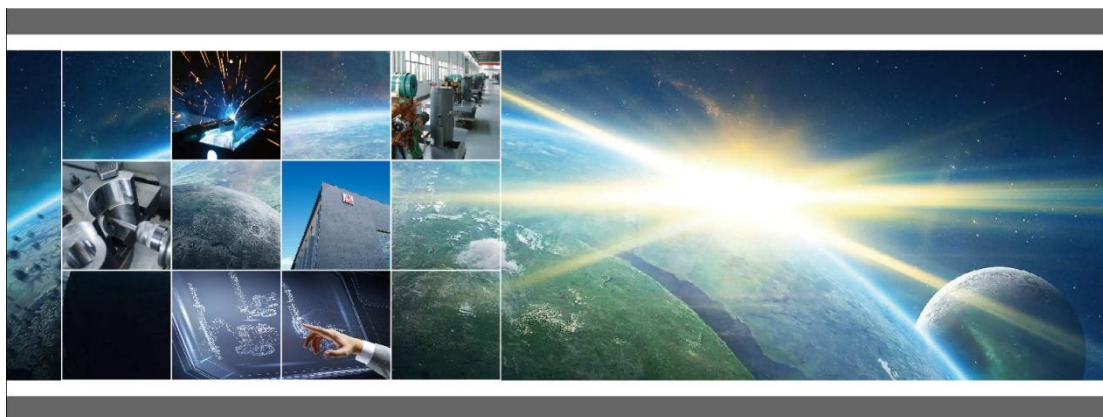


操作维修安全手册

Operating, Maintenance & Safety Manual



Diesel Engine Driven Portable Screw Compressor

设备型号 Model: 40SCY

序列号 S/N:

Read the instruction manual before operating this equipment.

This manual contains important safety information.

Do not destroy this manual.

This manual must be available to personnel who operate and maintain this machine.

Introduction

READ ALL MANUALS CAREFULLY. Learn how to operate and service your machine correctly. Failure to do so could result in personal injury or equipment damage. Consult your Zhejiang Zhigao Machinery Dealer if you do not understand the instructions in the manuals or need additional information.

THIS MANUAL should be considered a permanent part of the machine, and should remain with the machine and available for reference at all times.

WARRANTY is provided as part of Zhejiang Zhigao Machinery's support program for customers who operate and maintain their equipment as described in this manual. The warranty is explained on the warranty page of this manual.

RIGHT HAND AND LEFT HAND sides are determined by facing in the direction of forward travel. References are also made looking from the main frame end towards the compressor end.

The instructions, illustrations, and specifications in this manual are based on the latest information available at time of publication. Your machine may have improvements and options not yet contained in this manual.

When ordering replacement parts, specify the model number, serial number (S / N) of the machine, please also state part number (P / N) (not the ref. no.) , description and quantity (QTY) needed exactly in your parts manual. Any damage or malfunction caused by the use of unauthorized parts is not covered by warranty or product liability.

This publication refers only to the mentioned product.

Zhigao reserves the right to modify or make changes without prior notice or obligation.

© Copyright, Zhejiang Zhigao Machinery. All rights reserved.

Any unauthorized use or copying of the contents or any part thereof is prohibited.

This applies in particular to trademarks, model denominations, part numbers and drawings.

前 言 FOREWORD

本操作维护说明书详细叙述了浙江志高机械股份有限公司设计生产的各型号柴油机移动式螺杆空气压缩机的安全注意事项，各系统和组件的结构功能以及操作维护方法。This ***Operating and Maintenance Manual*** describes in detail the safety issues for various models of the diesel portable screw air compressor designed and manufactured by Zhejiang Zhigao Machinery Co., Ltd., and the structural functions of the various systems and components, as well as the instructions of operation and maintenance.

操作人员应仔细阅读完本操作维护说明书，在充分了解机组各系统和组件的结构功能和安全注意事项之后，方能对机组进行操作和维护。除本书中有说明的外，如用户不按本书的操作维护规程进行操作和维护保养，或自行对机器进行解体 and 改装，或使用了不是浙江志高机械股份有限公司指定的零件，您将会失去索赔的权利。To properly operate and maintain the machine, operators should read this operating and maintenance ***Manual*** carefully, and fully understand the structure functions of various systems and components of the machine. If users fail to comply with this ***Manual*** and the operation and maintenance procedures, or modify the machine in anyway without authorization from Zhejiang Zhigao, or install any spare parts not authorized by Zhejiang Zhigao, the right to claim warranty will be waived.

本操作维护说明书对柴油机的系统和维护作了一般性的介绍，但您在使用和维护本机组之前，还需仔细阅读柴油发动机厂编写的《柴油发动机使用保养说明书》。如还有疑问，请根据柴油发动机厂《柴油机特约服务站通讯录》上的地址与各级服务机构联系。您购买的新机工作 20 小时后，应交柴油发动机厂在当地的技术服务站进行走合保养，并取得“走保证书”，否则您将得不到三包赔偿。This ***Manual*** gives a general introduction for the system and the maintenance of the diesel engine. However, before operating and maintaining the unit, please also read carefully the diesel engine “operation and maintenance manual” by the diesel engine manufacturer. Should you have any question, please contact the customer service agents listed in “the contact list of diesel engine authorized service stations” issued by the diesel engine manufacturer. After 20 running hours of the new machine, it should be getting a breaking-in service from a local technical service station of the diesel engine manufacturer, and a 'breaking-in Certificate should be issued', or the engine warranty will be waived.

如有本操作维护说明书未涉及到而您在操作和使用中存在不明确的地方，请与当地的浙江志高机械股份有限公司的代理商联系，相信他们会帮助您解决一切问题的。During operation, if you have any question not covered in this ***Manual***, please contact your local dealer of Zhejiang Zhigao Machinery Co., Ltd..

安全注意事项 *Safety Notices*

操作和使用压缩机之前务必仔细阅读

Please read carefully before operating a compressor

▲警告 **WARNING**

压缩空气及压缩空气系统具有危险性!

Compressed air and compressed air system are dangerous!

不遵守本操作维护说明书的操作程序和安全注意事项, 会有酿成事故和造成您自己或其他人员伤亡的可能性! Failure to comply with the operating procedures and safety notices in this *Manual*, may lead to accidents and cause casualties to you or others!

操作和维护压缩机之前, 必须仔细阅读和弄懂本操作维护说明书! Before operating and maintaining the compressor, you must read this *Manual* carefully and thoroughly understand it!

本说明书在“安全操作注意事项”一章中对机器操作时需要遵循的安全注意事项和存在危险的地方作了详细的说明。机器出厂前, 已在存在危险的地方和需要注意操作的地方贴有明显的警示标志。The chapter of *Safety Notices* of this *Manual* describes in detail the safety considerations and possible dangers when operating the machine. Before leaving the factory, the machine was marked or labeled with clear warning signs on any place of danger and where attentions needed for operating.

本说明书中, 凡涉及安全问题的操作, 均以黑体字出现, 并且根据操作可能对机器造成的破坏的严重性和对人身伤害的程度, 分别加以“注意”、“警告”、“危险”的字样来提醒。

In this *Manual*, any operation involving safety issues, the font is in **bold**. The words of "**CAUTION**", "**WARNING**", and "**DANGER**" are used to indicate the levels of the risk according to the severity of damages that may cause to the unit and the seriousness of possible injuries.

“注意”表示可能会造成机器一般性破坏的操作。

"**CAUTION**" indicates potentially dangerous situations of which, if not avoided, may lead to moderate damages to the unit.

“警告”表示可能会造成机器破坏或人身伤害的操作。

"**WARNING**" indicates potentially dangerous situations of which, if not avoided, may lead to machine damages and / or personal injuries.

“危险”表示可能会造成重大事故或人身伤亡的操作。

"**DANGER**" indicates dangerous situations of which, if not avoided, will lead to serious accidents or casualties.

1. 在对机组进行任何操作和维护之前, 必须阅读和弄懂本操作维护说明书。

Read carefully and fully understand this *Manual* before operation and maintenance of the unit.

2. 机组绝不能在高于机组额定的排气压力下运行, 否则会造成柴油机因过载而损坏。

Never let the unit run at outlet air pressure higher than the rated pressure, otherwise it will cause damage to the diesel engine due to overloading.

3. 在机组运转时，绝不要拆卸或松动任何管路元件、接头、堵头和联接件，不要扳动安全阀。机组内充满具有压力的热工质，能引起严重的人身伤害事故。
Do not remove or loosen any piping components, connectors, plugs and couplings, and do not touch the safety valve when the unit is running. The unit is filled full of pressurized heat media, which can cause serious injuries.
4. 在对机组进行任何维修工作之前，必须确认：
Before performing any maintenance work on the unit, please make sure:
 - a) 机组已停车； The unit is completely shut down & switched off;
 - b) 机组内部压力已完全放空。 The internal pressure of the unit has been completely released.
5. 只能使用安全溶液来清洗压缩机和机组附属设备。
Only use safe solution to clean the compressor and any auxiliary equipment of the unit.
6. 任何零件一旦失效，必须立即更换，否则有可能造成不可估量的损失。
Replace malfunction machine parts immediately, or it may cause immeasurable losses.

目 录 Table of Contents

前 言 FOREWORD.....	2
安全注意事项 Safety Notices	3
第 1 章 技术规范 Chapter 1 Technical Specifications.....	7
1. 压缩机组的一般技术参数—标准型 General technical parameters - Standard equipment	7
2. 压缩机润滑油 Compressor lubricating oil	8
3. 柴油机润滑油 Diesel engine lubricating oil	8
4. 柴油机冷却液 Diesel engine coolant	9
5. 柴油机燃油 Diesel engine fuel.....	9
第 2 章 安全守则 Chapter 2 Safety Regulations.....	10
1. 总则 General provisions	10
2. 牵引与停放 Towing and parking	11
3. 压力释放 Pressure release	13
4. 防火与防爆 Fire and explosion prevention	14
5. 运转部件 Running and moving parts.....	15
6. 高温表面、尖角和锐边 The high temperature surface, sharp corners and sharp edges	16
7. 有毒和有刺激性的物质 Toxic and irritating substances	16
8. 触电 Electric shock.....	17
9. 蓄电池 Battery.....	17
10. 吊装 Hoisting	18
11. 其它注意事项 Other notices	18
第 3 章 系统功能介绍 Chapter 3 Introduction of System Functions.....	19
1. 简介 Profile	19
2. 总体布局 Overall layout	20
3. 压缩机机头 Compressor air end	20
4. 柴油发动机 Diesel engine	20
5. 进气系统 Air intake system.....	21
6. 压缩机排气系统 Compressor exhaust system	23
7. 压缩机冷却与润滑系统 Compressor cooling and lubricating system	25
8. 压缩机气量调节与控制系统 Compressor air capacity adjust and control system	25
9. 自动保护系统 Automatic protection system of the unit	26
10. 柴油机燃油系统 Fuel system of diesel engine.....	27
11. 柴油机润滑系统 Diesel engine lubricating system	28
12. 柴油机冷却系统 Diesel engine cooling system.....	29
13. 柴油机排气系统 Diesel engine exhaust system.....	31
14. 操控面板 Instrument operating panel.....	31
15. 电气系统 Electrical System	33
16. 行走系统 Tramming System	33
17. 车棚外罩组件 Unit enclosures and components.....	33
第 4 章 操作规程 Chapter 4 Operating Regulations.....	34
1. 概述 Overview	34
2. 控制元件和指标元件的用途 Descriptions of controls and indicators	35

3. 起动程序 Starting Procedures.....	37
4. 停机程序 Shutdown procedures	38
5. 跨接起动程序 Jump Start procedures.....	39
6. 存放 Storage.....	41
第 5 章 维护保养规程 Chapter 5 Maintenance Regulations	42
1. 概述 Overview	42
2. 螺杆压缩机的维护保养 Maintenance of screw compressor	42
3. 柴油发动机的维护保养 Maintenance of diesel engine.....	47
4. 零件的更换和调整程序 Parts replacing and adjusting procedures	51
5. 常见故障的诊断与排除 Common malfunction diagnosis and troubleshooting.....	56
第 6 章 噪音控制 Chapter 6 Noise Control.....	77
1. 噪声排放 Noise emission.....	77
2. 被禁止的操作 Prohibited operations.....	77
3. 维护记录 Maintenance records.....	78
第 7 章 零部件订购 Chapter 7 Parts Ordering	79
附录 Appendix: 公制英制换算表 Metric conversion table.....	80

第1章 技术规范 Chapter 1 Technical Specifications

1. 压缩机组的一般技术参数—标准型 General technical parameters - Standard equipment

机型 Model	40SCY/40SCG
整机 Complete machine	
公称容积流量 Free air delivery (m ³ / min)	4.5
额定排气压力 Rated working pressure (bar)	7
工作压力范围 Working pressure range (bar)	5 - 7
最大牵引速度 Maximum towing speed	5 km / h
最大工作角度 Max. working slope	5 °
噪声声功率级 Noise level	110 dBA(距表面 1 米, 相当于距表面 7 米声压级 76 dBA) 110 dBA (1 m from ground, equivalent to 7 m from ground, noise power level 76 dBA)
机组重量 Unit weight	860 kg / 750 kg
长 Length x 宽 Width x 高 Height (mm)	2,400 x 1,330 x 1,550 / 1,800 x 1,040 x 1,300
轮距 Wheel base	mm
轮胎规格 Tire size	5.00 - 8
轮胎压力 Tire pressure	500 kPa
工作海拔高度 Working altitude elevation	
最大海拔高度 Maximum altitude	1,000 m
柴油机 Diesel Engine	
制造商 Manufacturer	锡柴 Xichai
型号 Model	4DW91-50GBG3U
额定功率 kW(HP) Rated power	37
燃油箱容量 Fuel tank capacity	65 L
电气系统工作电压 Working voltage of electrical system	12 V
蓄电池额定容量 Rated capacity of battery	105 Ah / ea
压缩机 Compressor	
供气阀数量及规格 Numbers and sizes of outlet valves of air supply	1-G1"

*如用户需要高原机（海拔 2,000 M 以上），需要特殊配置

If high altitude unit required (2,000 m above), special configuration is optional.

2. 压缩机润滑油 Compressor lubricating oil

浙江志高机械股份有限公司设计制造的移动式螺杆空气压缩机可以使用下表所列的润滑油，这些润滑油都适用于有严重氧化的场合。不同种类的润滑油能够适应的环境温度和负载条件是不相同的，换油周期也不一样。只有使用志高压缩机润滑油才能享受一年保固服务。

The portable screw air compressor designed and manufactured by *Zhejiang Zhigao Machinery Co., Ltd.* can use lubricating oil listed in the table below. These lubricants are all applicable to severe oxidation cases. The applicable ambient temperatures and loading conditions of various types of lubricating oil are different, and the oil change cycles different, too. Only authorized oil used is valid for warranty claim.

润滑油类型 Lubricating oil type	换油周期(小时) Oil change cycle (hrs)	环境湿度℃ Ambient temperatures
ZG46B	1,000	0 °C ~ 40 °C
ZG46H	1,500	- 10 °C ~ 45 °C
ZG46D	2,000	- 25 °C ~ - 50 °C

浙江志高机械股份有限公司设计制造的移动式螺杆空压机组配有专用润滑油。该润滑油是一种重载多粘度、适用于各种气候条件的润滑油，是由制造商特殊供货的专用移动式螺杆压缩机油，具有较长的更换周期。The portable screw air compressors designed and manufactured by *Zhejiang Zhigao Machinery Co., Ltd.* come filled with this special lubricating oil, heavy-duty multi-viscosity, and applicable for various climatic conditions. It is a special lubricant supplied by the manufacturer for the portable screw compressor, with a longer change cycle.

油气分离器罐底部的冷凝水要定期排除。在高温高湿的情况下，润滑油中的水分会造成润滑油的乳化。如果乳化严重，就需要更换润滑油。**Condensed water at the bottom of oil separator tank should be drained regularly.** In the case of high temperature climate and humidity, the water in lubricating oil will cause oil emulsified. If the emulsification is severe, the lubricant should be replaced.

不同类型或不同商标的油切勿混合使用，否则会引起诸如润滑油起泡、过滤器堵塞、节流孔或管路堵塞之类的运行故障。Do not mix different types or different brands of oil, otherwise it will cause breakdown problems such as lubricating oil bubble, filter clogging, throttle orifice or pipe blockage.

如果环境温度超过许用值或想知道是否允许使用其他长效润滑油，请与浙江志高机械股份有限公司取得联系。If the ambient temperature exceeds the allowable value, or if any other long interval lubricants are to be used, please contact with *Zhejiang Zhigao Machinery Co., Ltd.* for advice and authorization.

3. 柴油机润滑油 Diesel engine lubricating oil

柴油机规定使用添加有抗磨剂，不按规定使用将严重影响发动机的使用寿命甚至造成拉缸、烧瓦等事故。Diesel engines require oil with wear resistant additives, improper oil will affect the life of the engine severely and even cause cylinder scoring, bearing burning and other problems.

注意：采用低粘度机油如 IOW-30，将有助于发动机的起动以及低的环境温度下提供充足的油。然而，连续使用低粘度机油会降低发动机的使用寿命。

Notice: Using low-viscosity oil such as IOW - 30 would help the engine start and provide adequate oil under low ambient temperature. However, continuous and long time use of low-viscosity oil will reduce the service life of engine.

4. 柴油机冷却液 Diesel engine coolant

使用防冻防锈冷却液，不但冬季可以防止缸体缸盖的水套和水箱等因结冰而冻裂，而且可以防锈和去垢。此外，防冻防锈液的沸点比普通水要高，这对冷却系统也有一定的好处。所以柴油发动机规定要长年使用防冻防锈液，决不要使用普通的冷却水。

Using antifreeze & anti-rust coolant will not only prevent crack of coolant tank and sleeves of cylinder and cylinder head due to freezing in winter, but also prevent rust and help keep it clean. In addition, the boiling point of antifreeze & anti-rust coolant is higher than water. It benefits the coolant system as well. Therefore antifreeze & anti-rust coolant for the diesel engine must be used all year round, and never use normal water.

冷却液同时还给柴油机水泵提供润滑作用。

Coolant also provides lubricant effect to the water pump of diesel engine.

5. 柴油机燃油 Diesel engine fuel

用户可以根据本地区的大气温度选用不同牌号的轻柴油

Users can choose different grades of light diesel fuel according to the atmospheric temperature in the region:

0#轻柴油→大气温度4℃以上； #0 light diesel → atmospheric temperature above 4℃;

10#轻柴油→大气温度-5℃以上； #10 light diesel → atmospheric temperature above -5℃;

20#轻柴油→大气温度-14℃~-5℃； #20 light diesel → atmospheric temperature -14℃~-5℃;

35#轻柴油 → 大气温度-29℃~-14℃。 #35 light diesel → atmospheric temperature -29℃~-14℃;

低粘度燃油是不可接受的。使用低粘度燃油，将可导致柴油机功率损失高达 25~30%，同时会缩短油泵的寿命。

Low-viscosity fuel is unacceptable. Using low-viscosity fuel will result in the loss of power of the diesel engine as much as 25~30%, and shorten the service life of the fuel pump.

第2章 安全守则 Chapter 2 Safety Regulations

1. 总则 General provisions

浙江志高机械股份有限公司的螺杆压缩机产品是精心设计和制造的，所以能安全可靠地运行。不过安全运行仍需使用和保养机器的工作人员来保证，以下注意事项若能认真遵循，会将发生事故的可能性降到最低。The products of screw compressor designed and manufactured by *Zhejiang Zhigao Machinery Co., Ltd. with Chinese wisdom* are safe and reliable. However, the safety operation still should be ensured by the operators and service staff maintaining the machine. The risks and possibilities of accidents would be reduced to minimum if the following can be complied with carefully.

只有经过培训并被授权的人员才能操作压缩机。这些人应仔细阅读本操作维护说明书并充分理解其中的内容。不遵循操作维护说明书中的操作维护规程和安全守则会有发生事故和人员伤亡的可能性。Only trained and authorized personnel can operate the compressor. The staff should read this *Operating and Maintenance instructions* carefully and fully understand the content within it. There will be risk of accidents and casualties if the operating and maintenance procedures and safety regulations within this manual are not complied with.

绝不可在不安全状况下起动机组：若机组已出现问题，不要试图开机，应切断电源，作出明显标志，使不知情的人不至于误操作。Never start the unit under unsafe condition: Don't try to start the unit if there is any problem of the unit pending, cut off the power, and post clear signs to avoid operation by someone who may not know the situation.

压缩空气具有危险性，只有在整个压缩机系统里的压缩空气都已放空的情况下方能对机组进行维修和保养。Compressed air is dangerous, so repair and maintain the unit only after the compressed air in the compressor completely released.

不要改动机组的内部结构及控制方式，除非有志高公司的书面认可。Do not modify internal structures and control methods of the unit, unless authorized in writing by Zhejiang Zhigao.

作好日常保养，每天都应仔细检查机组，查看是否有泄漏及零件的松动、损坏、调节失灵或零部件丢失等情况，发现问题及时处理。With routine maintenance, check the unit carefully every day for leakage and loose, damaged, failure or missing parts, etc., find and correct problems in time.

经常检查胶管，看是否有任何会影响其性能的损坏如划伤、磨损、绽裂、硬化、局部隆起等，如有应按规定更换之。胶管的使用时间不要超过其额定寿命。Check hose regularly for damages affecting the performance such as scratches, wear, tear, hardening, and bumps, etc., and replace the problem hoses in accordance with the regulations if any problem occur. The usage life of the hoses should not exceed its rated life.

注意：如果每周工作 5 天，每天 8 小时，胶管的寿命是 2 年。用户要根据具体情况折算胶管的寿命。Note: The hose life is generally 2 years, if it works 8 hours a day and 5 days a week. Users should calculate the service life of the hoses depending on the specific situations.

2. 牵引与停放 Towing and parking

2. 1. 牵引准备 Preparing for towing

▲警告 WARNING

●如果机组的自重超过了牵引车的额定牵引重量，不能强行牵引，因为此时牵引车可能会刹不住。

If the weight of the unit is heavier than the rated towing weight of the vehicle, do not tow it, because the tow vehicle might not be able to brake and stop.

为了安全起见，牵引之前应查阅牵引车操作手册中拖车的额定牵引重量和相关的安全条例。

For safety reasons, please review the rated towing weight and relevant safety regulations for the vehicle in its operating manual.

1) 将机组挂上牵引车之前，应检查各联接部位是否有：①过度磨损或腐蚀；②裂纹、弯曲、凹陷或其他损伤；③松动的螺母、螺栓或其他紧固件。如果有问题，一定要等问题解决之后才可牵引。

Before connecting the unit to the vehicle, check each connection place for any: ①excessive wear or corrosion; ②cracks, bending, dents or other damages; ③loose nuts, bolts or other fasteners. Problems must be addressed before towing.

