Hitachi Highly

Rollkolbenverdichter

Rotary Compressors

Spezifikation

Installation Manual

WHP09100VUKPA8LT6

R 410A, R 452B - R 454C- R 454B

22,6 cm3/rev

900 - 7200 min-1

DC/ BLDC

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Table of Contents

1. SCOPE

This specification is applied to SHANGHAI HIGHLY Heat pump water heater compressor.

2. SPECIFICATION OF THE MODEL

Item	Spec
2.1 Model Type	WHP09100VUKPA8LT6
2.2 Power source input to inverter	Rated voltage / Rated frequency/Phase 220V/50Hz/1Φ
2.3 Output	1930W/1850W/1835W/1225W(R410A/R452B/R454B /R454C @3600 min^{-1})
2.4 Application	Heat pump water heater

2.5 Performance 性能参数

Refrigerant	R410A	R452B	R454B	R454C
Item	Rated Condition	Rated Condition	Rated Condition	Rated Condition
Rotational speed	3600 min^{-1}	3600 min^{-1}	3600 min^{-1}	3600 min^{-1}
Nominal Heating Capacity	9105W	8830W	8785W	6245W
Motor input	2115W	2025W	2010W	1340W
Current	7.6A	7.5A	7.4A	5.2A
COP(see*)	4.30	4.36	4.37	4.66
Measuring condition				
Evaporating temp.	7.2℃	7.2℃	7.2℃	7.2℃
Condensing temp.	54.4℃	54.4℃	54.4℃	54.4℃
Liquid temp. entering expansion valve.	46.1℃	46.1℃	46.1℃	46.1℃
Return gas temp.	35℃	35℃	35℃	35℃
Ambient temp.	35℃	35℃	35℃	35℃
Wind speed	2m/s	2m/s	2m/s	2m/s

*. COP= Heating capacity (W) / Motor input (W)

*. Rated Capacity and input are measured with HITACHI inverter circuit by secondary Refrigerant calorimeter Methods of JIS B8606 by SHANGHAI HIGHLY Electrical Appliances Co., Ltd. Allowable capacity should be more than 95% of the rated capacity and allowable input should be less than 107% of rated motor input.

2.6 Refrigerant	R410A/R452B/R454B/R454C
2.7 Displacement	22.6ml /rev
2.8 Allowable frequency range	900～7200 min^{-1}
2.9 Oil	HAF68 630±20ml
2.10 Allowable amount of refrigerant charge	Below 2100g
2.11 Compressor cooling	Forced air
2.12 Hermetic Terminal	Conventional type
2.13 Space volume of inner case	1200cm^3
2.14 Compressor weight	10.2kg incl. Oil
2.15 Motor Type Insulation class	Direct current brushless motor E class

3. THE PARAMETER OF MOTOR

Item	Spec	explanation
3.1 Rotor Pole（Pole）	6	6 electrodes 9 slots concentrated winding
3.2 Rated Frequency Range（Hz）	15-120	Mechanical Frequency，Relating to VDCmax of Inverter
3.3 Demagnetizing Current（A）	30.0	Peak Current，at 130℃，-5% Demagnetizing Rate

3.4 Inductance Ld（mH）	Sheet 2	——
3.5 Inductance Lq（mH）	Sheet 2	——
3.6 Stator coil resistance（20℃）（Ω） 0.93		line-to-line
3.7 Voltage Constant（Vrms/krpm）	42.8	line-to-line
3.7 Torque Constant（N • m/Arms）	0.60	Torque/Current
3.9 Inertia （Kg • m2）	0.000388	
3.10 Flux Φa（Wb）	0.1110	Φ(Per Phase, Peak)= $\frac{\sqrt{2}\times E0}{2\pi f\sqrt{3}}$
3.11 Magnet Material	NdFeB	

Current（RMS） 1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Lq(mH)	8.45	8.33	8.18	7.95	7.74	7.51	7.26	7.02	6.79	6.56
Ld(mH)	6.10	6.13	6.10	6.01	5.89	5.75	5.61	5.48	5.36	5.24

2

4.CHARACTERISTICS

4.1 Appearance

The surface of the compressor is painted to black, without obvious flaw ,impact scar, paint peel off, rust and so on.

4.2. Indication

Compressor model type, manufacturing data are clearly indicated on the surface of compressor。

4.3. Residual moisture 120mg MAX

4.4. Residual impurities 60mg MAX

5 PARTS AND DRAWING LIST

PARTS NAME		QTY/SET	DRAWING NO.	REMARKS
Compressor		1	4CYCD0327	Dimensioned sketch
Mounting Parts	Rubber grommet	3	4CYC01088	
	Bolt	-	(M10)	*
	Nut	-	(M10)	*
Electrical Parts	Terminal cover	1	4CYC01114	
	Gasket	1	4CYC01113	
	Nut	1	3CYC00004	
	Rubber washer	1	4CYC00174	
	Thermostat	1	4CYC01045	
	Sleeve	1	4CYC01042	
			4CYC01268	Lead routing
			1	Pressure guarantee Chart
			2	Oil level datum
			3	Notes for rotational speed change

*. Out of supply, for reference.

COMPRESSOR CRITERIA

1 Strictly observe the specification

The compressor should be used in specifications written in this “compressor specification” and not be used in specifications outside it.. The main circuit must link up with fuse or breaker.

2 Source voltage

Specified inverter is linked up with compressor terminals . Applied voltage of this inverter should be voltage specified in this “compressor specification”. Alternating voltage should never be applied on terminals (for example: commercial alternating voltage of 1ϕ100V,200V,3ϕ200V).This is because that if applied alternating current the direct current motor will demagnetize.

3 Operating voltage range

The compressor should be operated in the range of rated voltage ±10% , under standard condition and overload condition of rated frequency (applied voltage to inverter).It must be satisfied with item 5 ,6,7.

4 Operating temperatures and pressures

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

5 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.

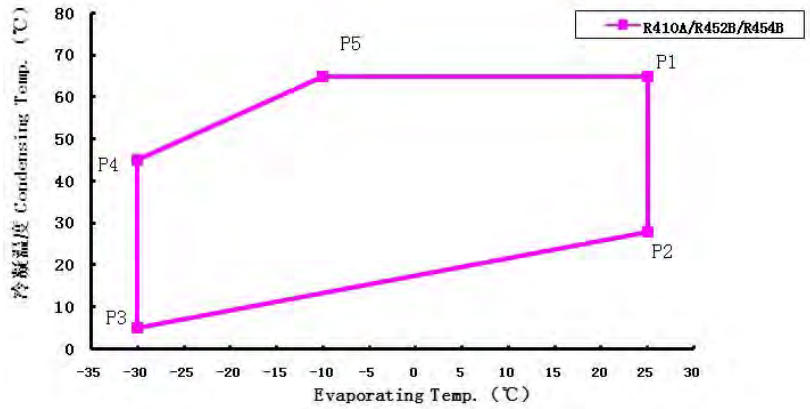
If you do not keep the oil level, the oil shortage will occur, and influence the reliability of compressor.

