

# Hitachi Highly

Rollkolbenverdichter

Rotary Compressors

**Spezifikation**

Installation Manual

## **WHP09400PSV-C9EU**

**R 290**

**47,0 cm<sup>3</sup>/rev**

**220-240V/1/50Hz**

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# Directory

A: WHP09400PSV-C9EU Specifications	1 ~ 4
1. Application range	
2. Compressor specifications	
3. Parts and drawings list	
4. General characteristics	
B: Heat pump water heater dedicated compressor use benchmark	5 ~ 12
1. System design restrictions	
2. Process limit	
3. other	
C: Acceptance	13
1. Acceptance basis	
2. Acceptance rule	
D: The drawings	14 ~ 24
E: Revision experience	25

	SUBJECT  Model WHP09400PSV-C9EU SPECIFICATION			PAGE: 1/25
1. SCOPE  This specification is applied to SHANGHAI HITACHI Heat pump water heater compressor.				
2. SPECIFICATION OF COMPRESSOR				
2.1 Model WHP09400PSV-C9EU				
2.2 Rated Voltage/Frequency/Phase 220V~240V/50Hz/single				
2.3 Application Heat pump water heater				
2.4 Refrigerant R290				
2.5 Compressor Cooling Forced air				
2.6 Displacement 47.0ml/rev				
2.7 Performance				
Performance (Voltage 220~240V)				
Item	Standard Condition	Summer Condition	Winter Condition	Rated Condition
Nominal Heating Capacity	9790W/9945W	11095W/11405W	7290W/7370W	9375W/9565W
Motor input	2140W/2220W	2135W/2215W	2060W/2110W	2115W/2215W
Current	10.10A/10.50A	10.10A/10.50A	10.00A/10.30A	9.90A/10.30A
COP(see*)	4.57/4.48	5.20/5.15	3.54/3.49	4.43/4.32
Test Conditions				
Evaporating temp.	10℃	15℃	0℃	7.2℃
Condensing temp.	55℃	55℃	55℃	54.4℃
Liquid temp. entering expansion valve.	46.7℃	46.7℃	46.7℃	46.1℃
Return gas temp.	20℃	25℃	10℃	35℃
Ambient temp.	35℃	35℃	15℃	35℃
Wind speed	2m/s	2m/s	2m/s	2m/s

\* COP=  $\frac{\text{Heating capacity (W)}}{\text{Motor input (W)}}$

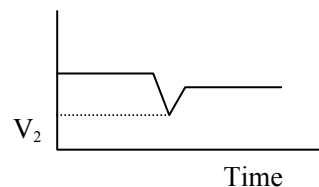
- |  |                            |
|--|----------------------------|
| 2.8 Allowable amount of refrigerant charge | 1100 g                     |
| 2.9 Amount of oil charge                   | 875±20 ml(Initial)         |
| 2.10 Oil                                   | 5GSD-TB                    |
| 2.11 Space volume of inner case            | 2140 ml                    |
| 2.12 Net weight                            | 22.6 kg incl.oil           |
| 2.13 Hermetic Terminal                     | 1/4"quick connect type     |
| 2.14 Motor Type                            | Permanent Split Capacitor  |
| Capacitor                                  | 50MFD/450 Volts            |
| Locked rotor amps                          | 60A (240V/50Hz)            |
| Approved voltage range                     | Rated Voltage (-10%, +10%) |
| Winding resistance(M/S )                   | 1.08/2.09 Ω (at 20℃)       |
- 
- 2.15 Starting performance
- (1) The starting voltage should be as follows.
  - (2) The starting pressure should be balanced between the suction and discharge of the compressor and should be adjusted to the following table.
  - (3) The temperatures of the compressor enclosure should be more than 20℃continuously at the following table.

TABLE 1

Starting Conditions		Spec
Motor temperature	Pressure MPa {kgf/ cm <sup>2</sup> G}	Starting voltage (V <sub>2</sub> ) **
Cold-Starting Cold state (room temperature)	1.027 {9.44}	Below 85% of rated voltage
Hot-Starting(Standard) Hot state after operated under standard load condition	0.984 {9.01}	Below 85% of rated voltage
Hot-starting(Overload) Hot state after operated under overload condition	1.286 {12.08}	Below 90% of rated voltage

\* Nominal heating capacity equals refrigerant capacity adding motor input. Refrigerant capacity and motor input are measured by secondary Refrigerant calorimeter Methods of GB5773 by Shanghai Hitachi Electrical Appliances Co., Ltd. Allowable heating capacity should be more than 95% of the nominal heating capacity and allowable motor input should be less than 107% of nominal motor input.

\*\* V<sub>2</sub> means minimum voltage measured between pins of hermetic terminal at the compressor starts.



\*\*\*. The suction pressure is measured on the position above the filter of accumulator.

	SUBJECT  Model WHP09400PSV-C9EU SPECIFICATION	PAGE: 4/25
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3. PARTS AND DRAWING LIST

WHP09400PSV-C9EU	Drawing code	Q'ty	Remarks
Outline dwg.	4CYCH519	—	Dimensioned sketch
Mounting accessories			
Rubber mount	4CYC00643	3	
Bolt	4CYC00700	*	
Nut	(M8)	*	
Electrical components			
Terminal cover	4CYC00987	1	
Sleeve	4CYC00986	1	
Gasket	4CYC00102	1	
Nut	3CYC00004	1	
Rubber washer	4CYC00174	1	
Wiring diagram	4CYC00124	—	

\*. Out of supply, for reference.

