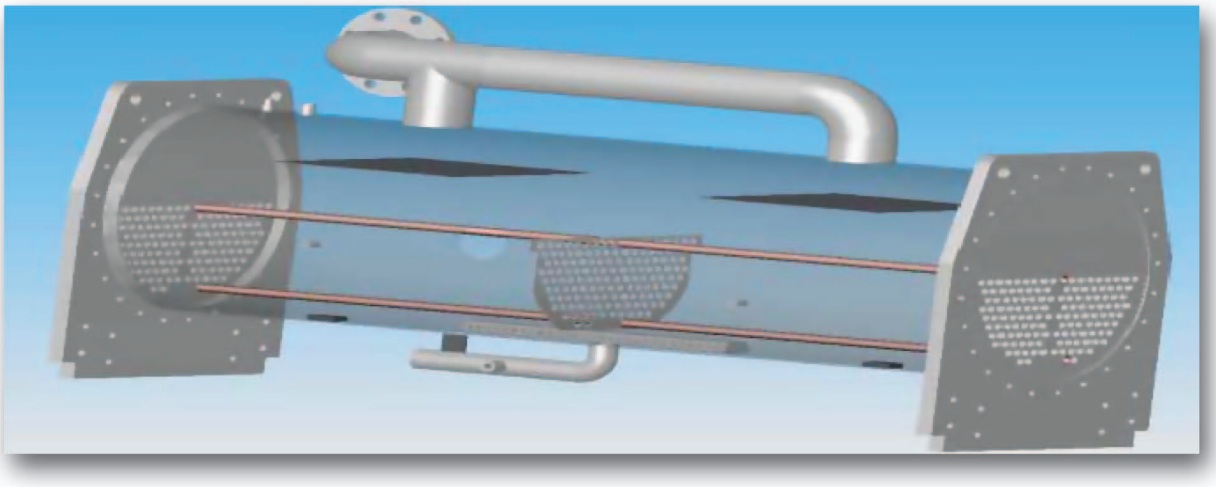
There is also a type of shell and tube chiller where the water runs through the tubes and the refrigerant flows over the outside of the tubes within a closed shell. This is known as a hooded arrangement or flooded type. However, this arrangement is not as common as the dry type of construction. Approximately 50% to 75% of the tubes are immersed in liquid refrigerant and the space above provides an allowance for the vapor generated through evaporation of the liquid below. This type is more often used with screw or centrifugal type compressors.



There is a variant of the hooded or flooded type known as the semi-flooded type where only the bottom row of tubes are immersed in the liquid refrigerant. A trough is often employed to ensure good distribution of liquid refrigerant along the full length of the evaporator as correct refrigerant distribution within the shell is important to ensure the tube bundle above is adequately wetted.

The refrigerant liquid and vapor mixture is normally supplied to the bottom of the shell via a distributor that supplies the refrigerant evenly under the tubes.

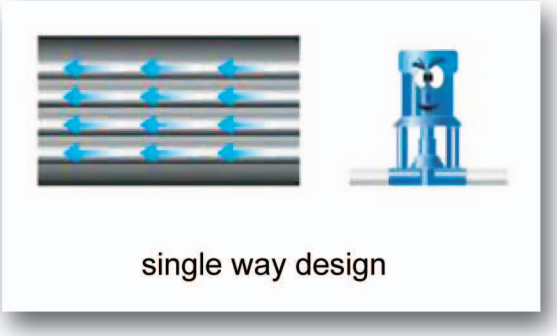


The warmer liquid (water or brine) flowing through the tubes causes evaporation of the liquid portion of the refrigerant. The resulting vapor bubbles rise through the tube bundle and the liquid surrounding the tubes becomes frothy and also foams of oil is present in reasonable quantity.

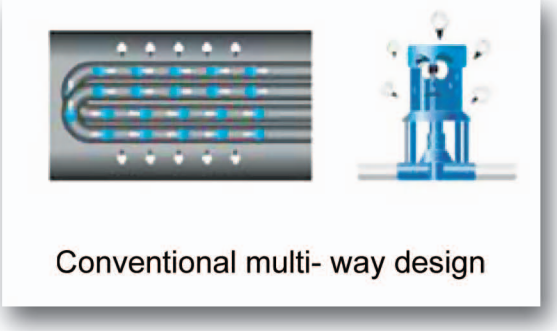
## Evaporator comparison

| Flooded type | Dry type |
|---|---|
| Piping circuit ：water,<br>shell circuit ：refrigerant | Piping circuit refrigerant ,<br>Shell circuit ：water |
| High heat exchange efficiency | Low heat exchange efficiency |
| Easy to clean | Not easy to clean (can't tear down ) |
| No leakage （packaged welding） | East to leakage （sealed with gasket) |
| Small flow resistance | Big flow resistance |
| Special oil return system | Oil return by flow speed |

## Reduce the water resistance



single way design



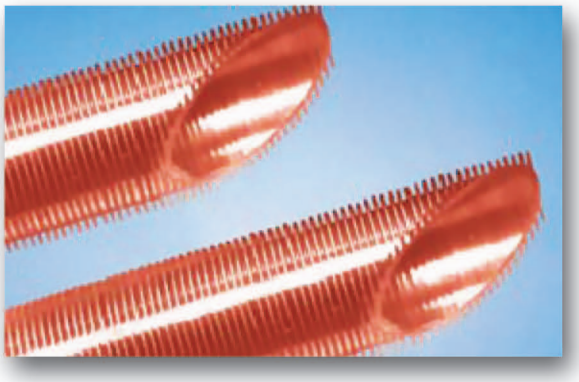
Conventional multi- way design

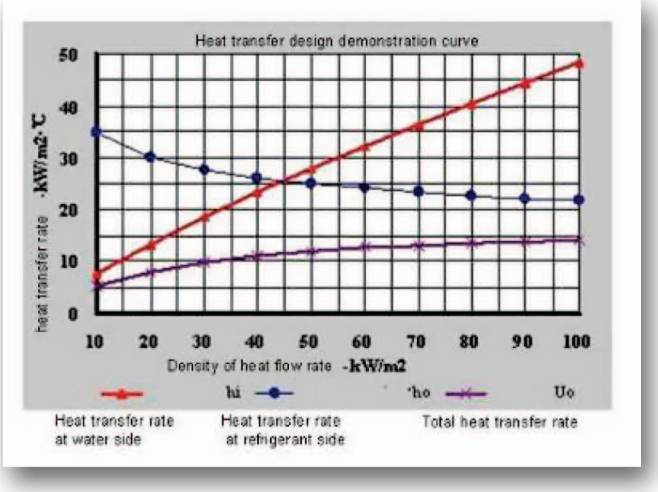
**Twin-head unit adopt special single way flow design, maximum water resistance is 32KPa, lower 50% than normal conventional unit. Cooling Water pump power consumption reduce 12%,and Condenser water resistance reduces 30%;**