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

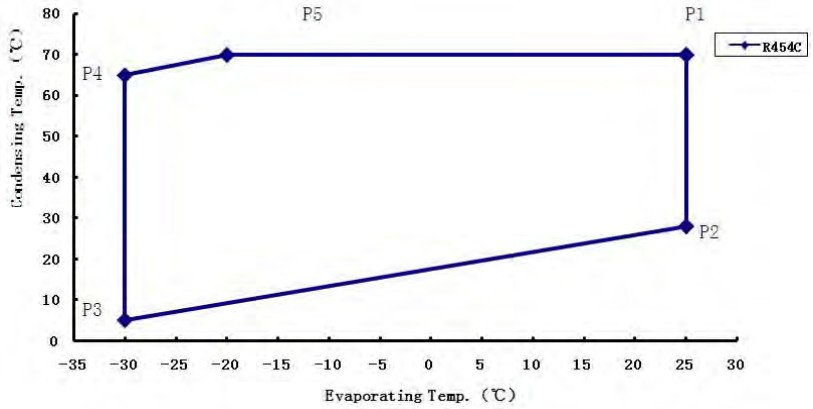
There should be superheated gas returned to the compressor under all normal operating conditions.

Table 2

Item	Operating Envelope			
Refrigerant	R410A	R452B	R454B	R454C
Discharge pressure MPa	4.28 MAX (condensing temperature: 65℃)	4.00 MAX (condensing temperature: 65℃)	3.95 MAX (condensing temperature: 65℃)	2.97 MAX (condensing temperature: 70℃)
Suction Pressure MPa	0.27~1.66	0.26~1.59	0.26~1.57	0.20~1.19
	(Evaporation Temperature : -30℃~25℃) It can also be 0.101～0.272 MPa when in transition , but should not be used when it is less than 0.101MPa 。			
Compressor case bottom temp	99℃ or below and 6 degrees higher than condensing temperature ℃			
Motor winding temp	Rated voltage: : 105℃ MAX	R.Voltage±10%: 120℃ MAX		
Accumulator temp	Higher than outlet pipe of evaporator			
Ambient temp	Meet for the condition of above mentioned motor winding temp.			



	P1	P2	P3	P4	P5
Condensing temperature	65℃	28℃	5℃	45℃	65℃
Evaporation Temperature	25℃	25℃	-30℃	-30℃	-10℃



	P1	P2	P3	P4	P5
Condensing temperature	70℃	28℃	5℃	65℃	70℃
Evaporation Temperature	25℃	25℃	-30℃	-30℃	-20℃

6 Current limitation

Current peak among motor terminals (include instantaneous current peak) should be below demagnetizing current in order to prevent magnet in motor from demagnetization.

7 Pressure difference between suction and discharge

In all allowable rotational speed range, the difference of pressure should be more than 0.39MPa{4kgf/cm^2}. But if there is no problem of noise when assembled in air conditioner, it can also below this value.

8 Discharge pipe temperature

Discharge pipe temperature is measured at a distance 300mm from the surface of compressor and should be less than 110℃. 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.

9 Dust of compressor hermetic terminals

Compressor hermetic terminals should be mounted with specified cover in right way to prevent dust entering, and should be used in direction which dust is hard to enter in.

10 Lead wire of compressor hermetic terminals

Measuring the temperature of hermetic terminals , lead wire should be resist to the temperature and be clamped so as not in touch with the surface of compressor and pipe.

11 Start-stop frequency

The frequency should be less than 6 times per hour. Operating time from start to stop should be more than 3 minutes. Stopping time should be more than 3minutes.

12 Rate of rotational speed change

The rate of compressor rotational speed (acceleration) should be less than 133min^{-1}/s, But if The variable range is below 120min^{-1}, rate can also be less than 600min^{-1} when rotational speed is reduced to avoid temporary over- current.

13 Air and moisture in refrigerating system

The degree of vacuum in refrigerating system should be less than 20Pa (150×10^{-3}mmHg) at room temperature just before charging refrigerant. The quantity of water should be less than 0.15ml.

14 Impurities in refrigerating system

(1) The weight of residue on the inside surface of the heat exchanger and tube should be less than 0.01g/m^2. But metallic dust should not be permitted in the system. This value means the weight of foreign residue collected by filer paper after washing inside surface of the heat exchanger tubes with R-11.

(2) Prevent the impurities from entering into the enclosed unit system used R410A. When the impurities entered into the enclosed system, it will damage the moving mechanism parts and result in the capillary depositing.

(3) Eliminate all system contaminants such as trichlorethylene, alkalies, soaps, oil, acids & washing fluid used at machining heat exchanger and tubes.

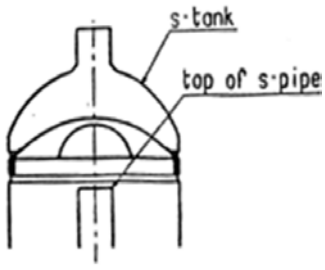
15 Compressor vacuum operation

Compressor should never be operated while under vacuum. Otherwise, internal arcing can cause damaging parts.

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

17 Liquid refrigerant return limitations

(1) Liquid refrigerant level in s-tank should be lower than the top of s-pipe in s-tank.(see chart at right)



(2) There should not exist noise of the liquid refrigerant compression, current and vibrancy increase. System can append the assistant stank or reduce the amount of refrigerant to prevent from liquid refrigerant compression. Refrigerant system forbid liquid refrigerant from flowing back compressor in any case. In normal condition the overheat gas refrigerant should flow back compressor.

18 Purge parts with dry nitrogen or dry air to remove remains in parts (dust, detergent, etc.) before assembly of system. Time fur purging: over one second for pipe; over three seconds for heat exchanger. Purging pressure: 0.9±0.1MpaG. Dew point of dry air: Below -20℃.

The motor winding temperature should be less than 149℃and hermetic terminal body temperature should be less than 177℃in process of manufacturing.

19 Apply for vehicle

The compressor should not be used on moving equipment such as automobiles,trains,ships, etc.

20 Installation

The rotational axis of compressor should be kept vertical during operation. But in actual application the axis incline must be within 5°at all directions during operation.

21 Pipe vibration

The displacement of the pipes, which connect from the compressor to other parts of the refrigerate-or systems, should be less than 0.8mm(1/32")when the compressor is operating at allowable rotational speed range and voltage range of rated ±10%.
Displacement in excess of 0.8mm(1/32") will require changing tube length and/or routing.

22 Connecting tube design

In designing and routing tubing that connect from the comprssor 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.

23 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.

24 Miscellany

(1) The compressor should be carried carefully to avoid drop, drag , impact and should not apply partial force on projection parts such as pipe, hermetic terminals, foot during carrying and processing.

(2) The compressor should not be operated to form a vacuum and to absorb air. The compressor only can run in one direction which according to lead routing wiring diagram. Never reversion otherwise thecompressor will be in trouble.

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

When the air entered into the unit system with refrigerant R410A, it will expedite the deterioration of the oil and result in the capillary depositing and the reducing of insulation resistance.

(4) Electric pulse should not be applied to compressor when it is in vacuum.

(5) The compressor should be kept in the place with low-dust, low-moisture.

(6) The compressor can't be used in the place with corrosive atmosphere such as hot spring and chemical warehouse. It should not be the structure often splash water on the surface of the compressor forcibly.

(7) The trouble of cross valve, electromagnetic valve, defroster, refrigerant controller, fan motor used in refrigerating system may cause compressor accident .So their reliability should be ensured completely. Moreover, the way of design, manufacture, application of refrigeration cycle with less-leak should be adopted.

(8) The main electric circuit should be equipped with fuse or breaker.

(9) Refrigerant should be charged from the end of condenser of refrigerating systems. Never Charge refrigerant to the compressor directly.