4. CHARACTERISTICS

4.1 Residual moisture                      150mg    MAX

4.2 Residual impurities                      90mg    MAX

## 1. SYSTEM DESIGN LIMITATIONS

### 1.1 Power source and Voltage

Voltage applied to hermetic terminal should be within the range mentioned in this specification.

In the case of three phase, the phase imbalance should be within 3% among the compressor terminals. The phase imbalance should be calculated according to the follow formula.

$$\text{the phase imbalance} = \frac{(V)_{\text{max}} - (V)_{\text{mean}}}{(V)_{\text{mean}}} \times 100\%$$

(V)max:Maximum voltage among the three terminals. (V)

(V)mean:average voltage among the three terminals. (V)

### 1.2 Operating Temperatures and Pressures

The operating temperatures and pressures of the compressor should be within the range shown in the table 2 and graph 1.

### 1.3 Operating and Shut-off Period

The compressor should be operated continuously at least for 5 minutes after being turned ON.

3 minutes shut-off time should be ensured at least until restarting.

### 1.4 Oil Back and height of the oil level

Oil should be returned continuously to the compressor and not kept in the refrigeration system.

Oil level of compressor should be higher than 7.5 mm from the lubricating piece fixed on the end of the crankshaft.

Compressor must not be started operated under a dual-layer separate status.

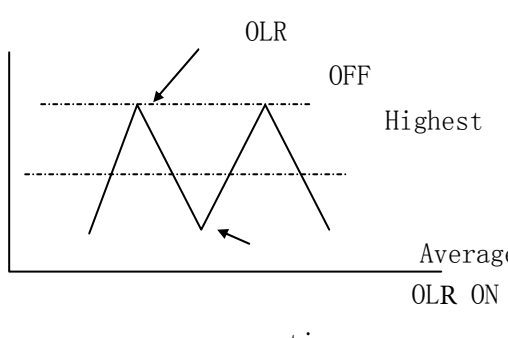
However, in case of foaming situation, the height of this foam does not mean the height of the oil level.

If you do not keep the oil level, the oil shortage will occur, and influence the reliability of compressor.

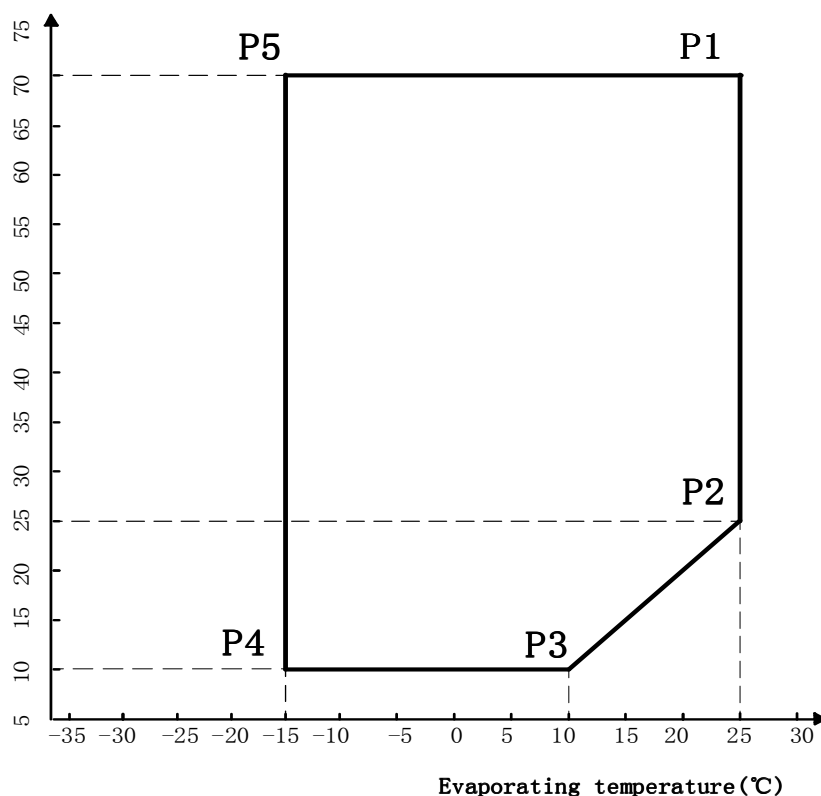
(Please check the oil level in the compressor with the sight glass we supply.)

There should be superheated gas returned to the compressor under all normal operating conditions.

Table 2

Item	Operating Envelope		
Discharge pressure MPa {kgf/cm <sup>2</sup> G}	2. 59 {25. 39} MAX  (condensing temperature 冷:70℃)	(see graph 1)	
Suction Pressure MPa {kgf/cm <sup>2</sup> G}	0. 29~0. 95 {1. 94~8. 67} (Evaporation Temperature: -15℃~25℃)		
Compressor case bottom temp	99℃or below and 6 degrees higher than condensing temperature		
Motor winding temp.	Voltage±10%            127℃MAX		
Motor winding temp. under locked-rotor condition	<div>under stable condition:    :</div> <div><div>Average            Temp</div><div>165℃MAX</div><div>Highest</div><div>190℃ MAX</div></div> <div></div>		
Accumulator temp	Higher than outlet pipe of evaporator		





Graph 1

	P1	P2	P3	P4	P5
Condensing temperature	70°C	25°C	10°C	10°C	70°C
Evaporation Temperature	25°C	25°C	10°C	-15°C	-15°C

#### 1.5 Discharge pipe temperature

Discharge pipe temperature is measured at a distance 300mm from the surface of compressor and should be less than 110°C. The tip of the thermocouple is fixed by soldering when measuring discharge pipe temperature .Furthermore, soldering point is covered with urethane foam to prevent the effect of wind.

