

Hitachi Highly

Rollkolbenverdichter

Rotary Compressors

Spezifikation

Installation Manual

WHP03600PRKQA7JT6

R 290

15,0 cm³/rev

1000 - 7200 min⁻¹

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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	WHP03600PRKQA7JT6
2.2 Power source input to inverter	Rated voltage / Rated frequency/Phase 220V/50Hz/1Φ
2.3 Output	750W(@3600 min ⁻¹)
2.4 Application	Heat pump water heater

2.5 Performance

Item	Rated Condition
Rotational speed	3600 min ⁻¹
Nominal Heating Capacity	3570W±5%
Motor input	820W±5%
Current	2.5A±5%
COP(see*)	4.35±5%
測定条件	
Evaporating temp.	7.2℃
Condensing temp.	54.4℃
Liquid temp. entering expansion valve.	46.1℃
Return gas temp.	35℃
Ambient temp.	35℃
Wind speed	2m/s

	<p>SUBJECT</p> <p>Model WHP03600PRKQA7JT6 SPECIFICATION</p>	PAGE: 2/30
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*.COP= Heating capacity

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.

2.6 Refrigerant	R290
2.7 Displacement	15.0ml /rev
2.8 Allowable frequency range	1000~7200 min ⁻¹
2.9 Oil	HAF68 480±20ml
2.10 Allowable amount of refrigerant charge	Below 750g
2.11 Compressor cooling	Forced air
2.12 Hermetic Terminal	Konventionel
2.13 Space volume of inner case	1200cm ³
2.14 Compressor weight	8.9kg 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)	16.7-120	Mechanical Frequency, Relating to VDCmax of Inverter
3.3 Demagnetizing Current (A)	18.50	Peak Current, at 130℃, -5% Demagnetizing Rate

3.4	Inductance Ld (mH)	Sheet 1	---
3.5	Inductance Lq (mH)	Sheet 1	---
3.6	Widerstand der Statorspule(20℃)	(Ω) 1.867 (20℃)	line-to-line
3.7	Voltage Constant (Vrms/krpm)	49.20	line-to-line
3.7	Torque Constant (N • m/Arms)	0.78	Torque/Current
3.9	Inertia (Kg • m2)	0.000311	---
3.10	FluxΦ a (Wb)	0.1279	$\varphi \text{ (Per Phase, Peak)} = \frac{\sqrt{2} \times E0}{2\pi f \sqrt{3}}$ $\frac{\sqrt{2} \times E0}{2\pi f \sqrt{3}}$
3.11	Magnet Material	NdFeB	

2

(RMS)	1.0	2.0	3.0	4.0	5.0	6.0	7.0
Lq (mH)	15.45	14.94	14.30	13.60	12.88	12.21	11.61
Ld (mH)	10.95	10.98	10.82	10.51	10.17	9.81	9.46

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 moisture200mg MAX (以下)
- 4.4. Residual impurities100mg MAX (以下)

5 PARTS AND DRAWING LIST

PARTS NAME		QTY/SET	DRAWING NO.	REMARKS
Compressor		1	4CYCD****	Dimensioned sketch
Mounting Parts 安装件	Rubber grommet	3	4CYC00851	
	Bolt	-	4CYC00940	*
	Nut	-	(M8)	*
Electrical Parts 电器部品	Terminal cover	1	4CYC01114	
	Gasket	1	4CYC01113	
	Sleeve	1	4CYC01042	
	Nut	1	3CYC00004	
	Rubber washer	1	4CYC00174	
	Thermostat	1	4CYC01045	*
			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 1 ϕ 100V, 200V, 3 ϕ 200V). 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 $\pm 10\%$, 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.

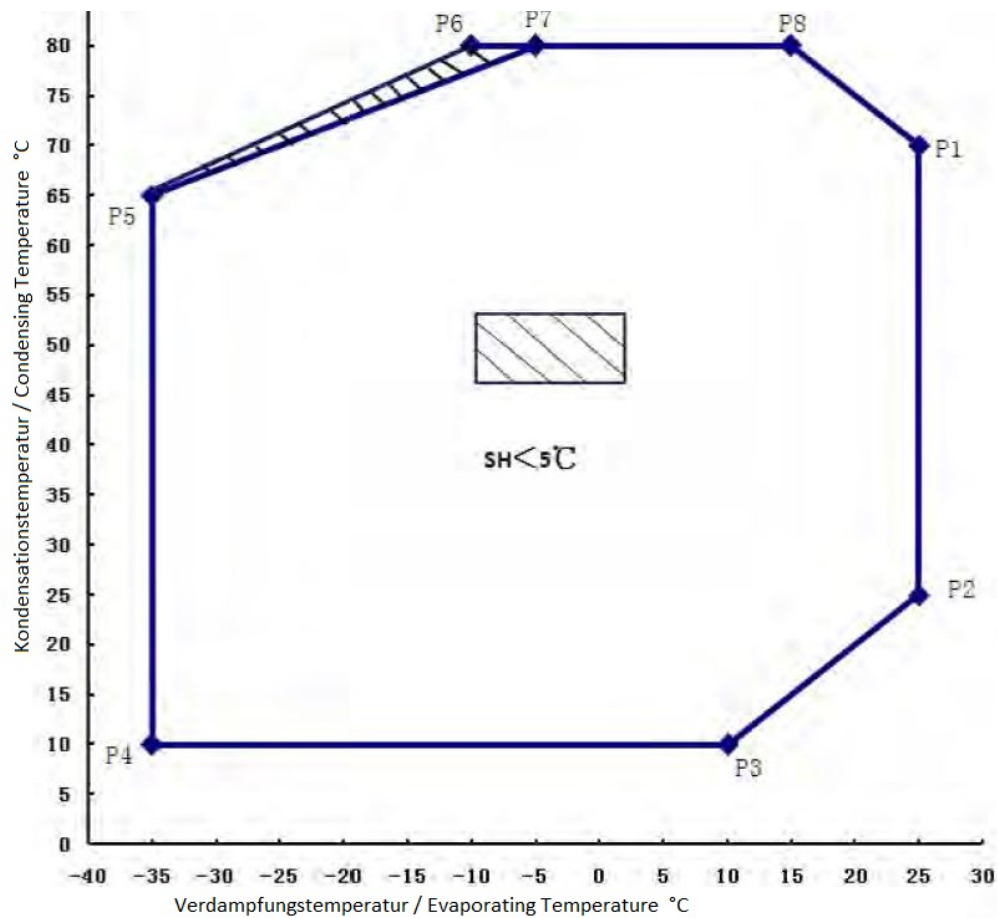
(Please check the oil level in the compressor with the sight glass we supply.)