## High efficient tube

**According to the heat exchange efficiency of refrigerant side and water side, calculate the numbers of tube and get the heat exchange efficiency;**

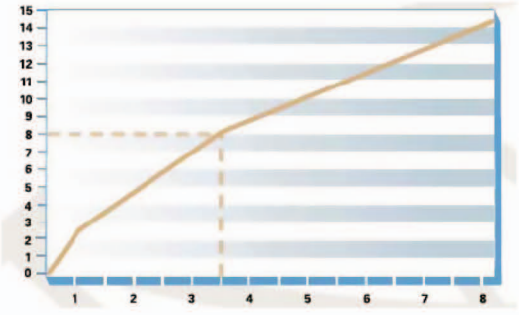
**Use inside and outside strengthened heat exchanger tube to make the heat exchange efficiency reach to the best Definite the best liquid distribution type based on two phase flow principle. The refrigerant enters the evaporator evenly to ensure each heat exchange tube can transfer heat well.**



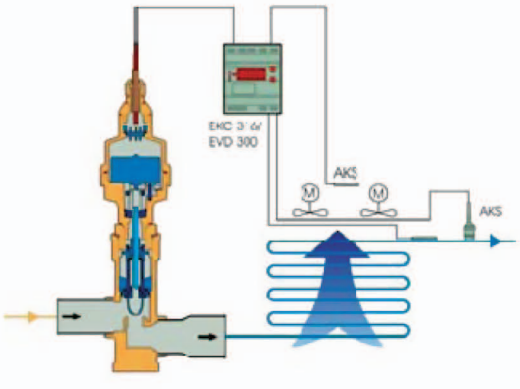


## Special Oil separator

Toyo design, oil separator efficiency reaches more than 99.9%, Reduce the refrigerant side thermo resistance effectively, Increase heat exchange efficiency;



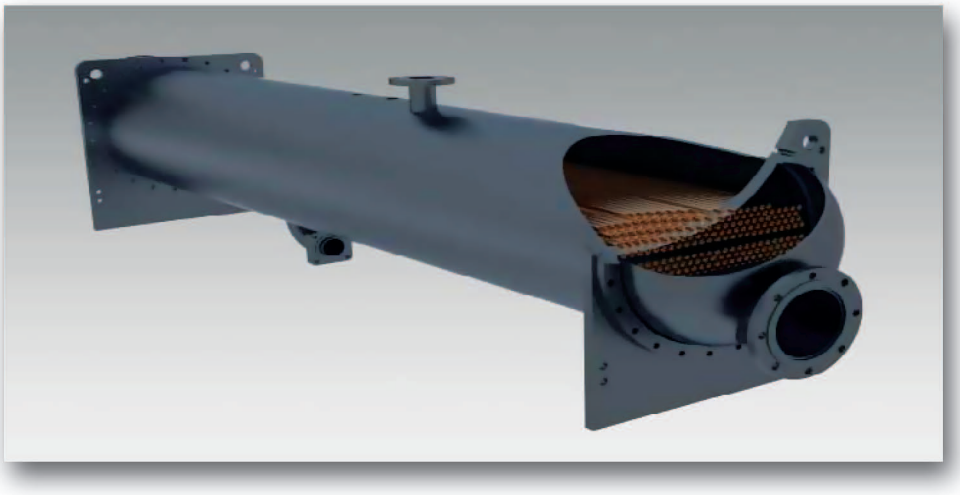

## Electronic expansion valve




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 to fully 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.

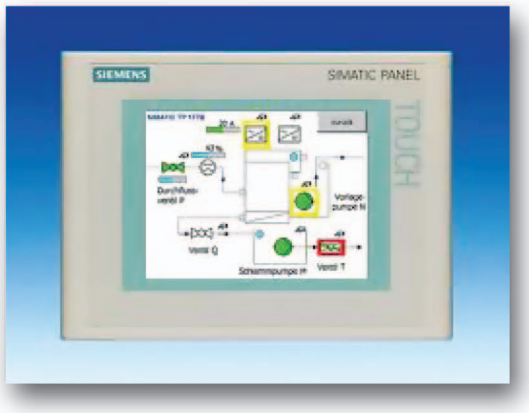
## Condenser



Shell and tube heat exchanger with external still sheet shell and internal cooper pipe bundled. The cooper pipe are expanded in to terminal plates at the end. The head plates can be removed for maintenance procedures. The water connection can be used for operation with cooling tower.

It can be designed to suitable for different fouling factors. There is a reserved 15% heat exchange capacity design which can make the condenser provide enough capacity even the cooling water temperature reaches 32 or there is fouling inside the water system.

## Electronic control




- 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)

## BMS

The unit can connect to BMS system to realize remote control;
RS-485 control connector, adopt international universal Modbus RTU protocol. Customer can use configuration software or VB, VC software to realize equipment's monitoring, multiple equipments' central control and communication with third parties BMS.

## Safety Protection Function

Protection on low cooling water leaving temperature, low oil pressure, high refrigerant pressure, electric leak, and compressor overload, high/low electrical voltage and phase lack.