### 1.6 Temperature of Shell Bottom

The Temperature of compressor shell Bottom must be 6 degrees higher than the corresponding saturated temperature of discharge pressure under normal operating conditions.

### 1.7 Avoid refrigerant migration

The refrigerant migration to compressor shell should be avoided during the heat pump water heater system shut down periods, It's suggested that the electric heating belt should be used around the shell bottom when necessary.

### 1.8 Allowable Incline

The allowable incline should be less than 5° during operation.

### 1.9 Pipe Vibration

The displacement of the pipes, which connect from the compressor to otherParts of the refrigerator systems, should be less than 0.8mm(1/32")when the compressor is operating at rated frequency +10Hz/ -10Hz and voltage range of rated  $\pm 10\%$ .

Displacement in excess of 0.8mm(1/32") will require changing tube length and/or routing.

°

### 1.10 Connecting Tube Design

In designing and routing tubing that connect from the compressor to the other parts of the air conditioner, following should be considered.

Moving tubes to the moving parts; minimum clearance 12.7mm(1/2")

Moving tubes to non-moving parts; minimum clearance 9.5mm(3/8")

Moving tubes never touch to lead wire.

## 2. PROCESS LIMITATIONS

2.1 The degree of vacuum in the refrigerating system should be less than 20Pa  
{ $150 \times 10^{-3}$  mmHg} at room temperature just before charging refrigerant.

The quantity of water should be less than 0.2ml.

- 2.2 Prevent moisture from entering into the enclosed unit system. When the moisture entered into the unit, the refrigerant oil and the organic compound material presented in the hermetic motor will possibly decompose on the affecting of water .

It will result in the capillary depositing and the reducing of insulation resistance.

It is necessary to install a dryer to dehumidify the residual moisture mixed in

the refrigerant in the cycling system . The specially defined device for drying and filtering of R-290 is advised.

- 2.3 The weight of foreign particles on the inside surface of the heat exchanger tubes should be less than  $0.05\text{g/m}^2$ .

Metallic dust should not be permitted to enter the refrigerating system.

This value means the weight of foreign particles filtered after washing inside surface of the heat exchanger tubes with R-11.

Prevent the impurities from entering into the enclosed unit system . When the impurities entered into the enclosed system , it will damage the moving mechanism parts and result in the capillary depositing.

- 2.4 Eliminate all system contaminants such as trichlorethylene, alkalies, soap , acid , oil & washing fluid used at machining the heat exchanger tubes.

- 2.5 Purge parts with dry nitrogen or dry air to remove remains in parts (dust, detergent, etc.) before assembly of system.. Time for purging :over one second for pipe ;over three seconds for heat exchanger . Purging pressure:  $0.9 \pm 0.1\text{MPaG}$ . Dew point of dry air: Below  $-20^{\circ}\text{C}$ .

Dry nitrogen should be charged in compressor before assembly of system.

Welding should be finished within one minute after charge of nitrogen. Dry nitrogen needs to be charged again and weld if over one minute. Always purge the compressor with dry nitrogen during assembly of system .

2.6 The motor winding temperatures should be less than 149°C in process of manufacturing the

refrigerating system. The temperature of the hermetic terminal body should be less than 177°C.

2.7 The compressor should be operated for more than 20 seconds within 15 minutes after charging refrigerant into the system so proper lubrication results.

2.8 The manufacturing process of refrigerating system must comply with the regulations related to flammable refrigerants, since R290 is flammable refrigerant.

2.9 Explosion-proof unit should be used in the system.

2.10 Refrigerant R-290 99.9% in purity should be used for apparatus. 99.95% is recommended, if possible.

### 3. MISCELLANY

3.1 The pipe and hermetic pins attached to the compressor should not be bent.

3.2 The compressor should never be operated while under vacuum; otherwise, internal arcing can cause damaging parts.

3.3 The compressor should not be operated to form a vacuum and to absorb air.

3.4 The compressor should not be left opened in the atmosphere for more than 5 minutes.

When the air entered into the unit system, it will expedite the deterioration of the oil and result in the capillary depositing and the reducing of insulation resistance.

- 3.5 The electric pulse should not be applied to the hermetic terminals when the compressor is under vacuum.
- 3.6 The compressor should be kept in the clean place with low-moisture.
- 3.7 The compressor must not be applied for transportation equipment, such as automobiles, trains, ships, and others.
- °
- 3.8 The compressor should not be splashed with water intentionally.
- 3.9 Use the refrigerant of specified brand . When the refrigerant not specified used , it will possibly cause trouble of the performance and reliability of the compressor by the impurities in the refrigerant.
- 3.10 Refrigerant should be charged from the end of condenser of refrigerating systems. Never charge refrigerant to the compressor directly.
- 3.11 Compressor mounting
- Rubber grommets are designed soft to provide the noise isolation and to lessen vibration energy transmission.Stud bolt should be designed to provide sufficient clearance for noise and vibration isolation and to prevent compressor from coming off its mount.
- 3.12 The first starting voltage supplied to the refrigerating system should be more than the starting voltage mentioned TABLE 1(page 3).
- The refrigerant can not dissolve in the oil at the beginning because of the high viscosity of the oil.

3.13 The compressor should be kept out of the corrosive atmosphere such as in a chemicals storage, beside a hot spring and so on.

3.14 The lead wires should be connected to hermetic terminals without being touched on the surface of the compressor.

3.15 The fuse or/and breaker should be equipped in the main circuit.

3.16 The oil should be returned continuously to the compressor and not stayed in the refrigerating system.

3.17 There should be adequate clearance between the OD26-under-surface of Bolt -Head and the upper surface of rubber grommets.

