

Hitachi Highly

Rollkolbenverdichter

Rotary Compressors

Spezifikation

Installation Manual

WHP05600VUKQA7JG6

R410A/ R454C/ R454B/ R134a

14,1 cm³/rev

1000 - 7200 min⁻¹

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revision experience

	<p>SUBJECT</p> <p>Model WHP05600VUKQA7JG6</p> <p>SPECIFICATION</p>	PAGE:1/29
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1. SCOPE

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

2. SPECIFICATION OF COMPRESSOR

2.1 Model

WHP05600VUKQA7JG6

2.2 Power source input to HIGHLY inverter

Rated Voltage/Frequency/Phase

220V/1/50Hz

2.3 Application

Heat pump water heater

2.4 Refrigerant

R410A/R454C/R454B/R134a

2.5 Compressor Cooling

Forced air

2.6 Displacement

14.1ml/rev

2.7 Performance

Performance				
Refrigerant	R410A	R454C	R454B	R134a
Rotational speed	3600 min-1	3600 min-1	3600 min-1	3600 min-1
Nominal Heating Capacity	5570	3875	5425	2620
Motor input	1330	855	1280	570
Current	4.6	3.26	4.32	2.00
COP (see*)	4.19	4.53	4.24	4.60
Test Conditions				
Evaporating temp. °C	7.2			
Condensing temp. °C	54.4			
Liquid temp. entering expansion valve.	46.1			
Return gas temp. °C	35			
Ambient temp. C	35			

	SUBJECT		PAGE:2/29
	Model WHP05600VUKQA7JG6		
	SPECIFICATION		
* COP= $\frac{\text{Heating capacity (W)}}{\text{Motor input}}$			
2.8 Allowable frequency range		1000~7200rpm	
2.9 Allowable amount of refrigerant charge		1250g	
2.10 Amount of oil charge		480±20 ml(Initial)	
2.11 Oil		HAF68D1/HAF68D1U/ALPHA68HES or equivalent	
~			
2.12 Space volume of inner case		1200 ml	
2.13 Net weight		9.4kg incl.oil	
2.14 Hermetic Terminal		1/4”quick connect type	
2.15 Motor			
Type		Direct current brushless motor	
Insulation class		Class E	
Winding resistance		1.532Ω(at 20℃)	
* Nominal heating capacity equals refrigerant capacity adding motor input. Refrigerant capacity and motor input are measured by secondary Refrigerant calorimeter Methods of GB5773by Shanghai Highly Electrical Appliances Co.,Ltd. Allowable heating capacity should be more than 95% of the nominal heating capacity and allowable motor input should be less than107% of nominal motor input.			

SPECIFICATION

3. MOTOR PARAMETER

Project	Parameter	Description
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 Curren (A)	21.6	Peak Current, at130℃, -5% Demagnetizing Rate
3.4 Inductance Ld (mH)	Sheet 1	—
3.5 Inductance Lq (mH)	Sheet 1	—
Project	Parameter	Description
3.6 Winding Resistance (Ω) (20℃)	1.532 (20℃)	Phase-to-Phase
3.7 Voltage Constant (Vrms/krpm)	49.5	Phase-to-Phase
3.8 Torque Constant (N·m/Arms)	0.78	Torque/Current
3.9 Inertia (Kg·m ²)	0.000388	--
3.10 Flux Φa (Wb)	0.1286	$\varphi(\text{Per Phase, Peak}) = \frac{\sqrt{2} \times E0}{2\pi \sqrt{3}}$
3.11 Magnet Material	NdFeB	

1: Measuring frequency 100Hz

Current (RMS)	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
Lq(mH)	13.76	13.48	12.99	12.50	11.99	11.47	10.95	10.49	10.06
Ld(mH)	10.12	10.03	9.88	9.70	9.43	9.15	8.86	8.59	8.32

		SUBJECT		Model WHP05600VUKQA7JG6		PAGE:4/29	
				SPECIFICATION			
4. PARTS AND DRAWING LIST							
PARTS NAME			QTY/SET	DRAWING NO.	REMARKS		
Compressor			1	4CYCD0***	Dimensioned sketch		
Mounting Parts	Rubber grommet		3	4CYC00851	* *		
	Bolt		-	4CYC00940			
	Nut		-	(M8)			
Electrical Parts	Terminal cover		1	4CYC01043	*		
	Gasket		1	4CYC01044			
	Sleeve		1	4CYC01042			
	Nut		1	3CYC00004			
	Rubber Washer		1	4CYC00174			
	Thermostat		1	4CYC01045			
				4CYC01426	Lead routing		
				1	Pressure guarantee Chart		
				2	Oil level datum		
				3	Notes for rotational speed change		
					Appendix		

*. Out of supply, for reference.