2) 挂接时，将牵引车辆缓慢地倒至合适位置，准备与压缩机组联接。When connecting to the vehicle, back it up slowly to appropriate position, preparing to connect with the compressor unit.

3) 确保联接机构已完全联接，上紧，锁牢。

Make sure that the connection mechanism has been fully connected, tighten and locked.

4) 确保牵引车辆和机组的牵引装置及调整机构，当在任何地形上运动时，都不互相干涉或妨碍。

When moving on terrain, make sure that there is no interference between the vehicle, the towing device and the adjustment mechanism of the unit.

5) 确保轮胎处于良好的工作状态，不允许随意更换轮胎的规格。轮胎上的螺栓要按规定力矩上紧。

Ensure the tires are in good working conditions, arbitrarily changing tires of different sizes is not allowed. Tighten the lug nuts of the tire in accordance with the provisions of torque.

6) 确保牵引车的指示灯状态良好，压缩机组的反光面要洁净、完整。Make sure that the indicator lights of the vehicle are in good conditions, the reflective surface of the compressor unit should be clean and in whole.

7) 确保供气胶管已经拆开，绕在卷筒上(如果配有的话)。

Make sure that the air-supply hoses are all disconnected and stored on the reel (if equipped so).

8) 确保机组各门都关牢，如果机组内空间较大，在关门之前要检查里面是否有人。Ensure that each door is tightly closed, and check whether anyone is still inside the unit before closing the door.

9) 确保机组车轮未被卡住，机组可以自由移动。

Ensure that the wheels are not stuck, and the unit can move freely.

10) 在以额定的速度行驶之前，要测试牵引车辆制动系统的性能。

Before towing with the rated speed, test the brake system of the vehicle.

11) 机组上不允许装带未固定的及其他不合适的工具和设备。

It's not allowed to have unfixed and inappropriate tools and equipment on the unit.

12) 不能装载会造成机组不平衡的工具或附件。机组不平衡会降低拖车的牵引能力，增大生倾斜、翻转、扭曲等事故的可能性。Do not have tools and accessories which could cause the unit unbalanced. Imbalance of the unit will reduce the towing capacity and increase the risk of tilt, flip over, twist and other accidents.

2. 2. 牵引 Towing

1) 牵引车的自重和牵引力应确保能够牵引机组驶过 15° ~ 30° 的斜坡。Ensure that the weight and traction force of the vehicle could tow the unit passing a slope of 15° ~ 30° .

2) 所用牵引车应能保证牵引时机组与路面的倾角不超过 12° 。

When towing, ensure that the tilt angle between the unit and the road surface is not more than 12° .

3) 行驶时不能超过最大拖行速度 15 公里/小时，并应根据限速标志、天气和道路情况随时调整行驶速度。Do not exceed the maximum towing speed of 15 km / h. Always control the speed according to the speed limit signs, weather and road conditions.

4) 由于机组的重量接近甚至超过牵引车，要保持合理的行车距离，不能突然变道、急转弯或作类似的危险操作，倒车时牵引车偏离角不宜过大，否则会造成严重事故。调头时尤其要谨慎，要放慢速度。Due to the weight of the unit is close to or even heavier than the vehicle, keep a proper distance, do not change lane suddenly, do not make sharp turn or other similar dangerous actions; the deflection angle shouldn't be too large when backing up the vehicle, otherwise it will cause serious accidents. In particular, be extremely careful when making an U-turn, and slow down as much as possible.

5) 避免在超过 12° 的斜坡上行驶。Avoid driving on slopes over 12° .

6) 避免在有大的碎石、凹坑或其它有障碍和不坚固的路面上行驶。

Avoid driving on a road with large rocks, pits and other obstacles or on rugged and unstable roads.

7) 不管在何种地形上行驶包括倒车时，都不要让压缩机牵引杆和联接装置超过其运动自由度。

No matter on what terrains when driving and backing up the vehicle, do not let the tow bar and the connector of the unit move exceeding the limits.

8) 行驶时机组上不许有人，尤其牵引杆上不许站人，机组与牵引车之间也不许有人。

When driving, do not let people stay on the unit, and on the tow bar in particular, neither in between the vehicle and the unit.

9) 确保机组四周无人。Make sure that no one is around the unit.

2. 3. 停放 Parking

1) 尽量将机组停放在平坦的地面上，并且地面应有足够的强度。如果只能停放在斜坡上，最好能跨过斜坡停放。Try to park the unit on a flat ground, ensuring the ground strong enough. It is better to park across the slope if it has to be on slopes.

2) 注意：不能停放在超过 12° 的斜坡上。Notice: Do not park on a slope more than 12° .

3) 停放时要考虑风向，避免机组排出的热空气流入压缩机进气口。还应避免在烟尘很大的环境下工作。Take wind direction into consideration to avoid the hot exhaust air from the unit into the air intake port of the compressor. Avoid working under heavy smoke and dust environment.

4) 卡住车轮前后两侧。Block both front and back sides of the wheels.

- 5) 拆开联接装置，注意手不要被卡住。Disconnect the connectors, and watch out for your hands.
- 6) 牵引车应停在不影响压缩机工作的地方，远一些较好。Park the vehicle away from the work place of the compressor as far as possible from affecting the operation of the compressor.
- 7) 如果机组停放在公路中间或附近，在不影响交通的情况下，应设置标志、栅栏，夜晚还应设置指示灯。If the unit is parked in the middle of or near a road, without affecting traffic, set up signs, fences and lights at night as well.

3. 压力释放 Pressure release

- 1) 每周至少打开安全阀一次，检查是否有堵塞或其他损坏。不能在机组带压时拉动安全阀手柄。Open the safety valve once a week at minimum, and check for blockage or other damages. Do not pull the safety valve handle when the unit is under pressure.
- 2) 保证所配气动设备、输气软管、管件、阀门、过滤器及其应它附件，使用时工作压力不高于其额定压力。Ensure the working pressure of the equipped pneumatic equipment, air hoses, fittings, valves, filters and other accessories not higher than the rated pressures.
- 3) 在打开油气分离器罐的加油盖之前，应停机并确保罐内不要带压。Before opening the filler cap of the oil separator tank, the unit should be shutdown and no pressure in the tank.
- 4) 拆卸任何管件、阀门和放油塞以及油过滤器和油气分离器等零部件或添加防冻冷却液时，应确保系统内部无压力。Ensure that there is no pressure in the internal system when removing any fittings, valves, drain plugs, oil filters and parts of oil separator, or adding antifreeze coolant.
- 5) 不要正对任何排气口工作，不管是供气管出口还是压缩机或气动设备的排气口。Do not work facing any exhaust vent, whether it is air supply pipe outlets or vents of compressor or pneumatic equipment.
- 6) 只能用压力低于 2 kg 的压缩空气进行除尘等作业，实际操作时，还应配有粉尘防护罩等防护用品。Only use compressed air with pressure lower than 2 kg for dust removal and other operation, and when operating, dust shield and other protective equipment and devices should also be used.
- 7) 要等柴油机散热器中冷却液的温度阵降到 50℃ 以下，才能慢慢地拧下散热器的盖子。这样既能将散热器中的压力放掉，又能检查冷却介质是否还在沸腾。The radiator cap shall be unscrewed slowly only when the coolant temperature in the engine radiator drops below 50 °C. This operation will not only release the pressure in the radiator, also check whether the cooling medium is still boiling.

4. 防火与防爆 Fire and explosion prevention

1) 最好在加油站或使用专门的容器加油。

It is better to refuel at gas station or using specialized container.

2) 一定要等机组冷却下来后才能加油。加油前将压缩机与油箱一起接地，并确保在加注燃油、润滑油及检查蓄电池时杜绝机组附近有火星、火焰或其它火源。Refuel only after shutting down the unit. Ground the compressor together with the fuel tank before refueling, make sure to prevent sparks, flames or other sources of ignition near the unit when refueling fuel, lubricating oil and checking the battery.

3) 若有燃油、润滑油或其它可燃物溅出，应立即清除。避免润滑油溅在外罩吸音材料上，或是洒到其他零件的表面上。一般情况下可用不损害油漆的清洁剂或蒸汽将油擦去，必要时还应更换受污染的吸音材料。另外，吸音材料的防护层一旦破损就须更换，以防内部积油。If any fuel, lubricating oil or other combustible spills, clean immediately. Avoid lubricating oil splashed on the cover of sound-absorbing material, or sprinkled onto the surface of other parts. Generally, the oil could be wiped out using paint safe cleanser or steam, if necessary, the contaminated absorbing material should be replaced. In addition, the protective layer of the sound-absorbing material must be replaced if it's damaged, to prevent the accumulation of oil.

注意：不要用可燃性清洁剂进行清洗。Note: Do not use combustible cleanser for cleaning.

4) 在机组内进行维修或清洁时，应首先断开电池的接地(负极)，并在断开处做出标志。

When repairing or cleaning the inside of the unit, disconnect the battery ground (negative) first, and mark at the disconnected spot.

5) 确保电气系统正常，接头洁净、牢靠，一有损坏立即更换。

Make sure that the electrical system is normal, the joints / connectors are clean and firm. Replace immediately if damaged.

6) 将可能接地的导体（如工具等）远离暴露的电气部分（如接线端子），以免产生电火花。

Keep the possible grounding conductors (such as tools, etc.) away from the exposed electrical parts (such as wire terminals), to avoid sparks.

7) 维护电池或给电池接线时，要断开充电器。

Disconnect the charger when maintaining or connecting the battery

8) 油箱、油管一旦损坏，要立即更换。Once the fuel tanks or the pipes are damaged, replace immediately.

9) 燃油系统如有泄漏，必须等排除故障后才能开机。在故障排除之前要设置警告标志。If there is leakage in the fuel system, the problems must be eliminated before starting the unit. Warning signs should be posted before repairing work.

10) 维修时若需焊接，应移开吸音材料等易燃或易被高温高热损坏的物品。

If welding is required in maintenance and service, the sound-absorbing and other flammable material, and items susceptible to be damaged by high temperature, should be removed.

▲警告 WARNING

- 不能在燃油系统附近进行焊接。Do not weld near the fuel system.

11) 应配有足够的、性能可靠的灭火器材，并且要经常检查。

Always be equipped with adequate and reliable fire-fighting equipment, and check regularly.

12) 随时清除机组内部及附近的油布、废纸等易燃物品。

Always clear the oily rags, waste paper and other flammable items inside and near the unit.

13) 开机之前，将机组门打开充分通风。

Before starting the unit, open the doors of the unit for full ventilation.

14) 机组在林区作业时，不得将压缩机置于低垂的树枝下或让树叶与机组的高温表面接触。

When the unit is working in forest zone, do not place the compressor under the low branches or let the leaves in contact with the high temperature surface of the unit.

15) 易燃易爆物品的存放点应远离工作区域，应配置灭火器材并经常检查。

The storage places for the flammable and explosive articles should be far away from the working area, fire extinguisher should be in place and checked regularly.

5. 运转部件 Running and moving parts

1) 手、胳膊和身体其它部分以及衣服不要碰及联轴器、风扇、皮带等运转部件。

Do not let your hands, arms, other parts of your body and your clothes in contact with the couplings, fans, belts and other moving parts.

2) 在风扇、联轴器或其它部件的防护罩取掉后，不要运转压缩机。

Do not operate the compressor after the protective shields of the fans, coupling and other parts being removed.

3) 工作时，特别是在高温表面或运转部件附近，应穿紧身衣服并将长头发包扎好。

Wear tight clothes and wrap up long hair when working, in particular, near high temperature surfaces or running parts.

4) 若非维修，机组上的门应关好。Closed the doors of the unit when it is not in repair and service.

5) 开机时，要确保机组内无人。Make sure that no one is in the unit before it being turned on.

6) 以下操作必须在停机后才能进行：加注燃油、冷却液、润滑油，更换电解液。

The following operation must be performed after the unit being completely shutdown: adding fuel, coolant, lubricating oil and replacing electrolyte.

7) 维修时，应断开电池负极接线，并做标记，以防他人误接。When repairing and servicing, the negative terminal of the battery should be disconnected and marked to prevent someone else from mishandling.

8) 有时可能需要在机组运行时调整压力调节器或柴油机转速。调整时，不要触及其它运动部件和柴油机起动马达接线柱。其它调整要在停机后才能进行。

Sometimes the pressure regulator or diesel engine speed needs to be adjusted when the unit is running. When adjusting, do not touch other moving parts and the engine starting motor connectors. Other adjustment must be carried out after the unit being shutdown.

9) 要清除手、脚、机组零件及机组附近地面的油水污渍，以防滑倒。

Clear the oil and water stains on hands, feet, parts and ground near the unit to prevent slippery.

6. 高温表面、尖角和锐边 **The high temperature surface, sharp corners and sharp edges**

- 1) 不要接触热的油、冷却液和高温表面，也不要碰尖锐的边角。
Do not touch hot oil, coolant and high temperature surfaces, and do not touch sharp edges.
- 2) 身体的任何一部分都不要正对压缩机和柴油机的排气口。
Do not face any part of your body to the exhaust outlets of the compressor and diesel engine.
- 3) 在机组内或机组周围操作或维护时，应穿戴防护用品如手套、头盔等。When operating or maintaining inside or around the unit, wear protective equipment such as gloves, helmets, etc.
- 4) 应配备急救箱。受伤后要立即救治，不要忽视可能引起感染的小划伤和烫伤。
First-aid kit must be equipped. Medical Treatment must be taken immediately when injury happens. Do not neglect small scratches and burns which may cause infections.

7. 有毒和有刺激性的物质 **Toxic and irritating substances**

- 1) 压缩空气和柴油机排气不能用于呼吸。
The compressed air and diesel engine exhaust are not suited for breathing.

▲ 危险 DANGER

- 吸入压缩空气，使用不适当的安全设备，可能会造成重伤甚至死亡。
Inhalation of compressed air or using improper safety equipment may cause serious injuries and even death.
- 2) 仅在露天或充分通风处运行压缩机。如果要在室内运转机组，应将柴油机排气完全通到室外。
Operate the compressor only in open air or well ventilated places. The diesel exhaust should be completely vented to the outdoors if the unit running indoor.
 - 3) 停放时要注意方向，避免人员和压缩机吸入柴油机排气。Pay attention to the parking direction to prevent people and compressor from taking in of diesel engine exhaust.
 - 4) 避免皮肤接触和吞入燃料、润滑油、冷却液。若不慎接触皮肤，要用肥皂水冲洗干净。若不慎吞入，应立即找医生治疗。Avoid skin contact and swallowing fuel, lubricating oil and coolant. If on skin, flush thoroughly with soap water. If accidentally swallowed, seek medical treatment immediately.
 - 5) 维护蓄电池时，一定要穿戴防酸围裙和面罩。若电解液溅到皮肤或衣服上，要立即用大量的水冲洗。When maintaining batteries, always wear acid resistant aprons and face masks. If electrolyte is splashed on the skin or clothes, rinse immediately with plenty of water.
 - 6) 若防冻冷却液溅入眼睛或挥发性气体刺激眼睛，要立即用水冲洗 15 分钟，然后立即找医生，最好是眼科医生。If the antifreeze coolant splashed in eyes or volatile gases irritated eyes, immediately flush with water for 15 minutes, then see a doctor, preferably an ophthalmologist.
 - 7) 不要将防冻冷却液存放于密闭的空间。Do not store antifreeze coolant in a confined space.
 - 8) 防冻冷却液有毒，千万不要吞食，并要避免皮肤接触和吸入其挥发物。万一吞入，要喝大量盐水洗胃。等呕吐物洁净后，再喝一杯苏打水。让病人躺下，马上叫医生。Antifreeze coolant is toxic, never swallow it. Avoid skin contact and inhalation of its vapor. In case of ingestion, drink plenty of salt water for gastric lavage. After cleaning the vomit, drink a cup of soda water. Then let the patient lie down and call for a doctor at once.

8. 触电 Electric shock

1) 保持机组、拖车和人员等距离外界电源、电线至少 3 米以上。

Keep the unit, tow vehicle and personnel at least 3 meters away from the external power supply and wire.

2) 身体、手持工具及其它导电物应避开电路的暴露端头。维修和调整这些部分时，要站在绝缘物体上，不要弄湿脚，不要接触压缩机的其它部位。Body, hand tools and other electrical conductors should be away from the exposed circuit / wire ends. Stand on insulating objects when repairing, servicing and adjusting these parts, do not wet your feet, and do not touch other parts of the compressor.

3) 应在清洁、干燥、光线好的地方维护压缩机。

Maintain and service the compressor in a clean, dry and bright place.

4) 有雷击时必须远离压缩机。Keep away from the compressor when lightning strikes.

9. 蓄电池 Battery

1) 蓄电池中可能含有氢气。由于氢气是易燃易爆的气体，机组周围不能有火星、火苗及其它火源。

The battery may contain hydrogen. Since the hydrogen is a flammable and explosive gas, no sparks, flames and other sources of fire should be surrounding the unit.

2) 蓄电池中的电解液有很强的腐蚀性和毒性，千万不能与眼睛、皮肤以及纤维表面接触，否则会造成人身的伤害或财产损失。万一有电解液溅出，要立即用大量清水冲洗干净。The electrolyte in battery is strongly corrosive and toxic, and do not get contacted with eyes, skin and fiber surface, otherwise it will cause personal injury or property damage. If electrolyte spilled, flush and clean it immediately with plenty of water.

3) 如果电解液冻住或含有冰块，不得起动机组，否则蓄电池会爆裂。If the electrolyte is frozen or containing ice, don't start the unit, otherwise the battery will explode.

4) 要避免接线头、线夹与其它金属部件意外接触，以防产生电弧，造成火灾。Avoid connectors, wire clips accidentally contacting with other metal parts to prevent arcing which may cause fire.

10. 吊装 Hoisting

- 1) 吊装之前, 应仔细检查各联接处, 查看焊缝是否有裂纹, 零部件是否有裂纹、变形或腐蚀, 紧固件是否有松动。Before lifting, check all connections carefully, check welds and parts for cracks, deformation or corrosion, and check fasteners for tightness.
- 2) 确保所用吊装设备和吊具、索具性能良好, 并能承受机组重量。如不清楚机组的重量, 吊装之前可以先称一下机组。Ensure that the performances of the lifting equipment, tools, devices, hooks, hangers and locking devices are in good conditions and are able to withstand the weight of the unit. The unit should be weighed before being lifted if the weight is unknown.
- 3) 起重吊钩应有保险卡扣, 起吊时应牢牢卡住吊耳或吊链。The lifting hooks should be with safety snap, and the unit should be firmly locked to the lifting lugs or hanging chains when lifting.
- 4) 用绳子将机组牵住, 以防起吊后机组旋转或晃动。
Hold the unit with a rope to prevent it from rotating or swinging when lifting.
- 5) 不要在刮大风时吊装机组。Do not hoist the unit in strong wind
- 6) 吊起后, 压缩机组下不能站人。After lifting start, do not stand under the unit.
- 7) 起吊后, 吊装员不能离开现场。After lifting start, the operator should not leave the site.
- 8) 机组吊起足够高度即可, 无需太高。Only lift the unit at a sufficient height, never lift too high.
- 9) 放下机组时, 其支撑面应有足够的硬度和强度。
When lowering down the unit, the supporting surface should have sufficient hardness and strength.
- 10) 解下吊钩前, 将机组轮胎前后卡住。
Before removing the lifting hooks, block the unit wheels from both front and rear sides.
- 11) 运输之前, 还要用钢绳或铁丝将轮轴和牵引杆拉住锁紧。
Before transporting the unit, hold and lock down the wheel axles and tow bar with steel wire ropes or iron wires.

11. 其它注意事项 Other notices

- 1) 若要进入车棚内调整压缩机, 必须告诉其他工作人员, 并在门外作出标志, 将门卡住, 以防他人把门关上。Before entering the unit to adjust the compressor, notify your co-workers, post signs at the door, and leave the door open to prevent it to be closed by someone.
- 2) 关门时, 必须确保机组内无人。Before closing the door, make sure that no one is in the unit.
- 3) 用作门撑的气弹簧为高压气体制品, 严禁火烤、砸碰和剖析。
The air-spring used in the door support is a high-pressure air product. It is forbidden to heat, break and disassemble it.

第3章 系统功能介绍 Chapter 3 Introduction of System Functions

1. 简介 Profile

浙江志高机械股份有限公司设计制造的各种型号柴油移动式螺杆压缩机组，不仅具有优良的性能和高的可靠性，而且所需要的维护极少。The various models of diesel portable screw compressors designed and manufactured by Zhejiang Zhigao Machinery Co. Ltd. have excellent performance and high reliability, and require less maintenance.

本机组是一种由柴油机驱动风冷冷却的两级压缩喷油双螺杆压缩机，可以根据工作需要很方便地进行移动作业。This unit is an air-cooled two-stage compression oil-injected dual-rotor screw compressor driven by a diesel engine, and portable & easy to operate according to working requirement.

本机组以知名品牌康明斯发动机为动力，压缩机机头为特别定制，因而机组具有良好的动力性、经济性和可靠性。机组最大工作海拔高度可达 2000 米，可在-20℃~+45℃温度环境下满负荷持续工作。The unit is powered by the well-known Cummins engine, the compressor air end is especially tailor made for Zhigao with excellent power, economy and reliability. The maximum operating altitude is up to 2,000 meters, and it can continuously work at full load in ambient temperature of -20℃ ~ +45℃.

本机组布局合理，功能齐全，操作维护简单，外形美观大方。机组采用全密闭静音型设计，使其具有较低的噪声。双压力机组在仪表盘上配有高低压选择开关，随时能够提供两种不同的工作压力。仪表盘上的所有显示仪表具有夜视功能，方便夜间操作。The unit has rational layout, and complete functions with simple operation and maintenance, and elegant appearance. The unit utilizes fully enclosed noise proof design with lower noise. The dual pressure unit is equipped with a high and low pressure switch on the instrument panel, providing two different working pressure. All instruments on the dashboard display have night vision feature for easy operation at night.

在阅读操作维护说明书的过程中，您将会了解机组的使用方法。与此同时，只要稍加留心，您就会发现将机组维持在最佳的工作状态是非常的容易。Reading this *Manual*, you will learn how to operate the unit. In the meantime, as long as you pay close attention, you'll find it easy to operate the unit in optimum working condition.

为使您购买或使用的移动式螺杆压缩机组保持最佳的运行状态，请详细阅读本操作维护说明书的第五章维护保养规程。如果您遇到本操作维护说明书未及解答的疑难问题，请与当地浙江志高机械股份有限公司代理商或浙江志高机械股份有限公司售后服务部联络。To keep your portable screw compressors at an optimum running condition, please read maintenance procedures in Chapter 5 of this *Manual*. If you encounter any problem that is not explained in this *Manual*, please contact your local dealer or the after-sale service department of Zhejiang Zhigao Machinery Co., Ltd.