3.18 To avoid water and impurity into the refrigeration system and make sure no leakage of refrigerant during the operating course. It's required to direct the erector and maintenance man of heat pump water heater.

### 1. Basis for Checking upon Delivery

The Performance test will be carried out in accordance with this “compressor specification”.

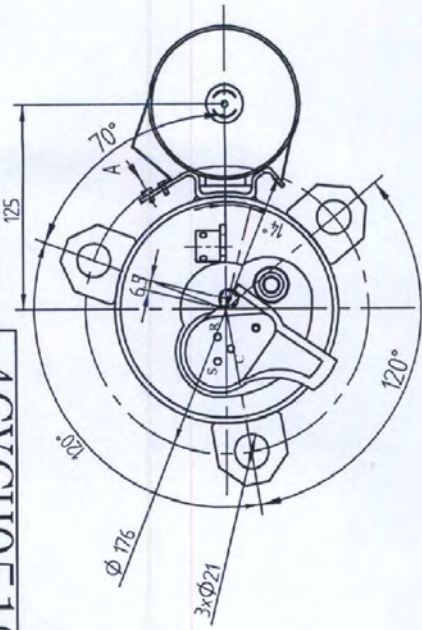
The Safety Performance in accordance with GB4706.1 Safety of household and similar electrical appliances General requirements and GB 4706.17 Safety of household and similar electrical appliances Particular requirements for motor-compressor.

### 2. Rule for Checking upon Delivery

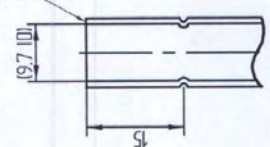
If come across any quality problem, please notify the company in written form within 30 days after the arrival of the cargo, the company shall exchange exactly the number of the products, otherwise they shall be regarded as being up to standard.

4CYCH0519

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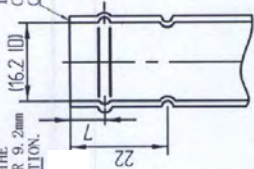


THE COLUMN WHICH LESS THAN DIAMETER 9.6mm CAN PASS THE PIPE, BUT THE COLUMN WHICH MORE THAN DIAMETER 9.2mm CAN'T PASS THE PROTRUSIVE POSITION.

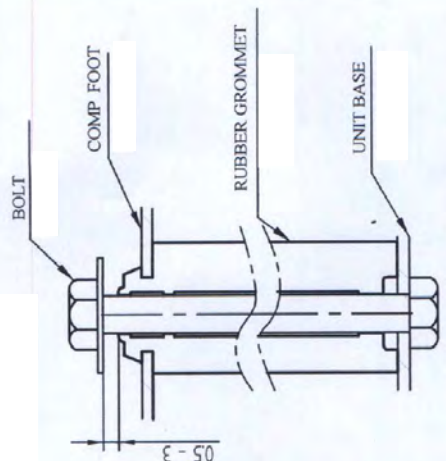


DISCHARGE PIPE (NTS)

THE COLUMN WHICH LESS THAN DIAMETER 16.15mm CAN PASS THE PIPE, BUT THE COLUMN WHICH MORE THAN DIAMETER 15.2mm CAN'T PASS THE PROTRUSIVE POSITION.

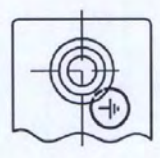


SUCTION PIPE (NTS)



RUBBER GROMMET STRUCTURE

DIMENSION mm



VIEW FROM A (NTS)

NOTE:

1. THE TORQUE ENFORCED ON THE NUT IS  $1.5 \pm 0.3N \cdot m$
2. PUTTING OUT RUBBER PLUG WHEN FIXING EARTH PARTS.

WHP09400PSV-C9EU	

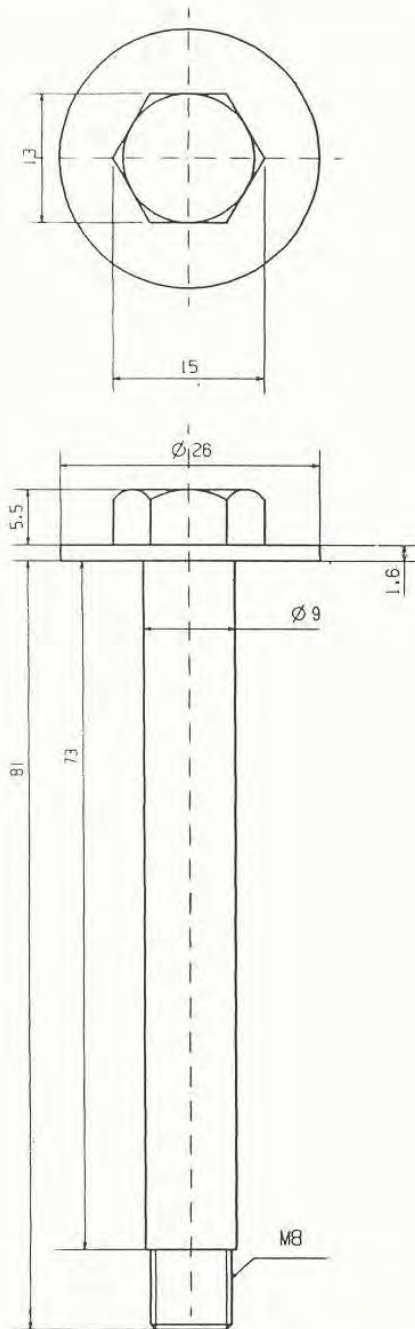
RECD	RE. MARKS	TITLE	PROJECTION	SCALE	DWN. NO.
	DWN. (同) 16.12.14	DIMENSIONED SKETCH	Shanghai Hitachi, Ltd.	NTS	4CYCH0519
	CHKD. 16.12.14				
	CHKD. 16.12.14				
	APPR. 16.12.14				