5. CHARACTERISTICS 5.1

Residual moisture 200mg MAX

5.2 Residual impurities 100mg MAX

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. Moreover, accessories should be specified parts used in specified way, service must use specified parts too. 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 100V,200V,3 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 10% , under standard condition and overload condition of rated frequency (applied voltage to inverter).

It must be satisfied with item 5 ,6,7.

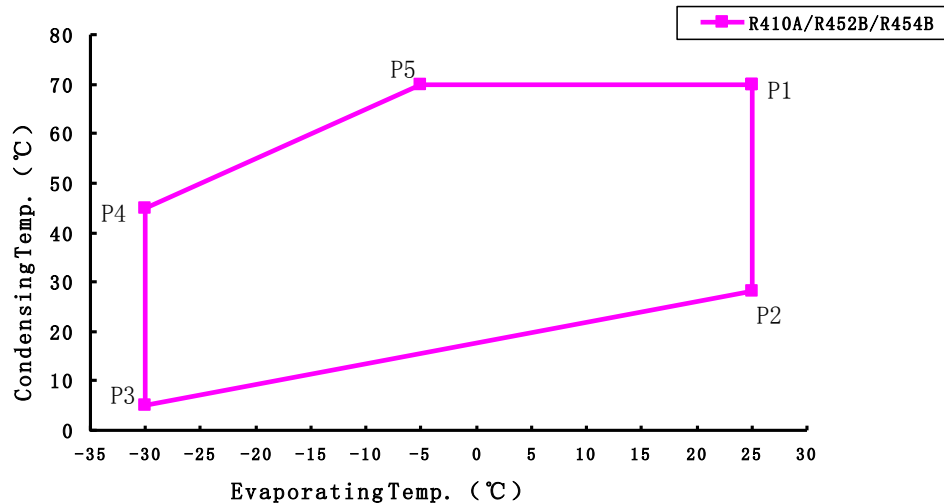
4 Operating temperatures and pressures

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

Table 2

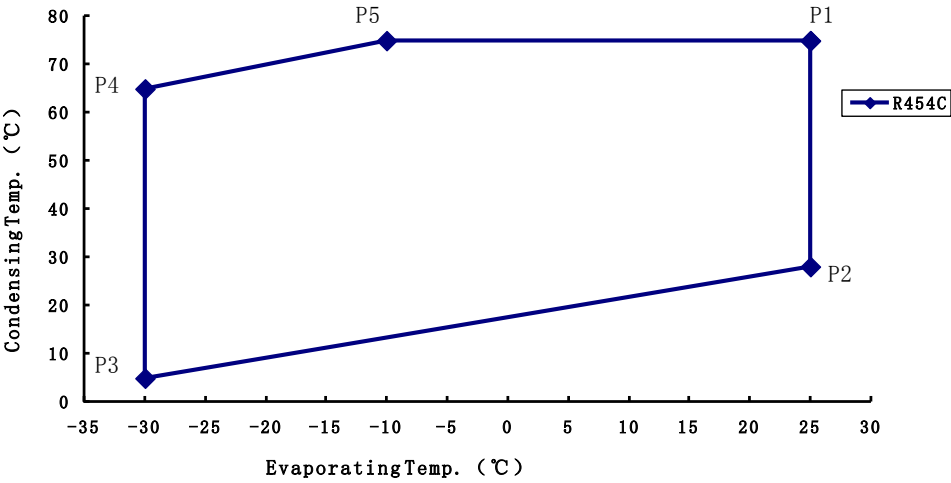
Item	Operating Envelope			
Refrigerant	R410A	R454C	R454B	R134a
Discharge pressure MPa {kgf/cm ² G}	4.762 MAX (condensing temperature :<70℃)	3.465 MAX (condensing temperature :<75℃)	4.439 MAX (condensing temperature :<70℃)	2.633 MAX (condensing temperature :<80℃)
Suction Pressure MPa {kgf/cm ² G}	0.272~1.652	0.172~1.084	0.251~1.543	0.106~0.665
	(Evaporation Temperature : -30/-25℃~25℃) It can also be 0.101~0.172 MPa when in transition, but should not be used when it is less than 0.101 MPa.			
Compressor case bottom temp	99℃or below and 6 degrees higher than condensing temperature			
Motor winding temp.	Rated voltage: 105℃ MAX		Rated Voltage±10%: 120℃ MAX	
Accumulator temp	Higher than outlet pipe of evaporator			

Notes: Overload condition should not be continuous.