2. 总体布局 Overall layout

浙江志高机械股份有限公司的各型号柴油移动式螺杆压缩机组的部件及相对位置分别参见图 3-1。机组由压缩机机头、柴油发动机、进气系统、压缩机排气系统、柴油机排气消声系统、冷却与润滑系统、压缩机气量调节与控制系统、燃油系统、自动保护系统、操控面板、电气系统、行走系统等组成。机组还配有优良的吸音隔声材料,能将机组噪声降到最低,使工作环境不至于太吵闹。For Parts and relative locations of the parts of each type of portable screw diesel compressors from Zhejiang Zhigao Machinery Co., Ltd., please see Figure 3-1. The unit consists of compressor air end, diesel engine, intake system, compressor exhaust system, diesel exhaust muffler system, cooling and lubrication systems, compressor air regulation and control systems, fuel systems, automatic protection system, control panel, electrical system, tramming system and other components. It comes with excellent acoustic insulation materials, reducing noise to a minimum, so that the working environment is not too noisy.

3. 压缩机机头 Compressor air end

压缩机机头(主机)是移动式螺杆压缩机组的一个非常重要的部件。精心设计制造的两级喷油冷却润滑的螺杆压缩机,可以提供稳定、无气流脉动的压缩空气。机头的独特之处在于机械可靠性和耐久性极高,其工作部件达到了“免检”的工艺要求,并且使用时无需保养和内部检查。Compressor air end is a very important component of the portable screw compressors. The well- designed and manufactured screw compressor with two-stage injection cooling and lubrication, provides stable, non-pulsating stream of compressed air. The unique air end has high mechanical reliability and durability. Its working parts have met the "inspection exemption" of the technological process requirements, and no maintenance and internal inspection needed.

4. 柴油发动机 Diesel engine

柴油发动机也是移动式螺杆压缩机组的一个非常重要的部件。柴油机是一种把柴油喷入气缸内与压缩空气混合,通过燃烧爆发将柴油中的化学能转化为机械能的一种装置。Diesel engine is also a very important part of the portable screw compressor. Diesel engine is a device to inject diesel fuel into the cylinder and mix it with compressed air, by the outbreak of the diesel combustion to convert chemical energy into mechanical energy.

移动式螺杆压缩机组柴油机的功率配置保有合理,因而在海拔 2000 米高度时,机组仍然可以在压缩机额定排气压力下正常工作¹。The power of the diesel engine in the portable screw compressors with rational configuration makes the unit work normally under the rated compressor working pressure even at the height of 2,000 meters above sea level¹.

5. 进气系统 Air intake system

参看图 3-1。压缩机机组进气系统的作用是向柴油机和压缩机提供清洁干净的空气，它包括两个空气过滤器，一个进气阀以及连接管路。Referring to Figure 3-1. The role of the compressor's intake system is to provide clean air to the diesel engine and compressor, which includes two air filters, an intake valve and connecting pipes.

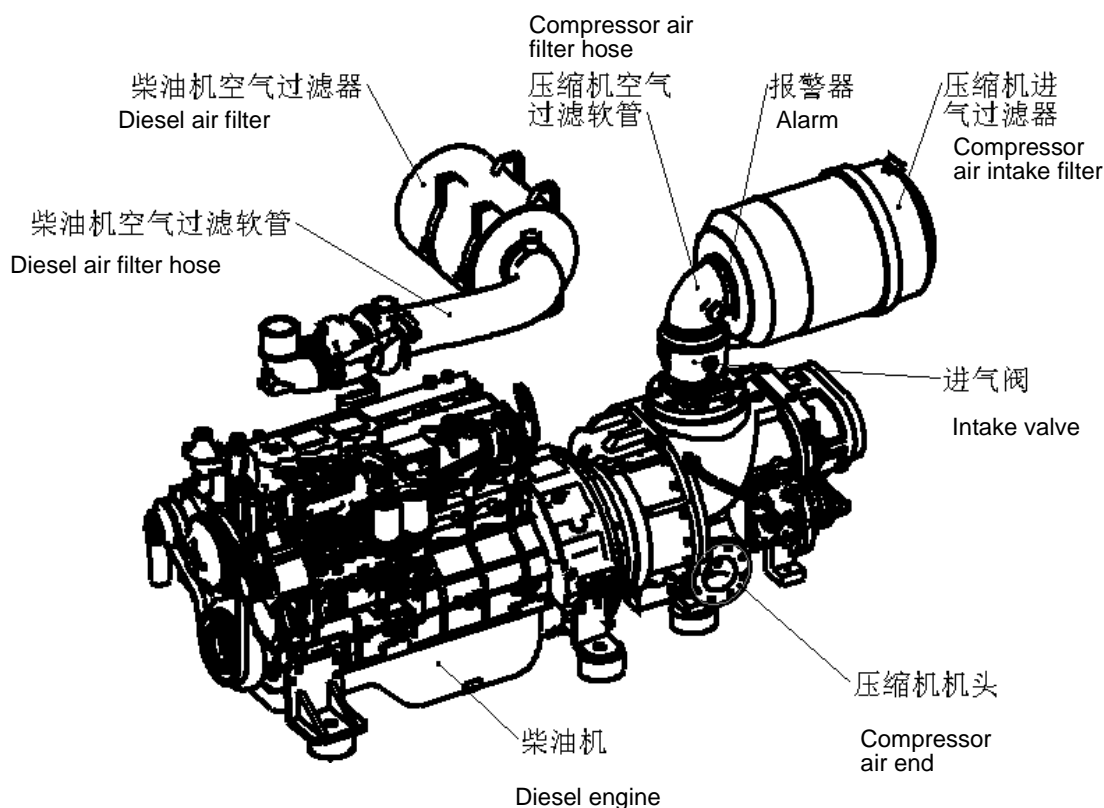


图 3-1 进气系统 Figure 3-1 intake system

1 当在超过 2000 米海拔使用时，须要特殊配置高原柴油机。压缩机的排气量随着使用海拔高度的上升而有降低，在不考虑温度变化时，排气量大致与大气压力成正比。

When working at altitude higher than 2,000 meters, a special CONFIGURATION plateau diesel engine should be used. The displacement of compressor decreases with increasing of the altitude. Without considering temperature change, the displacement is approximately proportional to the atmospheric pressure.

2 在 0℃ 以上温度时，不需要使用进气辅助加热装置。

At temperature above 0 °C, the intake assistant heater is not needed.

3 本文中涉及最低冷起动温度为平原地区测试数据，如海拔提高则最低冷起动温度应相应提高。The minimum cold starting temperature of the machine listed here is the test data at plain region. If the altitude increases, the minimum cold starting temperature should be increased accordingly.

在低温环境下工作时，必须使用合适的机油和燃油，参考第一章第 5 节和第 7 节。When working in low temperature environment, the appropriate oil and fuel must be used, please refer to Section 5 and 7 of Chapter 1.

机组所采用的空气过滤器能够处理很脏的空气。除主滤芯外，在壳体内主滤芯外有一个旋风分离叶片环，它可以预先滤除较粗的粉尘颗粒。操作人员应经常清除积聚在空气过滤器后盖集尘袋里的粉尘颗粒。当空气过滤器弯管的空滤器报警指示变红时，表明空滤器的流动阻力太大，应及时维护或更换主滤芯。另外，它还具有一个安全滤芯，其作用是在主滤芯破损的情况下，在短时间内起临时保护作用。安全滤芯平时不需要维护，只是当更换主滤芯时与主滤芯同时更换。

The air filters in the unit can treat very dirty air. In addition to the prime filter cartridge, there is a cyclone blade ring outside of the covered filter core, which can pre-filter coarse dust particles. Operator should regularly remove the dust particles accumulated in dust bag behind air filter cover. When the air filter alarm indicator of air filter elbow turning red, it indicates that the flow resistance of the air filter is too severe, and it is time to maintain or replace the prime filter cartridge. In addition, there is a safety filter cartridge, it will protect the engine temporarily once the prime cartridge is damaged. The safety filter cartridge usually does not require maintenance, but it should be replaced together with the prime.

注意：安全滤芯的孔径比主滤芯的大，它仅能在主滤芯失效后短时间内(4~6 小时)起临时保护作用。因此，一旦发现主滤芯失效应立即更换。否则有可能会造成柴油机拉缸、烧瓦等事故。

Note: The pore size of the safety filter cartridge is larger than that of the prime filter cartridge. This secondary filter cartridge only serves as temporary protection in a short time only (within 4 - 6 hours). Therefore, once the prime filter cartridge fails, it should be replaced immediately. Otherwise, it may cause accidents to the diesel engine such as cylinder scoring, bearing burning and so on.

进气系统的连接弯管采用高质量成型橡胶管件，具有较好的耐寒、耐热、耐老化特性。
The connecting elbow hose of intake system uses high quality molded rubber with good characteristic of cold, heat, and aging-resistant.

▲警告 WARNING

●密封不严的进气系统会造成机组的早期磨损。决不要用铁丝扎紧橡胶管件，更不能使用有裂纹的橡胶管件。Improper sealed intake system will cause early wear of the unit. Never use metal wire to tight the rubber hoses, and do not use cracked rubber hoses.

6. 压缩机排气系统 Compressor exhaust system

标准型移动式压缩机组的排气系统主要由排气管、油气分离器、最小压力阀，安全阀、供气球阀等组成。A typical exhaust system of portable compressor unit is mainly composed of exhaust pipe, oil separator, minimum pressure valve, safety valve, air supply valves and other components.

当压缩机工作时，螺槽封闭容积内的空气不断被压缩，同时空气在压缩过程中产生的热量又被持续喷入螺槽封闭容积的润滑油所吸收，当螺槽封闭容积减少到一定值(设计值)时，螺槽封闭容积与特殊设计的排气口接通，油气混合物逐渐通过排气口排出。由于螺杆压缩机的一对转子具有数条螺槽，转子的转速又非常高，所以机组的排气是没有脉冲的连续的。

When the compressor running, air in the closed screw grooves is compressed continuously, in the same time the heat generated in the process of the compression is absorbed by the lubricating oil which is continuously injected into the screw grooves. When the volume of the screw grooves has been compressed into a certain value (design value), the closed volume will turn on a specially designed exhaust vent, the oil and air mixture is gradually discharged through the exhaust vent. Since a pair of screw compressor rotors has several screw grooves, and the rotor turning speed is very high, so the outlet air runs continuously without any pulse.

从压缩机机头排出的油气混合物进入特别设计的油气分离器，由于高速，油气混合物进入后是沿着罐体内部流动的。在离心力的作用下，大多数的油从空气中分离出来，形成的油滴聚合成较大的颗粒，在重力的作用下落入罐的下部。油气分离器内部的挡板和隔板使空气和油滴不停地旋转，方向不断地改变，这种惯性作用使越来越多的油从压缩空气中分离出来。经过了初级分离的压缩空气中，只剩下一些非常细小的油雾，在空气流经油气分离器滤芯时，通过碰撞、弥散、拦截而在滤芯纤维上凝聚成细小的油滴。凝聚在滤芯外表纤维上的油滴，在重力的作用下滴落到筒体下部的油面；凝聚在内部纤维上的油滴，则最终汇集在滤芯的底部。从滤芯的底部引出一根二次回油管，使聚集在滤芯底部的油流回到压缩机。The air oil mixture discharged from the compressor air end enters a specially designed oil separator, due to the high speed, the air oil mixture then flow along the internal surface of the oil tank. Acted by centrifugal force, most of the oil is separated from the air oil mixture, forming oil drops and gathering into larger particles, then fall into the lower part of the tank under gravity force. The baffle plates in the oil separator make the air and oil spinning and changing directions constantly. The momentum makes more and more oil extracted from the compressed air. After the primary separation of compressed air, only little very tiny oil mist left in the air flowing. When it flow through the oil separator filter cartridge, by collisions, diffusion, interception, tiny oil drops are caught on the filter fibers. The oil drops on outer fiber of the filter drip to the lower part of the oil barrel under gravity; Oil drops on the inside of the fiber will ultimately collected at the bottom of the filter cartridge. A returning pipe from the bottom of the filter cartridge leads the collected oil flowing back to the compressor.

在油气分离器罐的平盖上装有一个最小压力阀，其作用是保证压缩机在正常运行时在罐内建立一个最小罐压，以保证润滑油路的正常工作。

In order to ensure the lubricating oil line working properly, a minimum pressure valve is installed on the flat cover of the oil separator tank to guarantee a minimum pressure in the tank during the normal operation of the compressor

经过油气分离后的压缩空气中仅含有几个 PPM 的润滑油，分离后的压缩空气经过最小压力阀后，就可以供用户使用了。在机组车架的前端右下方备有 2~3 个不同规格的供气阀，以方便用户不同的需要。

The compressed air after oil separation process contains a few PPM of lubricating oil only. Through the minimum pressure vale, the air is available and ready for use. At the bottom right of the unit front frame, there are 2 to 3 different sized hand valves to supply air for different needs of users.

在油气分离器罐的筒体上装有一个安全阀，当罐内的气体压力超过安全阀的设定压力安全阀会自动打开。安全阀的开启压力在出厂前已设定好，请用户不要擅自改变。排气管上还装有温度开关，当压缩机排气温度高于 120℃ 时使机组自动停机。A safety valve is installed on the tank of the oil separator tank. When the air pressure inside the tank exceeds the valve setting pressure, it will open automatically. The opening pressure of safety valve is factory set, please do not arbitrarily change it. The exhaust pipe is also equipped with a temperature switch, which will shut down the unit automatically when the compressor discharge temperature is higher than 120 °C.

油气分离器加油口的螺塞经过了特殊设计，能够在拆卸时泄放罐内可能残存的压力。装在筒体上的视油镜用于检查罐内的润滑油量，当机器运行时的正常油位应在视油镜的中心偏下位置。The specially designed screw plug at the filler of the oil separator will vent the pressure that may remain in the tank when it being disassembled. An oil level sight glass mounted on the tank is used to check the lubricating oil level in the tank. When the unit is running normally the oil level should be at the lower middle position of the sight glass.

▲警告 WARNING

●在压缩机运行或带压时，不要拆卸螺母、注油塞及其它零件。维护操作之前应停机并释放所有内部压力。When the compressor is running or under pressure, do not remove any nuts, fill plugs, fittings and any other parts. It should be shut down and all internal pressure released before any maintenance and service operations.

●不准更换和使用其它型号的安全阀。

Do not replace and use improper safety valve of other model and specs.

7. 压缩机冷却与润滑系统 Compressor cooling and lubricating system

压缩机冷却与润滑系统由油气分离器、油冷却器、冷却风扇、油过滤器、温控阀和油管路等组成。参见图 3-2。The compressor cooling and lubrication system consists of oil separator, oil cooler, cooling fan, oil filter, thermostat valve, oil pipe lines and other components. See Figure 3-2.

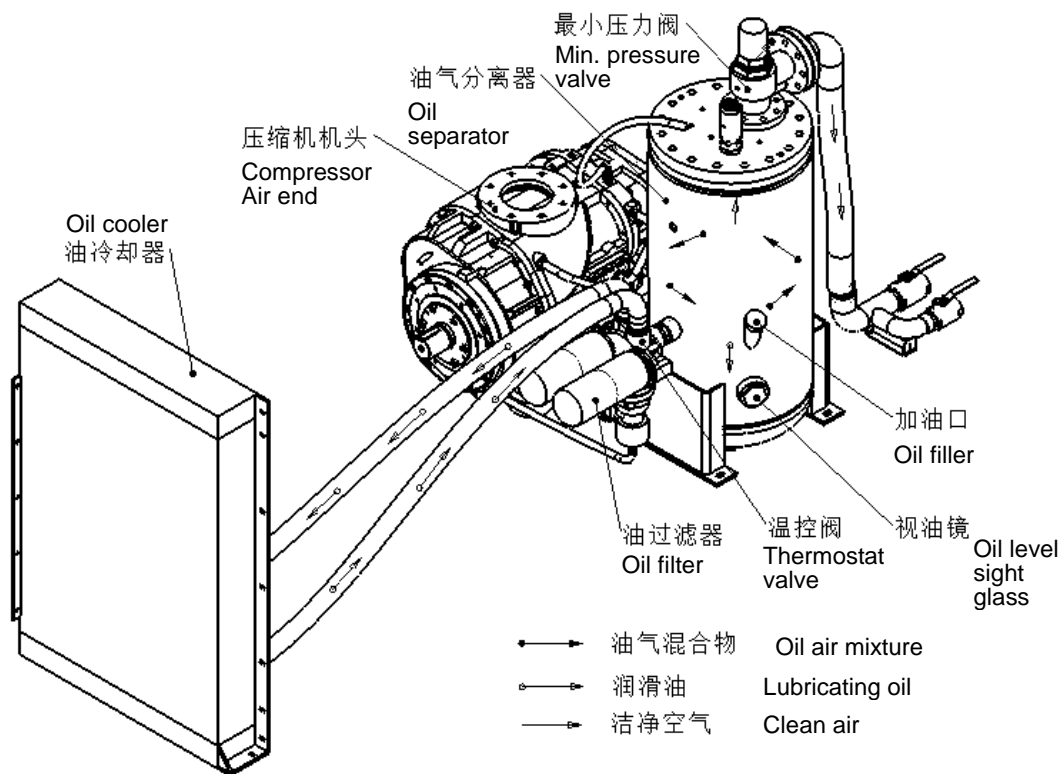


图 3-2 压缩机冷却与润滑系统 Figure 3-2 Compressor Cooling and Lubrication System

8. 压缩机气量调节与控制系统 Compressor air capacity adjust and control system

压缩机气量调节与控制系统能根据实际使用气量的大小自动调节进气量和柴油机转速，同时维持压缩机的供气压力不变。The compressor air adjustment and the control system regulates the amount of intake air and the running speed of the engine automatically according to the actual use of air, and maintains a constant air supply pressure of the compressor.

一般情况下，压缩机气量调节与控制系统不必进行调整。如果确需调整，应参阅本操作维护说明书的内容。Under normal circumstances, the compressor air adjustment and control system does not need any adjustment. If any adjustment needed, please refer to the detail in this *Manual*.

机组采用转速调节加进气节流的气量调节方式，也就是通过改变柴油机转速和控制进气阀的开度来控制压缩机的进气量，从而实现气量调节的目的。机组存在三种工作状态：A、起动工况；B、已调节负载运行工况；C、停机工况。The unit regulate the engine speed and control the air intake amount at the same time, that is, by changing the engine speed and controlling the intake valve opening degree to control the intake air to the compressor, to achieve air regulating. The unit has three working status: A, Starting status; B, Load regulated operating status; C. Stop status.

9. 自动保护系统 Automatic protection system of the unit

自动保护系统是机组的重要组成部分。它的作用是保证机组在不正常的情况下不能起动或及时自动停车，从而起到对压缩机主机和柴油机的安全保护作用。该系统主要包括：压缩机排气温度开关、柴油机水温开关。Automatic protection system is an important part of the unit. It is to ensure the unit will not start and stop automatically under abnormal circumstances, and thus play a safety role for the compressor and diesel engine. The system includes: compressor discharge temperature switch, diesel engine coolant temperature switch.

在机组运行时，以上控制开关任何一个触发都可使柴油机燃油电磁阀断电关闭，从而使机组停车，以下分别对各控制开关作详细介绍。During the unit running, any of above control switches being triggered will power off the diesel fuel solenoid valve, and then shut down the unit. Below are the details of the control switches.

- 压缩机排气温度开关——该开关安装在压缩机主机的排气管上，当主机排气温度达到 120℃时，排气温度开关断开使柴油机停机。Compressor discharge temperature switch—mounted on the compressor exhaust pipe, when the exhaust temperature reaches 120 °C, the switch will turn off and shut down the diesel engine.

- 柴油机水温开关——柴油机水温开关安装在柴油机主水道上，当柴油机的冷却液温度达到 102℃时，水温开关断开使柴油机停机。Diesel engine coolant temperature switch—mounted on the diesel engine main waterway. When the engine coolant temperature reaches 102 °C, the switch will turn off and shut down the diesel engine.

10. 柴油机燃油系统 Fuel system of diesel engine

燃油供给系统是柴油机的重要组成部分，它对发动机的动力性、经济性、可靠性及耐久性都有较大影响。燃油系统需要向柴油机提供充分的没有混入灰尘、水分等杂质，以及没有混入空气的清洁燃油，以满足柴油机功率、扭矩、转速、油耗、噪声、排放、起动及怠速等方面的要求。Fuel supply system is an important part of the diesel engine, it significantly affects the engine power, oil economy, reliability and durability. Diesel fuel system is required to provide adequate clean fuel without contamination of dust, moisture and other impurities, and certainly without any air, to meet the requirements of the diesel engine power, torque, speed, fuel consumption, noise, emission, starting, idling and so on.

燃油系统由燃油箱、吸油过滤器（预滤器），低压油管，输油泵，燃油过滤器，断油电磁阀、直列式燃油喷射泵，高压油管，燃油喷嘴，涡轮增压控制管、燃油回油管等组成。参见图 3-3。Fuel system consists of fuel tank, suction filter (pre-filter), low pressure tube, pump, fuel filters, oil shut off valve, inline fuel injection pump, high pressure tube, fuel injectors, turbo control tube, fuel return pipe and other components. See Figure 3-3.

燃油箱容积为 180L，能够满足一个班的用油要求。燃油箱的加油口由空气过滤和加油过滤两部分组成，它不仅可以防止油箱呼吸时将空气中的尘埃带入油箱内，又可以防止加油过程中混入颗粒杂质。燃油箱底部备有放油阀，用于定期清除沉积在油箱底部的水分和杂质。Fuel tank capacity is 180L, to meet the requirements of one shift. The filler neck of fuel tank consists of air filter and fuel filter. It not only prevents the tank from breathing in dust, but also prevent the refueling process from bringing in particulate impurities. A drain valve at the bottom of the fuel tank is used to periodically remove water and impurities deposited at the bottom of the tank.

吸油过滤器安装在燃油箱上，它是一种具有积污盘的易于清洗或更换的吸油过滤器。Suction filter is mounted on the fuel tank, which is easy to clean or replacing with dirt collecting feature.

采用两级式燃油滤清器(燃油滤清器和组合式油水分离器)。
Using two-stage fuel filters (the fuel filter and the combined water separator).

燃油的使用请参阅第一章第 7 节额定工况设定程序内容
Fuel types to use, please refer to Section 5 of Chapter 1-- Diesel engine fuel.