## TWS 50 – 230 (screw compressor)R22

| TWS(50-230)ADAD | | | 50 | 65 | 75 | 90 | 100 | 105 | 110 | 140 | 160 | 175 | 205 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cooling capacity | | BTU/HR | 600,000 | 780,000 | 900,000 | 108,000 | 120,000 | 1,260,000 | 1,320,000 | 1,680,000 | 1,920,000 | 2,100,000 | 2,460,000 | 2,640,000 |
| Power supply | | | 380V/3N/50Hz | | | | | | | | | | | |
| Compressor | | | Advanced asymmetric semi hermetic twin screw compressor | | | | | | | | | | | |
| Qty/refrigerant circuit | | Nr. | 1/1 | 1/1 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 |
| Cooling power input* | | kW | 36 | 44 | 52 | 62 | 68 | 70 | 76 | 98 | 112 | 120 | 142 | 164 |
| Energy adjustment steps | | % | 25%~100% | | 12.5%~100% | | | | | | | | | |
| Refrigerant charge | | kg | 32 | 39 | 46 | 55 | 60 | 64 | 68 | 85 | 100 | 107 | 126 | 142 |
| Condenser | | | Shell & tube heat exchanger | | | | | | | | | | | |
| Water side pressure drop | | kPa | 45 | 45 | 45 | 45 | 45 | 45 | 46 | 46 | 46 | 47 | 47 | 46 |
| Pipe size | | mm | DN80 | DN80 | DN100 | DN100 | DN100 | DN100 | DN100 | DN125 | DN125 | DN125 | DN125 | DN125 |
| Water flow rate | | $m^3/h$ | 37 | 45 | 54 | 64 | 70 | 74 | 78 | 99 | 116 | 124 | 147 | 165 |
| Evaporator | | | Shell & tube heat exchanger (dry type) | | | | | | | | | | | |
| Water side pressure drop | | kPa | 45 | 45 | 45 | 45 | 45 | 46 | 46 | 46 | 47 | 46 | 46 | 46 |
| Pipe size | | mm | DN65 | DN80 | DN100 | DN100 | DN100 | DN100 | DN100 | DN125 | DN125 | DN125 | DN125 | DN125 |
| Water flow rate in cooling* | | $m^3/h$ | 31 | 38 | 45 | 53 | 58 | 62 | 65 | 83 | 96 | 103 | 122 | 138 |
| Noise level | | dB(A) | 68 | 69 | 69 | 70 | 70 | 72 | 73 | 73 | 73 | 73 | 74 | 74 |
| Dimension | Length | mm | 2685 | 2720 | 2660 | 2880 | 2870 | 3170 | 3270 | 3170 | 3180 | 3180 | 3505 | 3505 |
| | Width | mm | 1090 | 1115 | 1175 | 1125 | 1125 | 1125 | 1230 | 1200 | 1285 | 1285 | 1280 | 1315 |
| | Height | mm | 1625 | 1555 | 1650 | 1645 | 1685 | 1685 | 1685 | 1685 | 1805 | 1805 | 1970 | 1990 |
| Net weight | | kg | 1600 | 1800 | 1900 | 2000 | 2100 | 2200 | 2250 | 2400 | 3000 | 3100 | 3500 | 3800 |

* Performance values refer to the following conditions:

Condenser water inlet/outlet temperature: 30°C/35°C, evaporator water inlet/outlet temperature: 12°C/7°C.

Noise level measured in free field condition at distance of 1 meter.

## TWS 260– 530 (screw compressor)R22

| TWS(260-530)ADAD | | | 260 | 270 | 275 | 320 | 340 | 360 | 390 | 420 | 475 | 490 | 530 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cooling capacity | | BTU/HR | 3,120,000 | 3,240,000 | 3,300,000 | 3,840,000 | 4,080,000 | 4,320,000 | 4,680,000 | 5,040,000 | 5,700,000 | 5,880,000 | 6,360,000 |
| Power supply | | | 380V/3N/50Hz | | | | | | | | | | |
| Compressor | | | Advanced asymmetric semi hermetic twin screw compressor | | | | | | | | | | |
| Qty/refrigerant circuit | | Nr. | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 |
| Cooling power input* | | kW | 181 | 189 | 193 | 225 | 237 | 249 | 273 | 295 | 333 | 341 | 369 |
| Energy adjustment steps | | % | 12.5%~100% | | | | | | | | | | |
| Refrigerant charge | | kg | 160 | 167 | 171 | 199 | 210 | 220 | 242 | 261 | 295 | 302 | 327 |
| Condenser | | | Shell & tube heat exchanger (dry type) | | | | | | | | | | |
| Water side pressure drop | | kPa | 46 | 46 | 46 | 46 | 46 | 47 | 46 | 46 | 48 | 47 | 48 |
| Pipe size | | mm | 2-DN125 | 2-DN125 | 2-DN125 | 2-DN125 | 2-DN125 | 2-DN125 | 2-DN125 | 2-DN125 | 2-DN150 | 2-DN150 | 2-DN150 |
| Water flow rate in cooling* | | $m^3/h$ | 186 | 194 | 198 | 231 | 244 | 256 | 281 | 304 | 343 | 351 | 380 |
| Evaporator | | | Shell & tube heat exchanger (dry type) | | | | | | | | | | |
| Water side pressure drop | | kPa | 46 | 47 | 47 | 46 | 47 | 46 | 46 | 46 | 46 | 46 | 46 |
| Pipe size | | mm | DN125 | DN150 | DN150 | DN150 | DN150 | DN150 | DN200 | DN200 | DN200 | DN200 | DN200 |
| Water flow rate in cooling* | | $m^3/h$ | 155 | 162 | 165 | 193 | 203 | 213 | 234 | 253 | 285 | 292 | 316 |
| Noise leve | | dB(A) | 74 | 73 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 75 |
| Dimension | Length | mm | 3505 | 3520 | 4060 | 4505 | 4505 | 4505 | 4660 | 4660 | 4660 | 4660 | 4660 |
| | Width | mm | 1375 | 1380 | 1415 | 1415 | 1415 | 1415 | 1460 | 1460 | 1585 | 1585 | 1585 |
| | Height | mm | 1980 | 1980 | 1975 | 2000 | 2000 | 2000 | 2090 | 2090 | 2215 | 2215 | 2240 |
| Net weight | | kg | 4000 | 4100 | 4210 | 4400 | 4740 | 5600 | 6600 | 6800 | 7000 | 7400 | 8000 |

* Performance values refer to the following conditions:

Condenser water inlet/outlet temperature: 30°C/35°C, evaporator water inlet/outlet temperature: 12°C/7°C.

Noise level measured in free field condition at distance of 1 meter.