The refrigerant should always be charged in liquid state. When the refrigerant is charged in gas state. The percent component will possibly be changed.

(10) Temperatures within systems during stable compressor operation should not be less than -35℃ to prevent wax precipitation from the oil.

(11) The units of refrigerating system should be connected to earth.

(12) 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 andvibration isolation and to prevent compressor from coming off its mount.

(13) There should be adequate clearance between the under—surface of Push-Nut and the upper surface of rubber grommets.

(14) SHEC will not take any responsibility against accident that is caused by the accessories equipped by yourselves.

(15) The hermetic terminals of compressor should not be inserted slantingly and not be applied twisting force after inserting so as to avoid reducing of terminal fixed force.

(16) The pipe and hermetic pens attached to the compressor should not be bent.

(17) The dropped compressor can't be used anymore.

(18) Compressor can be used when ambient temperature is higher than -10℃. Confirm the start-up of compressor if the temperature of compressor surface is below -10℃. Heat up compressor to reach the temperature higher than -10℃ with heater if the ambient temperature is below -10℃.

(19) Set a thermistor on the case cover of compressor to prevent from accident of leakage of refrigerant. The thermistor can stop the operation of compressor when compressor in abnormal temperature. The lead wires of thermostat is enveloped with tube, as same as that of the terminals, to avoid directcontact with the compressor and pipe.

(20) The compressor should not be splashed with water intentionally. Prevent moisture from entering into the enclosed unit system. When the moisture entered into the unit of the refrigerant R410A, 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 molecular-sieve dryer is advised.

(21) 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.

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

(23) Be careful of avoiding oxide scale while soldering during assembly of refrigerating system.

(for example: flow or fulfill dry nitrogen)

(24) The quantity and kind of contamination (the process materials) in the cycle should be grasped and managed. Carry on reliability test that input contamination a lot than anticipated contamination quantity.

(25) To avoid water and impurity into he refrigeration system and make sure no leakage of refrigerant during the operating course. It's required to direct the erector and maintenance man of air-conditioner.

(26) The start-up current and torsion of compressor

Adjust the start-up current of the compressor to get enough torsion by inverter. Confirm and measure the start-up current if change the parts and design.

(27) The fuse or/and breaker should be equipped in the main circuit.

(28) The thickness of the refrigerating system using tube
the tube thickness as followed

external diameter(mm)	6.35	9.52	12.7	15.88	19.05	22.2	25.4	31.75	38.1	44.45
Thickness (mm)	0.8	0.8	0.8	1	1	1	1	1.1	1.4	1.5

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.

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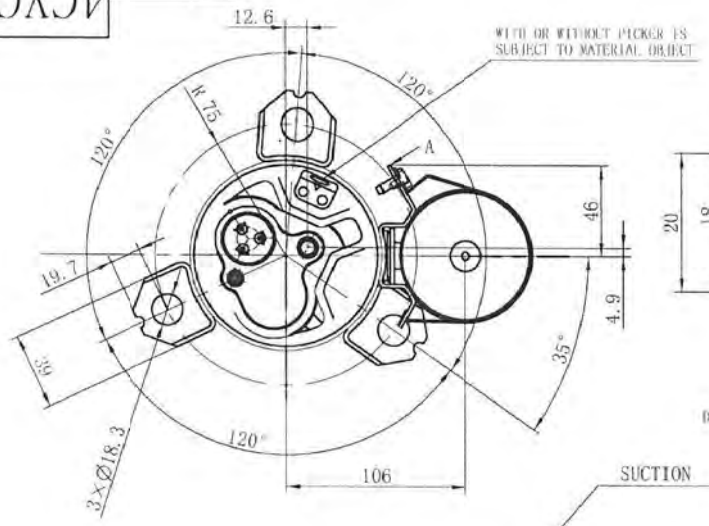

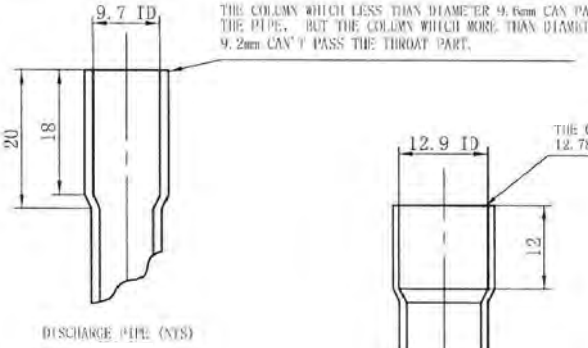

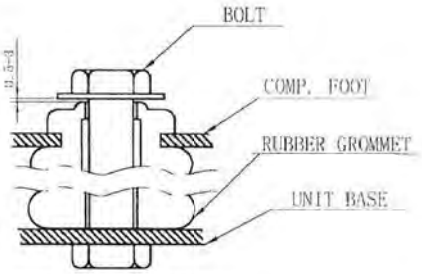

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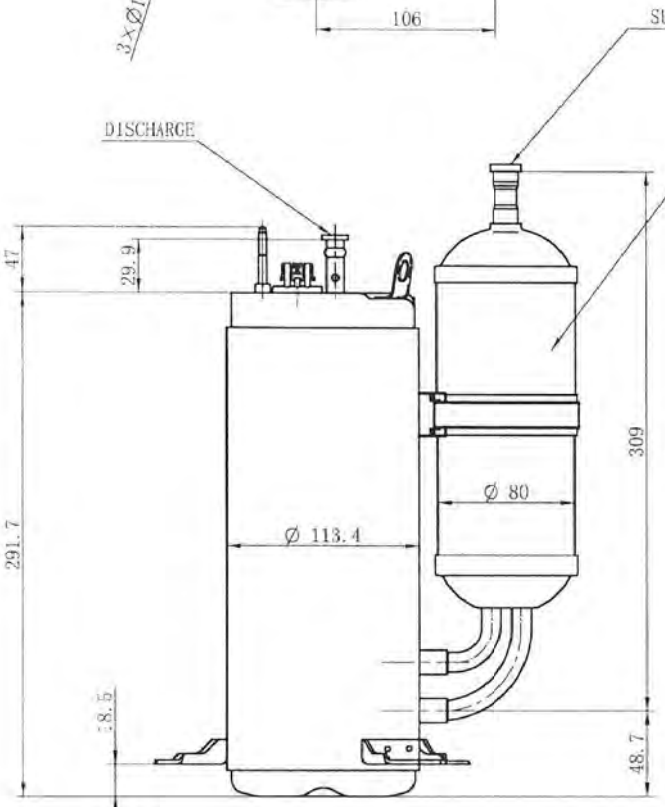

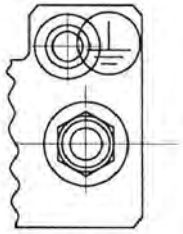

NOTE:

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

DIMENSION: mm

WHP09100VUKPA8LT6	

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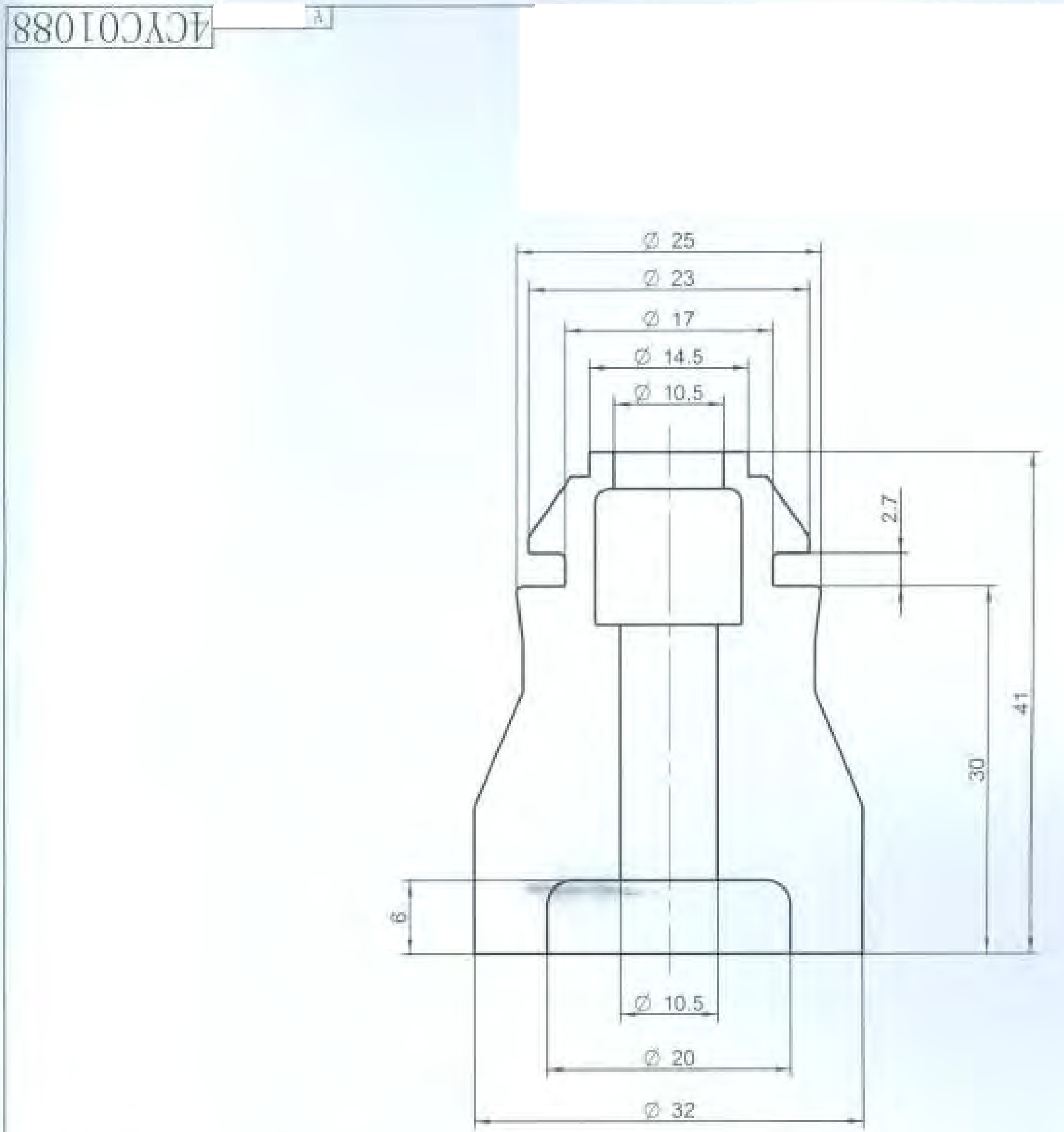
	APPD.						



NOTE:
1. MATERIAL: NATURAL RUBBER
2. HARDNESS: Hs=40±5°

DIMENSION: mm

	REMARKS			PROJECTION	SCALE NTS	
REGD.	DWN.	樣海林	13.12.17	TITLE RUBBER GROMMET	Shanghai hitachi, Ltd	DWN. NO. 4CYC01088
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	CHKD.					
	APPD.	刘香慧	13.12.17			

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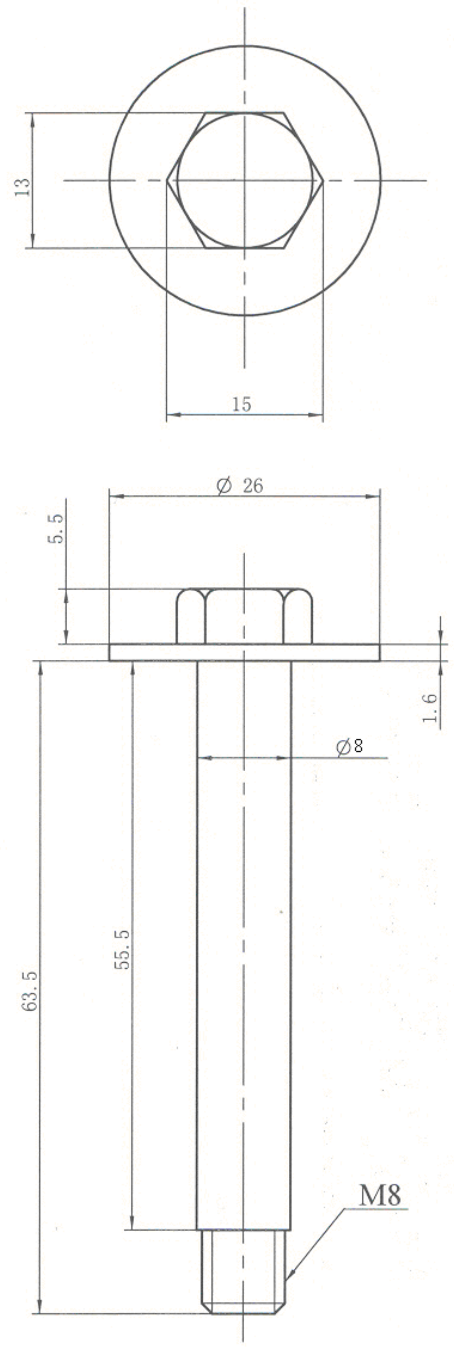

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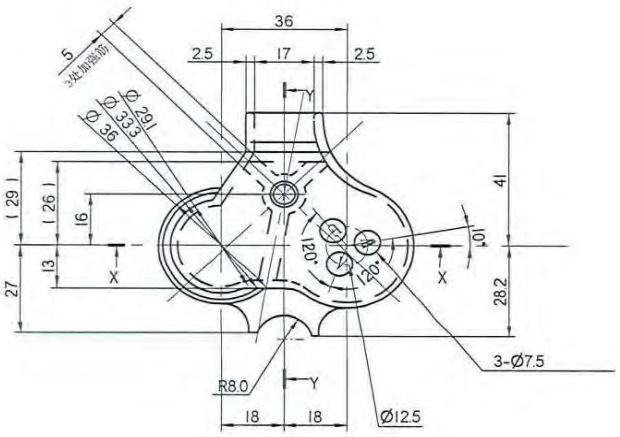

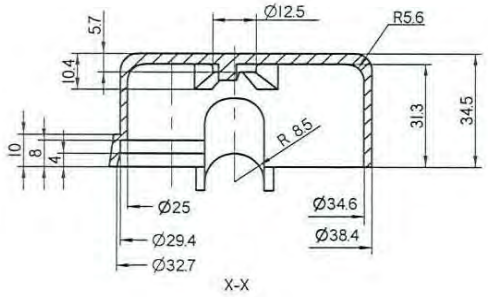

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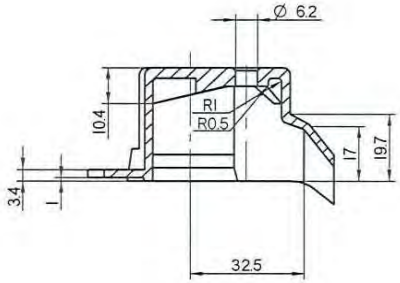