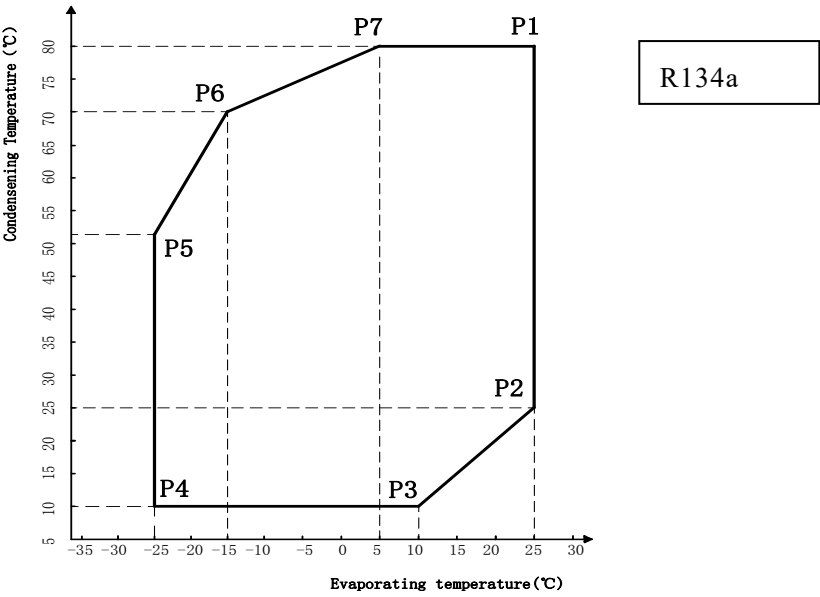
Graph 1(a) 1(a)

	P1	P2	P3	P4	P5
Condensing temperature	70℃	28℃	5℃	45℃	70℃
Evaporation Temperature	25℃	25℃	-30℃	-30℃	-5℃



Graph 1 (b)

	P1	P2	P3	P4	P5
Condensing temperature	75°C	28°C	5°C	65°C	75°C
Evaporation Temperature	25°C	25°C	-30°C	-30°C	-10°C



Graph 1

	P1	P2	P3	P4	P5	P6	P7
Condensing temperature	80°C	25°C	10°C	10°C	52°C	70°C	80°C
Evaporation temperature	25°C	25°C	10°C	-25°C	-25°C	-15°C	5°C

5 Current limitation

Current peak among motor terminals (include instantaneous current peak) should be below 21.6A(at130℃) in order to prevent magnet in motor from demagnetization.

6 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.

7 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.

8 Air leakage test pressure

The pressure should be less than 2.847MPa{28kgf/cm²G}.

9.Oil Back and height of the oil level

The oil should be returned continuously to the compressor and the structure of the refrigerating system should not make oil stay in the system. The oil level in compressor should be satisfied with chart 2.If not keep the oil level, the shortage will occur, and influence the reliability of the compressor.(please check the oil level in the compressor with the sight glass which supplied form SHEC.

10 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.

11 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.

12 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 3 minutes. But oil level should be met to item 8. Suction and discharge pressure should balance completely before restarting.

13 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. The change of compressor rotational speed is referred to chart 3.

14 Air and moisture in refrigerating system

The degree of vacuum in refrigerating system should be less than 133Pa ($998 \times 10^{-3}\text{mmHg}$) at room temperature just before charging refrigerant. The quantity of water should be less than 0,15 ml

15 Impurities in refrigerating system

- (1) The weight of residue on the inside surface of the heat exchanger and tube should be less than $0.01\text{g}/\text{m}^2$. 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.
- (1) Prevent the impurities from entering into the enclosed unit system used. When the impurities entered into the enclosed system, it will damage the moving mechanism parts and result in the capillary depositing.
- (1) Eliminate all system contaminants such as trichlorethylene, alkalies, soaps, oil, acids & washing fluid used at machining heat exchanger and tubes.

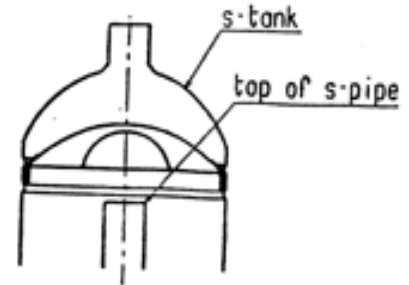
16 Compressor vacuum operation

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

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

18 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 compressor. should flow back



19 Process limitation of refrigerating system

- (1) Be careful of avoiding oxide scale while soldering during assembly o refrigerating system. (for example: flow or fulfill dry nitrogen)
- (2) 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.

20 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 $\pm 10\%$.

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 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, 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. Do not recharge with the remaining refrigerant in the system when leakage happened. Because the percent component of the refrigerant in the unit system had possibly been changed.
- (10) Temperatures within systems during stable compressor operation should not be less than -35°C to prevent wax precipitation from the oil.
- (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.
- (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 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) 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.
- (24) 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.
- (25) Adjust the start-up torsion of the compressor to above 0.55Nm by inverter. Confirm and measure the start-up current if change the parts and design.