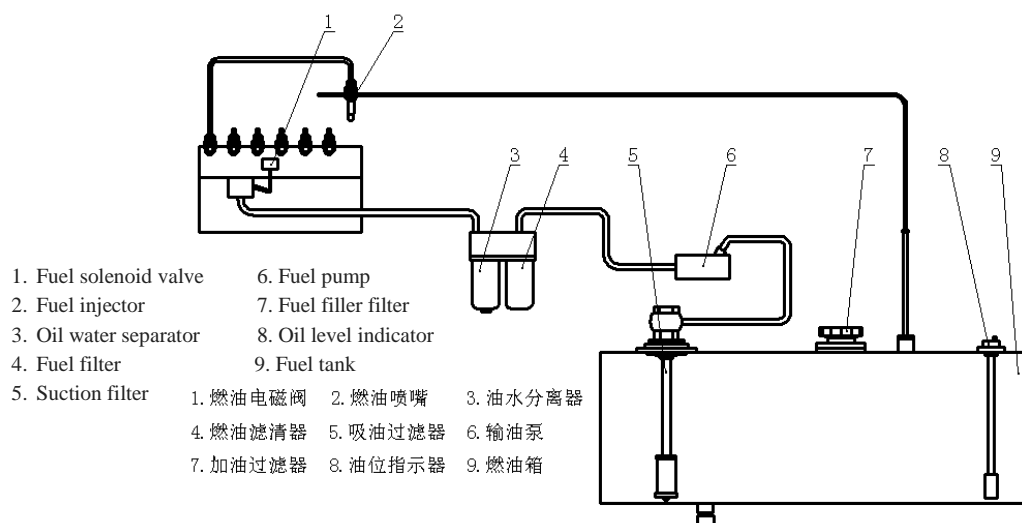


图 3-3 柴油机燃油系统 Figure 3 - 3 Diesel engine fuel system

11. 柴油机润滑系统 Diesel engine lubricating system

柴油机润滑系统是使柴油机的运动部件摩擦表面得到良好的润滑，以减少柴油机的摩擦功损失和零部件的磨损，同时带走零部件表面因摩擦而产生的热量以及磨屑。Engine lubrication system is to well lubricate the moving parts of the diesel engine and friction surfaces of these parts, and to reduce wear of engine components and power loss in friction, and take away the heat and debris due to friction from the component surface.

工作时，油泵将油底壳的机油吸出，经过加压后流向整个润滑系统，机油压力调节阀控制机油最高工作压力。当机油滤清器发生堵塞时，旁通阀开启以确保润滑油的供给。在润滑方式上，活塞销是靠活塞冷却喷嘴喷射润滑的，机油泵惰性齿轮衬套是强制润滑的，而前齿轮系的其它齿轮则是靠机油的携带和飞溅进行润滑。During operation, the oil pump sucks up the oil from the oil pan, and after pressurizing, oil flows to the entire system requiring lubrication, and oil pressure control valve adjusts maximum working pressure of the oil. When oil filter clogged, the bypass valve is opened to ensure the supply of lubricating oil. Piston pins are lubricated with oil sprayed from piston cooling nozzles, the oil pump slave gear bushing is mandatory lubricated regardless, and other gears of the front gear system are lubricated by oil carrying and splashing.

对于新的或修理过的柴油机，请勿使用特殊的“磨合”润滑油，在磨合期应使用与正常运行相同的机油。机油和机油滤清器的更换周期为 200~250h。For new or repaired diesel engine, do not use the special "break-in" lubricating oil, it should use the same oil as the normal operation in the break-in period. The oil and oil filter replacement cycle is 200 ~ 250 hrs.

机油压力在空载怠速时不低于 69kPa，对于新柴油机的正常范围是 130~200kPa；机油压力在额定转速时不低于 207kPa，新机的正常范围是 350~410kPa，柴油机处于冷态时，最高机油压力可达 650kPa，在柴油机的主油道设置有机油压力保护开关，其设定压力为 103kPa。柴油机润滑油的使用请参阅第一章第 5 节柴油机润滑油内容。The oil pressure at idle should not be lower than 69 kPa, the normal pressure range for new diesel engine is 130 ~ 200 kPa; the oil pressure at rated speed should be no less than 207 kPa, normal range for new machine is 350 ~ 410 kPa. When the diesel engine is cold, the maximum oil pressure could be up to 650 kPa, and the oil pressure protection switch is on the main oil line with setting at 103 kPa. For diesel engine lubricant to use, please refer to Section 5 of chapter 1, diesel lubricating oil.

12. 柴油机冷却系统 Diesel engine cooling system

柴油机冷却系统主要由水箱（散热器）、风扇、水泵、节温器、水套、发动机中冷器、橡胶水管等组成。参见图 3-4。柴油机的冷却系统能对柴油机进行强制冷却，保证柴油机能始终处于最适宜的温度状态下工作，以获得较高的动力性、经济性和可靠性。

Diesel engine cooling system consists of coolant tank (radiator), fan, water pump, thermostat, coolant jacket, the engine inter cooler, rubber hoses / pipes and other components. See Figure 3-4. The engine cooling system can cool down the engine regardless, to ensure the diesel engine running under the optimum temperature, and to obtain a higher power performance, fuel economy and reliability.

冷却液正常工作温度为 80 ± 5 °C。冷却系统的标准使用环境温度为 38°C（海拔 150 m），高温使用环境温度为 49 °C（海拔 150 m），高海拔（1500 m）使用环境温度为 38°C。

The coolant normal operating temperature is 80 ± 5 °C while the standard ambient temperature of the cooling system is 38 °C (at altitude 150 m), and the high ambient temperature is 49 °C (altitude 150 m), and the ambient temperature at high altitude (1,500 m) is 38 °C.

由于柴油机长期持续在 95 °C 以上温度工作，将导致机油加速变质，柴油机和冷却系统中弹性非金属材料加速硬化，因此在 95 °C 以上温度的工作时间要尽可能短，推荐每年该工况累计不应超过 50h。If the diesel engine continuously work at the temperature above 95 °C for long time, that will causes the oil deteriorating quickly, and accelerates hardening of elastic non-metallic parts in the engine and the cooling system. Therefore, the time for the engine running at a temperature of 95 °C and above should be as short as possible. It is recommended that this working status should not last longer than 50 hours per year.

水箱是柴油机冷却系统的一个重要部件，它是一个具有压力盖的封闭直流强制循环式管带式散热器。压力盖的开启压力为 50kPa，这一压力可以保证水在 1500m 海拔和 105°C 以下不会沸腾。压力盖的作用不仅仅在于可以提高散热器的散热能力，而且还可以减轻或消除冷却液循环中的气泡和气阻现象，尤其是可以消除水泵进口处(该处压力最低)的气阻现象，使水泵进口为正压，减少水泵叶轮和壳体的穴蚀，保证冷却液实际循环流量的稳定，让足够的冷却液把热量从发动机内带走。

The radiator is an important component of the engine cooling system, it is a cooler of closed water flow system, with forced circulation and serpentine pipes and with a pressure cap. The cap opening pressure is 50 kPa, and this pressure will ensure water not boiling at 105 °C in altitude of 1,500 m. The pressure cap not only improves the cooling capacity of the radiator, but also reduce or eliminate the air bubbles and air resistance conditions in the coolant circulation. In particular, it help eliminate the bubbles and air resistance conditions on the coolant pump inlet (where with lowest pressure), making positive pressure at coolant pump inlet, reducing corrosion of the pump impeller and housing, keeping the stability of the actual circulation of coolant flow and taking away heat from the engine with sufficient coolant..

柴油机一定要使用长效防冻防锈冷却液，请参阅第一章第 6 节柴油机冷却液的内容。防冻防锈冷却液对各种金属和橡胶都无腐蚀作用，可保证柴油机冷却系统水套内腔不会结垢，使极寒地区的柴油机安全过冬。冷却液的更换周期为两年或 2000 小时，在密封良好的系统内，无需经常添加，但应定期检查或补充冷却液中的防锈剂浓度。加注冷却液时，应缓缓加注，以便除掉柴油机水道中的积滞的空气和高温下产生的水蒸气。对于有中冷器的柴油机，加注冷却液时要打开中冷器上的放气阀排除空气。

The diesel engine must use long term antifreeze & anti-rust coolant, please refer to Section 6 of Chapter 1 - The diesel engine coolant. Antifreeze & anti-rust coolant are non-corrosive for various metals and rubber, which guarantee to prevent coolant jacket chamber of diesel engine cooling systems from scaling, so that the engine will be safe even in winter of a cold region. Coolant replacement cycle is two years or 2,000 hours, in a well-sealed system, there is no need to add coolant regularly, however, the rust inhibitor concentration in

the coolant should be checked or supplemented regularly. When refilling, the coolant should be poured slowly, to remove the air in diesel engine waterways and vapor created by high temperatures. For diesel engine with inter cooler, when refilling the coolant, please open the air vent valve on the inter cooler to let out air.

注意：不同牌号的防冻液和防锈剂切勿混用。 Note: Do not mix different brands of antifreeze and rust inhibitors.

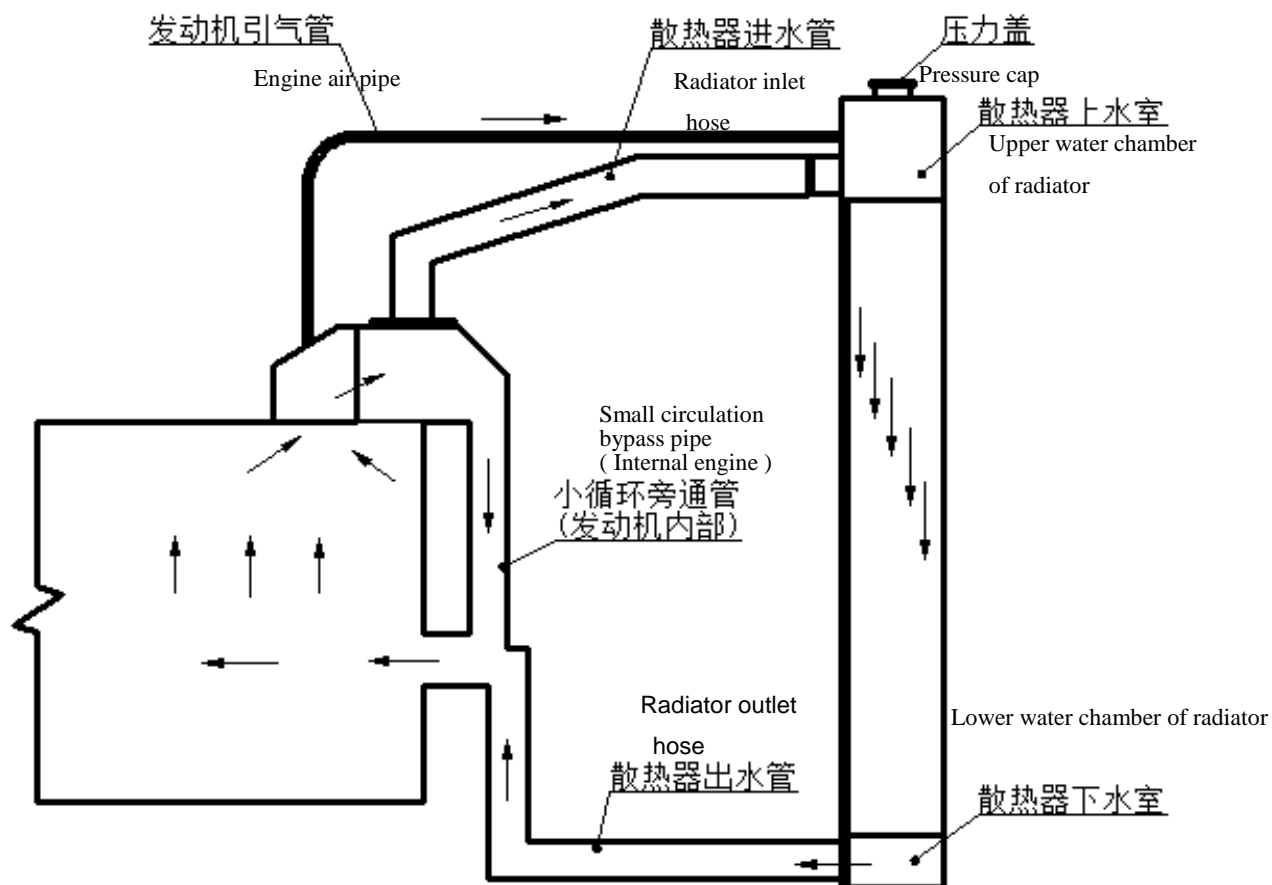


图 3-4 柴油机冷却系统 Figure 3-4 Diesel Engine Cooling System

13. 柴油机排气系统 Diesel engine exhaust system

柴油机排气系统的作用是降低排气噪声，防止排气泄漏，保持排气通畅。排气系统的部件有：排气歧管，涡轮增压器、排气管和排气消声器。The diesel engine exhaust system is to reduce exhaust noise, prevent exhaust leaks, and keep exhaust outlet unobstructed. The parts of the exhaust system include: exhaust manifolds, turbocharger, exhaust pipe and exhaust muffler.

涡轮增压器一端装在进气歧管上，另一端装在排气歧管上，柴油机全部吸入的空气和全部排出的废气都要经过涡轮增压器。当柴油机工作时，废气从排气歧管出来，流经涡轮增压器之一端，推动叶轮转动；在另一端，经过空气滤清器过滤的空气流过增压器外壳上的进气口，经过增压器叶轮压缩后，流入发动机的进气歧管内。One end of turbocharger attaches to the intake manifold, and the other end connects the exhaust manifold. The engine intake and exhaust air will all go through the turbocharger. When the diesel engine working, the exhaust air from the exhaust manifold flow through one end of the turbocharger turbine, driving the impeller; at the other end, the filtered air flows through the air inlet of the turbocharger, after compressed by turbocharger impeller, it flows into the engine intake manifold.

当发动机载荷增大时，喷入发动机气缸内的燃油增多，废气也就增加，使涡轮增压器的叶轮转动得更快，进入的空气量增多。由于涡轮增压器提供额外的进气，因此就有更多的燃油被燃烧，结果发动机的输出功率就增大。When the engine load increasing, the fuel injected into the engine cylinder increases, and the exhaust air increases as well. Therefore the turbocharger impeller runs faster, the amount of air entering increase. Since the turbocharger provides additional air intake, there is more fuel being burned, and the output power of the engine increases.

涡轮增压器的最高转速由涡轮增压控制管、发动机高空转转速设定值以及工地的海拔高度来控制。The maximum speed of the turbocharger is controlled by the turbo control tube, the set point for the engine high idle speed, and the altitude of the working site.

消声器的出口有防雨帽，可以避免雨水 / 雪进入消声器。
The muffler outlet has a rain cap on it to protect rain / snow coming into the muffler.

14. 操控面板 Instrument operating panel

操控面板上的仪表和操控元件包括：供气压力表、转速显示、机油压力显示、排气温度显示，水温显示，燃油油量表，点火开关，起动 / 运行开关、进气预热开关，电池充电指示灯，进气预热指示灯等，对于双压力调节机组还有高 / 低压选择开关。为保证机组的正常运行，需要操作人员熟悉各显示仪表和操纵元件的作用和用法，以便能根据显示数值作出正确判断。The display instruments and controls on the control panel include: air pressure gauge, speed display, oil pressure display, exhaust temperature display, coolant temperature display, fuel meter, ignition switch, start / run switch, intake preheating switch, battery charge indicator, preheat intake air indicator. For dual pressure regulator unit, there is a high / low pressure select switch as well. To ensure the normal operation of the unit, operator needs to be familiar with the role and usage of each instrument and control elements, to make correct decision according to the displays.

- 供气压力显示：显示机组提供的压缩空气的压力。
Supply air pressure display: Indicates the pressure of compressed air provided by the unit.
- 排气温度显示：显示机组排出的压缩空气的温度。
Exhaust temperature display: Indicates the temperature of the discharge compressed air.

- 转速显示: 显示柴油机的工作转速和机组累计运转时间, 转速小时表具有夜间显示功能。Speed display: Indicates diesel engine operating speed and the total operation time of the unit with night vision feature.
- 机油显示: 显示柴油机机油压力, 机油压力的正常值参见本章第 12 节柴油机润滑系统内容。Oil meter: Indicates the diesel engine oil pressure, and for the normal value of oil pressure please see section 12 - Engine oil lubrication system

注意: 机油压力对机组的正常运行非常重要。

Note: Oil pressure is very important for normal operation of the unit.

- 水温表: 显示柴油机冷却液的温度, 冷却液温度的正常读数应在 82~95℃之间。Water temperature display: Shows the temperature of the engine coolant. The regular reading of the coolant temperature should be between 82 ~ 95 °C.
- 燃油油量表: 显示燃油油量。Fuel gauge: Shows fuel level.
- 电源开关: 用于接通机组的电气系统, 是一个两位开关, 按顺时针转向转动依次为“断电”、“通电”。Power switch: To turn on the unit electrical system, a two-position switch, and turning clockwise in the order of "off" and "on"
- 启动 (点火) 开关: 用于接通机组的柴油机起动机, 摁下即点火。Start (Ignition) switch: To turn on the starter motor of the diesel engine, press down to start.
- 停机 / 预热开关: 开关拨到“停机”位置时, 柴油机停止运行; 预热开关用于辅助和寒冷气候机组启动。Stop / pre-heat switch: switch to "stop" position, the engine stops running; "Preheat" switch for the unit needing aid on starting or in cold climate.
- 启动 / 运行开关: 开关拨到“启动”位置时, 用于起动机组, 此时柴油机只能在怠速下运行; 机组启动后, 应将开关拨到“运行”位置, 此时柴油机全速运行, 压缩机在额定压力下运行。Start / Run switch: Switch to "Start" position, starting the unit, the diesel engine run at idle only; after the unit starting, the switch should be turned to "Run" position, then the diesel engine will run at full speed, and the compressor will run at its rated pressure.

注意: 压缩机停机之前, 必须先将启动 / 运行开关拨到“启动”位置, 让柴油机在怠速下运行 3~5 分钟, 等柴油机水温下降到 83℃以后, 才能将点火开关拨到“停机”位置。Note: Before shutting down the compressor, the Start / Run switch should be turned to "start" position, allowing the diesel engine to run at idle speed for 3 to 5 minutes, after the diesel engine water temperature dropped below 83 °C, then turn to "stop".

- 电池充电指示灯: 机组刚启动时, 蓄电池给发电机励磁, 此时电池充电指示灯亮; 当机组运行正常后, 电池充电指示灯灭。Battery charge indicator: when the unit starting, the battery excites the alternator and the battery charge indicator turns on; after the unit operating normally, the battery charge indicator turns off.
- 进气预热指示灯: 拧住预热开关, 辅助启动和进气加热装置即开始工作。Preheat Intake air indicator: Turn and hold the switch, auxiliary starting aid and intake air heating device begins to work.
- 压缩机油滤器和柴油机吸油过滤器报警: 当报警灯亮时, 表明过滤器已严重堵塞, 需要立即维护或更换。Compressor oil filters and diesel oil filter warning: When warning light on, indicating that the filter has been severely clogged, requiring immediate maintenance or replacement.

15. 电气系统 Electrical System

电气系统是执行机组启动、停机、参数显示和自动保护的控制系统。本系统包括：蓄电池、柴油机启动马达（包括内置继电器）、发电机（包括内置电压调节器）、燃油电磁阀、进气预热装置控制器，压缩机排气温度开关(当主机排气温度达到 120℃时，排气温度开关断开使柴油机停机)。Electrical system is to control unit starting, stopping, parameter displaying and automatic protection system. The system includes: battery, diesel engine starter motor (including built-in relay), alternator (including built-in voltage regulator), fuel solenoid valve, intake air preheating device controller, compressor discharge temperature switch (when the main engine exhaust temperature reaches 120 °C, the exhaust temperature switch will turned off to stop the engine).

16. 行走系统 Trammig System

整个机组安装在一个采用两轮行走系统的车架上，方便机器的移动。机组的拖杆是不可折叠的，由一个可以调节高度的支腿支撑。拖杆的高度也是可以调节的，适合所有的牵引车辆。The whole unit is set on the frame of a two-wheel trammig system, easy to move the machine. The tow bar of the unit is not foldable, supported by a height-adjustable leg. The height of the tow bar is adjustable as well, suitable for all towing vehicles.

17. 车棚外罩组件 Unit enclosures and components

本机组车棚外罩设计美观大方，通风流畅。车棚密封性能良好，能够有效地防止雨水的渗入。外罩上印有标中和警示贴花，罩内布置耐热阻燃的吸音隔声材料，能显著地降低组噪声。The unit has elegant appearance with great ventilation. It's well sealed to effectively stop the rain infiltration. There are reflective labels and warning signs on body. The heat-resistant and flame-retardant acoustic insulation materials are installed inside the covers, which can significantly reduce the unit working noise.

第4章 操作规程 Chapter 4 Operating Regulations

1. 概述 Overview

浙江志高机械股份有限公司设计生产的各型号柴油移动式螺杆压缩机组配置有一系列的控制/操纵元件和显示/指示文件。为确保机组的正常运行，需要操作人员能够正确操作机器，还需要操作人员能够根据显示/批示的数值或善对机组的运行善式故障情况作出正确的判断。在起动机组之前，操作人员要熟悉控制/操纵元件和显示/指示元件的位置、作用和用法。The various models of portable diesel screw compressors manufactured by Zhejiang Zhigao Machinery Co., Ltd. are equipped with a series of control / operation and display / indication elements. To ensure the normal operation of the unit, the operator need to operate the machine properly, and make proper decision according to the data displayed or when malfunction happened. Before starting the unit, the operator should be familiar with the positions / locations of the control / operation and display / indication elements, and their purposes and usages.