4CYC00700

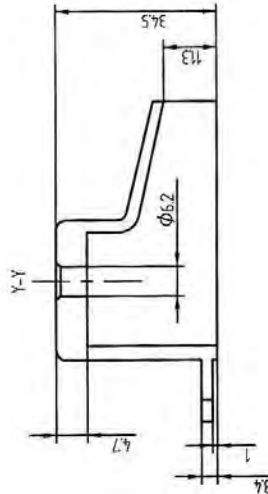
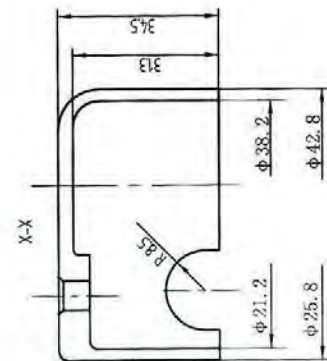
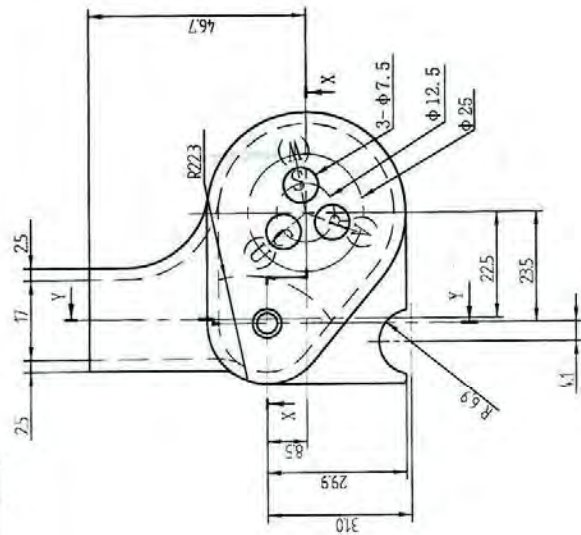
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	RE-				PROJECTION	SCALE	
	MARKS					NTS	
REGD.	DWN.	張夕菲	00.08.14	TITLE BOLT	Shanghai Hitachi, Ltd.		DWN. NO. 4CYC00700
	CHKD.	周易	00.05.14				
	CHKD.						
	APPD.	肖峰	00.10.8				

B

4CYC00987



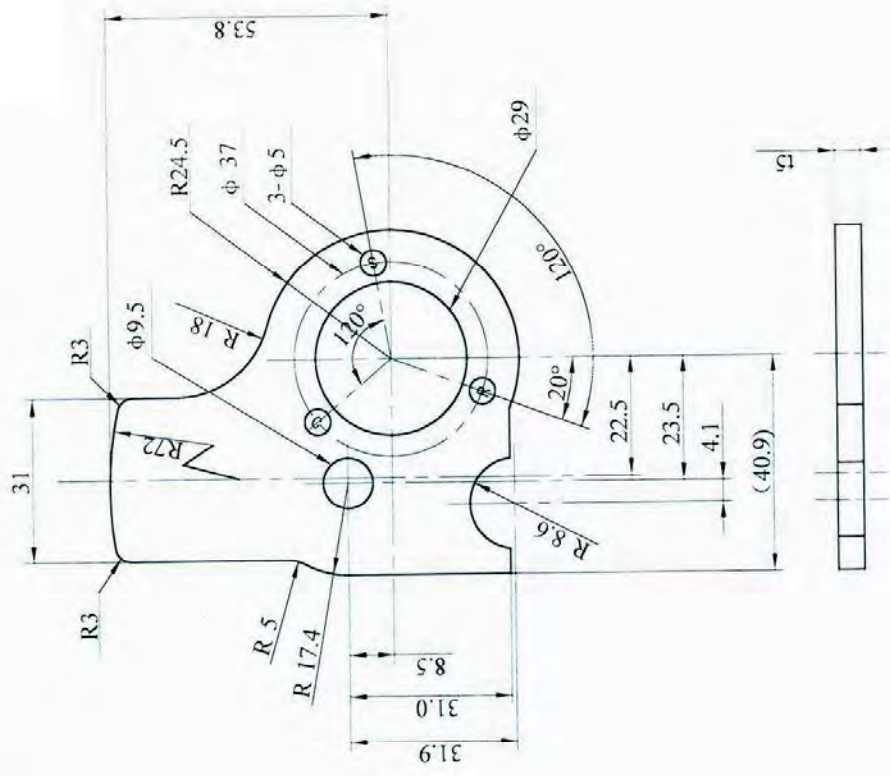
MATERIAL : VALOX 420 SEO BK1066

RECD	DES. MAZES	DWN. 郭婉倩	CHKD. 郭婉倩	DATE 10.11.20	TITLE	TERMINAL-COVER	PROJECTION	SCALE	DWG NO.
							Third Angle	NTS	4CYC00987





C 4CYC00102



DIMENSION: mm

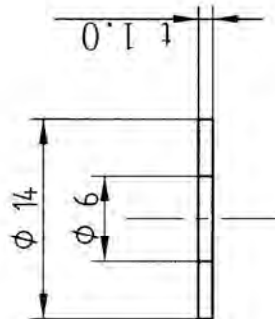
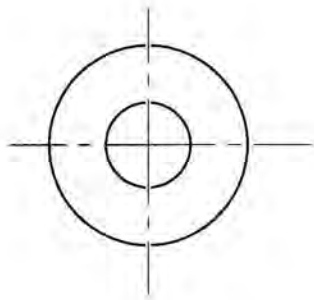
MATERIAL: EPDMFOP-B