Öl sollte kontinuierlich zum Kompressor zurückgeführt werden und darf nicht im Kältesystem verbleiben. Der Ölstand im Kompressor sollte 7,5 mm höher sein als der Ölversorgungsanschluss. Beim Betrieb des Kompressors dürfen die beiden Schichten Öl und Kältemittel nicht getrennt werden. Wenn jedoch der Schaumzustand entsteht und die Flüssigkeit zu Schaum wird, gehört dieser Teil nicht zum Ölstand. Wenn der Ölstand nicht erreicht werden kann, ist die Ölversorgung des Gleitteils unzureichend, was die Zuverlässigkeit erheblich beeinträchtigt. (Dies kann mit einem Kompressor mit Schauglas zur Beobachtung des Ölstands bestätigt werden)

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

Table 2

Item	Operating Envelope	
Discharge pressure MPa	3.13 MAX (condensing temperature :80℃)	(see graph 1)
Suction Pressure MPa	0.137~0.95 (Evaporation Temperature：-35℃~25℃) It can also be 0.101~0.17 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 condensingtemperature	
Motor winding temp	Rated voltage： 105℃ 以下 MAX	R.Voltage±10%: 120℃ MAX
Accumulator temp	Higher than outlet pipe of evaorator	
Ambient temp	Meet for the condition of above mentioned motor winding temp.	



Graph 1

	P1	P2	P3	P4	P5	P6	P7	P8
Condensing temperature	70°C	25°C	10°C	10°C	65°C	80°C	80°C	80°C
Evaporation Temperature	25°C	25°C	10°C	-35°C	-35°C	-10°C	-5°C	15°C

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/cm²}. 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°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.

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 $133\text{min}^{-1}/\text{s}$, 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 ($150 \times 10^{-3}\text{mmHg}$) 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 filter 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 R290. 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.

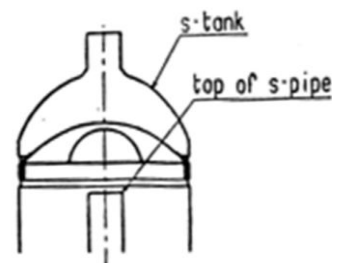
15 Compressor vacuum operation

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 tank 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 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°C .

The motor winding temperature should be less than 149°C and hermetic terminal body temperature should be less than 177°C 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 0.8 mm ($1/30''$) when the compressor is operating at allowable rotational speed range and voltage range of rated $\pm 10\%$.

Displacement in excess of 0.8 mm ($1/30''$) will require changing tube length and/or routing.

22 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.

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 the compressor 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 R290, 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°C 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 and vibration 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°C . Confirm the start-up of compressor if the temperature of compressor surface is below -10°C . Heat up compressor to reach the temperature higher than -10°C with heater if the ambient temperature is below -10°C .
- (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 direct contact 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 R290, 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 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 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.

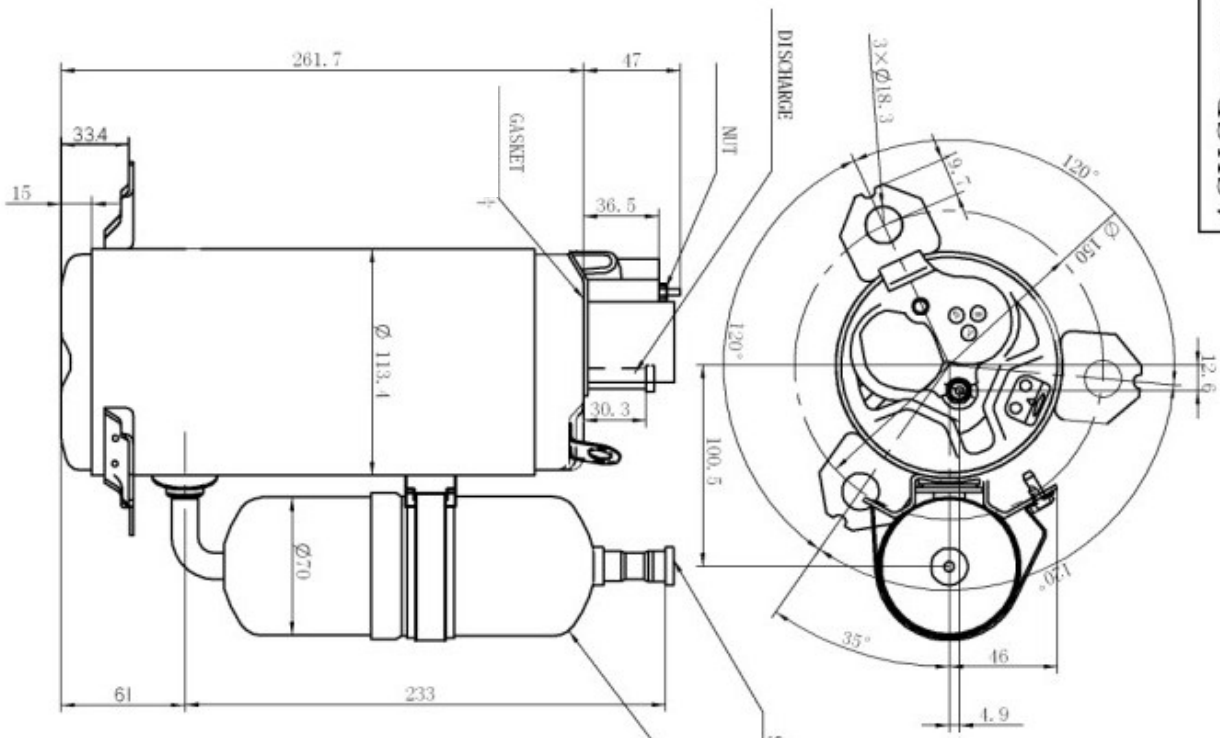
(28) The thickness of the refrigerating system using tube
the tube thickness as followed