2. 控制元件和指标元件的用途 Descriptions of controls and indicators

元件 Item	位置 Position / Location	作用和（或）用法 Purposes and (or) Usages
点火开关 Ignition Switch	操纵面板上 Control panel	<p>启动前先将电源开关拨到“通电”位置，接通机组电气系统；摁下点火开关不松手；柴油机一启动马上松开点火开关。</p> <p>Before starting, turn the power switch to "on" position to connect the electrical system; Press and hold the ignition switch; Release the ignition switch immediately when the engine starts up.</p>
启动预热开关 Start pre-heat switch		<p>接通或断开辅助压气机和进气预热装置的电路。</p> <p>Turn on or off the compressor start aid and the intake air preheating device.</p>
启动/运行开关 Start / Run switch		<p>柴油机启动后，开关拨到“启动”位置，此时柴油机只能在怠速下运行；启动后，应将开关拨到“运行”位置，此时柴油机全速运行，压缩机在额定压力下运行。</p> <p>After starting the engine, turn the switch to "Start", the diesel engine will run at idle only; after starting for a little while, the switch should be turned to "Run" position, then the diesel engine will run at full speed, and the compressor will run at the rated pressure.</p>
供气压力显示 Air pressure meter		<p>显示油气分离器内的空气压力。</p> <p>Indicating air pressure in the oil separator.</p>
转速显示 Speed meter		<p>显示柴油机运行转速，指示机组的累计运行时间，供操作维护参考。</p> <p>Showing diesel engine operating speed, indicating total running time of the unit, for operation and maintenance reference.</p>
机油压力显示 Oil pressure meter		<p>显示柴油运行时的机油压力，供操作维护参考。</p> <p>Showing the oil pressure during the engine running, for operation and maintenance reference.</p>
排气温度显示 Exhaust temperature display		<p>显示压缩机运行时的排气温度，供操作维护参考。</p> <p>Showing the exhaust temperature during the compressor running, for operation and maintenance reference.</p>
水温表 Water temperature gauge		<p>显示柴油机运行时的冷却液温度，供操作维护参考。</p> <p>Showing the coolant temperature during the engine running, for operation and maintenance reference.</p>
燃油油量表 Fuel meter		<p>显示燃油的油量状态。</p> <p>Indicating the fuel level.</p>
视油镜 Oil level meter	油气分离器筒身上 Oil separator tank	<p>用于察看油气分离器内油位和油质。参看第三章第 6 节</p> <p>To check oil level and oil quality in oil separator. Refer to Chapter 3 Section 6</p>
排气温度开关 Exhaust temperature switch	排气管上 The exhaust pipe	<p>在温度超过设定值使机组自动停机。参看第三章第 9 节</p> <p>Shutting down the unit automatically when the temperature exceeding the set value. Refer to Section 9 of Chapter 3</p>
水温开关 Temperature switch	柴油机主水道上 Diesel engine main waterway	<p>在温度超过设定值使机组自动停机。参看第三章第 13 节</p> <p>Shutting down automatically when the temperature above the set value. Refer to Section 13 of Chapter 3</p>
进气预热控制器 Air intake preheating controller	操纵面板上 Control panel	<p>在冷态启动时，执行和控制柴油机进气预热程序。参看本章第 5 节 冷态启动程序。</p> <p>When cold starting, run and control the diesel engine intake air preheating procedure. Refer to Section 5 of this chapter - cold start-up procedure.</p>

元件 Item	位置 Position / Location	作用和（或）用法 Purposes and (or) Usages
蓄电池充电指示 Battery charge indicator	仪表操纵面板上 Instrument control panel	起动时，蓄电池给发动要励磁，指示灯亮；正常运行时熄灭。 When starting, the indicator lights on, and off when operating normally.
进气预热指示 Intake air preheating indicator		指示机组进气预热控制装置正在进行进气预热。 Indicating the intake air preheating unit working.
压缩机油滤报警 Compressor oil filter warning		过滤芯已经严重堵塞，需要立即维护或更换。 Indicating the filter cartridge severely clogged and immediate maintenance or replacement required.
柴油机油滤报警 Diesel oil filter warning		
进气阀 Air intake valve	机头进气口上 On the air intake of air end	根据压缩空气的需求量调节进气量，由压力调节器进行控制。 Adjusting the air feed rate according to the demand of the compressed air, controlled by the pressure regulator.
温控阀 Thermostat valve	油气分离器出油口 Oil separator oil outlet	用于调节压缩机润滑油温度。在油温较低时关闭，使油路旁通，冷油不流经油冷却器。 For adjusting the compressor oil temperature. Off when the oil temperature low to let the oil bypass, and cold oil not flowing through the oil cooler.
最小压力阀 Minimum pressure valve	油气分离器平盖上 Oil separator flat cover	保持油气分离器中的压力不低于 4 bar。 To keep the pressure in the oil separator no less than 4 bars.
安全阀 Safety valve	油气分离器筒身上 Oil separator tank	保证压力容器在安全的操作压力下工作，当油气分离器内（湿侧）压力超过安全设定压力时，安全阀打开放气。 To ensure that the pressure vessel working in safe operating pressure, when the pressure of the oil separator (wet side) exceeding the set pressure of the safety relief valve, the valve will open to vent air.
压力调节器 Pressure regulator	油气分离器附近的控制管路上 Control pipeline by the oil separator	当管线压力达到设定值时，按一定的变化比例将控制气送入柴油机调速气缸和压缩机进气阀，调节进气。 When the pipe line pressure reaching the set level, certain controlled percentage of air sent to the speed control cylinder and compressor intake valve, to adjust the intake air flow.
放空阀 Vent valve		当机组停机时，将油气分离器内的压缩空气放空。 When the unit shutting down, vent the compressed air in oil separator.
燃油电磁阀 Fuel solenoid valve	柴油发动机上 Diesel engine	正常工作时，点火开关拨到“起动”位置燃油电磁阀打开，拨到“停机”位置燃油电磁阀关闭。自动保护开关动作时燃油电磁阀关闭。 In normal operation, when the ignition switch turns to "start", the fuel solenoid valve opens. When the switch turns to "stop", it will be closed. It will also be closed when the automatic protection switch is pressed

3. 起动程序 Starting Procedures

3. 1. 将机组停放在施工工地 / 作业区域上风口的水平位置上，检查散热器(水箱)中冷却液的液位，。如果液位过低，则按要求添加。Park the unit in a flat place of the construction site / work area where the wind from. Check the coolant level in the radiator. Refill as needed.
3. 2. 检查燃油箱是否要添加柴油²。Check if the diesel fuel refueling needed².
3. 3. 检查柴油机是否需要添加机油³。Check if the diesel engine oil refilling needed³.

注意：柴油机冷却液、燃油和机油的使用要求请参见本手册以及柴油机使用保养说明书的有关内容。
Note: For the requirements of engine coolant, fuel and oil, please refer to this Manual and related contents in the Diesel Engine Operating and Maintenance Manual.

3. 4. 检查压缩机润滑油的油位。开机正常的油位应处于视油镜的中心偏下位置。Check the compressor lubrication oil level. Normally in operation the oil level should stay at lower middle position in the oil level sight glass.
3. 5. 检查蓄电池是否需要添加电解液。Check if the electrolyte needed to be added to battery.
3. 6. 检查风扇皮带的张紧力大小是否需要调整。检查和调整方法参见第五章第 3 节柴油发动机的维护保养。Check for the fan belt tension. For The method of inspection and adjustment, please see Section 3 of Chapter 5 - Maintenance of diesel engine.
3. 7. 将压力选择开关拨到“低压”位置（对于双压力调节机组）。
Turn the pressure selector switch to "Low" position (for dual pressure model unit).
3. 8. 将“启动 / 运行”开关拨到“启动”位置。Turn the "Start / Run" switch to "start" position.
3. 9. 拧住辅助启动（预热）开关，同时将点火开关摁下。
Turn and hold the start-up aid (preheat) switch while the ignition switch is pressed down.
3. 10. 柴油机发动后松开点火开关。Release the ignition switch after the diesel engine started.
3. 11. 让机组在“启动”位置下运转 3-5 分钟，待柴油机水温升上来（~45℃）以后，打开主供气阀门，将“启动 / 运行”开关拨到“运行”位置。此时柴油机立即以额定转速运转，压缩机将很快达到额定压力。Let the unit run at the "start" position for 3 - 5 minutes, after the temperature of diesel engine water rising up (~ 45 °C), open the main air supply valve, and turn the "Start / Run" switch to "run" position. The engine will run in rated speed and will reach the rated pressure shortly.
3. 12. 关上所有的维护门，以控制机组的噪声，保证冷却空气的正常流动。Shut all maintenance doors to control the noise of the unit, and ensure the normal flow of cooling air.
3. 13. 检查各仪表指示值是否正常。参阅本章第五节常见故障诊断与排除。Check for normalcy of all gauges and indicators. See Section 5 of Chapter 5 - Common Troubleshooting.
3. 14. 初次运行后，按停机程序停机，检查水箱是否需要加注冷却液，油气分离器是否需要加注润滑油；检查各联接处是否有松动，检查风扇皮带的张紧程度。
After the initial run, stop the unit in according with shutdown procedures. Check if the radiator needs coolant, if the oil separator needs lubricant, if any loose connections, and check for the fan belt tension as well.

注意 Note: ①为防止启动马达损坏, 启动马达每次启动时间不能超过 30 秒钟。如果柴油机在 30 秒内不能启动, 要松开点火开关, 并保证再次启动之前必须至少要间隔 3 分钟。 In order to prevent damage to the starter motor, each starting time of the motor cannot exceed 30 seconds. If the engine does not start within 30 seconds, the ignition switch should be released, and make sure to have at least 3 minutes interval before starting again.

②启动后 15 秒钟之内, 机油压力必须达到正常压力, 否则应立即关闭柴油机进行检查。

Within 15 seconds after starting, the engine oil pressure must reach the normal pressure, or the diesel engine should be turned off immediately for troubleshooting.

③每次启动后, 应让柴油机在怠速下暖机 5 分钟才能让机组负荷运行, 在寒冷天气必须这样做。

With each starting, the diesel engine should be warmed-up at idle speed for five minutes, and then the unit could be allowed to load, especially in cold weather.

▲警告 WARNING

- 禁止在冷机时给机组加载。No loading when the unit cold.
- 发动机在怠速下运转严禁超过 10 分钟。Never run engine in idle speed longer than 10 minutes.
- 避免在冷却液温度低于 60℃或高于 100℃的情况下连续运转。
Avoid continuous running if the coolant temperature is below 60 °C or higher than 100 °C.
- 禁止在机油压力过低时运转柴油机。最小机油压力: 怠速运行——69kPa, 负载运行——207kPa。
Do not operate the diesel engine when the oil pressure is too low. Minimum oil pressure: idling --69 kPa, load operation --207 kPa.

注意: 要定期放出油气分离器底部的冷凝水。放出冷凝水的操作应在每天第一次启动机组前进行。
Note: To periodically drain the condensate water at the bottom of the air-oil separator. Draining water should be processed before the first starting of the unit in the day.

4. 停机程序 Shutdown procedures

4.1. 关闭所有供气阀。Close all the outlet valves of air supply.

4.2. 将“启动 / 运行”开关拨到“启动”位置。Turn the "Start / Run" switch to "start" position.

4.3. 等机组压力降至 6 kg 以下, 将停机开关拨到“停机”位置, 机器在延时 60 秒后自动停机。

Wait until the pressure in the unit drops to 6 kg and below, then turn the switch to the "stop" position, the machine will automatically be shutting down with delay of 60 seconds.

4.4. 如遇需要紧急停机, 直接将点火开关拨到“断电”位置即可。

For emergency shutting down, turn the ignition switch to the "off" position directly.

▲警告 WARNING

- 正常情况, 禁止进行直接停机操作。Under normal circumstances, do not shut down the unit directly.

注意: 在每次工作结束时, 应加满燃油箱, 避免燃油箱中形成固体凝结物和冷凝水。Note: After each work finished, fuel tank should always be refueled to avoid solid and condense water formed in the tank.

- 打开供气阀的过程要缓慢。频繁地开 / 关和突然打开供气阀会造成供气带油。Slowly open the outlet valves of air supply. Frequent turning on / off and sudden opening of the air supply valves can cause oil in the air.

5. 跨接起动程序 Jump Start procedures

▲警告 WARNING

●蓄电池中可能含有氢气。由于氢气是易燃易爆的气体，机组周围不能有火星、火苗或其它火源。
Batteries may contain hydrogen. Because hydrogen is a flammable and explosive gas, the unit cannot be around spark, flames or other sources of fire.

●蓄电池中的电解液有很强的腐蚀性和毒性，不能与眼睛、皮肤以及纤维表面接触，否则会造成人身伤害或财产损失。万一有电解液溅出，要立即用大量水冲洗干净。

The electrolyte in batteries is very corrosive and toxic, contact with skin and eye, or the surface of fibers is strictly prohibited. It will cause personal injury or property damage. In case of electrolyte spills, wash to clean immediately with plenty of water.

5.1. 跨接起动之前应仔细阅读本操作维护说明书第二章安全守则。跨接起动只是在机柴油组蓄电池容量不足时采取的应急措施。Before jump starting, please read Chapter 2 - Safety Regulations carefully. Jump starting is an emergency measure only when the battery of the unit has failed.

5.2. 操作前，穿戴好防酸围裙和面罩。Before operating, wear acid resistant apron and face mask.

5.3. 取下蓄电池的通气孔盖(如果有的话)，注意不能让灰尘或其它杂质落到电池内。检查电解液的液位，并按要求加够，然后用干净的湿布盖住通气孔。“免维护”电池不需要检查液位。

Remove the battery vent cover (if any), be careful not to allow dust or other impurities fall in the battery. Check the electrolyte level, add electrolyte as required, and then cover the vent with a clean, damp cloth. For "Maintenance-free" batteries, do not need to check the electrolyte level.

注意：如果电解液冻住或含有冰块，不得起动机组，否则电池会爆裂。

Note: If the electrolyte containing ice or frozen, do not start the unit, otherwise the battery will explode.

5.4. 注意将供电车辆停在机组旁边，注意车辆与压缩机之间不能有金属接触。

If the power supply vehicle parks next to the unit, do not allow any metal contact between vehicle and compressor.

5.5. 放下供电车辆的停车闸，用石块或其它物体将车轮塞住。

Make sure the parking brake of the power supply vehicle in place, and block the wheels with stones or other objects.

5.6. 将供电车辆置于空档或停车状态，关闭车上无关的电气设备，开动发动机。

Make sure the power supply vehicle in neutral or parking, shut down unrelated electrical equipment / devices in the vehicle, and start the engine.

5.7. 将第一根跨接电线的一端与供电车辆的正极接通。如果供电车辆是串联的两个 12V 电池，则把电线接在非接地电池的正极。

Connect one end of the first jumper cable to the positive terminal of the battery in the power supply vehicle. If there are two 12V series-connected batteries in the power supply vehicle, connect the cable to the positive terminal of the non-grounding battery.

5.8. 将该跨接电线的另一端与压缩机起动电机电池的正极接通。如果供电车辆是串联的两个 12V 电池，则把电线接在非接地电池的正极。Connect the other end of the 1st jumper cable to the positive terminal of the battery of the compressor starter motor. If there are two 12V series-connected batteries in the power supply vehicle, connect the cable to the positive terminal of the non-grounding battery.

5.9. 将第二根跨接电线的一端与供电车辆的负极接通。如果供电车辆是串联的两个 12V 电池，则把电线接在接地电池的负极。

Connect one end of the second jumper cable with the negative terminal of the battery in the power supply vehicle. If there are two 12V series-connected batteries in the power supply vehicle, connect the cable to the negative terminal of the grounding battery.

5.10. 将第二根跨接电线的另一端接在柴油机上。

Connect the other end of the second cable to the diesel engine.

5.11. 按常规起动程序起动机组。注意不要长时间持续起动。

Start the unit as usual starting procedures. Never continuously press start switch for long time.

5.12. 让柴油机预热并在怠速下平稳运转后，拆开接在机组上的负极接线端子，然后把另一端从供电车辆的负极上拆下，接着将另一根接线从机组的电池正极拆下，最后把供电车辆上的正极端子拆下

Allow the diesel engine warm up and run smoothly at idle speed, disconnect the negative cable from the engine, and remove the other end of the cable from the negative terminal of the battery in the power supply vehicle. Then, disconnect the other cable from the positive of the unit starter, and finally remove the other end of that cable from the positive terminal of the battery in the power supply vehicle.

注意 Note:

①使用的跨接电线要洁净，并且电线的额定电流要大于起动电流。

Jumper cables should be clean, and the rated current of the cable should be greater than the starting current of the unit.

②要避免电线接头、线夹与其它金属部件意外接触，以防止产生电弧，造成火灾。

Avoid the cable connectors and clamps accidental contact with other metal parts to prevent arcing and causing fire.

③不能将 24V 接到一个 12V 电池上，也不能用一个 12V 的电池起动需要 24V 电压的压缩机。

Do not connect a 12V battery with a 24V battery, nor use a 12V battery to start the compressor which uses voltage of 24V.

④只能使用带有与本机组类似电池系统的车辆供电，并且所供电压要相同。不能使用发电机、电焊机或其它直流电源供电，以免造成事故。

Use the power supply vehicle with battery system similar to that of the unit. The voltage supplied should be same. Do not use power supply from generators, welding or other DC power supply, to avoid accidents.

⑤要保证电线接头接触可靠，同时要远离燃油管、曲轴箱通气孔和蓄电池。

Ensure that the cable connectors are reliable, and keep away from the fuel pipes, crankcase vents and batteries.

6. 存放 Storage

机组如果连续几周不起动，润滑油会从柴油机和压缩机的各润滑表面上流失。缺少润滑油将会使摩擦副的零件生锈，并在下次起动机时导致活塞环、活塞与气缸套之间以及轴与轴承之间、轴与连杆瓦之间金属的直接接触。这种金属与金属之间的直接接触，尤其是在已经生锈之后，将大大缩短机组的使用寿命。所以，要求每次使用之后，必须对机组做到：If the unit does not start for weeks, the lubricating oil will drop from the various surfaces of the diesel engine and the compressor. Lack of lubrication will cause friction, rust and metal direct contact between piston rings, piston and cylinder sleeves, shaft and bearing, shaft and connecting rod in the next start. Such direct contact between metal parts, especially after rusty, will greatly shorten the life of the unit. Therefore, after each use, the unit must be:

①按本说明书维护保养规程的要求进行维护保养并给机组套上防雨塑料罩。Perform maintenance in accordance with the maintenance procedures and cover the unit with plastic rain hood.

②机组存放地点应清洁、干燥、无腐蚀性气体。Store in clean and dry without any corrosive gas place.

③每周起动机一次(至少每月一次)，并进行例行常规检查。如果机组打算长期使用，应做好机组的封存工作。有关机组封存方面的要求请与浙江志高机械股份有限公司售后服务部以及柴油发动机厂售后服务部联系。Start once a week (at least once a month), and make routine inspections. If the unit will not be used for a long period, it should be stored with proper preparation. For such unit storage requirements, please contact the service department of Zhejiang Zhigao Machinery Co., Ltd. and the after-sales service department of diesel engine producer as well.

第5章 维护保养规程 Chapter 5 Maintenance Regulations

1. 概述 Overview

为使机组正常运行和有长的使用寿命，良好的维护保养是关键。因此，必须认真地执行螺杆压缩机组的维护保养规程。以下给出的维护保养计划可以使机器保持在最佳的状态。有关柴油发动机的维护，除本章的介绍外，还请详细阅读柴油发动机厂的柴油发动机使用保养说明书。在着手进行维护之前，请阅读本说明书第二章安全守则。In order to keep the unit operate normally for a long service life, proper maintenance is the key. Therefore, the maintenance procedures for the screw compressors should be carefully followed. The following maintenance plan will help keep the machine in the best condition. Other Related maintenance subjects for the diesel engine, except that described in this chapter, please read operating and maintenance manual of the diesel engine from the diesel engine manufacturer. Before starting any maintenance and service, please read chapter 2 of this *Manual* - Safety Regulations.

▲警告 WARNING

- 维护保养工作不仅影响机组的正常运行，而且还可能影响操作人员的安全。Maintenance work not only affects the normal operation of the unit, but also may affect the safety of operators.
- 在压缩机运行或带压时，不要拆卸螺母、加油塞以及其它零件。When the compressor is running or under pressure, do not remove any nut, plug, and other parts.
- 只有在停机并释放完所有的内部压力后才能对机组进行维护保养。Only after the unit has been shut down and its internal pressure has been released completely, the maintenance work can be performed.

2. 螺杆压缩机的维护保养 Maintenance of screw compressor

螺杆压缩机维护保养计划表对压缩机的日常维护制定了保养计划。无论工作小时和保养周期两者中任何一个先达到，就需要对表中相应的保养项目进行保养。The screw compressor maintenance schedule is a detail plan for routine maintenance. Whichever of the working hour or the maintenance cycle reaches first, the corresponding maintenance item in the table needs to be performed.

机组起动之前，需要检查油位。如果油位太低，则需要加油。如果需要频繁地加油，则需要对机器进行检查，参见常见故障诊断与排除。Before starting the unit, check the oil level. Refilling if needed. If it needs frequent refilling, the machine needs to be checked, please refer to Malfunction diagnosis and troubleshooting table.

机组起动后，应检查各显示值是否正常。机器升温后，全面检查一下各显示仪表，检查是否有漏油或漏气现象，有无异常机械声响。如有异常，应停机卸压后进行处理。After the unit starting, check if all display values are normal. After unit warming up, check each display instrument, check for oil leaks and air leaks, and abnormal mechanical noise. If anything is unusual, shut down the unit, after unload and release the pressure, troubleshoot.

螺杆压缩机维护保养计划表 Screw compressor maintenance schedule

工作小时 Working Hours	保养周期 Maintenance Cycle	保养项目 Maintenance Item	维护保养内容 Maintenance Operation
10	每天 Daily	空气滤清器 Air filter	清洁集尘袋。如果指示变红则保养滤芯 Clean the dust bag. Maintain the filter cartridge if the indicator turns red.
		油气分离器 Oil separator	开机前放出积聚的冷凝水 Drain the accumulated condensation water before starting the unit
		燃油箱 Fuel tank	加满燃油 Refill the fuel full
50	每周 weekly	安全阀 Safety valve	检查是否有堵塞或其它损坏 Check for blockage or damage
		油冷/后冷却器 Oil cooler / after cooler	清洁外表面 Clean the outer surface
500	两个月 Two months	油过滤器 Oil filter	新机运行后的第一个 500 小时更换滤芯 Replace the filter cartridge at the first 500 running hours of the new unit
		润滑油 Lubricating oil	新机运行后的第一个 500 小时更换 Replace at the first 500 running hours of the new unit
1,000	半年 Half year	油过滤器 Oil filter	更换滤芯 Replace
		软管 Hose	检查, 如有必要则更换 Check, replace if necessary
		控制系统 Control system	检查, 如有必要则更换 Check, replace if necessary
		显示仪表 Display instruments	检查, 如有必要则更换 Check, replace if necessary
		空气滤清器 Air filter	更换滤芯 Replace the filter cartridge
2,000	一年 Yearly	润滑油 Lubricating oil	更换 Replace
		车轮轴承 Wheel bearings	加注润滑油 Add grease
		油气分离器滤芯 Oil separator filter cartridge	放出冷凝水, 如有损坏或脏堵则更换 Drain condensation water, replace if any damage, contamination or blockage

2. 1. 燃油箱 Fuel tank

燃油箱应每天或每 8 小时加满一次柴油，所加柴油的牌号应与当地环境温度相适应。

Fuel tank should be refilled with diesel daily or every eight hours, and the type of the diesel used should be matching the local ambient temperature.

为防止燃油箱内燃油的凝结，建议在机组停机后或每天工作结束时给燃油箱加满柴油。

To prevent fuel condensation in the tank, it's recommended to refill diesel after unit shutting down or the work of the day completed.