## TWS 40 – 120 (screw compressor)R134a

| TWS(40-120)ASAD | | | 40 | 50 | 60 | 70 | 75 | 80 | 90 | 105 | 110 | 120 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cooling capacity | | BTU/HR | 480,000 | 600,000 | 720,000 | 840,000 | 900,000 | 960,000 | 1,080,000 | 1,260,000 | 1,320,000 | 1,440,000 |
| Power supply | | | 380V/3N/50Hz | | | | | | | | | |
| Compressor | | | Advanced asymmetric semi hermetic twin screw compressor | | | | | | | | | |
| Qty/refrigerant circuit | | Nr. | 1/1 | 1/1 | 1/1 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 |
| Cooling power input* | | kW | 26 | 33 | 39 | 48 | 50 | 58 | 60 | 70 | 76 | 82 |
| Energy adjustment steps | | % | 25%~100% | | | 12.5%~100% | | | | | | |
| Refrigerant charge | | kg | 32 | 39 | 46 | 55 | 60 | 64 | 68 | 85 | 100 | 107 |
| Condenser | | | Shell & tube heat exchanger (dry type) | | | | | | | | | |
| Water side pressure drop | | kPa | 42 | 45 | 44 | 44 | 45 | 45 | 44 | 44 | 44 | 42 |
| Pipe size | | mm | DN80 | DN80 | DN100 | DN100 | DN100 | DN100 | DN100 | DN125 | DN125 | DN125 |
| Water flow rate in cooling* | | $m^3/h$ | 27 | 35 | 41 | 49 | 54 | 58 | 64 | 74 | 78 | 86 |
| Evaporator | | | Shell & tube heat exchanger (dry type) | | | | | | | | | |
| Water side pressure drop | | kPa | 42 | 45 | 45 | 45 | 45 | 46 | 46 | 46 | 47 | 46 |
| Pipe size | | mm | DN65 | DN80 | DN100 | DN100 | DN100 | DN100 | DN100 | DN125 | DN125 | DN125 |
| Water flow rate in cooling* | | $m^3/h$ | 22 | 29 | 34 | 41 | 45 | 48 | 53 | 62 | 65 | 72 |
| Noise level | | dB(A) | 68 | 69 | 69 | 70 | 70 | 72 | 73 | 73 | 73 | 73 |
| Dimension | Length | mm | 2685 | 2720 | 2660 | 2880 | 2870 | 3170 | 3270 | 3170 | 3180 | 3180 |
| | Width | mm | 1090 | 1115 | 1175 | 1125 | 1125 | 1125 | 1230 | 1200 | 1285 | 1285 |
| | Height | mm | 1625 | 1555 | 1650 | 1645 | 1685 | 1685 | 1685 | 1685 | 1805 | 1805 |
| Net weight | | kg | 1600 | 1800 | 1900 | 2000 | 2100 | 2200 | 2250 | 2400 | 3000 | 3100 |

* Performance values refer to the following conditions:

Condenser water inlet/outlet temperature: 30°C/35°C, evaporator water inlet/outlet temperature: 12°C/7°C.

Noise level measured in free field condition at distance of 1 meter.

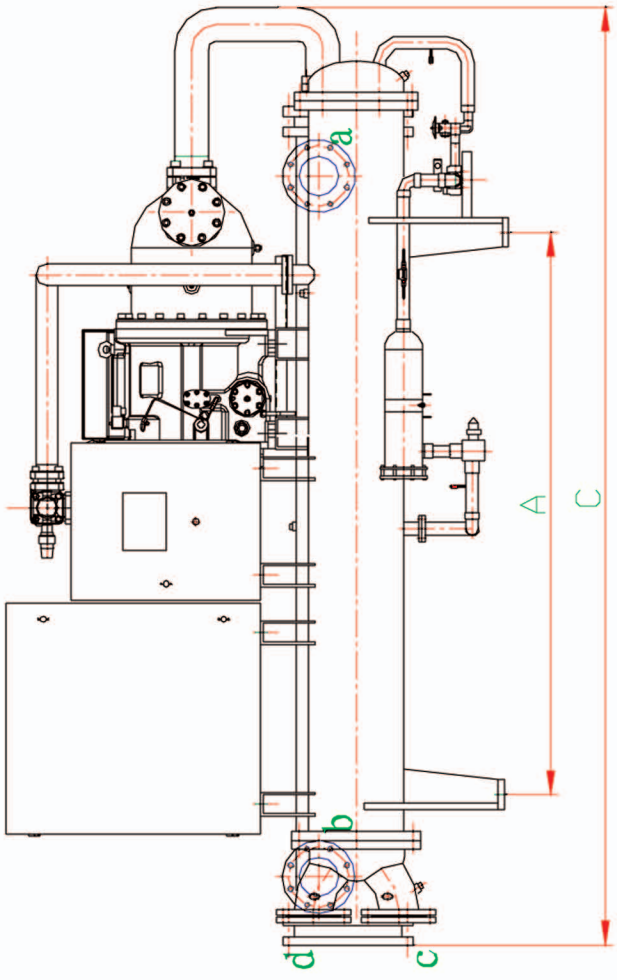
## TWS 140 – 320 (screw compressor)R134a

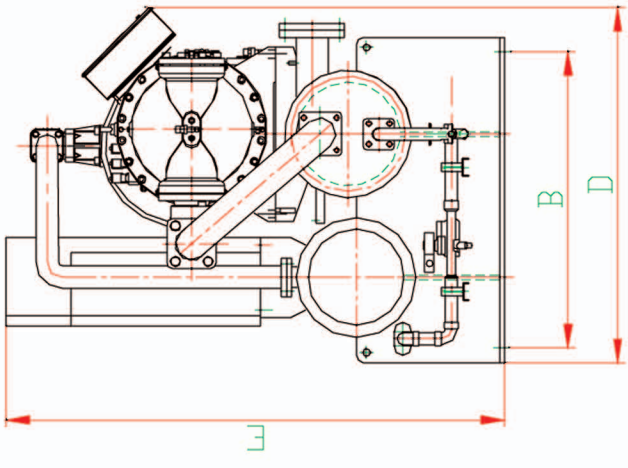
| TWS(140-320)ASAD | | | 140 | 150 | 175 | 200 | 205 | 220 | 245 | 275 | 285 | 320 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cooling capacity | | BTU/HR | 1,680,000 | 1,800,000 | 2,100,000 | 2,400,000 | 2,460,000 | 2,640,000 | 2,940,000 | 3,300,000 | 3,420,000 | 3,840,000 |
| Power supply | | 380V/3N/50Hz | | | | | | | | | | |
| Compressor | | Advanced asymmetric semi hermetic twin screw compressor | | | | | | | | | | |
| Qty/refrigerant circuit | | Nr. | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 |
| Cooling power input* | | kW | 94 | 104 | 120 | 134 | 140 | 150 | 169 | 189 | 197 | 220 |
| Energy adjustment steps | | % | 12.5%~100% | | | | | | | | | |
| Refrigerant charge | | kg | 126 | 142 | 160 | 167 | 171 | 199 | 210 | 220 | 242 | 261 |
| Condenser | | Shell & tube heat exchanger (dry type) | | | | | | | | | | |
| Water side pressure drop | | kPa | 42 | 42 | 44 | 42 | 44 | 42 | 44 | 42 | 44 | 44 |
| Pipe size | | mm | 2-DN125 | 2-DN125 | 2-DN125 | 2-DN125 | 2-DN125 | 2-DN125 | 2-DN125 | 2-DN125 | 2-DN125 | 2-DN150 |
| Water flow rate in cooling* | | $m^3/h$ | 99 | 109 | 126 | 140 | 146 | 156 | 177 | 198 | 206 | 231 |
| Evaporator | | Shell & tube heat exchanger (dry type) | | | | | | | | | | |
| Water side pressure drop | | kPa | 46 | 46 | 46 | 47 | 47 | 46 | 47 | 46 | 46 | 46 |
| Pipe size | | mm | DN125 | DN125 | DN125 | DN150 | DN150 | DN150 | DN150 | DN200 | DN200 | DN200 |
| Water flow rate in cooling* | | $m^3/h$ | 83 | 91 | 105 | 117 | 122 | 131 | 148 | 165 | 172 | 193 |
| Noise level | | dB(A) | 74 | 74 | 74 | 73 | 74 | 74 | 74 | 74 | 74 | 74 |
| Dimension | Length | mm | 3505 | 3505 | 3505 | 3520 | 4060 | 4505 | 4505 | 4505 | 4660 | 4660 |
| | Width | mm | 1280 | 1315 | 1375 | 1380 | 1415 | 1415 | 1415 | 1415 | 1460 | 1460 |
| | Height | mm | 1970 | 1990 | 1980 | 1980 | 1975 | 2000 | 2000 | 2000 | 2090 | 2090 |
| Net weight | | kg | 3500 | 3800 | 4000 | 4100 | 4210 | 4400 | 4740 | 5600 | 6600 | 6800 |