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

<div>Check upon Delivery</div> <div>验收依据及规则</div>	<div>PAGE: 16/30</div>
<div>1. Basis for Checking upon Delivery</div> <div>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.</div> <div>2. Rule for Checking upon Delivery</div> <div>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.</div>	

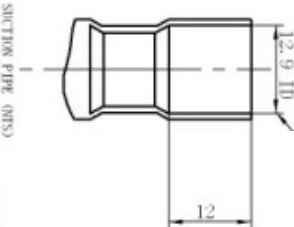
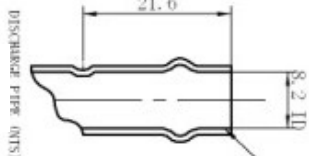
4CYCD****

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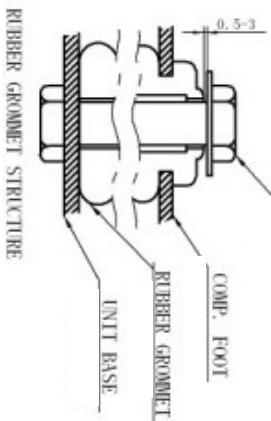
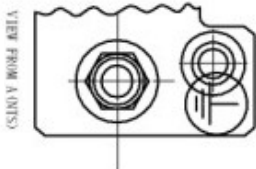


THE COLUMN WHICH LESS THAN DIAMETER 8.1mm CAN PASS THE PIPE, BUT THE COLUMN WHICH MORE THAN DIAMETER 7.5mm CAN'T PASS THE PROHIBITIVE POSITION.

THE COLUMN WHICH LESS THAN DIAMETER 12.7mm CAN PASS THE PIPE.



BOLT



DIMENSION: mm

NOTE:

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

WHP03600PRKQAJT6

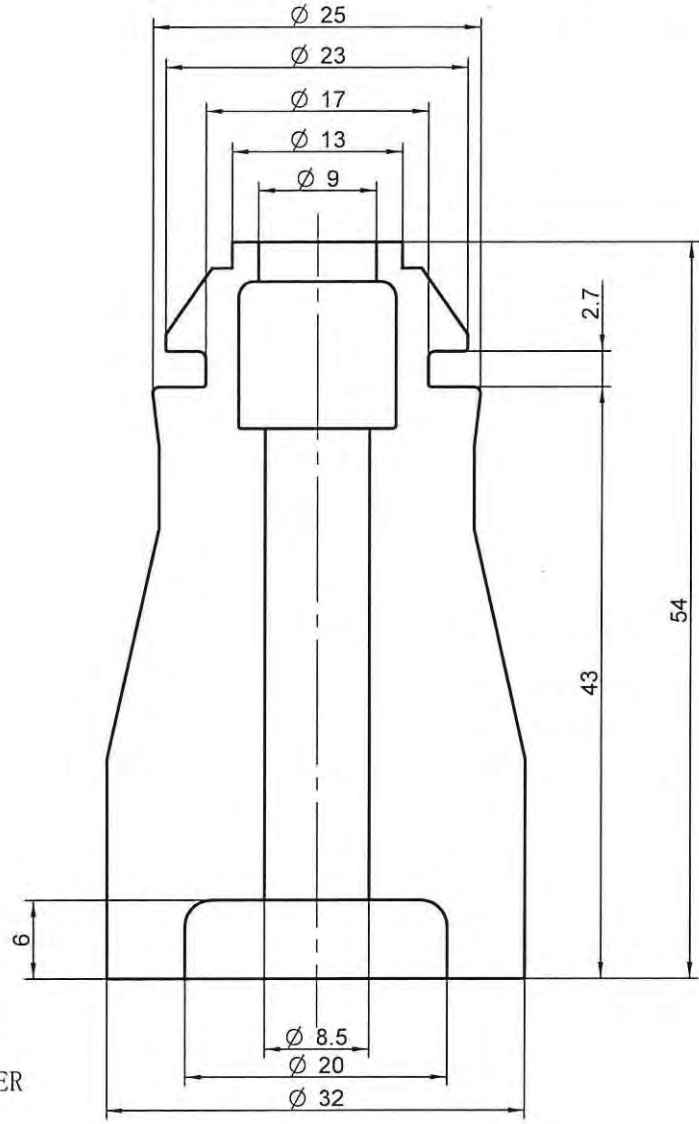
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APP'D						
DIMENSIONED SKETCH			4CYCD****			

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4CYC00851

版本标识 E


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①					④				
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NOTE:

- 1. MATERIAL: NATURAL RUBBER
- 2. HARDNESS: $H_s = 40^{+5}_{-3}$

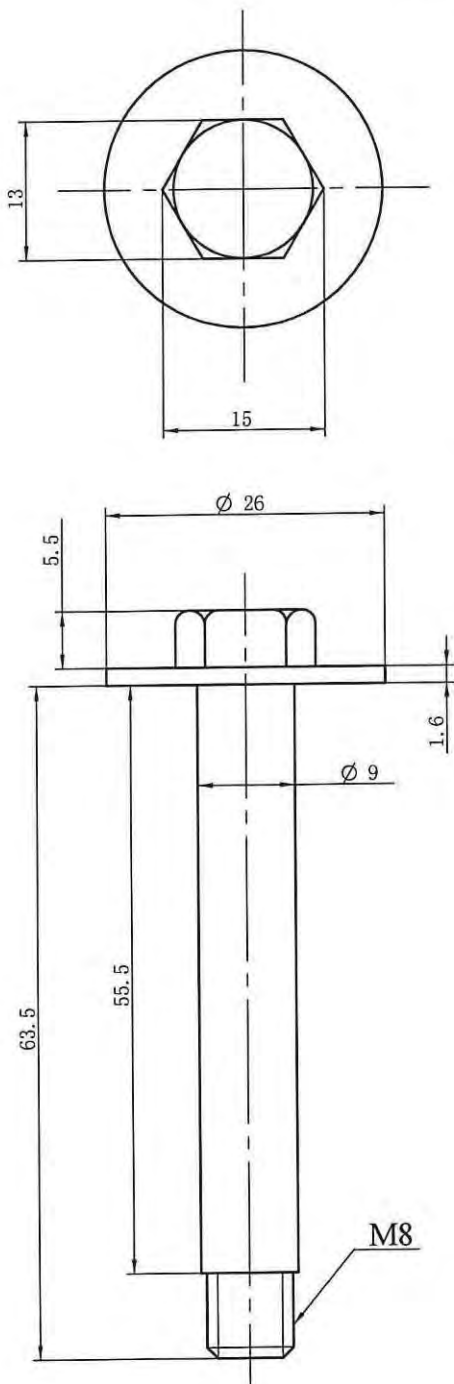
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	CHKD.	杨细钦	2018.5.29				
	CHKD.	雷海钧	2018.5.29				
	APPD.	毛玉智	2018.5.29				

4CYC00940

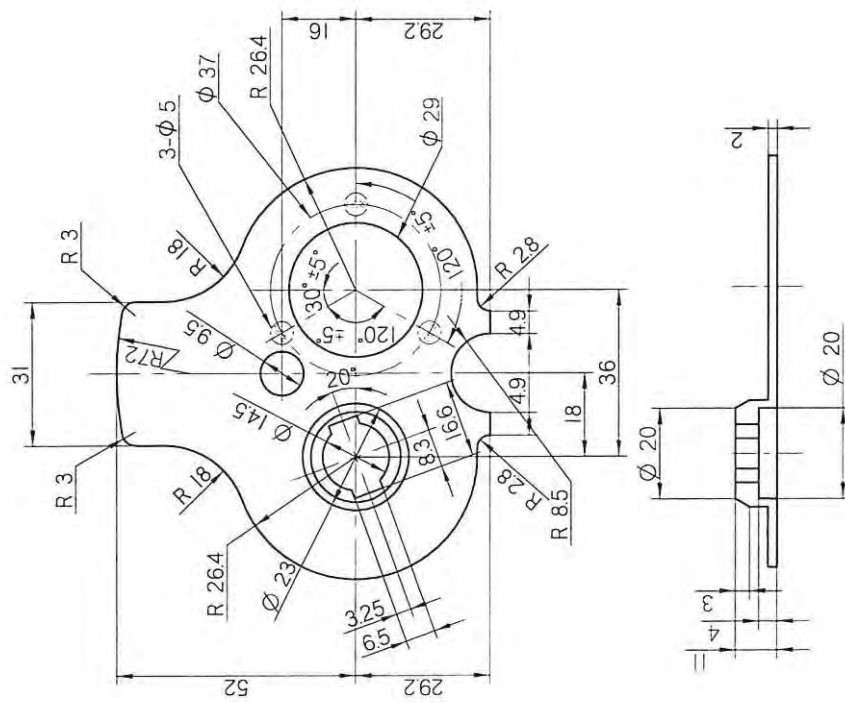
版本标识 C

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③					⑥				



	RE-MARKS			PROJECTION	SCALE NTS	
REGD.	DWN. 黄仕龙	18.5.18	TITLE			DWN. NO.
	CHKD. 王德	18.5.18	BOLT	SHEC		4CYC00940
	CHKD.					
	APPD. 王德	18.5.18				

4CYC01113										版本标识		B
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MATERIAL: EPDMFOP-B

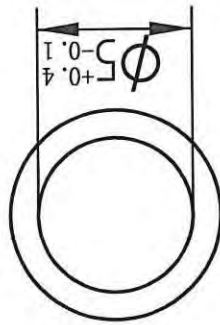
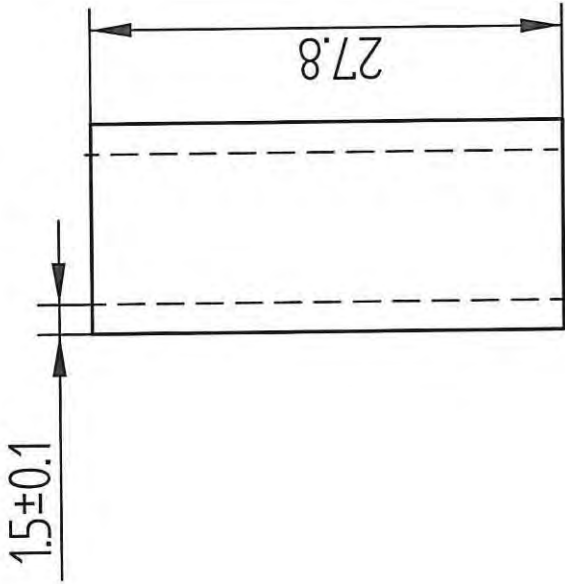
DIMENTION: mm

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		APPD.						
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版本标识

