



# 燃气发电机组培训资料

## Gas Generator Training Documents

### I 安全注意事项 Safety Precautions

#### 1 操作前安全说明 Safety instructions before operation

- 本机组必须由合格及有经验的电工进行负载连接和管线布置，相关操作必须符合相关的电器条例规范.标准及其他准则。The generator must be operated by qualified and experienced electricians for load connections and pipeline layout; related operations must comply with the relevant electrical regulations norms, standards and other criteria;
- 确保所有绝缘保护和接地连接符合相关规范。Ensure that all insulation protection and ground connections comply with the relevant specifications;
- 设备操作维护人员应了解燃气相关安全知识，操作前必须经过培训并被授权。Generator operation and maintenance personnel should be aware of the gas-related safety knowledge; they must be trained and authorized before operation;
- 检查发动机机油，冷却液，确保其无泄漏。Check engine oil and coolant to guarantee no leakage;
- 查看发动机机油，冷却液液位，确保其符合相关要求，Check engine oil and coolant level to ensure they are in compliance with relevant requirements;
- 检查机房燃气管道及各阀门，确保无燃气泄漏。Check gas pipe and valve in generator room to guarantee no gas leakage;
- 操作设备前操作人员请穿戴好个人防护设备。Before operating the generator, the operator should wear personal protective equipment properly;
- 检查机房通风状态，确保各通风设备状态良好。Check the generator room ventilation conditions, and ensure that the ventilation equipment in good conditions;
- 发电机组启动前，确保机组断路器处于断开位置。Before generator starting, please ensure that the generator circuit breaker is in disconnected/off position.

#### 2 操作安全说明 Operation Safety Instructions

- 当机组运行时，严禁儿童或动物进入工作区。When the generator is running, children or animals are prohibited to enter into the work area;
- 当机组运行时，操作维护人员需带上防护耳罩，以免长时间噪音损坏耳膜。When the generator is running, operation and maintenance personnel are required to wear protective earmuffs so as not to damage the eardrum;
- 当机组运行时，严禁触摸机组各电路连接线，因为其都处于带电状态，会有触电危险。When the generator is running, do not touch the electrical connection wires, because the generator is in charged state, there will be risk of electric shock;
- 当机组运行时，严禁连接或者断开负载连接，机组运行会产生高危险的高压电。而负



载连接须在启动发电机组前完成。When the generator is running, the generator will produce high-voltage high-risk electricity, so connect or disconnect the load is strictly forbidden. The load connections should be completed prior to generator starting;

- 当机组运行或者刚停机时，严禁触摸发动机、散热器或排气口。因为他们表面温度极高，会有烫热危险。When the generator is running or has just stopped, never touch the engine, radiator or exhaust port. Because their surface temperature is very high, there will be scald hazard;
- 当机组运行时，严禁移动。When the generator is running, move is strictly prohibited;
- 当机组运行时，不要在机房内抽烟或者使用明火。机房内可能含有少量燃气，而燃气是易燃易爆气体，容易发生火灾或爆炸危险。When the generator is running, do not smoke or use an open flame in the engine room. The engine room may contain a small amount of gas, and the gas is flammable and explosive, so the smoke or open flame may cause fire or explosion;
- 当机组运行时，不要随意按动紧急停机按钮，只能发生紧急时间时使用。When the generator is running, do not arbitrarily press the emergency stop button, the emergency button can only be used when there is a time of emergency;
- 如果发电机组发生故障停机，严禁在未查明并排除故障的前提下重新开机。If the generator fails, it is strictly prohibited to restart the generator unless all troubles has been identified and solved;
- 在进行发电机组维修或者保养工作前，请停止设备运行，关闭好燃气阀门，待机组充分冷却后在进行操作。Before making repairs or maintenance, the generator should be shutdown and the gas valve be closed. And then, after the generator has been sufficiently cooled, you can start the repair or maintenance work.

### 3 电气安全说明 Electrical Safety Instructions

- 对电器系统进行安装和维护前，关闭蓄电池开关。Before carrying out installation and maintenance of the electrical system, switch off the battery;
- 对电器系统进行安装和维护前时，切勿站在水里或湿地上。当机组运行发电时，切勿接触例如电缆线，接线柱等带电装置。When you do installation and maintenance of electrical systems, do not stand in the water or wet ground. When the generator is running, do not touch cables, terminals and other electrical devices;
- 对接线箱进行维护后，请立即将保护盖板复位。切勿在接线箱保护盖板打开的状态下操作发电机组。After performing maintenance on junction box, be sure to put protective cover on its original location. When the junction box protective cover is open, do not operate the generator;
- 检查发电机组的特性与其所在的市电系统，备用电源系统以及负载相匹配。进行保养维修前，切断所有电源。Check the generator characteristics, and make the civil power systems, backup power systems and load matched. Cut off all power before maintenance;
- 检查机组线束，确保无裂痕、破损、损伤以及连接锈蚀。保持所有的接线柱和接线端子清洁并连接紧密。Check whether generator wiring is in good condition, ensure that no cracks, breakage, damage and corrosion on the wiring. Keep all terminals clean and tightly connected;



- 检查并确保所有的电器元件,线束和电缆绝缘良好。Check and ensure that all electrical components, wire and cable insulation is good.