2. 2. 安全阀 Safety valve

安全阀如果出现脏堵，将会造成安全阀不能打开或者打开后不能自动关闭。安全阀不能打开将使其失去保护压力系统的功能，使机组的安全没有保障。安全阀不能自动关闭将会出现油气分离器内的润滑油大量喷出的事故，造成财产损失。每周应停机检查安全阀的状态。Fouling in safety valve will cause it not opened or fail to close automatically after open. If the valve cannot open, it would lose protection to the pressure system, leave the unit without protection at all. While the safety valve cannot close automatically, it will lead to lubricant pouring out from the oil separator, and will cause property damage. The unit should be shut down for safety valve inspection every week.

2. 3. 油过滤器 Oil filter

新机运行 500 小时后应更换油过滤器滤芯，以后每 1000 小时更换一次滤芯。滤芯的更换程序见本章第 4 节零件的更换和调整程序，更换滤芯时需停机，小心抹去从外面进来的脏物和油，尽可能防止杂质进入润滑系统。After 500 hours of operation of the new unit, the oil filter cartridge should be replaced, and it should be replaced every 1,000 hours thereafter. Filter cartridge replacement procedure please see Section 4 - parts replacement and adjustment procedures in this chapter. The unit should be shut down when replacing the filter cartridge. Carefully wipe off the dirt and oil coming from outside, prevent contaminants from entering the lubrication system as much as possible.

2. 4. 润滑油 Lubricating oil

ZG46D 润滑油, 当每工作 2000 小时或一年, 无论谁先达到, 必须更换润滑油。The ZG46D lubricant must be replaced when operating time reaches 2,000 hours or one year, whichever reaches first .

注意: 如果机组在恶劣环境下运行, 换油周期要短些。

Note: If the unit is running in severe environment, oil change cycle should be shorter.

有些润滑油是不相容的, 混合后会导致不溶解的沉积物的形成, 这种沉积物会引起包括油过滤器堵塞在内的严重故障。因此, 要避免不同牌号的润滑油的混用, 最好在彻底放出油之后才能改用其它牌号的润滑油。Different lubricants are not compatible, the mixtures will lead to formation of insoluble deposits, and such deposits can cause serious problems including oil filter clogging. Therefore, avoid mixing different grades and brands of lubricating oil, and it's best to completely discharge the old oil before adding lubricants of different brands and types.

如果油气分离器的油位在停机后下降到视油镜的下部, 机组需要加油, 但只有当机组处于停机并彻底放空之后才可进行加油。If the oil level of the oil separator drops down to the lower section in the oil level meter, the unit needs to refill. However, refilling is allowed only after the unit is shut down, and pressure is released.

注意: 如果有迹象表明在油过滤器滤芯上形成了不溶性沉积物, 表明压缩机润滑油已不能正常工作, 必须立即更换。NOTE: **If there are indications that the oil filter cartridge forms insoluble deposits, it indicates that the compressor lubricant is not working properly, it must be replaced immediately.**

2. 5. 二次回油管路 Secondary oil return line

二次回油管路的作用是将积聚在油气分离器滤芯内部的油引回到压缩机的低压腔, 其中的节流孔用于保证回油稳定。如果二次回油管路出现严重堵塞(主要出现在节流孔和过滤器), 将会使排气含油过多。应在规定的时间检查二次回油管路, 清洗节流孔。The role of the secondary oil return line is to lead the oil accumulated in the oil separator filter cartridge back to the low pressure chamber of the compressor, of which, the orifice is used to ensure the stability of oil returning. If severe blockage happening in the secondary return lines (mainly in the orifice and filter), it will cause the exhaust air containing too much oil. Secondary return lines should be checked at the specified time, and the orifice should be cleaned as well.

2. 6. 油冷却器 / 后冷却器 Oil cooler / After-cooler

当有油、油脂、粉尘和脏物堆积在冷却器表面时, 冷却器的换热效果就会被削弱, 最终导致排气温度过高。每隔半个月, 要使用吸尘器、清洗液或低压压缩空气清洁冷却器外表面。When oil, grease, dust and dirt accumulating on the surface of the cooler, the heat transfer effect of the cooler will be weakened, which will ultimately cause the exhaust temperature too high. Clean the outer surface of the cooler every two weeks with vacuum, cleaning solution or low pressure compressed air.

2. 7. 空气滤清器 Air filter

空气滤清器每天都应进行检查。Air filter should be checked daily.

每天都要清理集尘袋，清洗集尘盖。在多尘的环境下，清理工作应更频繁。Clean the dust bag and the dust collecting cover daily. In dusty environments, clean work should be more frequent.

每当空气滤清器报警指示变红时，应对滤芯进行保养；每工作 1000 小时或时隔一年，两种情况无论谁先出现，都应更换空滤器滤芯。滤芯的保养或更换程序见本章第 4 节零件的更换和调整程序。When the air filter alarm indicator turns red, filter cartridge should be maintained. Every 1,000 hours of operation or every year, whichever reaches first, the air filter cartridge should be replaced. Filter cartridge maintenance or replacement procedures, please see Section 4 of this chapter - Parts replacement and adjustment procedures.

2. 8. 油气分离器 Oil separator

正常情况下，如果空气滤清器和油过滤器保养得当，油气分离器滤芯不需要周期性更换。Under normal circumstances, if the air filter and oil filter are maintained properly, the oil separator filter does not require periodic replacement.

如果油气分离器阻力很大，或者排气含油量突然增加，应检查油气分离器滤芯，必要时按本章第 4 节零件的更换和调整程序更换滤芯。If the resistance in the oil separator appears very high, or the oil amount contained in the exhaust air is suddenly increased, check the oil separator filter, AND if necessary, replace the filter cartridge according to the Section 4 of this chapter - Parts replacement and adjustment procedures.

冷凝水与润滑油混合会使油乳化变质，每天开机前，应打开油气分离器罐下部的排污球阀，放出前一天工作结束后产生的冷凝水。如果润滑油乳化严重，就要更换润滑油。Condensed water mixed with lubricating oil will lead the oil emulsification and deterioration. Before starting the unit every day, open the drain ball-valve under the oil separator, discharge the condensation water from the work of last day. If the lubricating oil is emulsified seriously, replace.

2. 9. 蓄电池 Battery

要保持蓄电池接线和电线接头、线夹的干净，并用油布轻轻擦拭，以防止产生腐蚀。蓄电池内要保持适当的电解液液位。Keep the battery wiring and connectors, and wire clamps / clips clean, wipe gently with oil cloth to prevent corrosion. Keep the electrolyte of the battery at proper level.

2. 10. 车轮 / 轮胎压力 Wheel / tire pressure

轮胎压力要求为 500kPa，见第一章技术规范。

Tire pressure requirement is 500 kPa, see Chapter 1 - Technical Specifications.

每年要给车轴的滚动轴承加注润滑脂，加注时要揭开轴端盖。

Add grease to the axle rolling bearing every year. Open the axle shaft cover when adding.

2. 11. 软管 Hoses

每工作 1000 小时或半年，必须对进气软管、润滑油管路以及控制管路的挠性软管进行检查，必要时予以更换。After every 1,000 hours or every six months of operating, check the air intake hoses, lubricating oil pipe lines and the flexible hoses of the control pipe lines. Replace if necessary.

3. 柴油发动机的维护保养 Maintenance of diesel engine

柴油发动机维护保养计划表 Diesel engine maintenance plan

工作小时 Operating Hours	保养周期 Maintenance Cycle	保养项目 Maintenance Item	维护保养内容 Maintenance Contents
10	每日 Daily	油底壳 Oil pan	检查同面——视需要添加机油 Check oil level - add if needed
		散热器 Radiator	检查冷却液液位——视需要添加 Check the coolant level - add as needed
		空气滤清器 Air filter	清洁集尘袋。如果指示变红，则保养滤芯 Clean the dust bag. If the indicator turns red, maintain the filter cartridge
		油水分离器 Oil-water separator	放掉积水 Drain water
50	每周 Weekly	吸油过滤器 Oil suction filter	检查或清洗 Check or clean
100	半个月 Half a month	散热器 Radiator	清洗外表面 Clean the outer surface
300	两个月 Every two months	油底壳 Oil pan	更换机油和机油滤清器 Replace oil and oil filter
		冷却系统 Cooling system	检查 / 添加防锈剂 Check / add rust inhibitor
		空气滤清器 Air filter	检查无损坏 Check for damage
		进气系统 Air intake system	检查有无密封不严 Check whether the seal is firm and tight
600	半年 Half a year	燃油滤清器 Fuel filter	更换 Replace
		柴油机转速 Engine speed	检查并调整 Check and adjust if needed
		调速气缸 Speed cylinder	适当润滑 Proper lubrication
1,000	一年 One year	空气滤清器 Air filter	更换滤芯 Replace filter cartridge
		气门间隙 Valve clearance	测量 — 必要时请专业人员调整 Check — adjust by professional if necessary
		风扇轮毂 Fan hub	检查 Check
		皮带张紧轮 Belt tensioner	检查 Check
	两年 Two years	冷却系统 Cooling system	更换冷却液 Change coolant
根据需要 As required		冷却系统 Cooling system	当冷却液脏时，排放并清洗 When coolant is dirty, discharge and clean system
		燃油系统 Fuel system	视需要对燃油系统充油排气 Discharge / bleed air in the system if needed

柴油发动机维护保养计划表对柴油机的日常维护制定了保养计划。无论工作小时和保养周期两者中任何一个先达到，就需要对表中相应的保养项目进行保养。有关柴油机预防性维护的特别注意事项或特殊要求可以参考柴油发动机厂柴油发动机使用保养说明书。This plan develops a routine maintenance schedule for the diesel engine maintenance. The operating hours or the maintenance cycle, whichever is first, the corresponding item needs to be maintained. For special precautions or requirements of the preventive maintenance for the diesel engine, please refer to the operating and maintenance manual of the diesel engine by the diesel engine producer.

3. 1. 机油 / 油过滤器 Oil / oil filter

每天抽出油尺检查机油油位，机油油位应在上下标线之内，高于上标线要放掉，低于下标线要添加。Check the oil level every day, and the oil level should be between the upper and lower mark. Drain oil if the level is too high and add oil if it is too low.

每工作 300 小时或两个月，无论谁先达到，就要更换机油和机油滤清器。更换程序详见本章第 4 节零件的更换和调整程序。Every 300 hours of operating or every two months, whichever comes first, replace the oil and oil filter. Replacement procedures are specified in Section 4 of this chapter - Parts replacement and adjustment procedures.

如果机油被稀释了，必须彻底查明被稀释的原因，否则柴油机会发生严重损坏。If the oil is diluted, the reason has to be investigated clearly, otherwise it will cause serious damages to the engine.

3. 2. 散热器 / 冷却系统 Radiator / cooling system

每天检查冷却液液位，如有必要则添加。Check coolant level every day, add if needed.

如果每天都需要添加冷却液，就要检查冷却系统是否有泄漏。
If coolant is required every day, check the cooling system for leaks.

▲警告 WARNING

- 机组工作时，冷却液是热的且有压力。
When the unit is working, the coolant is hot and under pressure.
- 热的冷却液和蒸气能引起人身伤害。Hot coolant and steam can cause personal injury.
- 只有在柴油机停机，用手触摸散热器盖感觉不烫手时，才可以检查冷却液液位。
Only when the diesel engine is shutdown, and not feeling hot when touching the radiator cap by hand, then the coolant level will be allowed to check.
- 要慢慢地拧下散热器盖以释放压力。Slowly unscrew the radiator cap to release pressure.
- 防冻防锈液含碱，皮肤和眼睛会引起人身伤害。
Antifreeze & anti rust coolant contains alkali. Contacting skins and eyes may cause personal injury.
- 严禁用水替代防冻防锈冷却液。Never replace the antifreeze & anti rust coolant with water.

当有油、油脂、粉尘和脏物堆积在散热器表面时，散热器的换热效果就会被削弱，最终导致冷却液因温度过高而开锅，机组无法继续运转。每隔半个月，要使用吸尘器、清洗液或低压压缩空气清洁散热器外表面。When oil, grease, dust & dirt accumulate on radiator surface, the heat exchanging effect will be weakened. It will result in boiling due to the high temperature of the coolant, and stop the running of the unit. Every half month, clean outer surface of the radiator with vacuum, cleaning solution or low pressure compressed air.

每工作 300 小时或两个月，就要检查防冻防锈液的浓度，以保护柴油机冷却系统免受到冷却液变脏、焊点发华以及一般性腐蚀的危害。如果防冻防锈液的浓度不够，就要按要求添加。Every 300 operating hours or every two months, check the concentration of antifreeze & anti-rust coolant to protect the diesel engine cooling system from coolant contamination, welding problem and other harm from general corrosion. If the concentration is low, add as required.

注意：为便于向冷却系统添加防锈剂，可能需要打开散热器底部的旋塞阀放出一些冷却液。

Note: In order to add rust inhibitor to the cooling system, it may be needed to open the plug in the bottom of radiator to discharge some of the coolant.

检查散热器压力盖的密封垫，如有损坏应立即更换。

Check the radiator pressure cap gasket, replace immediately if damaged.

冷却系统的冷却液每两年应更换一次。详见本章第 4 节零件的更换和调整程序。

Coolant of the cooling system should be replaced every two years. See Section 4 of this chapter - Parts replacement and adjustment procedures.

3. 3. 进气系统 Air intake system

空气滤清器每天都应进行检查。Air filter should be checked daily.

每天都要清理集尘袋，清洗集尘盖。在多尘的环境下，清理工作应更频繁。Clean the dust bag every day, and clean the dust collecting cover. In dusty environments, clean work should be more frequently.

每当空气滤清器报警时，应对滤芯进行保养；每工作 300 小时或两个月，应检查空气滤清器有无损坏，进气系统是否密封不严；每工作 1200 小时或时隔一年，两种情况无论谁先出现，都应更换空滤器滤芯。滤芯的保养或更换程序见本章第 4 节零件的更换和调整程序。Whenever the air filter alarm on, the filter cartridge should be maintained; Every 300 operating hours or every two months, check the air filter for any damage, and check the intake system for proper sealing; every 1,200 hours or every year of operating, whichever comes first, replace the air filter cartridge. Filter cartridge maintenance or replacement procedures see Section 4 of this chapter - Parts replacement and adjustment procedures.

3. 4. 燃油过滤器 / 油水分离器 Fuel filter / Fuel-water separator

每天排出燃油水分离器的积水。

Discharge the accumulated water from the fuel-water separator filter every day.

每工作 600 小时或半年，更换燃油过滤器(包括油水分离器)。

Every 600 hours or every six months, replace the fuel filter (including fuel-water separator).

如果燃油系统中有空气，会导致起动困难或运转不稳，此时需要进行人工排气。可以采取下述三种方法之一进行：If there is air in the fuel system, it will cause starting problems or running unstably. If so, the manual air bleeding is required. One of the following three could be performed:

3. 4. 1. 通过低压油管排气 Discharge the air through the low-pressure fuel pipe

松开低压油管上的放气螺钉，接通断油电磁阀，通过手动泵泵油，空气可以从该排气螺钉处排出。

Loosen the air vent fitting on the low pressure fuel supply lines, turn on the fuel cut off solenoid valve, and pump fuel manually by hand pump, then the air can be discharged.

3. 4. 2. 在喷油泵排气螺钉处排气 Discharge air through the air vent fitting at the fuel pump

松开喷油泵的排气螺钉，接触断油电磁阀，通过手动泵泵油，空气可以从该排气螺钉排出。

Loosen the air vent fitting on the fuel pump, turn on the fuel cut-off solenoid valve, pump fuel manually by hand pump, the air can be discharged from this air vent fitting.

3. 4. 3. 用起动机将燃油回油管中的空气排出 **Discharge the air from the fuel return pipes with starting the unit**

松开喷油器上的螺母，起动发动机，让截留的空气从管路中放出，再拧紧该螺母。Loosen the nut on the injector, start the engine and let trapped air discharged from the pipe, then tighten the nut.

注意：防止高压燃油损伤皮肤。不要用手触摸来检查有无泄漏。

Note: Prevent high-pressure fuel to damage skin. Do not check for leaks by hand.

▲警告 WARNING

●不要在热机时排气，否则燃油溢到高温状态的排气歧管上可能引起火灾。

Do not discharge air when the engine is still hot, otherwise it may cause a fire once the fuel spilling to the high temperature exhaust manifold.

3. 5. 吸油过滤器 **Oil suction filter**

每周检查或清洁吸油过滤器——清理积污虫，过滤网。

Check or clean the oil suction filter weekly, clean up the contamination and the filter.

3. 6. 皮带张紧轮 **Belt tension pulley**

每工作 1,200 小时或一年，无论谁先达到，检查风扇皮带张力，测量皮带在最大跨度上的挠度，正常值应为 9.5~12.7mm，若不正常，应仔细检查皮带张紧轮。拆下风扇皮带，并做如下检查：
Every 1,200 hours of operating or every one year, whichever comes first, check the fan belt tension by checking the maximum deflection of the belt. The normal sag should be 9.5 ~ 12.7 mm, and if abnormal, check the belt tension pulley carefully. Remove the fan belt, and check as following as well:

●检查皮带的损坏情况； Check belt for damage;

●检查张紧轮轴承，张紧轮在手压下自由旋转，没有发卡现象；

Check the tension pulley bearings. The tension pulley should run freely with hand pressure;

●风扇轮毂应自由旋转，没有过大的轴向窜动。

Fan hub should run smoothly without excessive axial movement.

3. 7. 气门间隙 **Engine valve clearance**

每工作 1200 小时或一年，无论谁先达到，要检查气门间隙。详见本章第 4 节零件的更换和调整程序。Every 1,200 hours of operating or every one year, whichever first, check the engine valve clearance. See Section 4 of this chapter - Parts exchanging and adjusting procedure.

4. 零件的更换和调整程序 Parts replacing and adjusting procedures

4. 1. 压缩机润滑的更换 Compressor lubricating oil replacement

让压缩机运转 5-10 分钟，将油加热，停机并释放掉所有内压，然后打开油气分离器底部的放油球阀把油放出来。重新加注润滑油并更换滤芯，参考 4. 2 节油过滤器的更换及第一章技术规范。Let the compressor run for 5 - 10 minutes to warm up the oil, shut down the compressor and release all internal pressure, and then open the drain ball-valve at the bottom of the oil separator to discharge the oil. Refill the lubricant and replace the filter cartridge. Refer to Section 4.2- Oil filter replacement, and Chapter 1 - Technical Specification.

注意：不要让润滑油淋到皮肤上，热的润滑可能会烫伤人。

Note: Do not touch oil, hot lubricant could cause skin burns.

4. 2. 油过滤器的更换 参看图 5-1。 Oil filter replacement. See Figure 5-1.

① 使用带形扳手，拆下旧的滤芯和垫圈。

Use filter wrench to remove old filter cartridge and gaskets.

② 清洁垫圈的安装表面。Clean the surface for the gaskets.

③ 在新的垫圈表面涂一薄层润滑油。Apply a thin layer of lubricant on the washer.

④ 用清洁的润滑油加满新的油过滤器。Fill the new oil filter with clean lubricating oil.

⑤ 用手将滤芯旋至密封圈与滤座接触后，再将滤芯旋紧 1 / 2—3 / 4 圈。

Screw the filter cartridge until the gasket contacts to the filter holder by hand, then tighten the cartridge for 1 / 2 - 3 / 4 turns.

⑥ 重新开机，检查有无泄漏。Reboot the unit & check for leaks.

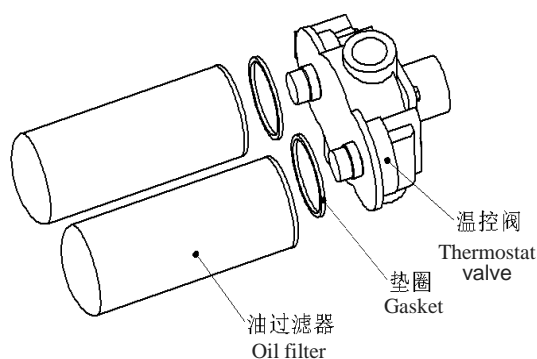


图 5-1 油过滤器
Figure 5-1 Oil Filter

▲警告 WARNING

●为将滤芯破损的可能降到最低，只能使用浙江志高机械股份有限公司提供的产品，因为其它替代品可能与机组的压力不匹配。In order to minimize the risk of damage to the filter cartridge, only use genuine parts provided by Zhejiang Zhigao Machinery Co., Ltd., because other alternative or replacement parts may not work with the pressure of the unit.

4. 3. 空气滤清器滤芯的保养和更换 Air filter maintenance and replacement

集尘袋每天都要清理。在多灰尘的环境下，清理工作更要经常进行。
Dust bag should be cleaned every day. In dusty environment, it should be cleaned more often.

每当空气滤清器报警指示时，应对滤芯进行保养；每工作 300 小时或两个月，应检查空气滤清器有无损坏，进气系统是否密封不严。每工作 1000 小时或时隔一年，两种情况无论谁先出现，都应更换空滤器滤芯。更换主滤芯时要同时更换安全滤芯。安全滤芯在使用过程不必保养。Whenever the air filter alarm indicator lights up, the filters need maintenance. Every 300 hours of operating or every two months, the air filters should be checked for damage and seal condition of the intake air system as well, every 1,000 hours of operating or every year, whichever first, the air filter cartridges should be replaced. The safety filter cartridge should be replaced together as the primary filter cartridge being replaced. The safety filter cartridge does not need any maintenance.

滤芯保养或更换步骤：Filter cartridge maintenance or replacement procedure:

- ① 拆除后端盖，清除集尘盘内灰尘。Remove the rear cover, clean dust in the dust pan.
- ② 小心取下主滤芯，对光检查滤纸是否有破损，橡胶密封垫的粘接是否牢固，金属端盖与滤纸粘接是否牢固，金属端盖是否有裂纹。Take out the primary filter cartridge carefully. Facing light, check whether the filter paper is damaged, whether the rubber gasket is stick firmly, whether the metal end covers and filter paper is firmly bonded, and whether the metal covers has cracks.
- ③ 用干净的湿布清洁外壳内侧，注意不能使用压缩空气。Use clean damp cloth to clean the inside of the covers, and not to use compressed air.
- ④ 在平板上轻轻拍打滤芯端面后，用不超过 3bar (45 psi) 的干燥压缩空气沿与滤芯纵向成 45 度方向从内向外吹除主滤芯每条皱折里的灰尘。Gently tap the filter surface on a flat plate, from inside, using no more than 3 bar (45psi) of dry compressed air to blow out the dust in each wrinkle along 45 degree of the longitudinal direction.