25. PROCESS LIMITATIONS

- 25.1 The degree of vacuum in the 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 0.2ml.

- 25.2 The weight of foreign particles on the inside surface of the heat exchanger tubes should be less than 0.05g/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.

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

25.4 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 .

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 .

25.5 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 .

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

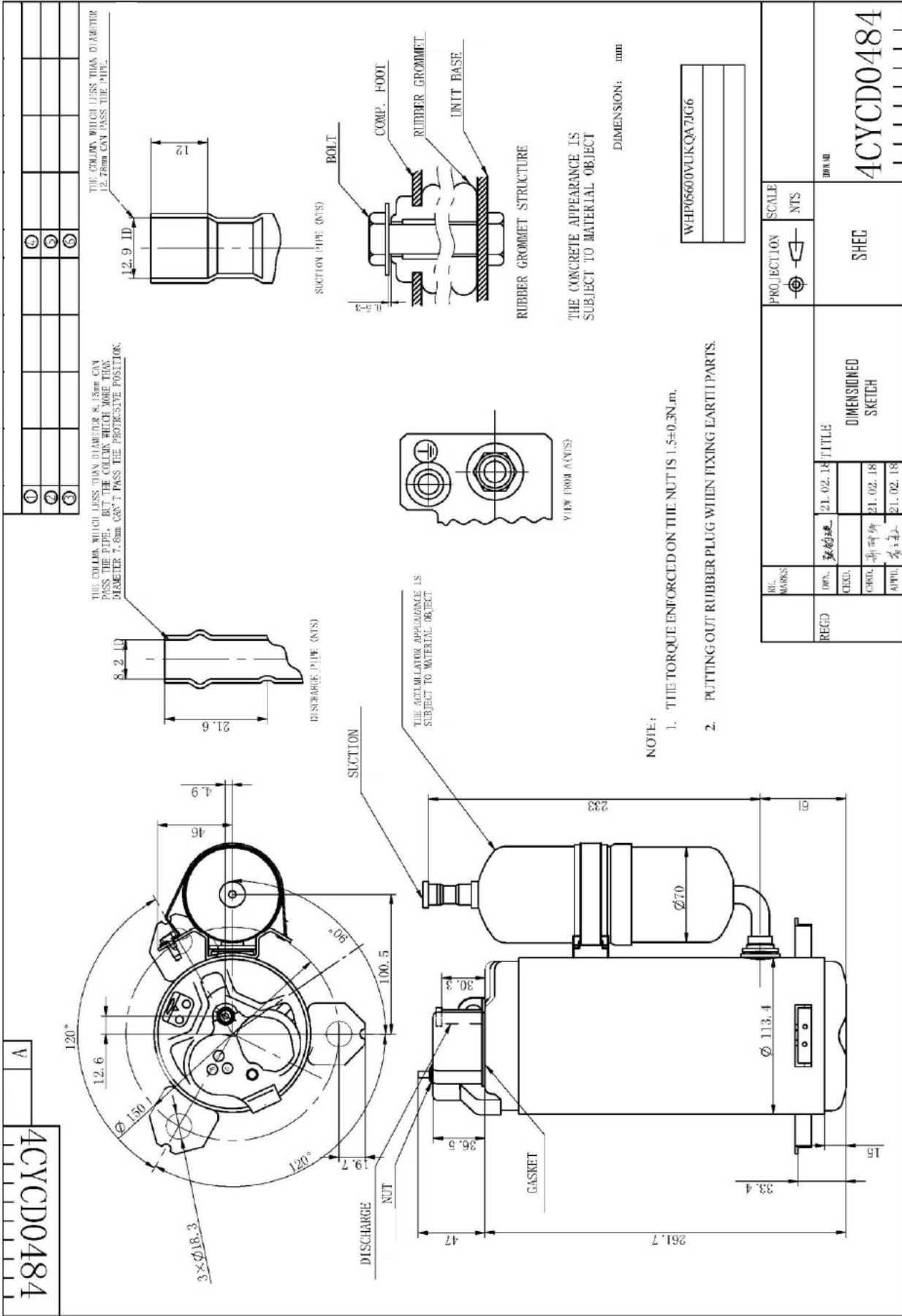
1. Basis for Checking upon Delivery

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.