#### 4 发动机使用安全说明 Safety Instructions for Engine Use

- 机组运行或刚停机时,不要加注或更换冷却液,否则会造成严重烫伤或破坏。When the generator is running or just stopped, do not fill or replace the coolant, otherwise it will cause severe burns or damage;
- 不要在冷却液未完全冷却时拧开散热器盖。应在冷却液冷却后,先松开盖子,让里面的气压释放,然后再完全把盖拧开。Do not unscrew the radiator cap when the coolant is not completely cooled. After the coolant is being sufficiently cooled, firstly loosen the lid and let pressure release and then completely turn the cap on to add the coolant;
- 在风扇保护罩或其他安全保护罩拆开,切勿试图开机。开机时切勿试图把手伸到这些保护装置下面或者附近去进行维修。In the case of fan guard or other safety protective cover open, do not attempt to start the generator. When generator in working, do not attempt to carry out maintenance;
- 严禁在密闭空间内运行发动机。所有的内燃机工作时都会产生碳氧化合物,此类物质若在密闭空间内聚集将导致疾病甚至死亡。NEVER operate the engine in confined / airtight space. All internal combustion engines will produce carbon and oxygen compounds, if such substances accumulate in a confined/airtight space, it will cause illness, even death.

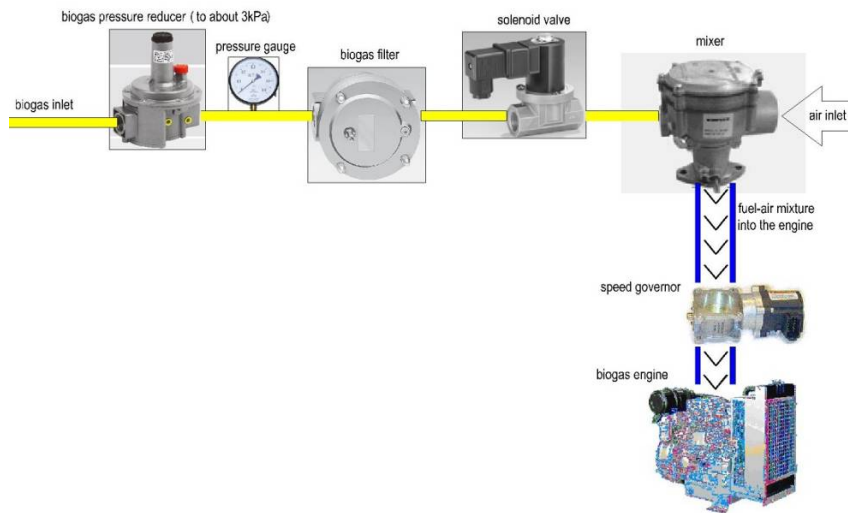
#### 5 燃气安全使用说明 Safety Instructions for Gas Use

- 燃气为易燃易爆气体,机组运行时,机房切勿吸烟或产生明火。The gas is flammable and explosive, when generator is running, do not smoke or have open flames in the engine room;
  - ◇ 如果在机组或机房内闻到辛辣气体味道,说明有燃气泄漏,应采取以下措施处理: , if smell pungent gas in the generator room, this means gas leakage, you should take the following measures to deal with:
  - ◇ 防止火花! 不要操作任何电力设备如关机和手机。Prevent sparks! Do not operate any electrical device, like the shutdown of generator or the use of a mobile phone;
  - ◇ 如果听到气体泄漏的声音,要立即离开。If you hear the sound of a gas leak, leave immediately;
  - ◇ 如果可能并安全,请开闭隔离阀。If possible and secure, close the isolation valve;
  - ◇ 打开所有外部门窗。Turn on all external doors and windows;
  - ◇ 在危险区域警告任何其他人,命令他们离开。Warn anyone else in the danger zone and order them to leave.
  - ◇ 防止其他人进入危险区机组运行时,确保机房通风装置正常工作。When the generator is running, ensure that the engine room ventilation device work correctly;
- 定期检查燃气管道,确保管道及相关阀门无损坏。Regularly check the gas pipeline, to ensure that no damage to the pipeline and associated valve;

- 严格遵守有关部门相关的燃气安全规范, 确保自身安全。Please follow strictly with safety regulations from related departments to ensure your own safety.