## TWS 345 – 570 (screw compressor)R134a

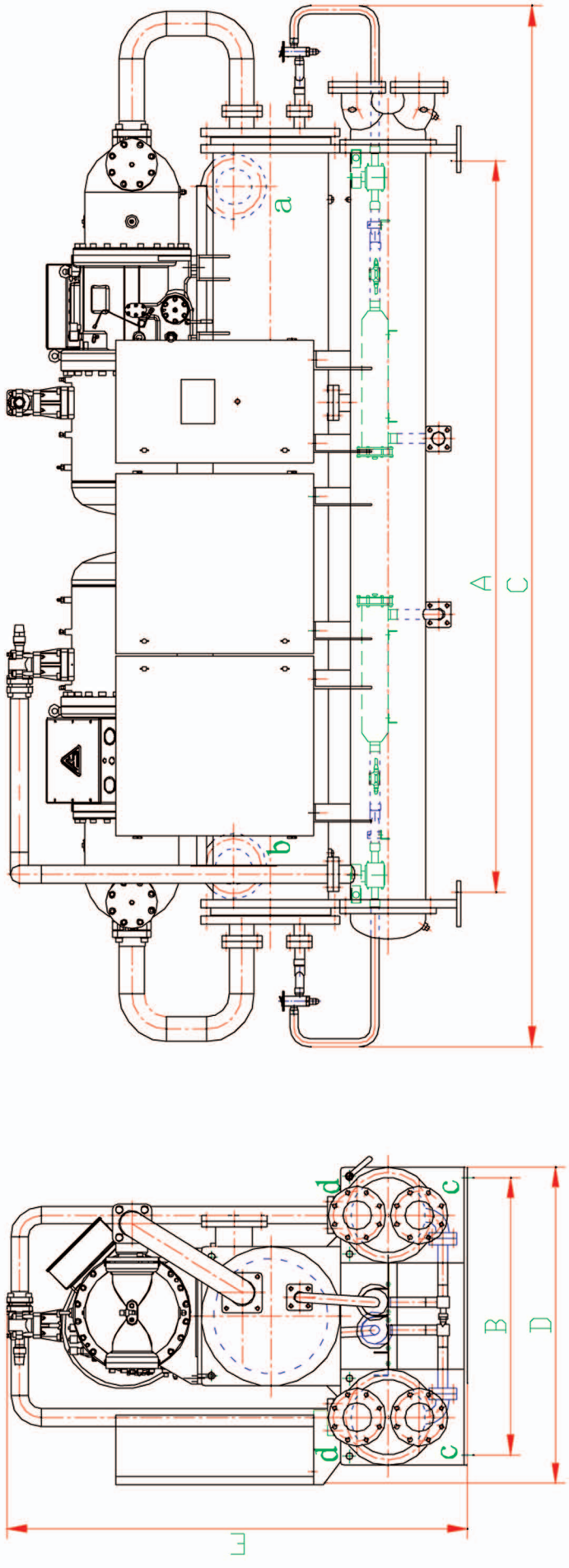
| TWS(345-570)ASAD | | | 345 | 360 | 390 | 420 | 490 | 525 | 570 | 670 | 715 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cooling capacity | | BTU/HR | 4,140,000 | 4,320,000 | 4,680,000 | 5,040,000 | 5,880,000 | 6,300,000 | 6,840,000 | 8,040,000 | 8,580,000 |
| Power supply | | | 380V/3N/50Hz | | | | | | | | |
| Compressor | | | Advanced asymmetric semi hermetic twin screw compressor | | | | | | | | |
| Qty/refrigerant circuit | | Nr. | 2/2 | 2/2 | 2/2 | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 |
| Cooling power input* | | kW | 236 | 246 | 268 | 289 | 339 | 362 | 394 | 463 | 492 |
| Energy adjustment steps | | % | 25%~100% | | | 12.5%~100% | | | | | |
| Refrigerant charge | | kg | 295 | 302 | 327 | 338 | 393 | 430 | 453 | 494 | 537 |
| Condenser | | | Shell & tube heat exchanger (dry type) | | | | | | | | |
| Water side pressure drop | | kPa | 44 | 42 | 45 | 52 | 52 | 52 | 52 | 52 | 52 |
| Pipe size | | mm | 2-DN150 | 2-DN150 | 2-DN150 | 2-DN200 | 2-DN200 | 2-DN200 | 2-DN200 | 2-DN200 | 2-DN200 |
| Water flow rate in cooling* | | $m^3/h$ | 247 | 257 | 280 | 303 | 354 | 379 | 412 | 484 | 515 |
| Evaporator | | | Shell & tube heat exchanger (dry type) | | | | | | | | |
| Water side pressure drop | | kPa | 46 | 46 | 46 | 45 | 45 | 46 | 46 | 47 | 47 |
| Pipe size | | mm | DN200 | DN200 | DN200 | 2-DN150 | 2-DN150 | 2-DN200 | 2-DN200 | 2-DN200 | 2-DN200 |
| Water flow rate in cooling* | | $m^3/h$ | 206 | 215 | 234 | 253 | 296 | 316 | 344 | 404 | 430 |
| Noise level | | dB(A) | 74 | 74 | 75 | 76 | 80 | 80 | 81 | 81 | 81 |
| Dimension | Length | mm | 4660 | 4660 | 4660 | 4600 | 4650 | 4690 | 4600 | 4780 | 4800 |
| | Width | mm | 1585 | 1585 | 1585 | 2250 | 2270 | 2300 | 2450 | 2450 | 2450 |
| | Height | mm | 2215 | 2215 | 2240 | 2350 | 2380 | 2410 | 2460 | 2470 | 2500 |
| Net weight | | kg | 7000 | 7400 | 8000 | 8800 | 9000 | 9800 | 11600 | 12300 | 13000 |