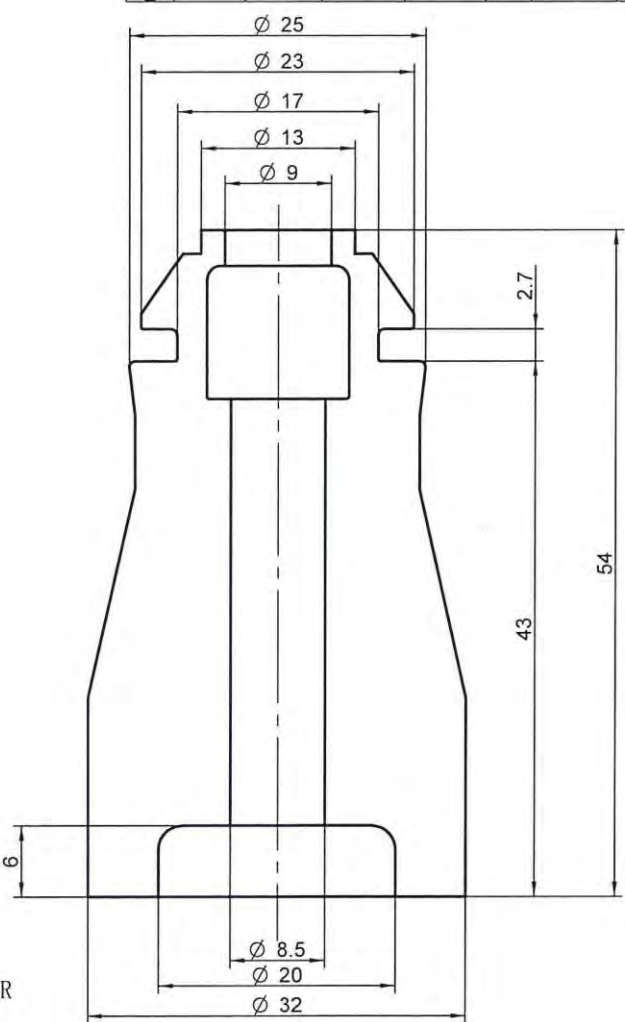
2. Rule for Checking upon Delivery

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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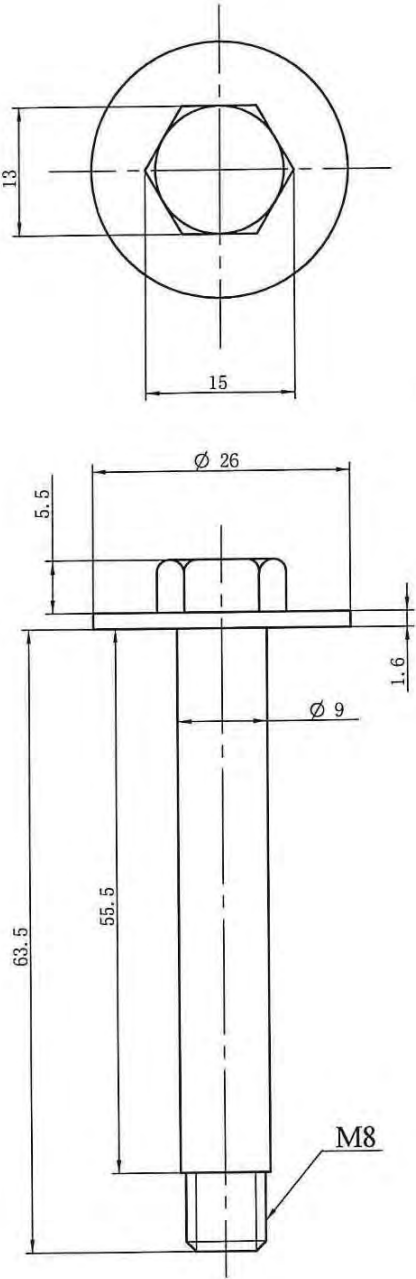
NOTE:
1. MATERIAL: NATURAL RUBBER
2. HARDNESS: Hs = 40⁺⁵₋₃

DIMENSION: mm

	RE-MARKS		PROJECTION 	SCALE NTS	
REGD.	DWN. 李朋 2018.5.29				DWN. NO.
	CHKD. 梅细钦 2018.5.29	TITLE			
	CHKD. 曹海均 2018.5.29	RUBBER			
	APPD. 毛开智 2018.5.29	GROMMET	SHEC		4CYC00851