4CYC01042

记号	来历	年月日	订正	审查	记号	来历	年月日	订正	审查
①					④				
②					⑤				
③					⑥				



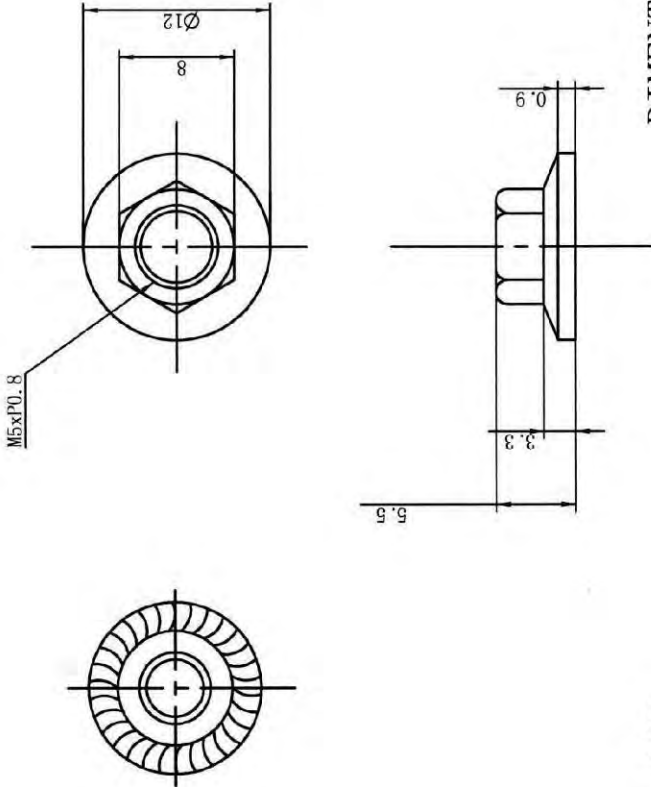
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1、COLOR:WHITE
2、MATERIAL:SILICONE RUBBER

REGD	RE. MARKS	TITLE			PROJECTION 	SCALE NTS	DWG NO. 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3CYC000004

版本标识E

记号	来历	年月日	订正	审查	记号	来历	年月日	订正	审查
①					④				
②					⑤				
③					⑥				



MATERIAL: 08F

DIMENTION: mm

REF. MARKS	PROJECTION	SCALE	DWN. NO.
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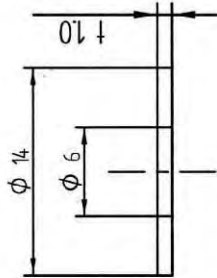
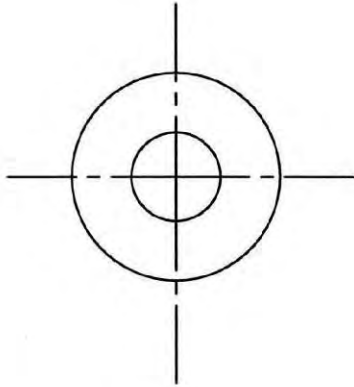
DWN.	CHKD.	CHKD.	APPD.	TITLE
周扬	杨志浩		4/17/18	NUT
18.5.21	18.5.21		18.5.21	

3CYC000004


4CYC00174

版本标识B

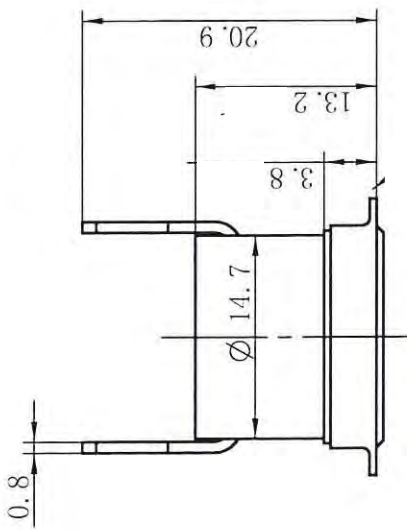
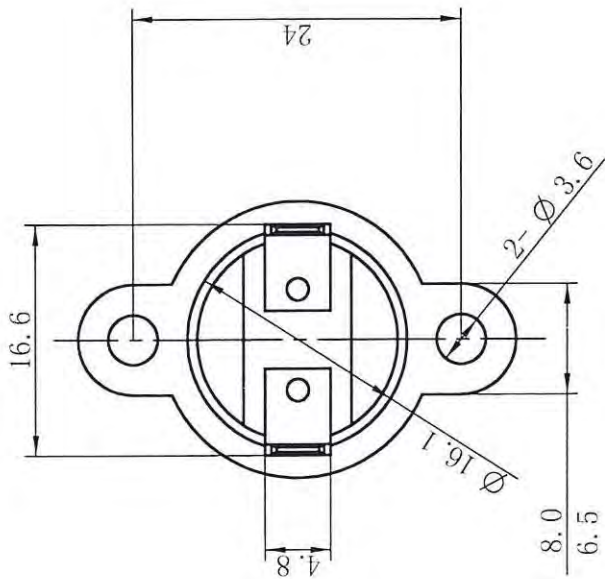
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①					④				
②					⑤				
③					⑥				



MATERIAL:EPDM

REGD	REV. MARKS					PROJECTION		SCALE	NTS	DWG NO	4CYC00174
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	CHKD.	18.5.21			TITLE	RUBBER WASHER	SHEC				
	CHKD.										
	APPD.	18.5.22									

4CYC01045				版本标识		B			
记号	来历	年月日	订正	审查	记号	来历	年月日	订正	审查
①					④				
②					⑤				
③					⑥				



SPECIFIED LIMITS

	(OFF)	(ON)	
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HPC-115/95-UI	115±3℃	95±5℃	10A