## DIMENSION - R22



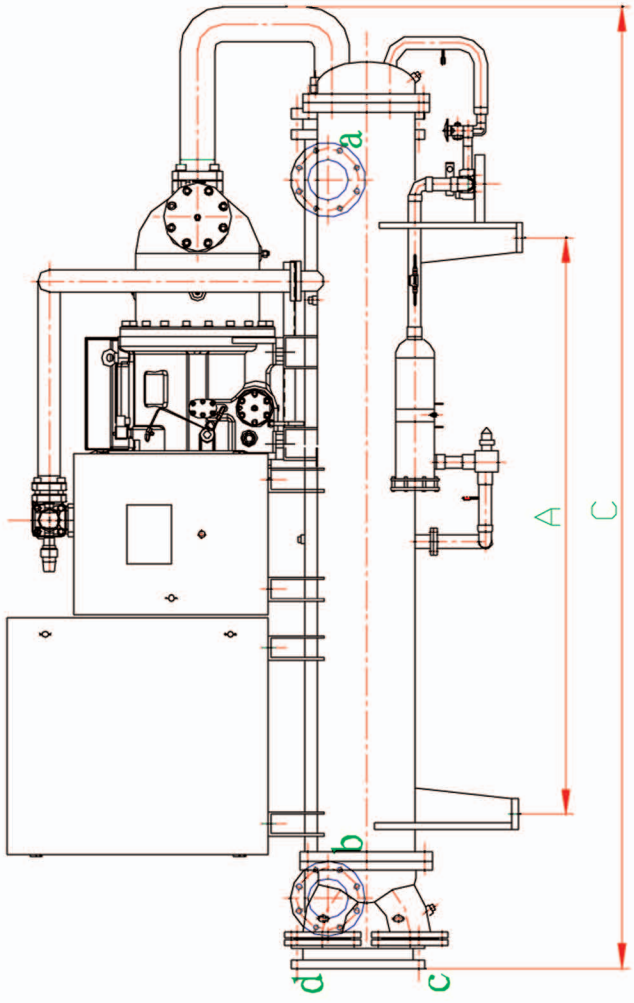



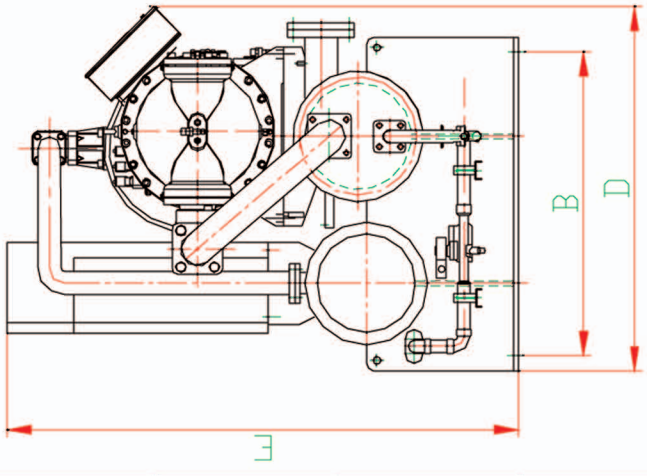

| Model | A | B | C | D | E |
|---|---|---|---|---|---|
| TWS(50)ADAD | 1450 | 900 | 2685 | 1090 | 1625 |
| TWS(60)ADAD | 1600 | 1000 | 2720 | 1115 | 1555 |


a
b
A
C
d
c
B
D
E

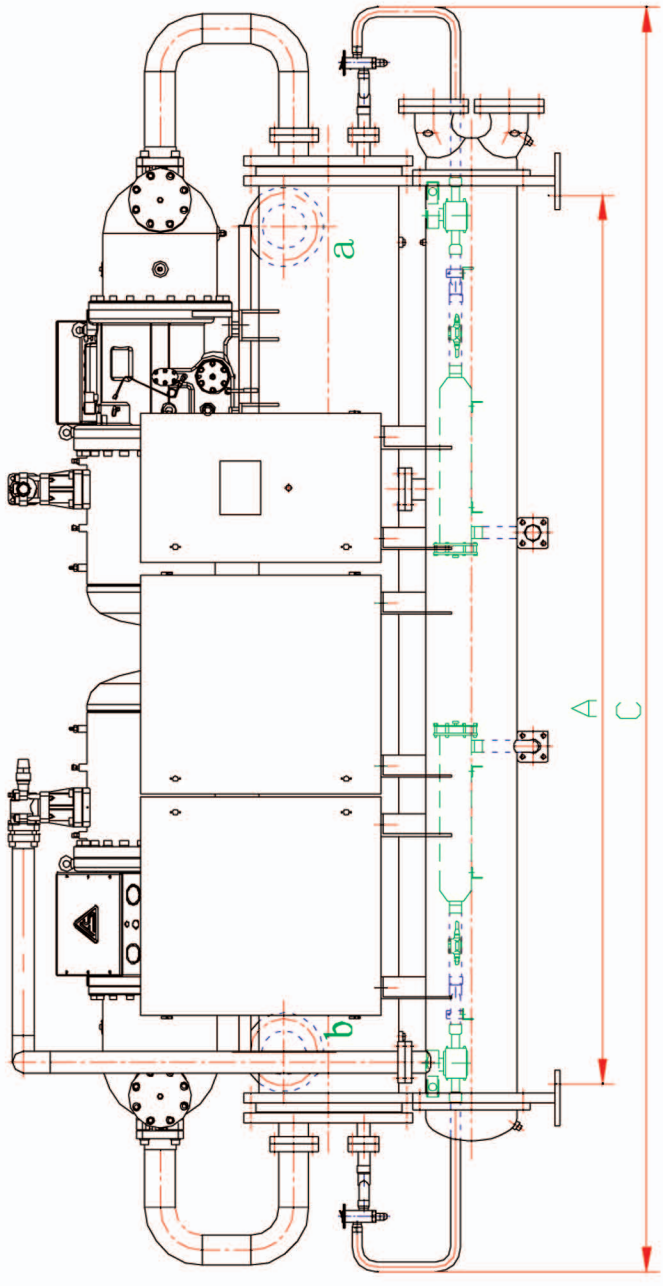
| MODEL | A | B | C | D | E |
|---|---|---|---|---|---|
| TWS(75)ADAD | 1460 | 1000 | 2660 | 1175 | 1650 |
| 90 | 1650 | 1000 | 2880 | 1125 | 1645 |
| 100 | 1650 | 1000 | 2870 | 1125 | 1685 |
| 105 | 1650 | 1000 | 3170 | 1125 | 1685 |
| 110 | 1650 | 1000 | 3270 | 1230 | 1685 |
| 140 | 1900 | 1000 | 3170 | 1200 | 1685 |
| 160 | 2000 | 1000 | 3180 | 1285 | 1805 |
| 175 | 2000 | 1000 | 3180 | 1285 | 1805 |
| 205 | 2050 | 1100 | 3505 | 1280 | 1970 |
| 220 | 2050 | 1100 | 3505 | 1315 | 1990 |
| 260 | 2050 | 1200 | 3505 | 1375 | 1980 |
| 270 | 2050 | 1200 | 3520 | 1380 | 1980 |
| 275 | 2865 | 1200 | 4060 | 1415 | 1975 |
| 320 | 3165 | 1200 | 4505 | 1415 | 2000 |
| 340 | 3165 | 1200 | 4505 | 1415 | 2000 |
| 360 | 3165 | 1200 | 4505 | 1415 | 2000 |
| 420 | 3465 | 1200 | 4660 | 1460 | 2090 |
| 475 | 3465 | 1200 | 4660 | 1460 | 2090 |
| 490 | 3465 | 1300 | 4660 | 1585 | 2215 |
| 530 | 3465 | 1300 | 4660 | 1585 | 2215 |