4CYC00940

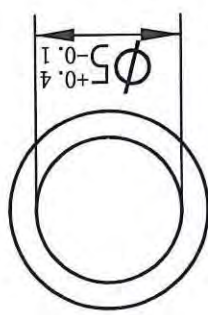
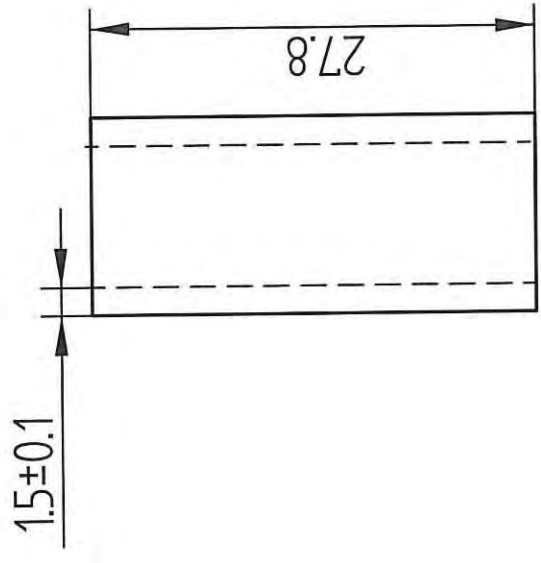
C



	RE-MARKS		PROJECTION	SCALE	
				NTS	
REGD.	DWN.	黄文林 18.5.18	SHEC		DWN. NO. 4CYC00940
	CHKD.	王浩 18.5.18			
	CHKD.				
	APPD.	王浩 18.5.18			
		TITLE			
		BOLT			

4CYC01042

C

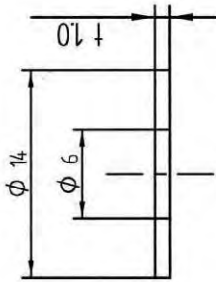
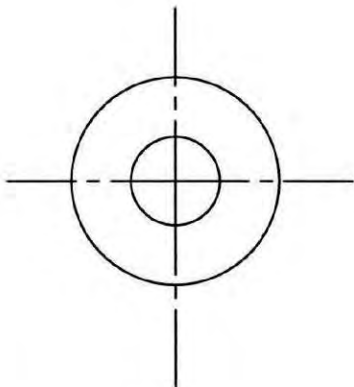


NOTE:
1、COLOR:WHITE
2、MATERIAL:SILICONE RUBBER


	RE. MARKS				PROJECTION	SCALE	
						NTS	
REGD					SHEC		
		TITLE					
		DWN.	B.5.18		DRAWING		
		CHKD.	B.5.18				
		CHKD.	B.5.18				
		APPR.	B.5.18				
					4CYC01042		