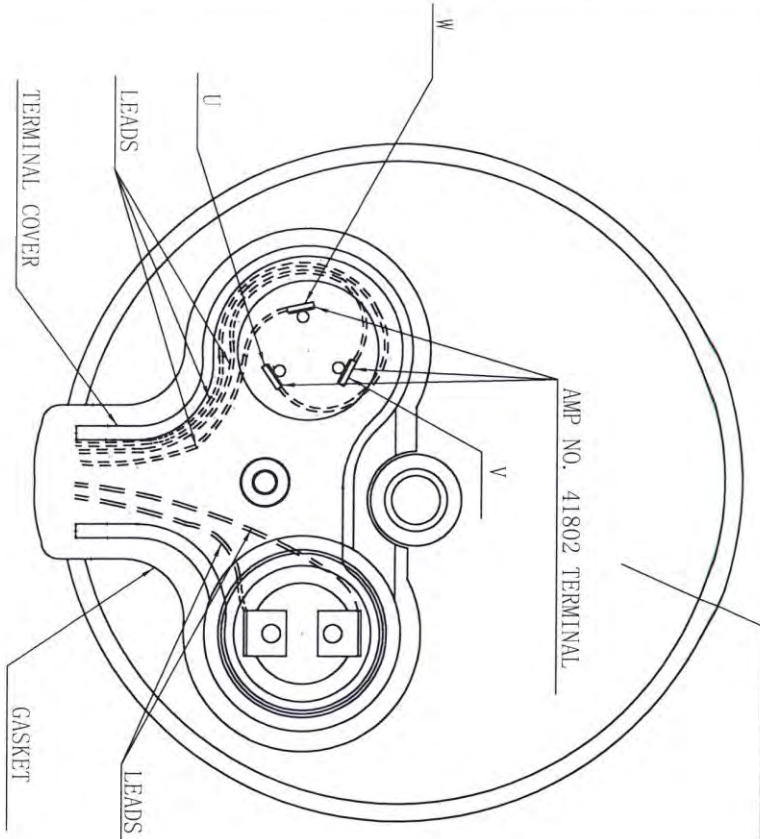
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			NTS
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CHKD. 18.6.21	THERMOSTAT		
CHKD. 18.6.21			
APPD. 18.6.21			
4CYC01045			

4CYC01268

版本标识

B

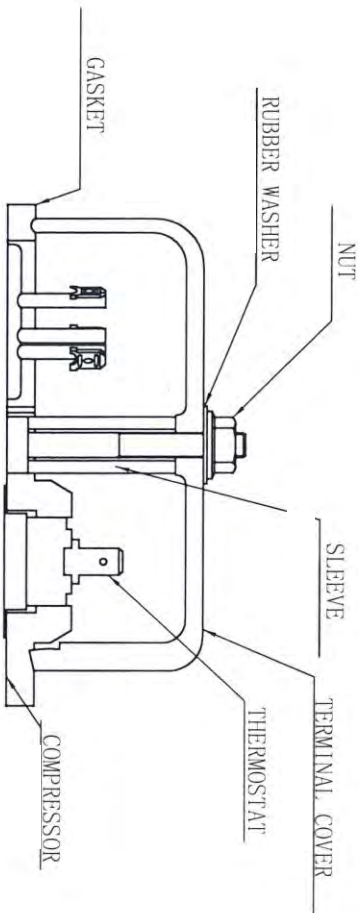
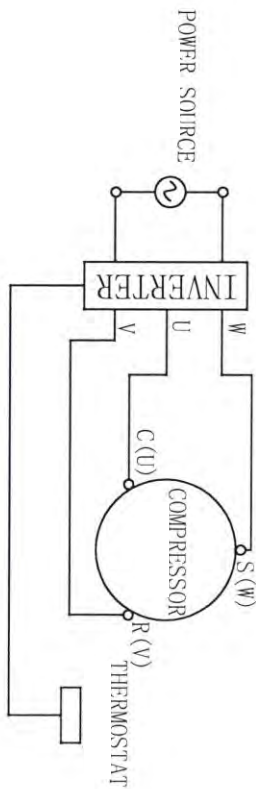
COMPRESSOR



NOTES:

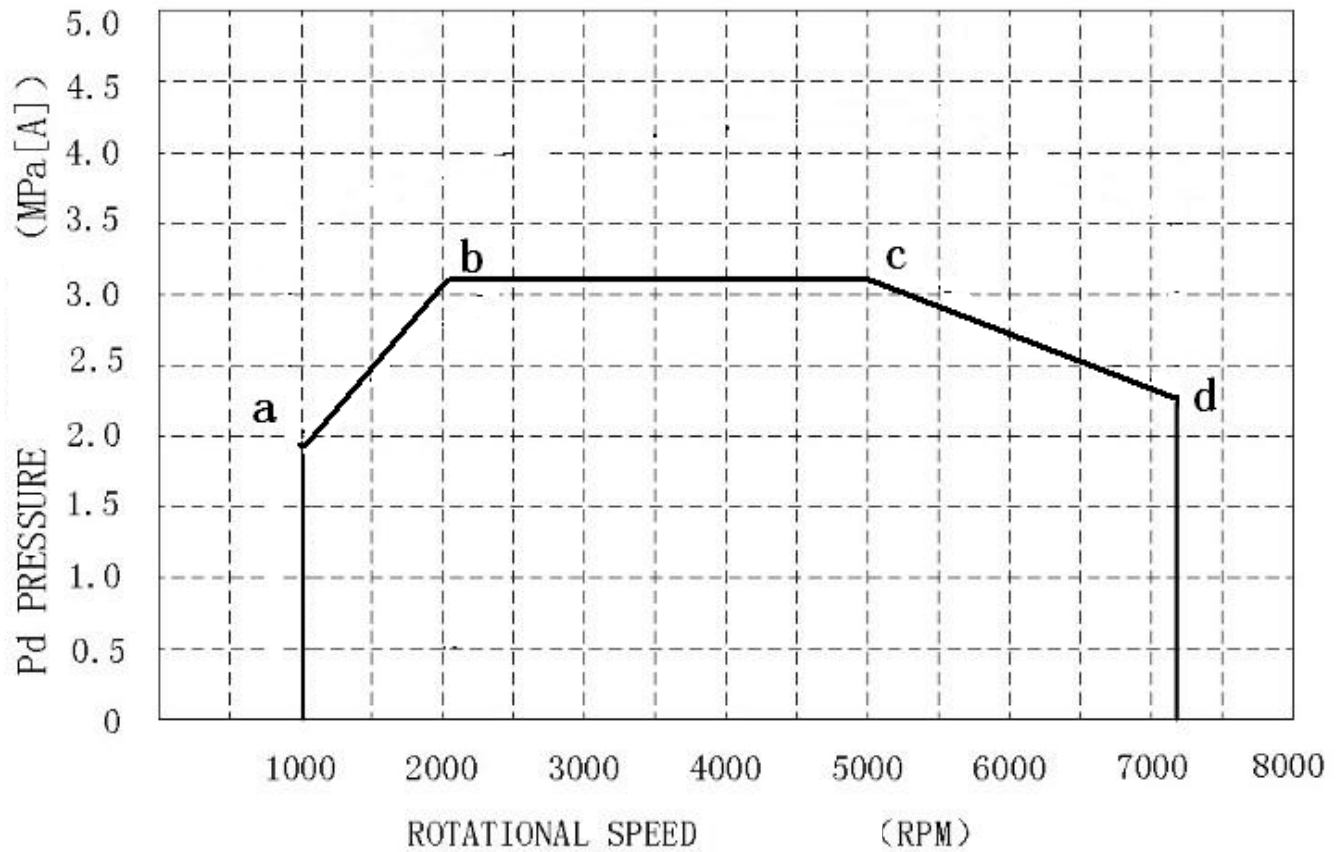
1. PLEASE PREPARE LEADS BY YOURSELF.
2. THE LETTER U, V OR W STANDS FOR EACH TERMINAL.
3. TABS FOR HERMETIC TERMINAL ARE AMP #250.
4. THERMOSTAT TO BE SET ON THE TOP OF COMPRESSOR AS SHOWN.