Y-Y

MATIERIAL: VALOX 420 SE0 BK1066

材　　料：聚对苯二甲酸丁二醇脂

DIMENTION: mm

尺寸单 位：mm

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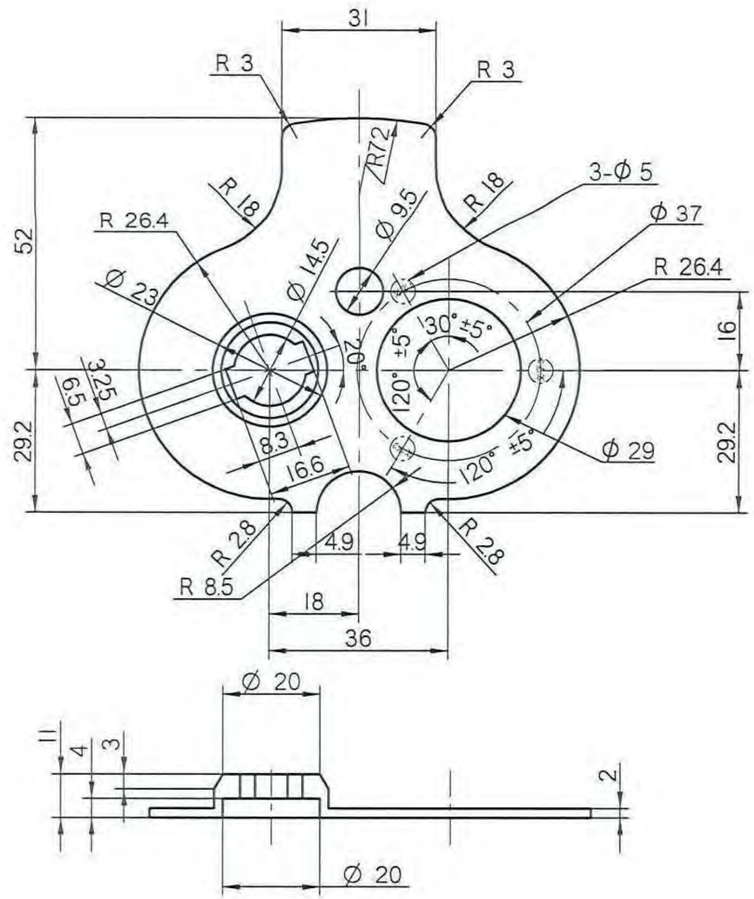

MATIERIAL: EPDMFOP-B

DIMENTION: mm

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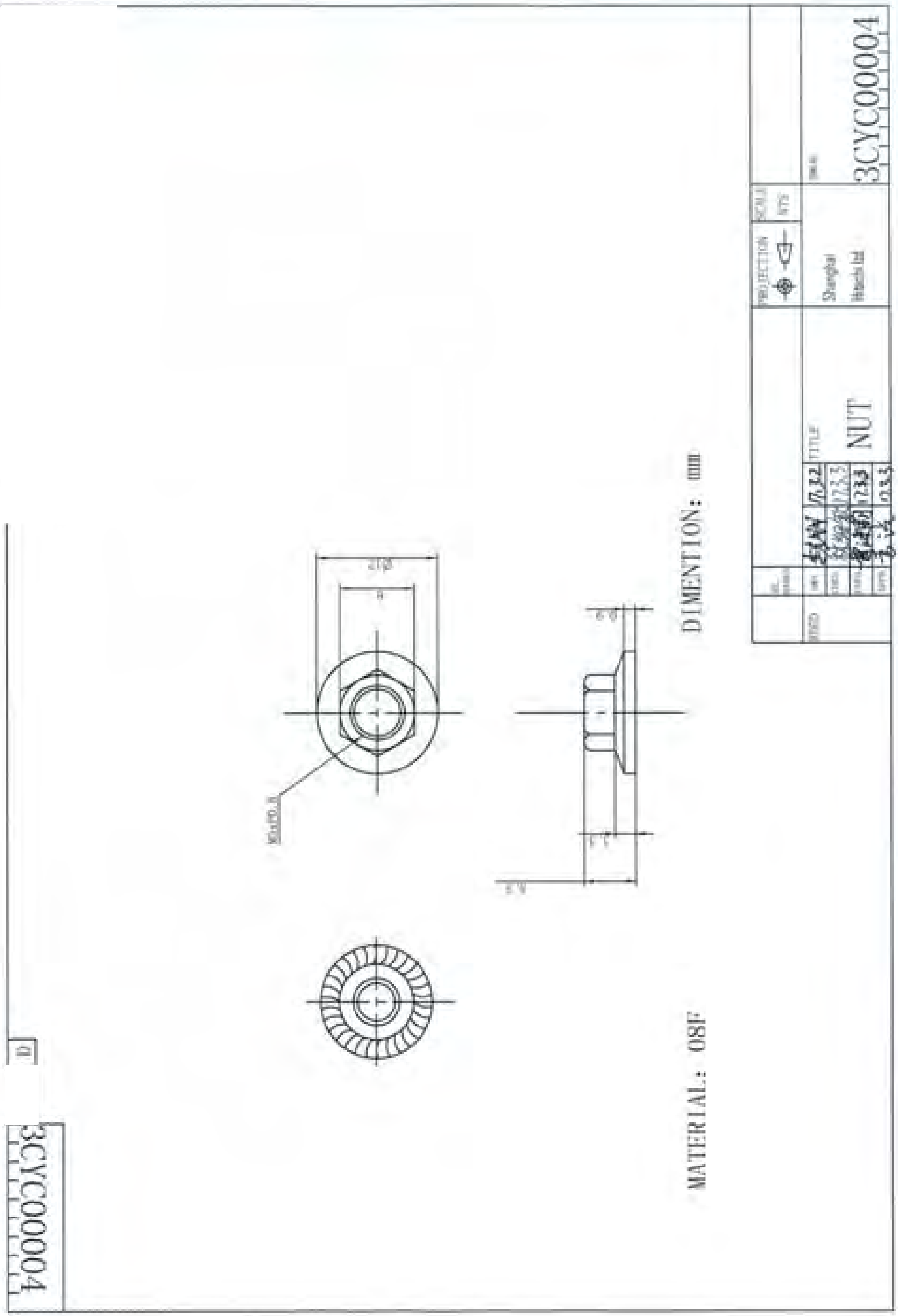
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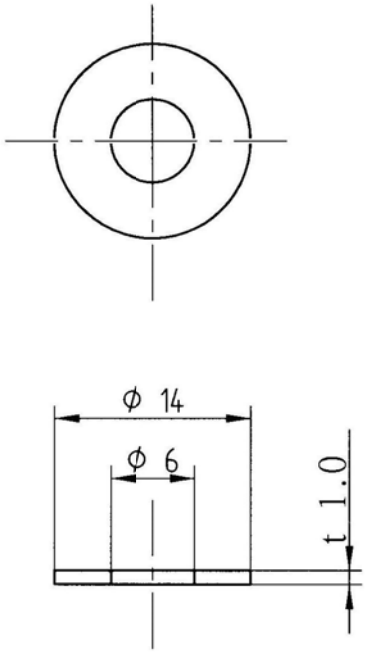
DIMENTION: mm
MATERIAL: 08F
PROJECTION
Shanghai