REGD	RE. MARKS	PROJECTION	SCALE	DRAWN
		Shanghai Hitachi Ltd	N.T.S	
		GASKET		
		4CYC00102		



A

4CYC00174



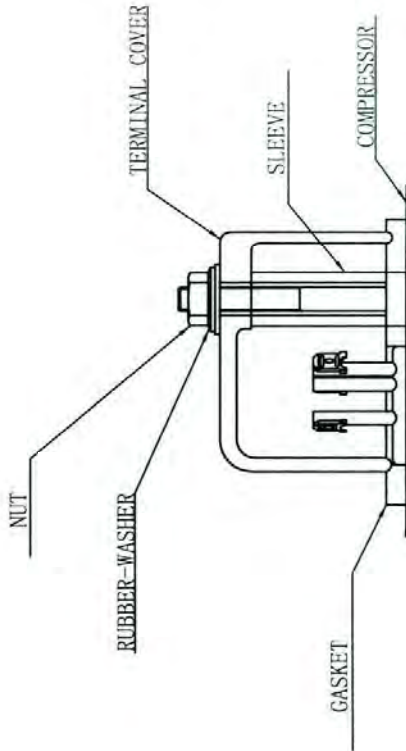
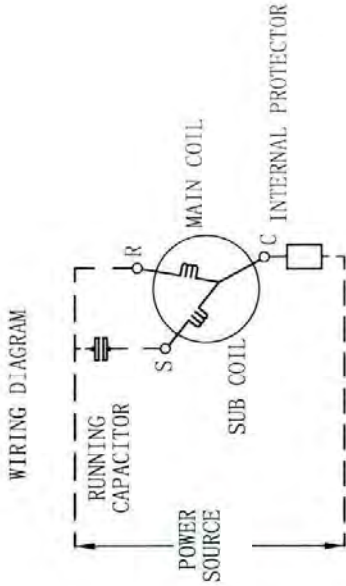
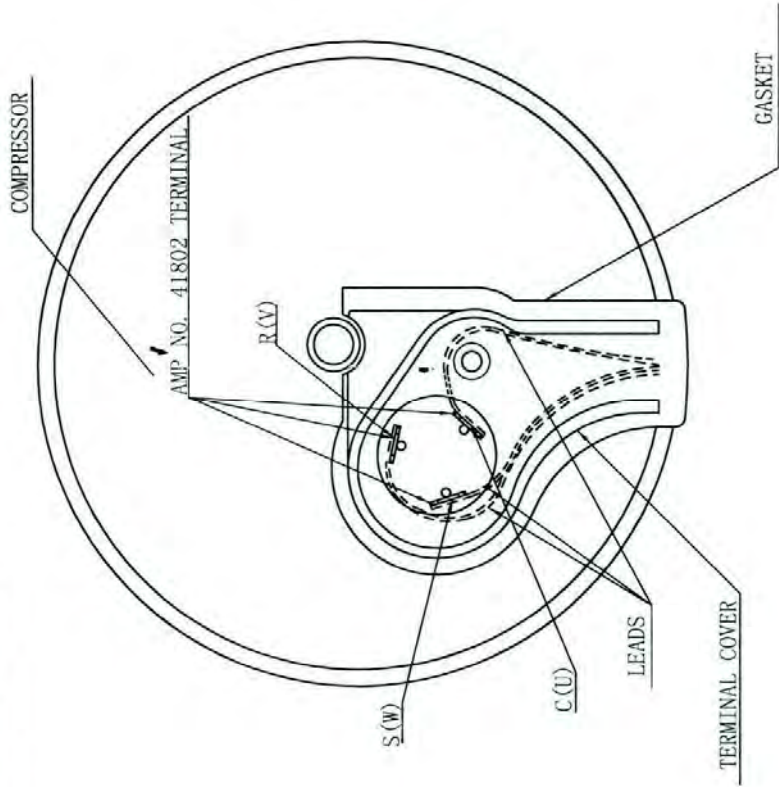
MATERIAL: EPDM

DIMENSION: mm

REGID	RE. MARKS	PROJECTION	SCALE	DWG. NO.
			NTS	
DWN. 吳建勇	DATE 2017.7.10	Shanghai Hitachi, Ltd.		
CIRCD. 01.7.10		RUBBER WASHER		
CIRCD.				
APPD. 吳建勇	DATE 2017.7.10	4CYC00174		

D

4CYC00124



NOTES:  
1. PLEASE PREPARE LEADS BY YOURSELF.  
2. THE LETTER C, R OR S STANDS FOR EACH TERMINAL.  
3. TABS FOR HERMETIC TERMINAL ARE AMP #250.