记号	来历	年月日	订正	审查	记号	来历	年月日	订正	审查
①					④				
②					⑤				
③					⑥				



REGD	REV.	DATE	DESCRIPTION	PROJECTION	SCALE	DATE
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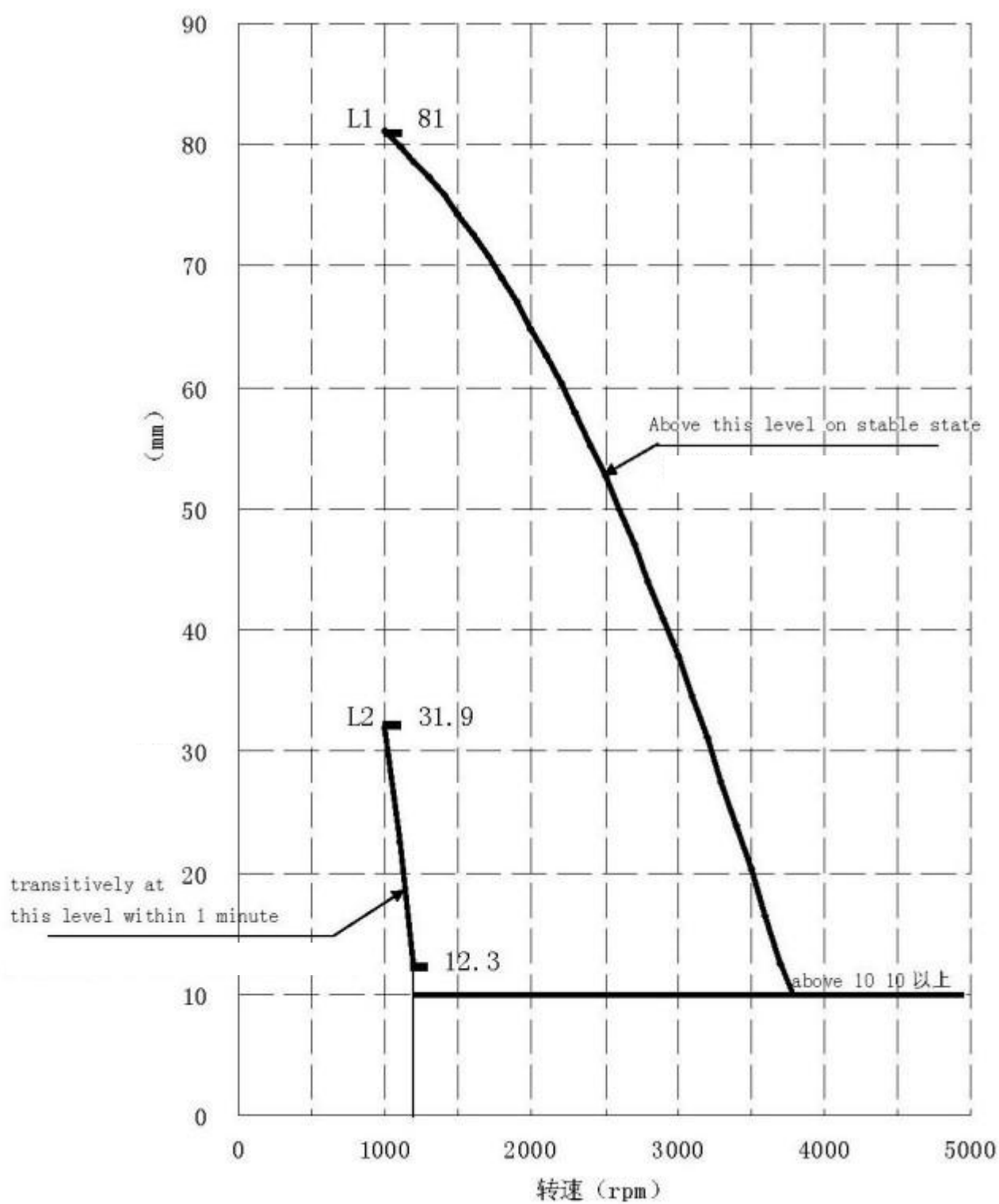
WHP SERIES INVERTER COMPRESSOR GUARANTEE PRESSURE RANGE