4CYC00174 | A



MATERIAL: EPDM

DIMENSION: mm

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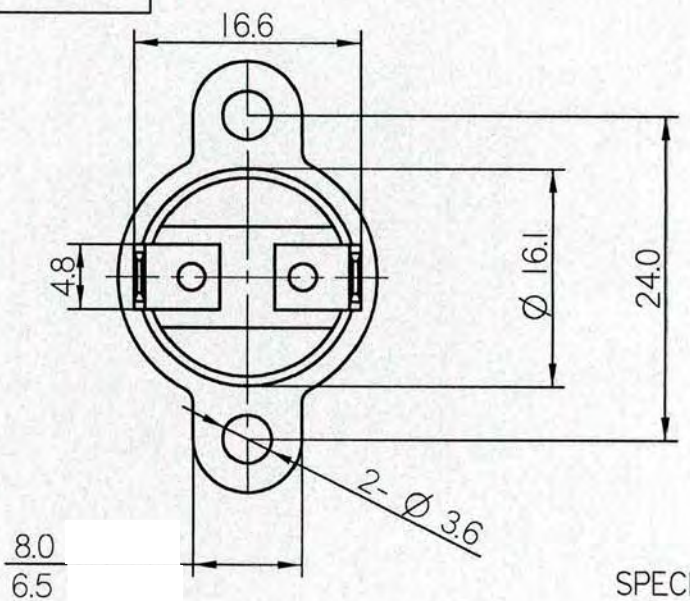
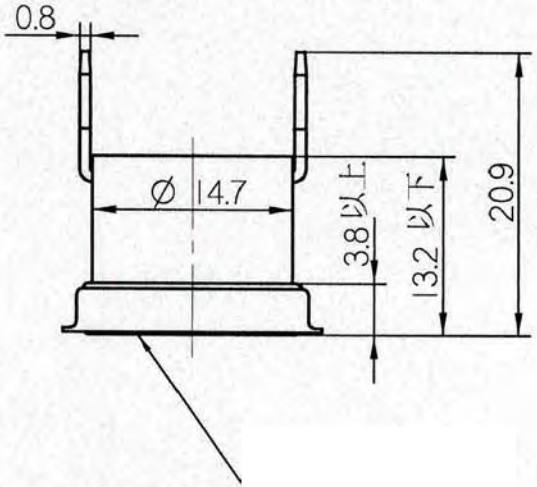
4CYC01045 A



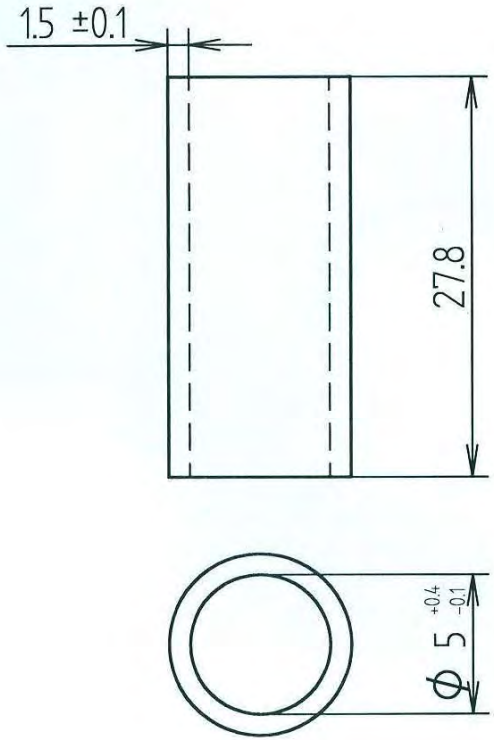


SPECIFIED LIMITS

		OFF)	ON)		
	KSD301	115±3℃	95±5℃	AC250V	10A
	HPC-115/95-U1	115±3℃	95±5℃	AC250V	10A

	RE. MARKS			PROJECTION	SCALE NTS	
REGD	DWN.	2012.2.2	TITLE		DWN.NO.	
	CHKD.	12.2.2	THERMOSTAT	shanghai Hitachi,Ltd.	4CYC01045	
	CHKD.	12.2.2				
	APPD.	12.2.2				

4CYC01042 A

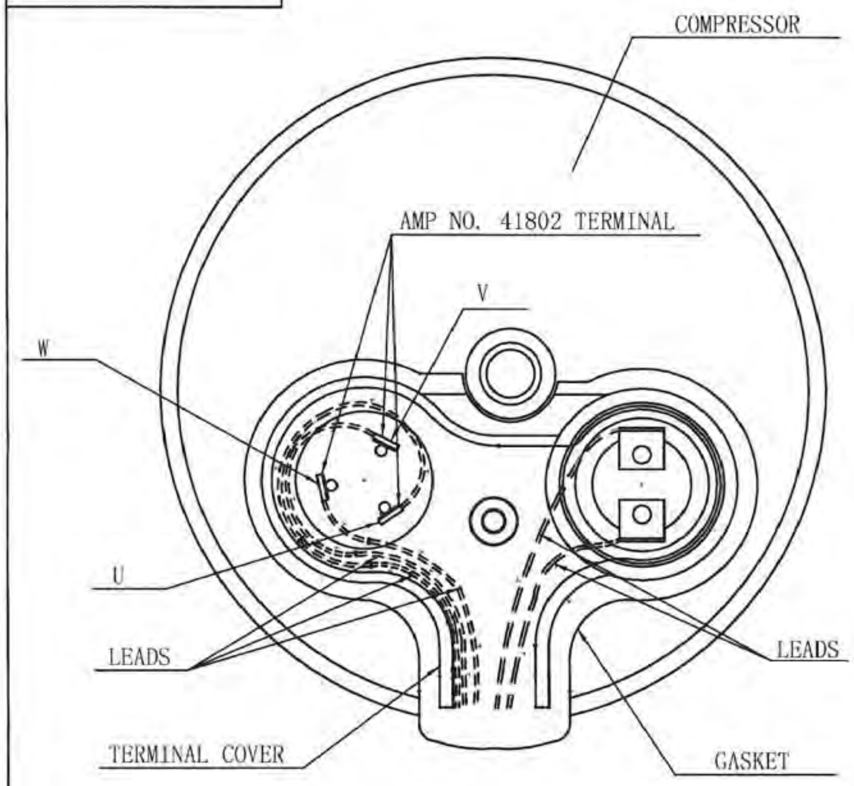


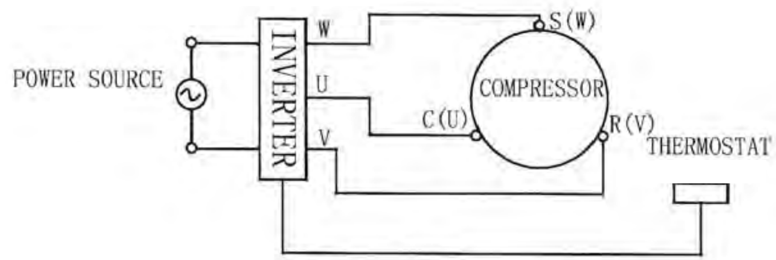
NOTE:
1. COLOR:WHITE
2. MATERIAL:SILICONE RUBBER