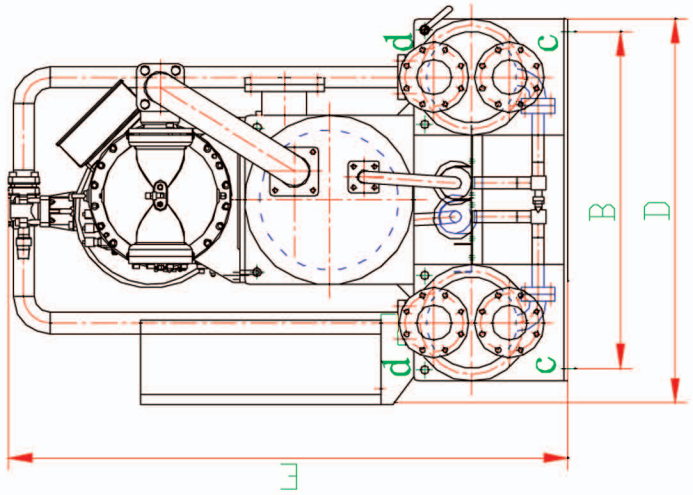
## DIMENSION - R134A



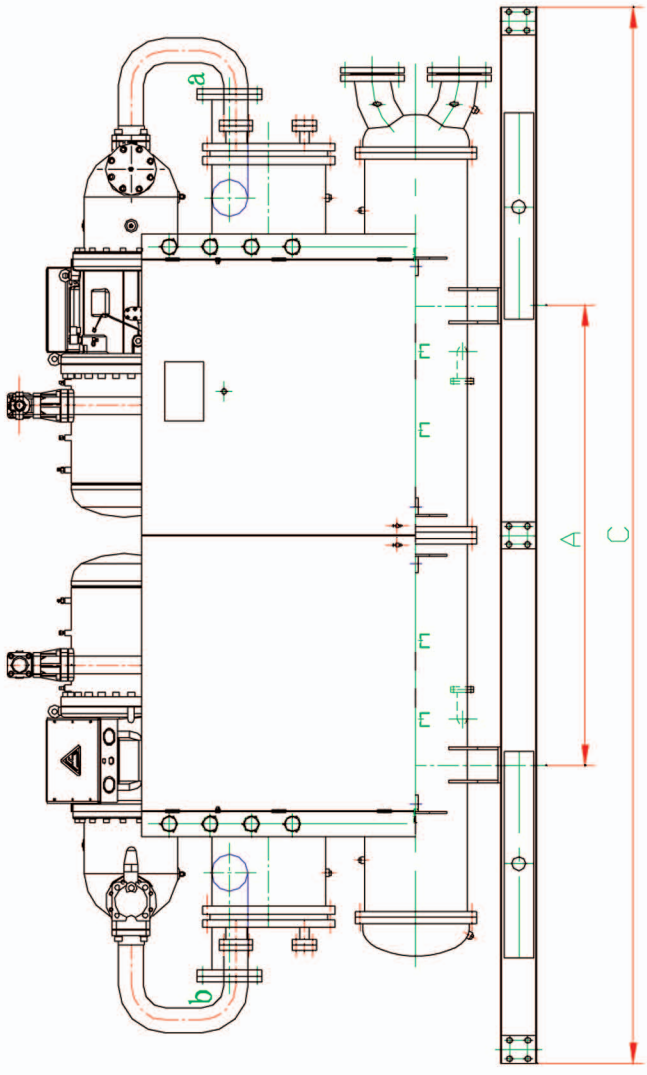



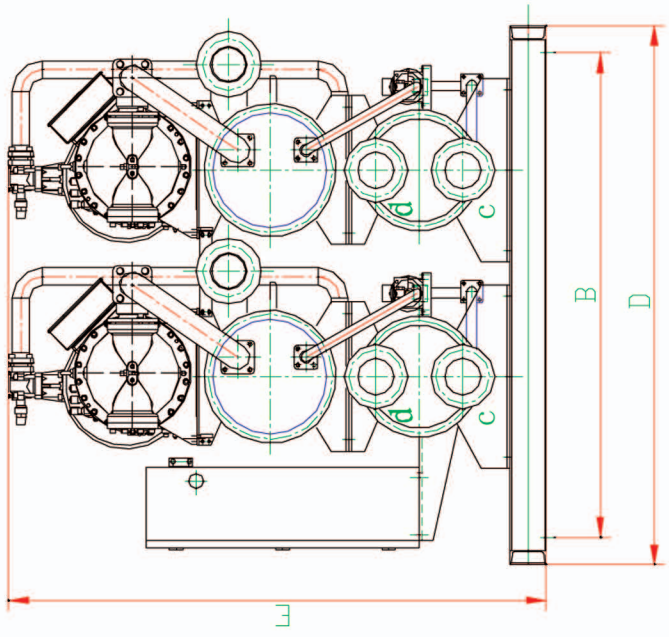

| Model | A | B | C | D | E |
|---|---|---|---|---|---|
| TWS(40)ASAD | 1450 | 900 | 2685 | 1090 | 1625 |
| TWS(50)ASAD | 1600 | 1000 | 2720 | 1115 | 1555 |
| TWS(60)ASAD | 1460 | 1000 | 2660 | 1175 | 1650 |