B

4CYC00174



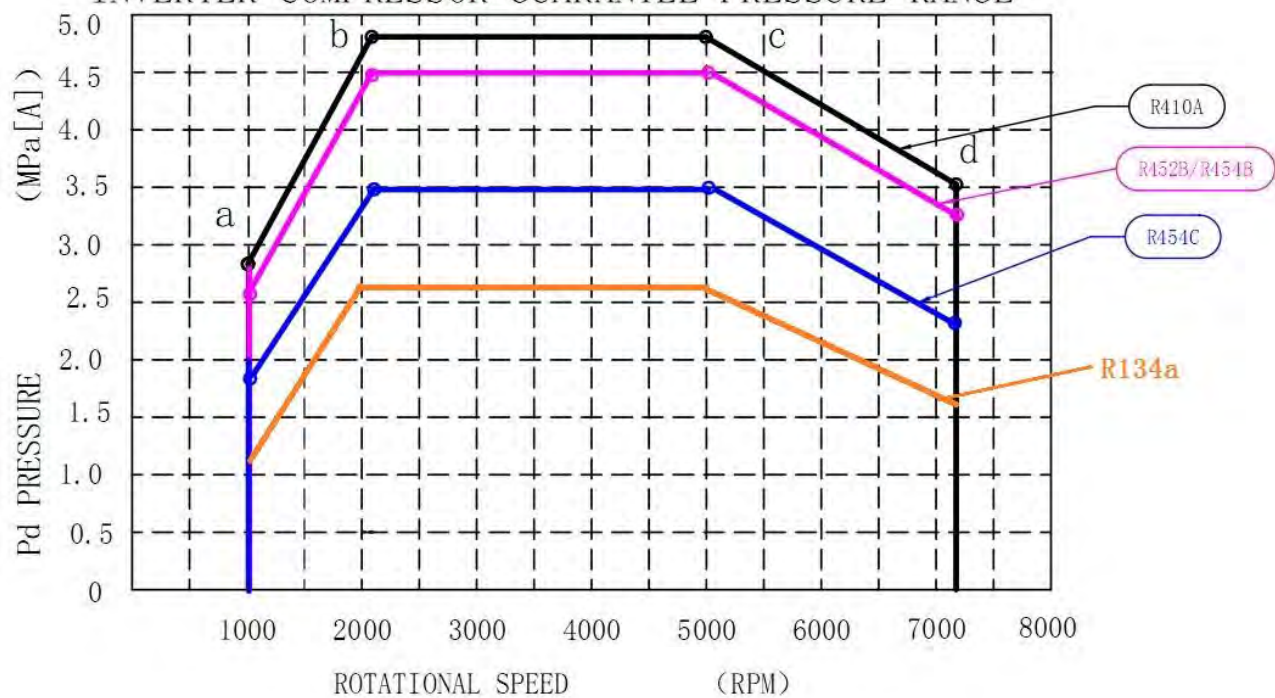
MATERIAL: EPDM

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

R410A/R134a/R454C/R454B

WHP SERIES R410A/R134a /R454C/R454B

INVERTER COMPRESSOR GUARANTEE PRESSURE RANGE

Compressor running speed range: Min 1000min⁻¹ ~ Max 7200min⁻¹

	Rotational speed (rpm)	Pd limit (MPa)			
		R410A	R454C	R454B	R134a
a	1000	2.73	1.80	2.55	1.148
b	2100	4.76	3.47	4.44	2.633
c	5000	4.76	3.47	4.44	2.633
d	7200	3.51	2.31	3.28	1.528