⑤ 将清洁过的滤芯或新滤芯重新装好。注意不要忘记滤芯固定螺母下的密封胶圈，螺母的拧紧要适度，太松不能保证密封垫圈与外壳端面贴紧，太紧则容易使滤芯端盖变形脱胶。Refit the cleaned filter cartridge or a new cartridge. Don't forget the filter gasket under the tightening nut, the nut should be tightened moderately. While too loose connection will not ensure the sealing firmly, too tight connection may easily cause the cover of the filter cartridge disconnected with deformation.

⑥ 安装集尘盘和后端盖，注意开口方向不能错。Restore the dust pan and the rear cover, and watch for correct opening direction.

注意：压缩机在运转时，绝对不可以拆卸和更换空气滤清器滤芯。Note: Never remove and replace air filter cartridges when the compressor is running.

禁止用油、水或含水的压缩空气清洗滤芯。
Do not clean the filter cartridge with oil, water or compressed air with water.

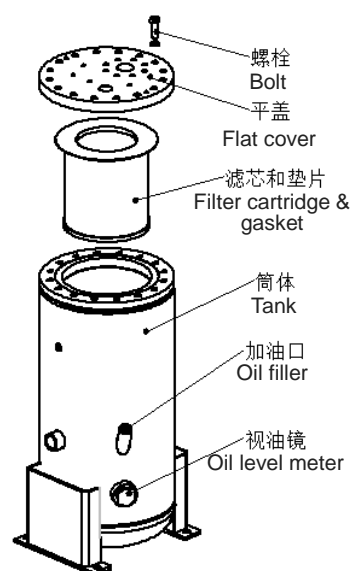


图 5-2
Figure 5-2

滤纸或密封胶圈损坏的滤芯必须立即更换图 5-2。

Replace the filter cartridge immediately if the filter paper or sealing gasket is damaged. See Figure 5-2

每次安装滤芯时，沿滤芯密封胶圈的端面整周涂少量油脂，以防止密封圈与空气滤清器壳体粘连。
Every time installing the filter cartridge, apply a little oil along the end surface of the filter cartridge sealing gasket to prevent sticky between the sealing gasket and the filter housing.

4. 4. 油气分离器滤芯的更换 Oil separator filter replacement

参看图 5-2。如果供气明显带油，而单向阀、节流孔以及放空阀隔膜经检查都处于正常状态，那就要更换油气分离器滤芯。具体步骤如下：Referring Figure 5-2. If the air contains obvious oil, but the one-way check valve, the orifice and the vent valve diaphragm all normal, then the oil separator filter cartridge must be replaced. The specific steps are as following:

① 拆下连在乎盖上的所有管路(回油管、供气管)等。

Detach all pipes connected to the flat covers (oil return pipe, air supply pipe, etc.).

② 从平盖的接头上将回油管拆下。Remove the oil return pipe from the fitting of the flat cover.

③ 卸下平盖上的螺栓和垫片，取出平盖（最小压力阀还留在原处）。Remove bolts and washers from the flat cover, remove the flat cover (leaving the minimum pressure valve where it is).

④ 取出滤芯。Take out the filter cartridge.

⑤ 清洁平盖与筒体之间的密封表面注意不要让碎片和灰尘落入筒体内。Clean the sealing surface between the flat cover and the tank. Make sure no debris and dust falling into the tank.

⑥ 换上新的滤芯，注意严禁把垫片上的订书钉取掉

Install new filter cartridge and not to remove the staples on the gasket.

⑦ 安装平盖，用手拧紧螺栓，然后分 4-5 步将螺栓交叉上紧。

Restore the flat cover, tighten the bolts by hand, then cross tighten the bolts in 4 - 5 steps.

⑧ 重新接好所有管路，回油管应伸到离油气分离器滤芯底部 1.5mm 处回油通畅。

Reconnect all pipelines, the oil return pipe should extend to the position of 1.5 mm from the bottom of the oil separator to ensure the oil flows smoothly.

⑨ 再次开机之前，清洁节流孔及单向阀。

Before unit reboot, clean the orifice and the one-way check valve.

⑩ 重新运行 24 小时后，按第 7 步要求上紧平盖上的螺栓。

After 24 hours of operating, tighten the bolts on the flat cover as in step 7.

4. 5. 燃油滤清器的更换 Fuel filter replacement

① 使用带形扳手，拆下旧的滤芯和垫片。

Remove the old filter cartridge and gaskets with a filter wrench.

② 清洁垫片的安装表面。Clean the gasket surface.

③ 在新的垫片表面涂一薄层润滑油。Apply a thin layer of lubricating oil on the gasket surface.

④ 用清洁的燃油加满新的燃油滤清器。Fill the new fuel filter with clean fuel.

⑤ 用手将滤芯旋至密封圈与滤座接触后，再拧紧 1 / 2 ~ 3 / 4 圈。

Screw the filter cartridge by hand until the sealing gasket contacting the filter holder, then tighten it for another 1 / 2 - 3 / 4 turns.

⑥ 重新开机，检查有无泄漏。Reboot the unit and check for leaks.

对燃油滤清器的水过滤器的安装要求与此相同。

The installation requirements of the water separation filter are as same steps as above.

注意：装新滤芯时，一定要加满燃油，否则燃油中进气后，将引起起动困难或运转不稳。

Note: When installing a new filter cartridge, be sure to fill the fuel to full, otherwise, if air in the fuel, it will cause difficulty in starting or running stability.

4. 6. 冷却液的更换 Coolant replacement

▲警告 WARNING

●机组工作时，冷却液是热的且有压力。

When the unit is working, the coolant is hot and under pressure.

●热的冷却液和蒸气能引起人身伤害。Hot coolant and steam can cause personnel injury.

●只有在柴油机停机，用手触摸散热器盖感觉不烫手时，才可以检查冷却液液位。

Only when the diesel engine is shutdown, and cool enough when touching the radiator cap, then the coolant level could be checked.

●要慢慢地拧下散热器盖以释放压力。Slowly unscrew the radiator cap to release the pressure.

●防冻防锈液含碱，皮肤和眼睛会引起人身伤害。Antifreeze & anti rust coolant contains Alkali. Any contact with skins and eyes may cause personnel injury.

●严禁用水替代防冻防锈冷却液。Never replace the antifreeze & anti rust coolant with water.

① 在正常停机，冷却液温度降下来后，慢慢地拧下散热器盖以释放压力。

After shutting down normally and coolant temperature dropping down, slowly unscrew the radiator cap to release pressure.

② 旋开散热器的旋塞阀，放出散热器和柴油机的冷却液。

Unscrew the radiator drain plug, drain the coolant from the radiator and the diesel engine.

③ 关闭旋塞阀。Close the drain plug.

④ 按第三章第 13 节的要求加注冷却液。Refill coolant as required in Section 13 of Chapter 3.

⑤ 拧紧散热器盖。Tighten the radiator cap.

4. 7. 柴油机润滑油的更换 Lubricating oil change

让压缩机运转 5-10 分钟，将机组预热，正常停机，然后卸下油底壳的放油螺塞把机油放出来。重新加注润滑油并更换滤芯，参考 4. 2 节油过滤器的更换及第一章技术规范。Let the compressor run for 5 - 10 minutes to warm up, then shut it down normally. Remove the oil drain plug of the oil pan to discharge the oil. Refill the lubricant and replace the filter cartridge. Refer to Section 4.2 - Oil filter replacement, and Chapter 1 - Technical Specification.

注意：不要让润滑油淋到皮肤上，热的润滑油可能会烫伤人。

Note: Do not contact oil with skin because hot lubricating oil could cause burns.

4. 8. 控制系统的调整 Control system adjustment

当压缩机达不到额定工作压力，或者机组不在额定工作转速工作时，需要调整控制系统。具体做法参照第四章第 7 节额定工况设定程序。When the compressor cannot reach the rated working pressure, or the unit is not working on the rated operating speed, the control system needs to be adjusted. For Specific procedures please refer to [Section 2 of Chapter 4 – Controls and indicators](#).

4. 9. 柴油机气门间隙的调整 Diesel engine valve clearance adjustment

先拆下气阀罩盖，然后一边按住发动机上的正时销（正时齿轮室靠近喷油泵处），一边缓慢地转动发动机，以确定第一缸上止点的位置。Remove the valve cover first. While hold down the timing pin (on timing gear chamber near the fuel pump) on the engine, slowly turn the engine to locate the position of the upper stop point of the first cylinder.

当正时销插入凸轮轴齿轮上的孔时，第一缸处于压缩冲程的上止点。此时按如下顺序调整气门间隙（从前向后数气门）：When the timing pin is inserted into the hole on the cam gear, the first cylinder is at the upper stop point of the compression stroke. Now, adjust the valve clearance following the orders as below:

气门 1 (进)、2 (排)、3 (进)、6 (排)、7 (进)、10 (排)。

Valve 1 (Intake), 2 (Exhaust), 3 (Intake), 6 (Exhaust), 7 (Intake), 10 (Exhaust).

使用 14 mm 扳手，进气门间隙：0. 254 mm；排气门间隙：0. 508 mm。

Use 14 mm wrench to adjust, intake valve clearance as : 0.254 mm, exhaust valve clearance as : 0.508 mm.

注意：找到第一缸的上止点后，一定要退出正时销。

Note: when upper stop point of the first cylinder is located, be sure to take out the timing pin.

检查调整气门间隙应在冷机状态下进行（60~C 以下）。

Checking and adjusting valve clearance should be performed in the cold status of the unit (60 ~ C or lower).

当厚薄规在阀杆与摇臂间富有手感地滑动时，间隙是合适的。

If the feeler is free to slide between valve stem and rocker arm, the valve clearance is proper.

在调完一缸压缩上止点所应调的气门间隙后，将与曲轴直连的皮带轮做好记号后转动一周，此时为第六缸压缩上止点。此时按如下顺序调整气门间隙（从前向后数气门）：气门 4 (排)、5 (进)、8 (排)、9 (进)、11 (进)、12 (排)。After completing the adjustment for valves of the compression upper stop point in the first cylinder, make on the pulley directly connected to the crankshaft and turned it for one circle. Now it will be at the top compression upper stop point of the sixth cylinder. Then adjust the valve clearance following the order as below (count the valves from front to back): valve 4 (exhaust), 5 (Intake), 8 (Exhaust), 9 (Intake), 11 (Intake), 12 (Exhaust).

5. 常见故障的诊断与排除 Common malfunction diagnosis and troubleshooting

机组产生故障的原因是多种多样的，一个故障通常不是由一个零件或一个因素引起的，因此故障的诊断与排除往往是比较困难的。The reasons of unit malfunction vary. A malfunction usually is not caused by one particular parts or one factor. Therefore, malfunction diagnosis and troubleshooting usually is difficult.

故障的诊断与排除表是建立在实际应用和制造厂家广泛的试验基础之上的。该表指出了机组通常可能出现的故障和导致上述故障的一般性原因，以及如何排除的方法，但不可能列举所有的故障和排除方法。The Malfunction diagnosis and troubleshooting table is based on practical applications and extensive testing from the manufacturer. The table indicates the possible malfunctions and the general causes, as well as the possible solutions. However, it is impossible to list all of the possible malfunctions and the troubleshooting in the table.

在维修或更换部件之前，应对产生故障的各种可能因素作全面系统的分析。遇到问题，应仔细观察，找出故障，查明原因，然后进行必要的维护工作，避免给机组带来无谓的损伤。Before repair or replace parts, comprehensive and systematic analysis of various possible factors and causes shall be thoroughly conducted. When problems come up, observe carefully, locate the malfunction, identify the reason, and then conduct necessary maintenance and service & repair, to avoid unnecessary damage to the unit.

以下几点需要牢记：The following points should always be in mind:

- a. 检查电线是否松落； Check for loose wires;
- b. 检查是否有损坏的管路； Check for damages of the pipelines;
- c. 检查是否有因为过热或电路短路而产生的部件损伤（一般伴有变色或焦味）。Check parts for damages due to overheating or short circuit (usually accompanied by discoloration or burned smells).

按推荐的方法检查后，如果故障仍无法排除，请向柴油机售后服务部咨询。If the problem still exists after following the recommended procedures, please contact the service department of the diesel engine manufacturer for advice.

故障诊断与排除表 Malfunction diagnosis and troubleshooting table

一、螺杆压缩机的故障排除 Air compressor malfunction & troubleshooting

1. 排气量不足 Insufficient air displacement

可能原因 Possible causes	排除方法 Solutions
空气需求量过大 Too much air required	检查用气设备与压缩机排气量是否适配。 Check whether the air consumption equipment matches the compressor displacement.
高压空气泄漏 High pressure air leaking	检查供气管路和阀门，看有无泄漏。 Check for air supply lines and valves for leaks.
空气滤清器堵塞 Air filter clogging	察看仪表是否显示需要维护信号，必要时更换滤芯。 Check display for warning light. Replace if needed.
油气分离器滤芯堵塞 Oil separator filter clogging	更换油分滤芯、油过滤器滤芯和油。 Replace the oil separator filter cartridge, oil filter cartridge and oil.
压力调节阀失调或损坏 Pressure regulating valve disorder or damage	调整压力调节器，见第四章操作规程。检查调节器隔膜，必要时更换（有备件）。 Adjust the pressure regulator, see Chapter 4 - Operating Regulations. Inspect the regulator diaphragm, replace if necessary.
柴油机转速过低 Engine speed too low	调整转速，或检查柴油机燃油滤清器。 Adjust the speed, or check the engine fuel filter.
压缩机转子磨损 Compressor rotors worn	请志高公司服务人员检查。 Contact the service personnel of Zhejiang Zhigao Machinery Co., Ltd.
进气阀打开不足 Inadequate opening of air intake valve	检查控制管路 Check the control pipe line.

2. 供气压力不足 Insufficient air supply

可能原因 Possible causes	排除方法 Solutions
空气需求量过大 Too much air required	检查用气设备与压缩机排气量是否适配。 Check whether the air consumption equipment matches the compressor displacement.
空气滤清器堵塞 Air filter clogging	察看仪表是否显示需要维护信号，必要时更换滤芯。 Check display for warning light. Replace if needed.
高压空气泄漏 High pressure air leaking	检查供气管路和阀门，看有无泄漏。 Check for air supply lines and valves for leaks.
压力调节阀失调或损坏 Pressure regulating valve disorder or damage	调整或更换（有备件）。 Adjust or replace.

3. 压缩机过热 Overheating

可能原因 Possible causes	排除方法 Solutions
油气分离器的油位太低 Oil level of the oil separator too low	加油。检查泄漏情况。 Refill, and check for leaks.
油冷却器太脏或被堵塞 Oil cooler dirty or clogging	清洁油冷却器芯子翅片。 Clean oil cooler core fins.
风扇皮带松或损坏 Fan belt loose or damaged	调整张紧轮，或更换皮带。 Adjust the tension, or replace the belt.
温控阀的热力元件失灵 Thermal insert of the temperature control valve failed	更换热力元件。 Replace the insert.
温控阀到机头油管堵塞 Oil pipe from thermostat valve to the air end clogging	疏通油管 Clean the pipes.
机头主进油接头堵塞 Air end main oil inlet fitting clogging	清通接头 Clean the fitting.
油过滤器堵塞 Oil filter clogging	更换滤芯。 Replace the filter element.
二次回油管堵塞 Secondary oil return pipe clogging	清洁回油管过滤器和节流孔。 Clean the oil return pipe filter and the orifices.
热空气回流 Hot air back flow	移动机器，改变方向，避免回流。 Move the machine, change direction to avoid back flow.
环境温度过高 High ambient temperature	改善通风环境 Improve ventilation.

4. 空滤处有油 Oil present at air filter

可能原因 Possible causes	排除方法 Solutions
没有卸载，直接高压停机 Unit shut down at high pressure without unloading	请卸载后压力降到 4kg 以下停机 Unload, and shut down the unit after the pressure dropping down to 4 kg and lower.
进气阀密封圈破损 Air intake valve seals damage	更换进气阀 Replace the air intake valve.

5. 压缩机油耗过高 High compressor oil consumption

可能原因 Possible causes	排除方法 Solutions
二次回油管路堵塞 Secondary oil return pipe clogged	清洁回油单向阀和回油管/节流孔。 Clean the oil return one-way check valve and the oil return pipe / orifices.
润滑系统泄漏 Lubrication system leak	检查管路、接头及系统部件，维修或更换。 Check the pipeline, connectors and system components, repair or replace.
油气分离器芯子破损 Oil separator filter element damaged	更换芯子。 Replace the element.
系统压力过低 System pressure too low	检查最小压力阀和消声器节流孔。 Check the minimum pressure valve and the muffler orifice.
加油过多 Too much oil added	放掉一些润滑油 Drain some of the lubricants.
冷凝水过多 Too much condensation water	排放冷凝水 Discharge the condensation water

6. 压力过高或安全阀开启 Pressure too high or opening of the relief valve

可能原因 Possible causes	排除方法 Solutions
压力调节阀设定压力太高 Regulating valve setting pressure too high	调整压力设定 Adjust the pressure setting.
超压放空阀故障 Over pressure vent valve malfunction	清洗或更换 Clean or replace.
控制气管泄漏 Air control pipe leaking	检查控制管路 Check the control line.
进气阀不能关闭(卡住) Air intake valve failed to close (jammed)	保养或更换进气阀 Service or replace the air intake valve.
控制系统堵塞 Control system clogged	检查控制管路 Check the control pipelines.
压力调节阀失调或损坏 Pressure regulating valve malfunction or damaged	调整或更换(有备件) Adjust or replace.
安全阀失灵 Safety valve failed	更换 Replace.

7. 内压过高（超过 4.5 kg）或过低（低于 2 kg） Internal pressure too high (over 4.5 kg) or too low (less than 2 kg)

可能原因 Possible causes	排除方法 Solutions
呼吸帽故障 Breather cap malfunction	呼吸帽调节螺钉冲掉或呼吸帽堵塞，更换呼吸帽或清理调整呼吸帽调节螺钉 The regulating bolt on the cap lost or the cap clogged. Replace the cap, or clean and adjust the regulating bolt

8. 空压机不卸载 Compressor not unloading

可能原因 Possible causes	排除方法 Solutions
加卸载手柄开关故障 Loading and unloading handle switch malfunction	调整手柄位置或更换 Adjust the handle position or replace it.
电磁阀故障 Solenoid valve malfunction	检查线路或更换电磁阀 Check circuit or replace the solenoid valve.

9. 机组在有负载时停机 Compressor shutdown when loading

可能原因 Possible causes	排除方法 Solutions
燃油缺乏 Fuel low	检查燃油液位及燃油系统 Check fuel level and the fuel system.
排气温度开关动作 Exhaust temperature switch acting	排气温度开关动作的原因包含压缩机过热的因素。参看第 3 项 Check for compressor overheating. Please refer to #3 above.
冷却液温度过高 Coolant temperature too high	检查冷却液液位、节温器，检查风扇情况 Check the coolant level, thermostat, and the fan.
机油压力过低 Engine oil pressure too low	检查油尺油位及油过滤器 Check oil level and oil filter.
开关失灵 Switch failure	测试开关 Test switch.
电路系统故障 Electrical system malfunction	测试电路系统回路 Test the circuitry loop.

10. 机组振动过大 Unit vibration too high

可能原因 Possible causes	排除方法 Solutions
柴油机转速过低 Diesel engine speed too low	检查调速情况。检查燃油滤清器。Check the speed control. Check the fuel filter.
皮带轮或减振器固定螺栓松了 Bolts of pulley or engine mounts loose	拧紧螺栓或螺母。 Tighten the bolts or the nuts.
皮带轮或减振器不平衡 Pulley or engine mounts unbalanced	更换新的皮带轮或减振器。 Replace the pulley or engine mounts.
风扇叶轮不平衡 Fan impeller unbalanced	如果拆下皮带运转不振动，就更换新风扇。 Removing the belt, if the vibration is gone, then replace the fan.
机组支座松动或磨损 Unit stands loose or worn	拧紧固定螺栓，必要时更换新件。Tighten the mounting bolts, replace if necessary.
柴油机点火不良或转速不稳定 Diesel engine ignition misfire or speed unstable	参看第 13~15 项。 See below 13 to 15.

二、柴油机的故障与排除 Diesel engine malfunction & trouble shooting**1. 柴油机能转动但不能起动——排气管没有烟排出 Diesel engine turning but the unit not starting — no smoke out from the exhaust pipe**

可能原因 Possible causes	排除方法 Solutions
燃油箱无油 No fuel in the tank	添加燃油。 Refuel.
燃油电磁阀关闭 Fuel solenoid valve closed	检查是否接通电源，或更换电磁阀。 Check whether the power on, or replace the solenoid valve.
燃油管堵塞 Fuel pipe clogging	检查 / 吹通油管。 Check / unclogging the pipe.
输油泵不工作 Fuel pump not working	检查或更换输油泵。 Check or replace the pump.
燃油滤清器堵塞 Fuel filter clogging	更换燃油滤清器。 Replace the fuel filter.
喷油泵不工作 Fuel injection pump not working	取下，调试并修复，或更换。 Remove, check and repair, or replace.

2. 柴油机起动困难或不能起动——排气管有烟排出 **Hard or not starting of the diesel engine — the exhaust pipe no smoke coming out**

可能原因 Possible causes	排除方法 Solutions
曲轴转速太低 The crankshaft speed too low	检查蓄电池、起动机及线路接头是否牢固。 Check the battery, starter motor and the wiring connectors if securely connected.
需冷起动装置或有但不工作 Cold starting device required or not working	确定所需要的装置，检查操作是否合适。 Ensure the devices required in place, and check whether the operation appropriate.
劣质燃油 Poor fuel quality	放尽燃油并清洗燃油系统。 Discharge the fuel completely and clean the fuel system.
燃油的“浊点”高于环境温度 The fuel "cloud point" higher than ambient temperature	更换燃油和燃油滤清器。 Replace fuel and fuel filters.
空气滤清器堵塞 Air filter clogging	检查空滤器，清洁或更换之。 Check air filter, clean or replace it.
燃油系统中有空气 Air in Fuel system	给燃油系统排气。 Bleed air from the fuel system.
喷油泵喷油正时不对 Fuel injection pump injection timing incorrect	检查调整喷油正时。 Check and adjust injection timing.
气门间隙不对 Incorrect engine valve clearance	重新调整气门间隙。 Adjust the valve clearance.

3. 柴油机启动后不能持续运转 Diesel engine not running continuously after start

可能原因 Possible causes	排除方法 Solutions
怠速太低 Low idle speed	检查调整怠速螺钉。 Check and adjust the idle speed.
带负荷启动 Starting with load	让机组空载启动。 Start without load
劣质燃油 Poor fuel quality	放尽燃油并清洗燃油系统。 Discharge fuel completely and clean the fuel system.
燃油系统中有空气 Air in the Fuel system	给燃油系统排气。 Bleed air from the fuel system.