Compressor running speed range: Min 1000min^{-1} ~ Max 7200min^{-1}

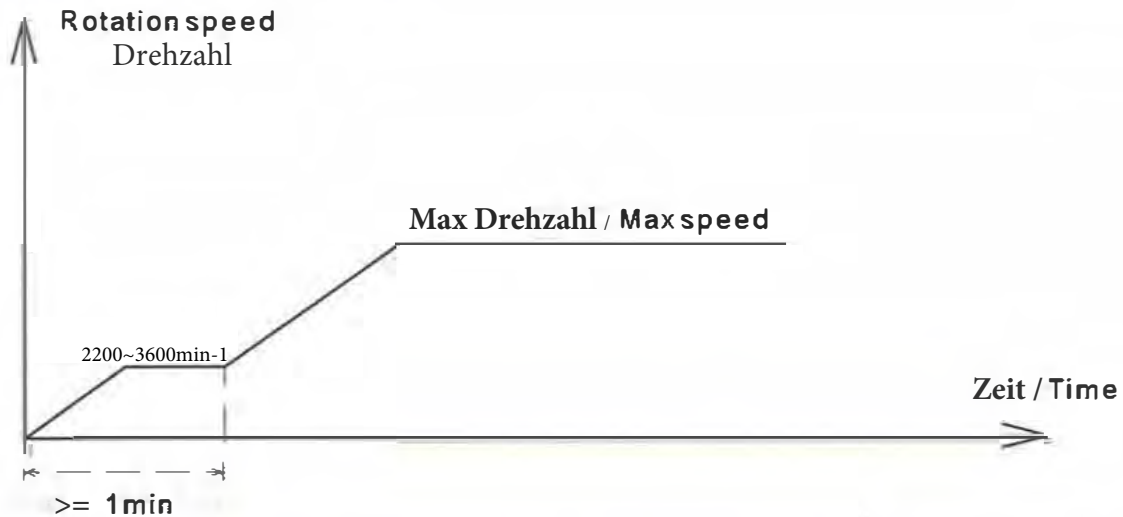
Rotational speed	Pd limit
min-1	MPa
1000	1.96
2100	3.13
5000	3.13
7200	2.34

Chart 2 DC INVERTER COMPRESSOR OIL LEVEL DATUM

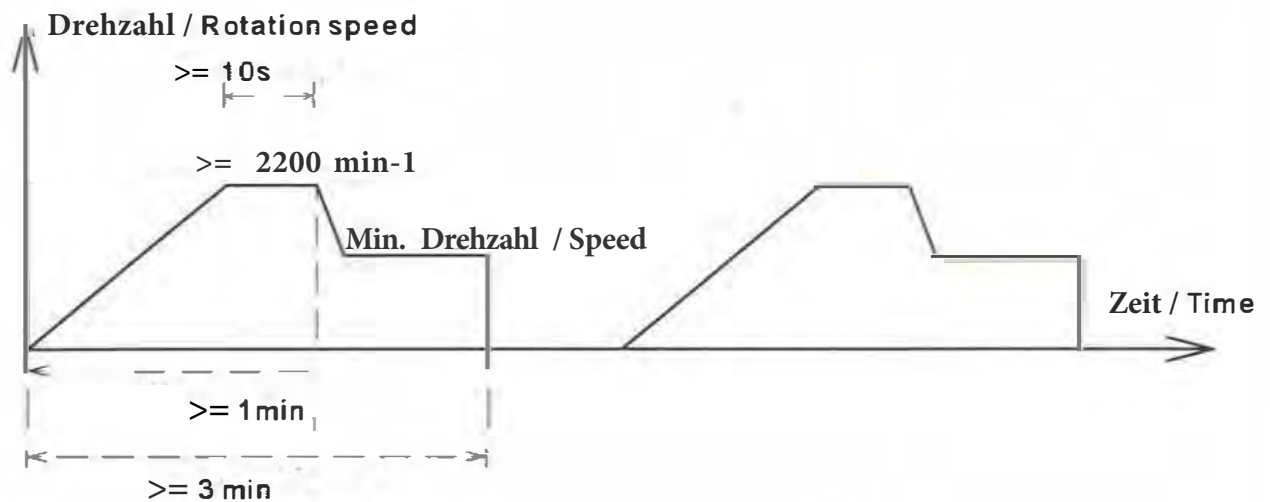


Drehzahländerung / Speed change rate: $\leq 133 \text{ min}^{-1}/\text{s}$
Max und Min Drehzahl in den einzelnen Spezifikationen
Max and min speed is showed in the specification

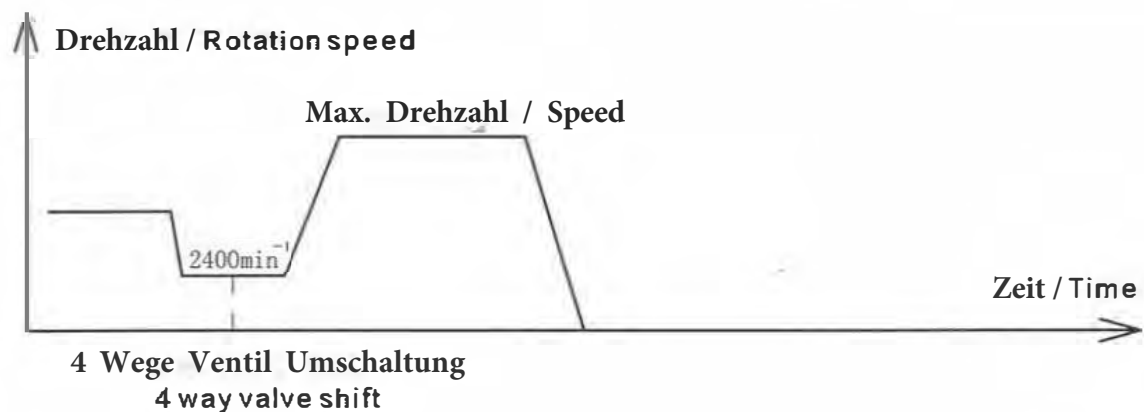
(1) Vom Start zur gewünschten Drehzahl / From starting to normal running



(2) Niedrige Drehzahl und unregelmäßiger Betrieb / Low speed un-continuously running



(3) Abtauung / Defrost mode {unter Verwendung eines 4 Wege Ventiles / by using 4 way valve}



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