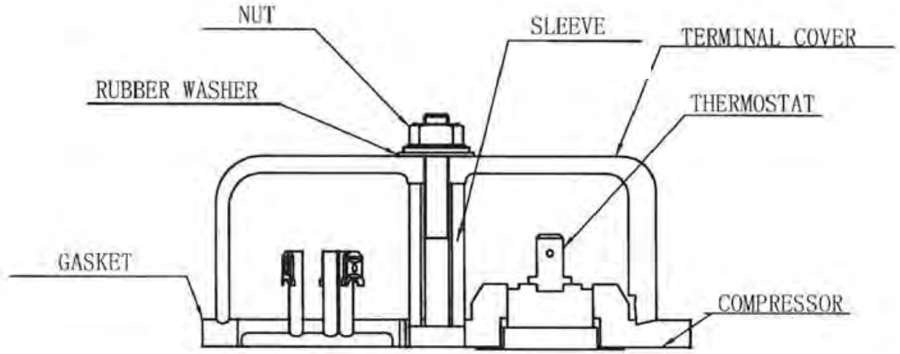
DIMENSION: mm

	RE. MARKS				PROJECTION	SCALE
REGD	DWN.		12.2.1	TITLE: SLEEVE	Shanghai Hitachi,Ltd.	NTS
	CHKD.		12.2.1			DWN.NO. 4CYC01042
	CHKD.					
	APPD.		12.2.1			

4CYC01268 A







NOTES:

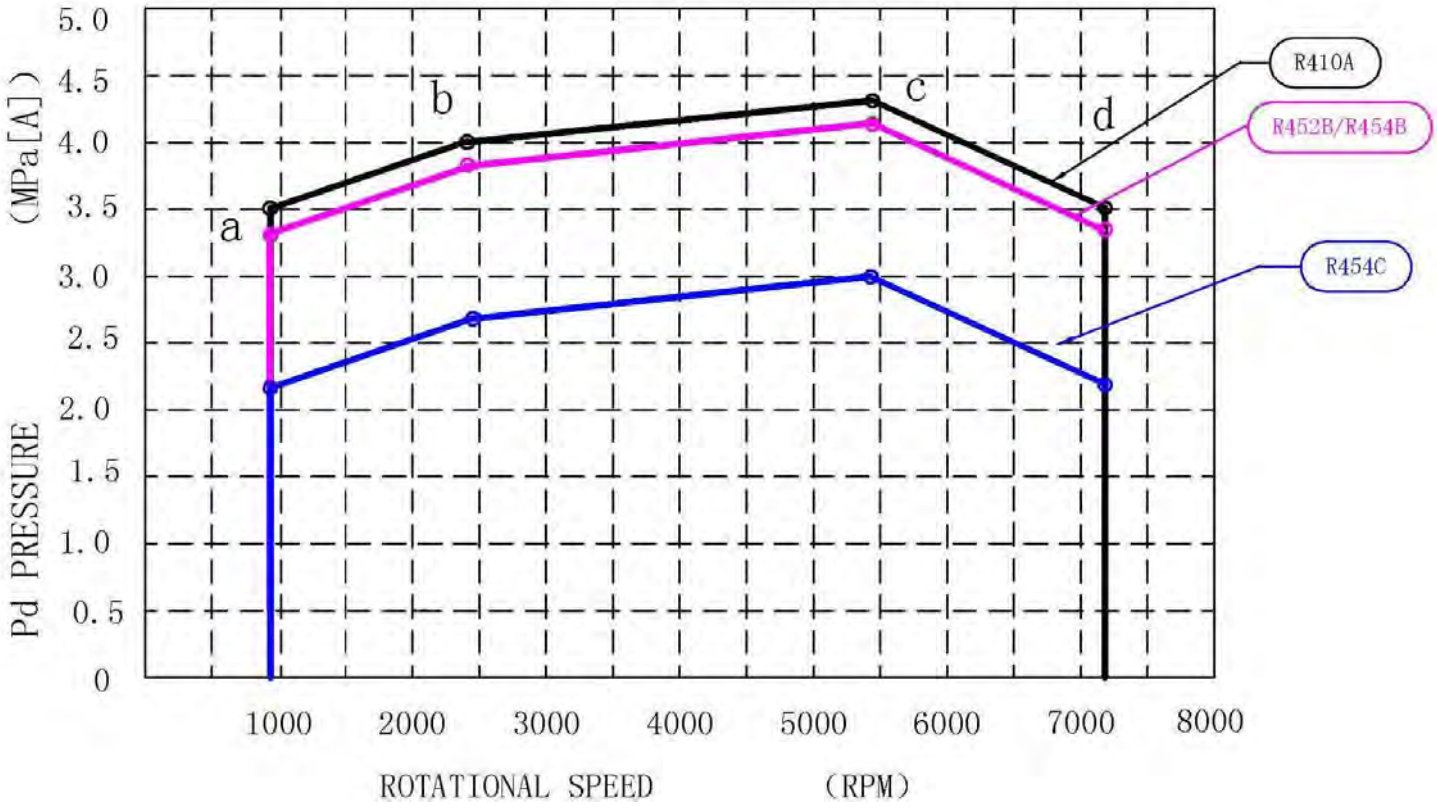
1. PLEASE PREPARE LEADS BY YOURSELF.
2. THE LETTER U, V OR W STANDS FOR EACH TERMINAL.
3. TABS FOR HERMETIC TERMINAL ARE AMP #250.
4. THERMOSTAT TO BE SET ON THE TOP OF COMPRESSOR AS SHOWN.

	RE. MARKS			PROJECTION	SCALE NTS	
REGD	DWN.	17.5.22	TITLE	shanghai Hitachi,Ltd.		DWN.NO. 4CYC01268
	CHKD.	17.5.22	LEAD ROUTING WIRING DIAGRAM			
	CHKD.					
	APPD.	17.5.23				