REGD	DWG.	CHKD.	APPR.	RE. MARKS	TITLE	PROJECTION	SCALE	DRAWN
	10.10.27	10.10.27	10.10.27		LEAD ROUTING WIRING DIAGRAM	shangha	NTS	
						Huashu		4CYC00124



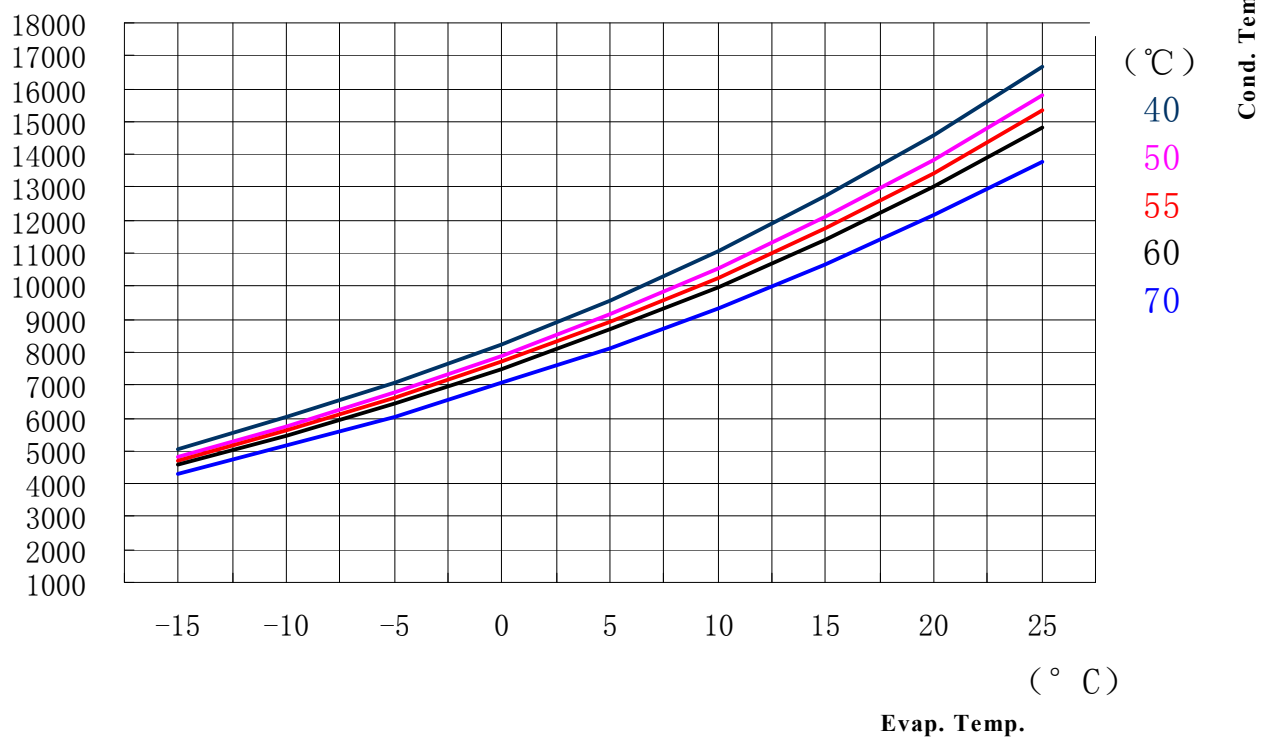
WHP09400PSV-C9EU

Performance Curve

(50Hz 220V)