4. 柴油机转速过低 Diesel engine speed too slow

可能原因 Possible causes	排除方法 Solutions
调速系统设置不对 Incorrect setting of the speed control system	检查、调整调速系统设置。 Check, adjust the settings of speed control system.
燃油滤清器堵塞 Fuel filter clogging	检查燃油滤清器，必要时更换。 Check the fuel filter, replace if necessary.
空气滤清器堵塞 Air filter clogging	检查空滤器，清洁或更换之。 Check the air filter, clean or replace it.
压力调节阀失灵 Pressure regulating valve failure	检查，调整或更换。 Check, adjust or replace it.

5. 柴油机不能停机 Engine not shutting down

可能原因 Possible causes	排除方法 Solutions
断油电磁阀失灵 Fuel cut solenoid valve failure	检查，更换密封垫圈、柱塞。 Check, replace gaskets, insert.

6. 柴油机怠速时振动大 Engine vibration too much when idling

可能原因 Possible causes	排除方法 Solutions
怠速太低 Low idle speed	检查调整怠速螺钉。 Check and adjust the idle speed.
燃油系统中有空气 Air in the Fuel system	给燃油系统排气。 Bleed air from the fuel system.
燃油箱油位太低 Low fuel level	给燃油箱加油。Refuel the tank.
输油管、滤清器堵塞 Fuel supply pipe, fuel filter clogging	吹通输油管，更换滤清器。 Unclog the fuel pipe, replace the filter.
喷油泵工作不正常 Injection pump not working properly	卸下喷油泵调试、修复，或更换新件。 Remove the fuel pump, adjust, repair, or replace.

7. 热机怠速不稳 Engine idle unstable after warm up

可能原因 Possible causes	排除方法 Solutions
怠速太低 Low idle speed	检查调整怠速螺钉。 Check and adjust the idle speed.
燃油系统中有空气 Air in the Fuel system	给燃油系统排气。 Bleed air from the fuel system.
喷油泵喷油正时不对 Incorrect fuel injection timing of the pump	检查调整喷油正时。 Check and adjust the injection timing.
喷油嘴堵塞或工作不正常 Fuel injection nozzle clogging or not working properly	修复。 Repair.
支座松动或磨损 Unit stands loose or worn	拧紧固定螺栓，必要时更换新件。 Tighten the mounting bolts, replace if necessary.
高压油管使用不对 Wrong high-pressure pipe	用正确油管更换。 Replace with correct pipe
喷油泵工作不正常 Fuel injection pump not working properly	卸下喷油泵调试、修复，或更换新件。 Remove the fuel pump, adjust, repair, or replace.

8. 柴油机点火不良或转速不稳定 Engine ignition misfire or speed unstable

可能原因 Possible causes	排除方法 Solutions
劣质燃油 Poor fuel quality	放尽燃油并清洗燃油系统。 Discharge fuel completely and clean the fuel system.
燃油系统中有空气 Air in the Fuel system	给燃油系统排气。 Bleed air from the fuel system.
高压油管漏油 High-pressure pipe leaking	检查更换裂漏的油管。 Check and replace the cracked / leaking pipe.
气门间隙不对 Incorrect engine valve clearance	检查推杆、弹簧，调整气门间隙。 Check the push rod, spring, adjust the valve clearance.
喷油嘴堵塞或工作不正常 Fuel injection nozzle clogging or not working properly	拆下、修复、更换。 Remove, repair, replacement.
燃油系统喷油正时不正确 Incorrect fuel injection timing of the fuel system	必要时调整正时。 If necessary, adjust the timing.

9. 柴油机温度不升高 Engine temperature not rising

可能原因 Possible causes	排除方法 Solutions
水温表失灵 Water temperature meter failure	校对或更换。 Calibrate or replace.
节温器不起作用或工作不正常 Thermostat malfunction or not working properly	测试或更换。 Check or replace.

10. 柴油机燃烧粗暴 Engine combustion rough

可能原因 Possible causes	排除方法 Solutions
燃油质量太差 Poor fuel quality	放尽燃油，换新滤芯，加入优质干净的燃油。 Discharge fuel completely, replace filter, refill quality and clean fuel.
燃油系统中有空气 Air in the Fuel system	给燃油系统排气。 Bleed air from the fuel system.
喷油正时不正确 Incorrect fuel injection timing	检查 / 调整喷油正时。Check / adjust the injection timing.

11. 喷油泵或出油阀故障 Injection pump or oil outlet valve malfunction

可能原因 Possible causes	排除方法 Solutions
喷油泵或出油阀故障 Injection pump or oil outlet valve malfunction	让柴油机在燃烧噪声最大的情况下运转，逐个拧松每个气缸喷油泵上的油管螺母，检查出可燃烧噪声消失的气缸来，然后检查检查气缸的喷油泵柱塞付和出油阀，或更换之。 Let diesel engine run at the loudest combustion noise level. By loosening each pipe nut one by one on each cylinder of the injection pump, find the cylinder of which the combustion noise disappears, then check the cylinder injection pump plunger pair and valve, or replace.

12. 满载 / 空载转速改变 Full load / no-load speed change

可能原因 Possible causes	排除方法 Solutions
柴油机调速器或喷油泵故障 Diesel engine speed governor or fuel pump malfunction	检查弹簧、拉杆或其它零件有无损坏，检查油量控制齿条活动行程是否通畅。 Check springs, pull rod or other parts for damage, check if fuel control rack stroke moving smoothly.
调速气缸失调 Speed adjustment cylinder disorder	检查限速螺钉或复位弹簧。 Check the speed limiting bolt or reset spring.

13. 柴油机转速过高 Engine speed too high

可能原因 Possible causes	排除方法 Solutions
油门控制失调 Throttle control disorder	检查调速气缸是否正常，气管和接头是否漏气 Check whether speed adjustment cylinder normal, whether the air pipe and connectors leaking.

14. 柴油机功率不足 Diesel engine power shortage

可能原因 Possible causes	排除方法 Solutions
油门杆系调节不当 Accelerator linkage adjusted improperly	检查 / 调整调节杆系。 Check / adjust the linkage.
燃油质量太差 Poor fuel quality	放尽燃油吹通油管。 Discharge fuel completely and clean the fuel pipe.
空气滤清器堵塞 Air filter clogging	检查, 清洁或更换。 Check, clean or replace.
空气或燃油管路泄漏或节流 Air or fuel pipe line leaking or blockage	拧紧接头, 必要时更换。 Tighten the fittings, replace if necessary.
燃油系统中有空气 Air in the fuel system	给燃油系统排气。 Bleed air from the fuel system.
燃油管、燃油滤清器堵塞 Fuel pipe, fuel filter clogging	更换燃油滤清器, 吹通油管。 Replace the fuel filter, clean the pipe.
机油油面太高 Oil level too high	放油到正常的油面高度。 Drain the oil back to normal.
燃油回油管堵塞 Fuel return pipe clogging	清除出堵塞物。 Clear the blockage.
涡轮增压器或进气歧管漏气 Turbocharger or air intake manifold leaking	检查进气歧管压力, 清洗、修复或更换。 Check the air intake manifold pressure, clean, repair or replace.
涡轮增压器上有积碳或有碰擦 Carbon deposit or scuffing in the turbocharger	检查涡轮增压器, 清洗、修复或更换。 Check the turbocharger, clean, repair or replace.
喷油泵正时不对 Incorrect fuel injection pump timing	检查喷油泵正时。 Check the pump timing.
阀门定位不准 Incorrect valve positioning	检查推杆、弹簧。 Check push rod, spring.
喷油嘴喷油不正常 Fuel injection nozzle not working properly	取下, 试验、清洁、修复。 Remove, test, clean and repair.
喷油泵工作不正常 Fuel injection pump not working properly	取下, 试验、清洁、修复。 Remove, test, clean, repair.

15. 柴油机过热 Engine overheating

可能原因 Possible causes	排除方法 Solutions
风扇皮带松或损坏 Fan belt loose or damaged	上紧或更换新皮带。 Tighten or replace the belt.
风扇皮带轮安装不到位 Fan belt pulley not installed correctly	调整皮带轮安装。 Adjust the pulley installation.
冷却液液位低 Low coolant level	添加冷却液。 Add coolant.
散热器翅片脏堵 Radiator fin dirty and blocking	清洁翅片表面。 Clean fin surface.
油位太低 Low oil level	添加机油到正常油位。 Add oil.
水泵不工作 Water pump not working	更换水泵。 Replace the pump.
水箱压力盖失灵 Radiator pressure cap failure	检查压力盖工作情况，必要时更换。 Check the pressure cap, replace if necessary.
未装节温器，或节温器不正确或不工作 No thermostat installed, wrong thermostat or not working	检查，或更换节温器。 Check or replace the thermostat.
油量过大或喷油正时不对 Excessive fuel supply or incorrect fuel injection timing	检查更换喷油泵。 Check and replace the fuel injection pump.
负荷过大 Excessive load	检查压力设定，必要时调整 Check the pressure setting and adjust if necessary.

16. 冒黑烟或灰烟过浓 Black or gray smoke too thick

可能原因 Possible causes	排除方法 Solutions
燃烧时空气不足 Combustion air shortage	查看压力设定，必要时调整。检查空气滤清器有无堵塞，检查进气歧管压力和涡轮增压器工作是否正常，保养、修复或更换。 Check the pressure setting, adjust if necessary. Check the air filter for clogging. Check whether the air intake manifold pressure and if turbocharger working properly. Maintenance, repair or replacing.
喷油嘴不良 Fuel injection nozzle not working properly	测试所有的喷油嘴，必要时更换新件。 Test all fuel injection nozzles, replace if necessary.
喷油正时不正确 Incorrect fuel injection timing	枪查调整喷油正时。 Check and adjust the injection timing.
燃油系统中有空气 Air in the Fuel system	排出空气。 Bleed out air.
油量过大 Excessive fuel	检查调整喷油泵。 Check and adjust the fuel injection pump.
柴油机不能升温 Diesel engine temperature not rising	检查节温器和冷却系统。 Check the thermostat and the cooling systems.
装了一个以上的喷油密封垫片 More than one fuel injection gasket installed	去掉多余的垫片。 Remove the excess gaskets.

17. 柴油机冒白烟或蓝烟太浓 Engine with thick white or blue smoke

可能原因 Possible causes	排除方法 Solutions
机油太多 Too much oil	放出多余机油。 Drain excess oil.
柴油机点火不良或转速不稳定 Diesel engine ignition misfire or speed unstable	参阅第 15 项。 See No. 15 above.
喷油正时不正确 Incorrect fuel injection timing	调整正时。 Adjust the timing.
涡轮增压器油封损坏 Turbocharger seal damage	检查进气歧管有无机油，必要时修理。 Check whether the air intake manifold with oil, if necessary, fix and repair.
气门导管磨损 Engine valve guide damaged	检查修理气缸盖。 Check and repair cylinder head.
活塞环磨损 Piston ring wear	换新活塞环。 Replace.

18. 燃油消耗量过高 Fuel consumption too high

可能原因 Possible causes	排除方法 Solutions
燃油系统漏油 Fuel system leak	检查燃油系统，修理或更换零件。 Check the fuel system, repair or replace necessary parts.
喷油正时不对 Incorrect fuel injection timing	调整喷油正时。 Adjust fuel injection timing.

19. 机油压力低 Low oil pressure

可能原因 Possible causes	排除方法 Solutions
机油不足 Oil shortage	添加到正确油位，检查泄漏。 Add oil, check for leaks.
压力表或传感器工作不正常 Pressure gauge or sensor not working properly	检查更换。 Check and replace.
机油被稀释(有柴油或有水) Oil diluted (diesel or water in oil)	检查原因，更换机油和机油滤清器滤芯。 Check, change oil and oil filter cartridge.
机油粘度不对 Incorrect oil viscosity	检查更换正确粘度的机油。 Check and replace with correct viscosity oil.
机油滤清器或机油冷却器脏堵 Oil filter or oil cooler clogged	检查、清洗，更换机油滤清器和机油。 Check, clean, replace the oil filter and oil.
机油调压阀不起作用 Oil pressure regulator valve not working	检查修复或更换。 Check, repair or replace.

20. 柴油机过早磨损 Diesel engine premature wear

可能原因 Possible causes	排除方法 Solutions
机油太脏 Oil too dirty	更换掉脏的机油和机油滤清器。 Replace oil and oil filter.
进气管路漏气 Air intake pipeline leaking	检查所有进气管路元件，若有漏气则维修。 Check all air intake pipelines and related parts, repair leaks.
空气滤清器破损或垫圈损坏 Air filter damaged or gasket broken	检查空气滤清器，更换滤芯。 Check the air filter, replace the filter cartridge.
燃油进入机油里 Fuel into oil	检查原因，维修，更换机油和机油滤清器。 Check, repair, replace oil and oil filter.

21. 机油中有冷却剂 Coolant in oil

可能原因 Possible causes	排除方法 Solutions
气缸盖密封垫损坏 Cylinder head gasket damaged	换上新的密封垫，按要求拧紧固定螺栓。 Replace the gasket, tighten the mounting bolts as required.
气缸盖破裂或有缺陷 Cylinder head broken or defective	更换新的气缸盖。 Replace.
气缸体破裂或有缺陷 Cylinder block broken or defective	更换新的气缸体。 Replace.
气缸套密封圈损坏 Cylinder sleeve seals damage	更换新的密封圈。 Replace the seal.
机油冷却器芯子损坏 Oil cooler core damaged	更换新的冷却器芯子。 Replace.

22. 废气中有机油 Oil in exhaust air

可能原因 Possible causes	排除方法 Solutions
气门室内机油太多 Too much oil in the air intake valve chamber	与柴油机厂家服务部联系，检查，维修。 Contact the service department of the diesel engine manufacturer, check, repair.
气门导管磨损 Air intake valve guide damaged	检查修理气缸盖。 Check and repair the cylinder head.
活塞环磨损 Piston ring wear	更换新的活塞环。 Replace with new piston rings.
柴油机在空载怠速下运转时间太长 Engine running too long at no-load idling speed	不要让柴油机在空载怠速下长时间运转。 Do not let the engine run at idling speed with no load for long time.

23. 冷却系统内有油 Oil in Cooling system

可能原因 Possible causes	排除方法 Solutions
机油冷却器芯有缺陷 Defective oil cooler core	更换新的机油冷却器芯 Replace.
气缸盖密封垫有缺陷 Defective cylinder head gasket	更换新的密封垫 Replace with new gasket.

24. 柴油机内有异常机械噪音 Abnormal mechanical noise inside the diesel engine

可能原因 Possible causes	排除方法 Solutions
连杆轴瓦损坏 Connecting rod bearing damage	检查连杆轴瓦和曲轴的轴颈表面。 Check the connecting rod bearing and the journal surface of the crankshaft.
定时齿轮损坏 Timing gear damage	根据需要更换新的零件。 Replace as required.
曲轴损坏 Crankshaft damage	修复或更换曲轴。 Repair or replace the crankshaft.

25. 气门或气门驱动部件发出异常噪声 Engine valve or valve driving parts making abnormal noise

可能原因 Possible causes	排除方法 Solutions
气门弹簧损坏 Valve spring damage	更换损坏的气门弹簧。 Replace the damaged valve spring.
凸轮轴损坏 Camshaft damage	更换凸轮轴，将发动机彻底清洗干净。 Replace the camshaft, thoroughly clean the engine.
气门挺杆损坏 Valve lifter damage	更换凸轮轴和气门挺杆，彻底清洗发动机，检查气门能否自由活动。 Replace camshaft and valve lifters, thoroughly clean the engine, and check whether the valves moving freely.
气门损坏 Valves damage	更换气门，必要时进行调整。 Replace valves, adjust if necessary.

26. 起动马达不转动 Starter motor not turning

可能原因 Possible causes	排除方法 Solutions
蓄电池输出功率太低 Battery output power too low	检查蓄电池，根据需要对蓄电池进行充电或更换蓄电池。 Check, charge or replace the battery as needed.
线路或开关故障 Wires or switch malfunction	进行修理，必要时更换。 Repair, replace if necessary.
起动马达电磁开关故障 Starter motor solenoid switch malfunction	更换新的电磁开关。 Replace with new solenoid switch.
起动马达故障 Starter motor malfunction	修理或更换。 Repair or replace.

27. 交流发电机不充电 AC alternator not charging

可能原因 Possible causes	排除方法 Solutions
交流发电机皮带松弛 AC generator belt loose	调整皮带使之具有合适的张紧力。 Adjust the belt so that it has proper tension.
充电电路、接地回路或蓄电池接头故障 Charging circuit, ground loops or battery connection malfunction	检查所有导线和接头，拧紧全部接头螺母并将接头擦拭干净，更换有问题的零件。 Check all wires and connectors, tighten all the fitting nuts and clean the joints, replace the malfunction parts.
转子线圈故障 Rotor coil malfunction	更换新的线圈 Replace with new coil.

第 6 章 噪音控制 Chapter 6 Noise Control

1. 噪声排放 Noise emission

压缩机从设计、制造、安装到试验都是符合中华人民共和国有关噪声排放的标准与规定的。
The design, manufacture, installations and tests of the Zhejiang Zhigao compressor all comply with the related standards and regulations of People's Republic of China on noise emissions.

以上保证是针对整个机组而言的，并不局限于某个专门的部件或部分系统。只要是在销售给第一代理商时出现违反噪声排放法规的问题，无论是由于设计、制造、安装还是由某一系统、部件造成的，一概由本公司负责解决。The above statement is for the entire unit, not limited to a specific component or part of the system. We guarantee to solve any problems if in violation of the regulations on noise emissions, which might be caused by design, manufacture, installation or by a specific system or a particular part of the unit, as long as the problems rise in sales to the first dealer or customer directly by Zhejiang Zhigao.

2. 被禁止的操作 Prohibited operations

- 禁止在当消声系统中有部件被拆除后运行机组。

Never operate the unit after the parts been removed from muffler system.

具体包括以下操作：The specific operations include:

A. 拆卸或损坏 Disassembled or damaged:

- a. 柴油机消声系统及部件； Diesel engine muffler system and its parts;
- b. 压缩机进气系统及部件； Compressor air in-take system and its parts;
- c. 罩壳及任何部件。 Enclosures and any parts.

B. 拆除 Remove:

- a. 消声器； Muffler
- b. 减振器； Shock absorbers;
- c. 门、隔板； Doors, divider boards;
- d. 风扇护罩； Fan shrouds;
- e. 隔声材料。 Acoustic materials.

C. 拆除或损坏消声系统中的任何部 Removal of or damage to any part of the muffler system

3. 维护记录 Maintenance records

请妥善使用和维护压缩机组，以防消声系统的损坏。

Please operate and maintain the compressor unit properly to prevent damages of the muffler system.

每年至少检查一次消声器和柴油机排气系统、空气滤清器和进气系统、柴油机减振系统、罩壳等，确保所有部件都装好，上紧，并处于良好的工作状态：检查隔声材料，确保没有零件丢失或变形，所有零件都装好，并处于良好的工作状态。如有损坏，不得开机，应按零部件目录订购和更换所需的零件。Check the muffler and diesel exhaust system, air filter and in-take system, diesel engine shock absorber system and all enclosures at least once a year, to ensure all components well installed and tightened, and in good working status as well. Check acoustic materials and Ensure that no parts missing or deformed, and all components installed well and in good working status. If there is any damage, do not start the unit. Order and replace required parts according to the spare parts catalog / manual.

每次维护都要对维修项目和维修内容作好记录。可参考下表填写：

Keep records for maintenance items and maintenance contents each time. Refer to the table as following:

维护项目 Maintenance Project	
维护人员 Maintenance staff	
维护地点 Maintenance location	
维护日期 Maintenance date	
维护项目 Maintenance Project	
维护人员 Maintenance staff	
维护地点 Maintenance location	
维护日期 Maintenance date	
维护项目 Maintenance Project	
维护人员 Maintenance staff	
维护地点 Maintenance location	
维护日期 Maintenance date	

第 7 章 零部件订购 Chapter 7 Parts Ordering

零件订购程序 Parts ordering procedures

向您的交货代理商订购您所需要的零备件。如果由于某种原因您不能从他们那里得到这些零备件，也可以按本手册封底地址直接与浙江志高机械股份有限公司零件部联系。Order spare parts from your delivery agent. If you can't get these spare parts from them for any reasons, please contact directly with the *Parts Department of Zhejiang Zhigao Machinery Co., Ltd.* as per the address at the back cover of this **Manual**.

附录 Appendix: 公制英制换算表 Metric conversion table

公制与英制的换算表 Metric conversion table		
1 巴 bar	=	14.504 psi
1 毫巴 mbar	=	0.401 英寸水柱 in wc
1 牛 N	=	0.225 磅力 lbf
1 牛 N	=	0.102 千克力 kgf
1 牛米 Nm	=	0.738 磅力.英尺 lbf.ft
1 千克 kg	=	2.205 磅 lb
1 克 g	=	0.035 盎司 oz
1 米 m	=	3.281 英尺 ft
1 米 m	=	1.094 码 yard
1 厘米 cm	=	0.394 英寸 in
1 毫米 mm	=	0.039 英寸 in
1 千米/小时 km/h	=	0.621 海里/小时 mile/h
1 米/分钟 m/min	=	35.315 立方英尺每分钟 cfm
1 升 L	=	0.264 美制加仑 US gal
1 升 L	=	0.220 英制加仑 Imp gal (UK)
1 升 L	=	0.035 立方英尺 cu.ft
1 立方米 m ³	=	1,000 升 L
1 立方米 m ³	=	35.315 立方英尺 ft ³
1 立方米 m ³	=	6.29 桶 bbl
1 千瓦 kW	=	1.341 马力 hp (UK and US)
华氏度 t F	=	32 + (1.8 x 摄氏度 t C)
摄氏度 t C	=	(华氏度 t F - 32) / 1.8
摄氏温差 1 C = 华氏温差 1.8 F		

志存高远 持之以恒

High Aspirations with Great Ambitions and Perseverance

Zhejiang Zhigao Machinery Co., Ltd.
Visiting Address: No. 15, Bailing North Avenue,
Qujiang Economic Development Zone, Quzhou City,
Zhejiang Province, China.
Tel: +86 570 3375622 3375599 3375666
Fax: +86 570 3375621
Http: www.zhigaojx.com

浙江志高机械有限公司
地址: 浙江省衢州市衢江经济开发区百灵北路 15 号
电话: +86 570 3375622 3375599 3375666
传真: +86 570 3375621
网址: www.zhigaojx.com

注: 本公司对产品不断研究改进, 拥有设计变更权, 如有改动, 恕不另行通知。

Note: Our products are subject to constant improvement and subject to change without prior notice. We reserve the rights to modify and change the products.