1000 ~ 1800 min⁻¹

CHART2 WHP DC INVERTER COMPRESSOR OIL LEVEL DATUM

2 WHP

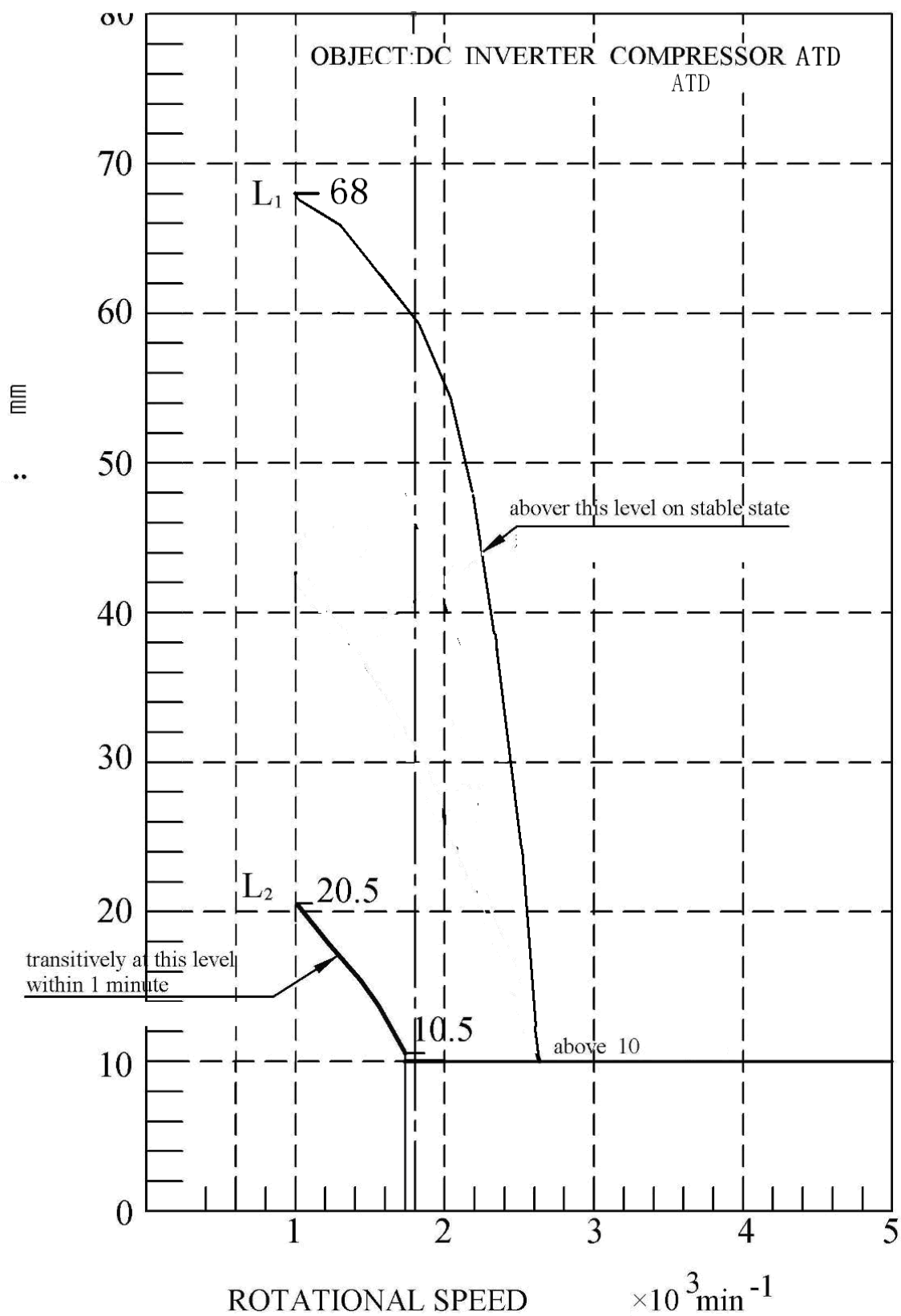
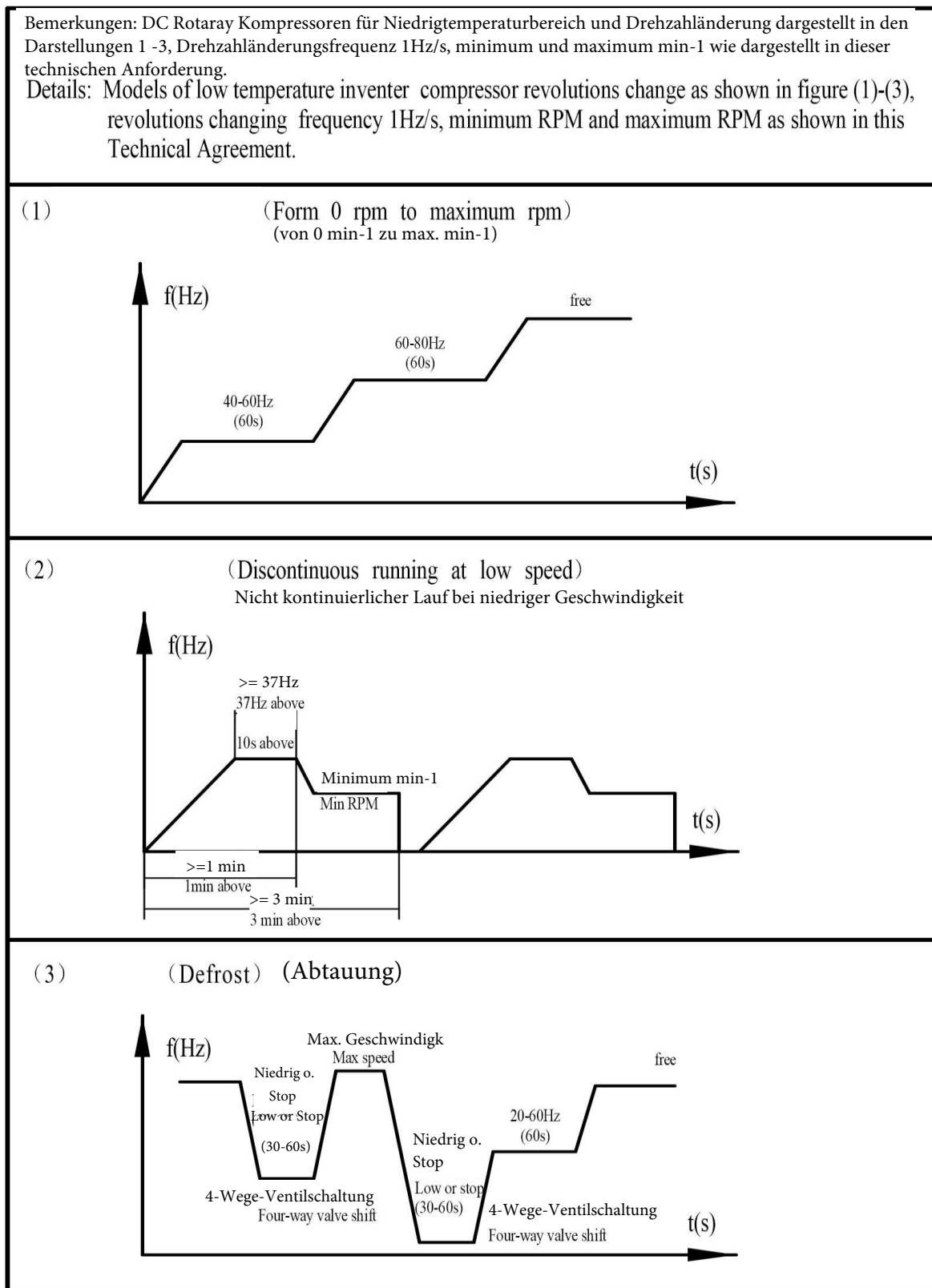


Diagramm 3 Instruktionen für Drehzahländerungen bei DC Inverter Rotary Kompressoren im niedrigen Verdampfungsbereich

CHART 3 Instructions for low temperature inverter rotary compressor revolutions change



Specification Revision Record				
No.	Date	Page in Spec	Revision Reason	Conclusion Date
A				
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