## II 机组运行流程 Generator Operation Process

### 1. 进气阀组 Gas trains



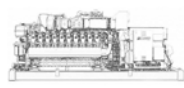
- 2. 进气功率阀, 在没有专业检测设备及专业人员的情况下请勿触动此阀。**Gas inlet power valve**, in the absence of professional testing equipment and professional staff, please do not touch this valve;



### 3. 燃气点火系统 Gas ignition system

- 点火控制器, 可以准确的控制点火角度, 有效的提高发动机的功率。The ignition controller can exactly control the ignition angle, effectively improve the power of the engine;



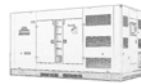
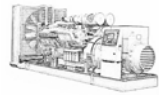
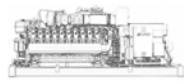


- 火花塞、高压线、高能点火线圈, Spark plugs, high-voltage cables, high-energy ignition coil



- 防爆阀，用于控制进气压力达到极限时，及时释放进气管道压力，注意释放一次后需做压力测试。Explosion-proof valve is used for controlling the gas intake pressure. If the intake pressure reaches the limit, the explosion-proof valve will timely release the intake manifold pressure. Stress tests should be done after each pressure release.





### III 机组操作流程 Generator Operating Procedures

#### 1. 总则 General Principles

本系列的机组均装备有一个先进的控制系统，根据客户的需要实现对机组的手动或者自动控制，详细的配置请参看您的机组配置表。This series generator are equipped with an advanced control system, the generator can be manually or automatically controlled according to the needs of customers. For detailed configuration, please refer to our configuration tables. 在机组的控制系统中，均设有保护电路，当机组运行发生问题时，会根据问题的大小进行警告或者停机。The generator's control system is equipped with protection circuit, when the generator is running, if a problem occurs, there will be a warning or generator-stop according to the size of the problem.

#### 2. 开机前检查（使用于所有控制系统)Check before generator start( for all control systems )

在开机前应作如下检查：Following check should be done before starting generator:



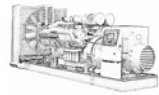
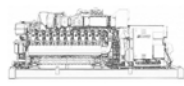
在开启大型带外壳机组之前，必须确保外壳之内所有障碍物已被清除。

**Warning!** Before start of canopied generator, please make sure that all unrelated things inside the canopy should be cleared;

不要在冷却液未充分降温前打开散热器的盖子，也不要热机状态时添加冷却液，否则会对机组造成严重损坏。Before the coolant is sufficiently cooled, do not open the radiator cap; do not add coolant when the engine is not completely cooled, otherwise it will cause serious damage to the generator.

- 确认控制开关/钥匙开关处于关闭状态。Verify that the control switch / key switch are turned off;
- 检查发动机润滑油及冷却液的水平，不够时加满。Check the engine oil and coolant levels, if not enough, please add the engine oil and coolant;

◇ 备注：润滑油和冷却液要缓慢倒入，以便使发动机润滑系统和冷却系统内残留的空气排出。Note: The oil and coolant should be slowly poured, so that the



residual air in the cooling system of engine lubrication system can be discharged;



- 检查燃气管道是否产生泄露，燃气压力3-5kPa      Check whether the gas pipeline leaks , the gas pressure is 3-5kPa
- **⚠危险**: 检查燃气管道时，绝对不允许有火星或者明火靠近!!! **Dangerous!** When checking the gas pipeline, spark or open flame is strictly forbidden.
- 任何情况下，不得向燃气机组提供未经过滤、脱水、脱硫处理的燃料，否则发电机组将很快损坏。 Under no circumstances shall provide unfiltered, un-dehydrated or un-desulphurized gas to the generator, otherwise it will cause serious damage.
- 检查发动机风扇状态和充电机皮带的松紧，必要时收紧。 Check the engine fan status and charging machine belt tension, tighten it if necessary;
- 检查所有线管，看看是否连接处松脱或破损，如有则收紧或者换掉。 Check the cable tube to see if the connection is loose or damaged, if any, tighten or replace them;
- 检查蓄电池电极有无腐蚀，有则清洁之。 Check the corrosion of the battery electrode, if any corrosion, clean it;
  - ✧ **⚠危险**: 清理蓄电池时，绝对不允许有火星或者明火靠近!!! 防止蓄电池正负极短路。 **Dangerous!** When clean the battery, spark or open flames is strictly forbidden, otherwise it will cause battery positive and negative short-circuit;
- 若使用的非免维护蓄电池，则应检查蓄电池液液位，必要时可添加蒸馏水。如果是从未充过电的新蓄电池，则加入预先配制好的蓄电池液。并检查电池电量 用万用表测量，看是否足够，达不到启动要求时，应重新充电到满。如果发动机启动马达启动时转速很低，则在启动时测量电瓶电压，如果电瓶在发动机启动时电压比静止时电压低于 4V，那么电瓶电量不足，机组不能启动，需要对电瓶充电后，再启动机组。 If non-maintenance-free batteries were used, you should check the battery fluid level periodically, add distilled water when necessary. If the new battery was never charged, add previously prepared battery liquid firstly, and then check the battery power by a multimeter to see if it reaches the start-up requirements. If failed, battery should be re- charged to the full. If the speed of engine starting motor is low when you start the generator, you can measure the