a
b
A
C


d
c
B
D
E

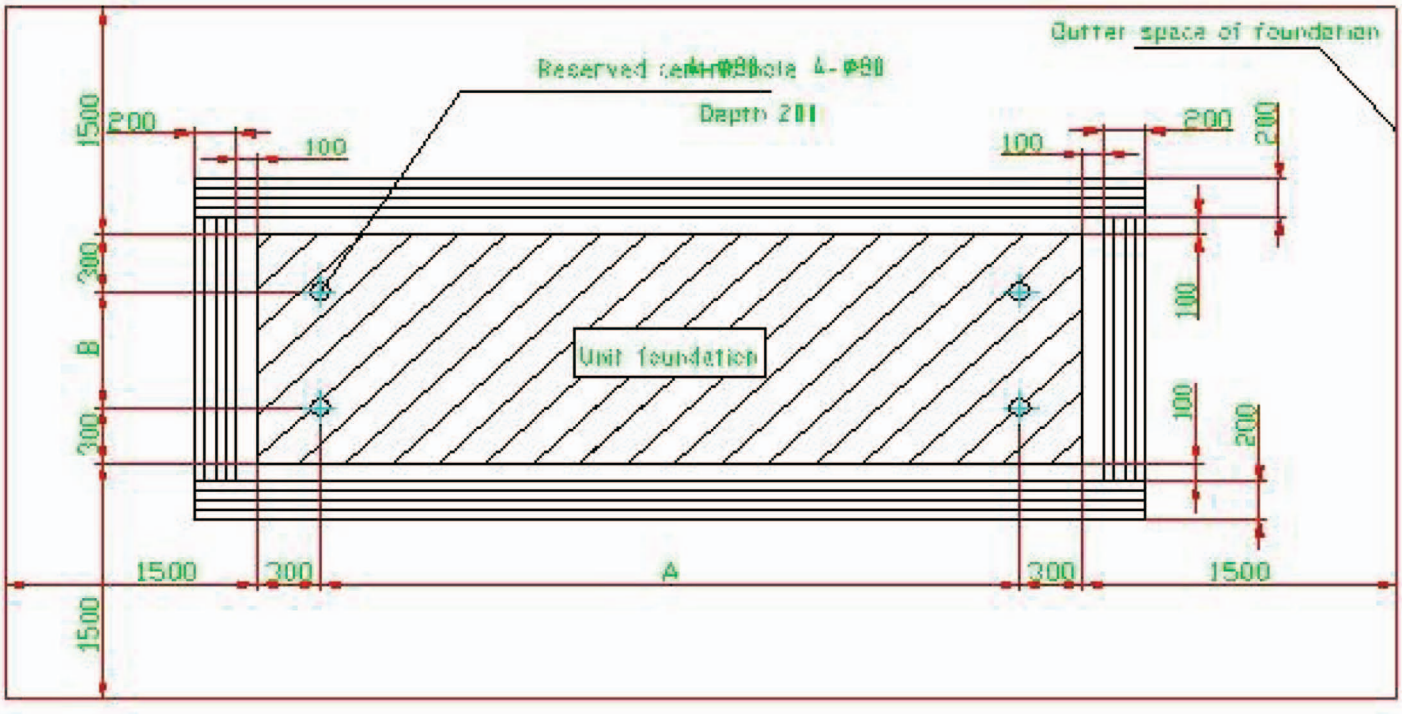
| MODEL | A | B | C | D | E |
|---|---|---|---|---|---|
| TWS(70)ASAD | 1650 | 1000 | 2880 | 1125 | 1645 |
| 75 | 1650 | 1000 | 2870 | 1125 | 1685 |
| 80 | 1650 | 1000 | 3170 | 1125 | 1685 |
| 90 | 1650 | 1000 | 3270 | 1230 | 1685 |
| 105 | 1900 | 1000 | 3170 | 1200 | 1685 |
| 110 | 2000 | 1000 | 3180 | 1285 | 1805 |
| 120 | 2000 | 1000 | 3180 | 1285 | 1805 |
| 140 | 2050 | 1100 | 3505 | 1280 | 1970 |
| 150 | 2050 | 1100 | 3505 | 1315 | 1990 |
| 175 | 2050 | 1200 | 3505 | 1375 | 1980 |
| 200 | 2050 | 1200 | 3520 | 1380 | 1980 |
| 205 | 2865 | 1200 | 4060 | 1415 | 1975 |
| 220 | 3165 | 1200 | 4505 | 1415 | 2000 |
| 245 | 3165 | 1200 | 4505 | 1415 | 2000 |
| 275 | 3165 | 1200 | 4505 | 1415 | 2000 |
| 285 | 3465 | 1200 | 4660 | 1460 | 2090 |
| 320 | 3465 | 1200 | 4660 | 1460 | 2090 |
| 340 | 3465 | 1300 | 4660 | 1585 | 2215 |
| 360 | 3465 | 1300 | 4660 | 1585 | 2215 |
| 390 | 3465 | 1300 | 4660 | 1585 | 2240 |


a
b
A
C


c
d
B
D
E

| MODEL | A | B | C | D | E |
|---|---|---|---|---|---|
| TWS(420)ASAD | 2000 | 2050 | 4600 | 2250 | 2350 |
| 490 | 2000 | 2060 | 4650 | 2270 | 2380 |
| 525 | 2000 | 2060 | 4690 | 2300 | 2410 |
| 570 | 2000 | 2160 | 4600 | 2450 | 2460 |
| 670 | 2000 | 2160 | 4780 | 2450 | 2470 |
| 715 | 2000 | 2160 | 4800 | 2450 | 2500 |

## foundation for installation

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