R410A/R452B/R454C/R454B

WHP SERIES R410A/R452B/R454C/R454B

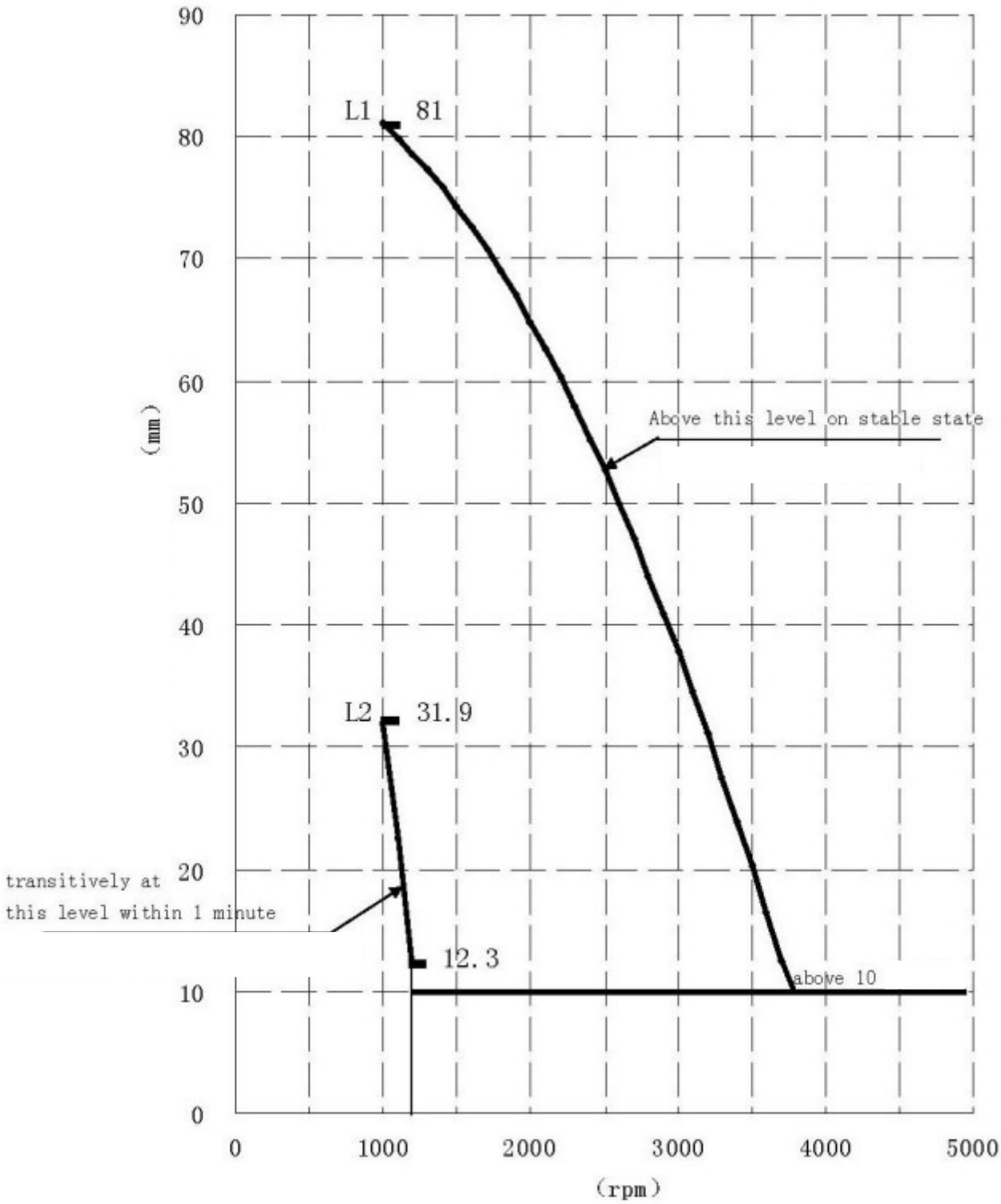
INVERTER COMPRESSOR GUARANTEE PRESSURE RANGE



	Rotational speed (rpm)	Pd limit (MPa)		
		R410A	R452B/R454B	R454C
a	900	3.50	3.22	2.25
b	2400	4.00	3.72	2.75
c	5400	4.28	4.00	2.97
d	7200	3.50	3.22	2.25

900～1800 min^{-1}

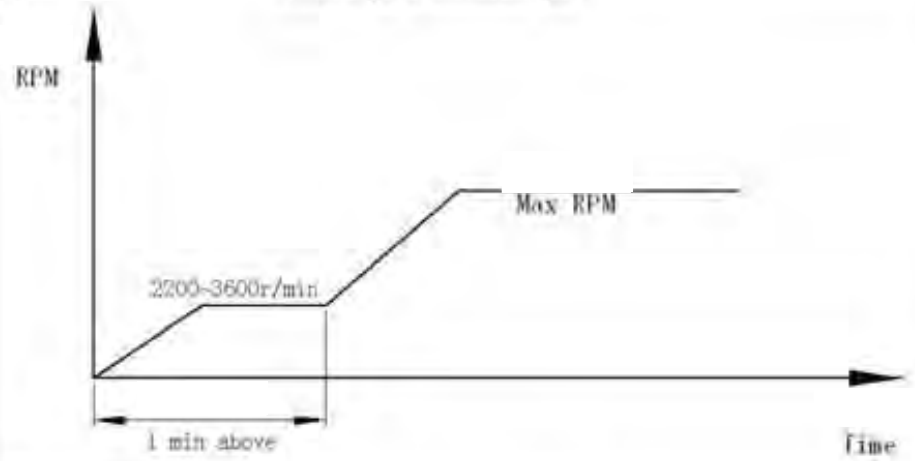
Chart 2 DC INVERTER COMPRESSOR OIL LEVEL DATUM



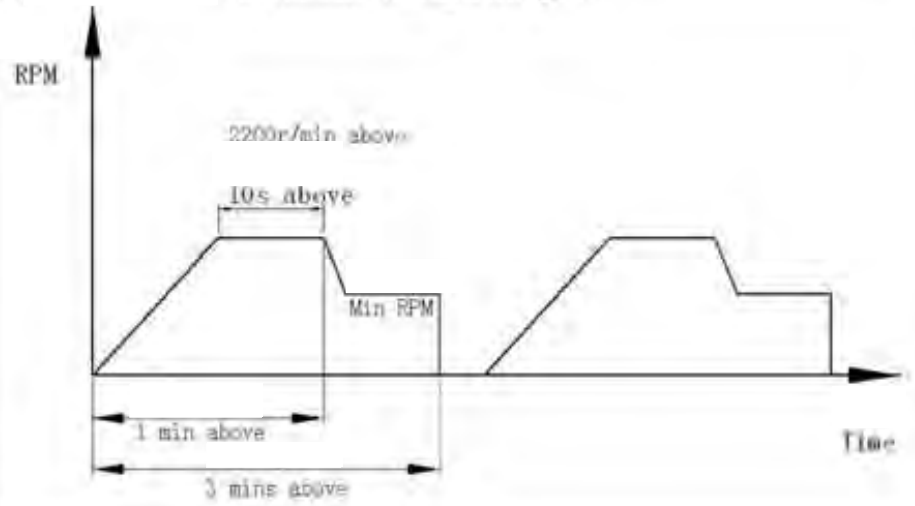
133min^{-1}/s

Details: Models of inverter rotary compressor revolutions change as shown in figure (1)-(3), revolutions changing frequency is below 133min $^{-1}$/s, minimum RPM and maximum RPM as shown in this Technical Agreement.

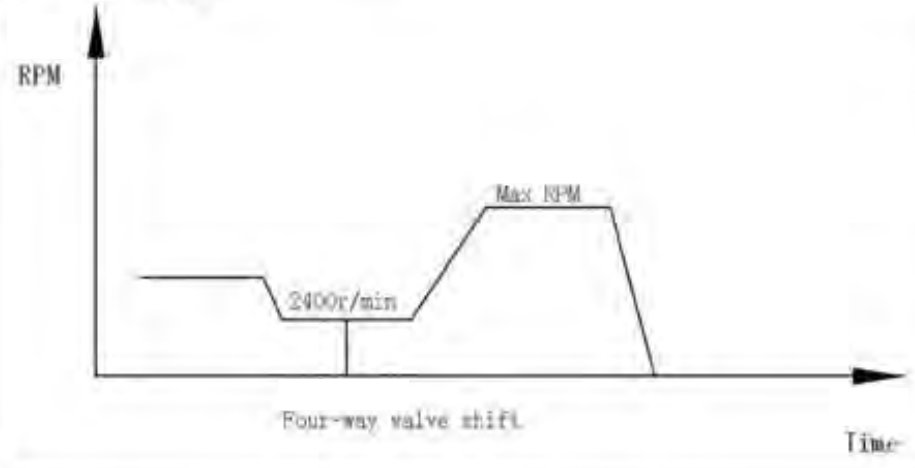
(1) (Form 0 rpm to maximum rpm)



(2) (Discontinuous running at low speed)



(3 (Defrost)



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