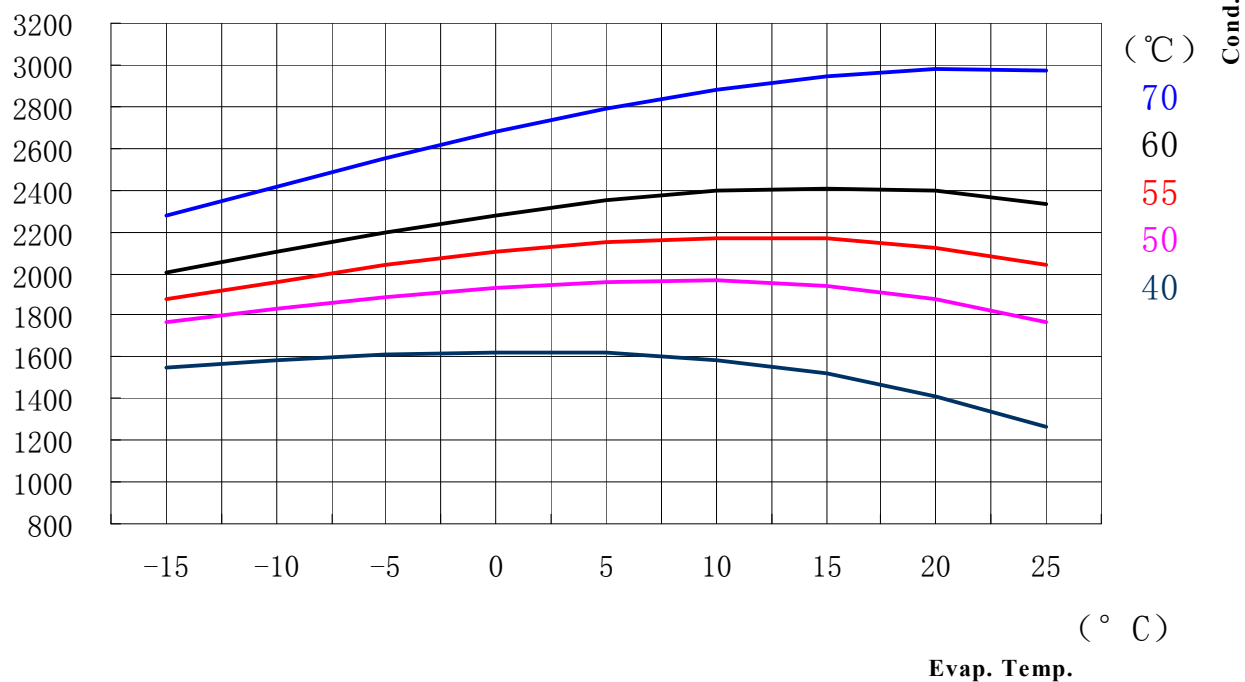
Capacity

(W) Q



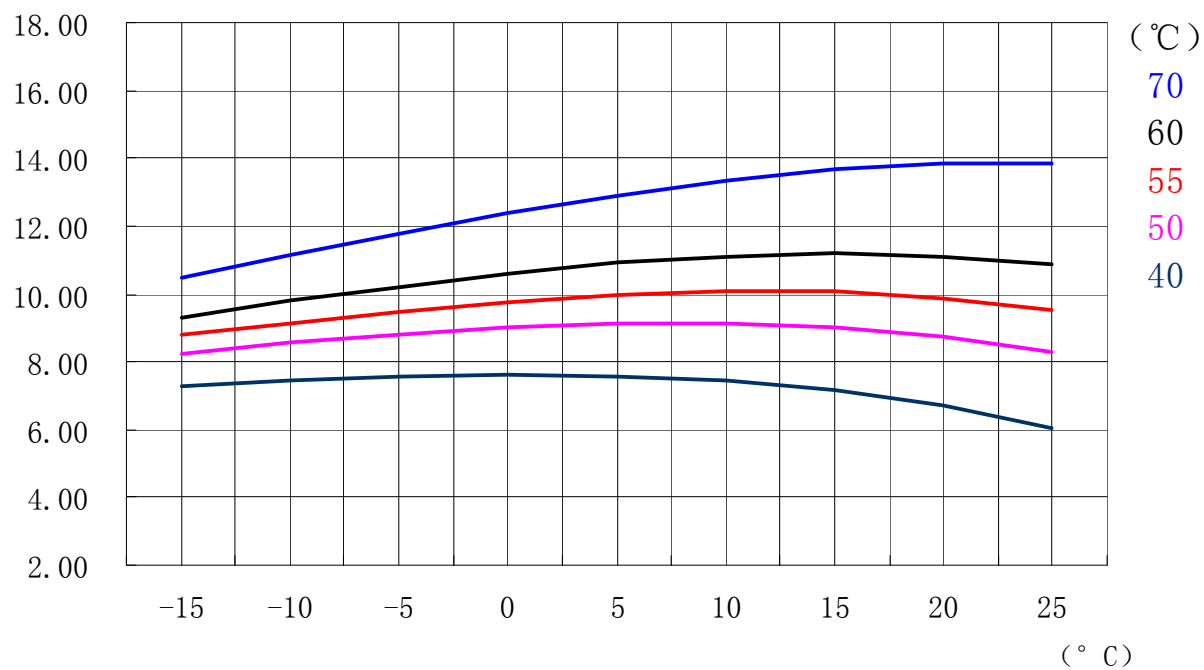
Motor input

(W)

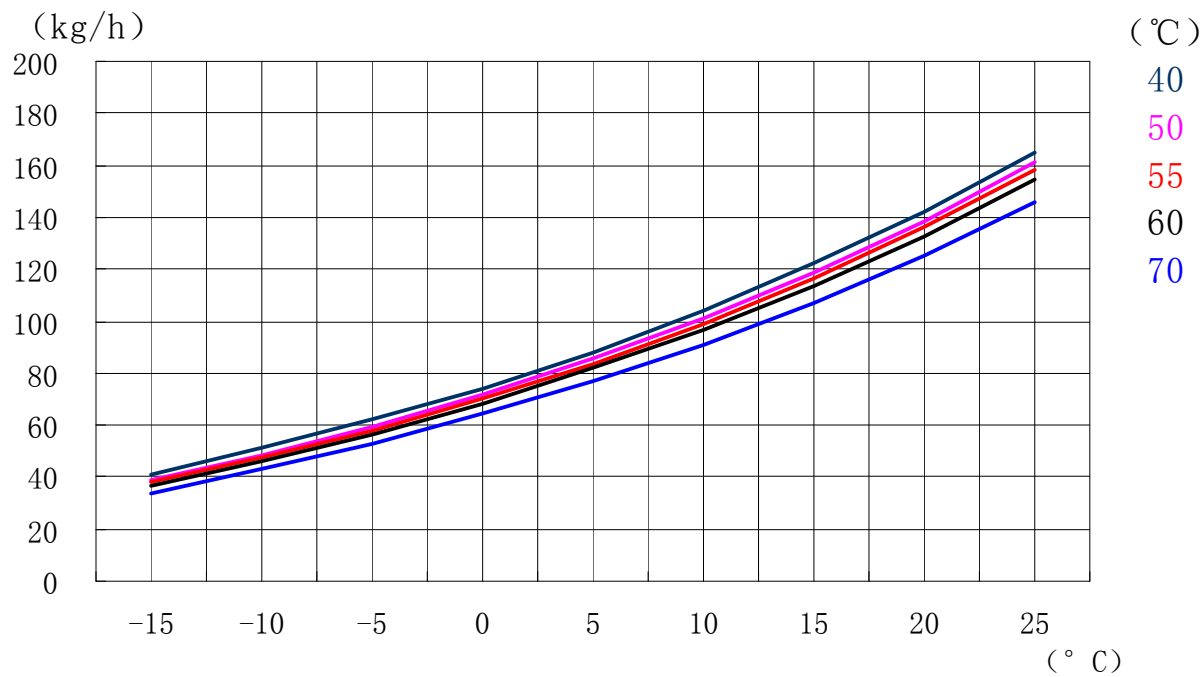


**Current**

(A)

**Evap. Temp.****Flux**

(kg/h)

**Evap. Temp.**

Specification Revision Record				
No.	Date	Page in Spec	Revision Reason	Conclusion Date
A				
B				
C				
D				
E				
F				
G				
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K				
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