battery voltage. If the battery voltage in engine starting condition is 4V lower than battery's stationary voltage, this means the battery power is low, the generator cannot start, you need to charge the battery firstly and then start the generator;

- 检查机组控制屏和发电机组上是否有大量灰尘堆积，有则清洁之，以防止这些灰尘和污染物造成电击、影响冷却效果和阻塞空气滤清器。Check the generator to see whether there is a lot of dust accumulation, if there is a lot of dust, you should clean it to avoid the possibility of electric shock, lower cooling effect and air filter block;
- 检查空气滤清器的阻塞指示器，如出现阻塞显示请保养空气滤清器。Checks the air filter blockage indicator, if blockage occurs, please maintain the air filter.
- 发电机组周围场地要清理，把不安全物件搬开以免影响操作或引起危险，确保机房进排风的通风道没有阻塞。The neighboring area of the generator should be cleaned up to ensure that the engine-room's exhaust & ventilation is not blocked;
- 检查机组的润滑油和冷却液是否有泄露现象。Check whether there is leakage of lubricating and coolant;
- 如排烟系统有排水阀，定期排放积聚的水分。If the exhaust system is equipped with drain valve, drain the accumulated water regularly;
- 确保机组的空气开关在分闸位置（手柄向下）。Ensure that the generator's air switch in the OFF position (handle in down direction).

### 3 发电机组停机 Generator Shutdown

- 切断负荷，再将主空开断开。Cut off the load, and then disconnect the main breaker;
- 按停机键 ，机组经高速散热，怠速后自动停机；Press Shutdown button ，generator will shut down after idling;
- 关闭天然气阀门，关断控制柜上电源开关；Close the gas valve, turn off the power switch on the control cabinet.

### 4 机组控制器操作 Generator Controller Operation

- 手动开机停机：Manual Start Stop


在所有准备工作就绪后，请注意控制器面板 After all the preparations, note the controller





panel;






### ➤ 按键功能描述 Button Functions Description



✧ 停机/复位键  在手动/自动模式下，均可以使运转中的发电机组停止。在发电机组报警模式下，可以使任何的停机报警复位。在停机模式下，按下此键 3 秒钟以上，可以测试面板指示灯是否正常(试灯)。在停机过程中，再次按下此键，可快速停机。



Stop/Reset Button . In manual / automatic mode, press this button can cause the running generator to stop. In generator's alarm mode, this button can make any alarm mode to be reset. In generator's stop mode, press this button for more than 3 seconds, you can test the panel lights are normal or not(lamp test). During the process of generator shutdown, press this button again you can stop the generator quickly;

✧ 开机键  在手动模式或手动试机模式下，按此键可以使静止的发电机组开始启动。

Start Button , in manual mode or manual test mode, press this button can make a stationary generator begin to start;

✧ 手动键  按下此键，可以将控制器置于手动模式。Manual-button , press this button, you can place the controller in manual mode;

✧ 自动键  按下此键，可以将控制器置于自动模式。Auto-button , press this button, you can place the controller in automatic mode.

✧ 合闸键  按下此键，机组自动合闸。Switch-on Button , press this button, the generator will automatically be switched on;

- ◇ 分闸键  按下此键，机组自动分闸。Switch-off Button , press this button, the generator will automatically be switched off;
- ◇ 设置/确认  和  键同时按下进入设置菜单，并在参数设置中移动光标及确认设置信息。Set/Confirm Button  , press these 2 buttons simultaneously, you can enter the set menu, you can move the cursor on the parameter settings and confirm the setting information;
- ◇ 报警消除键  按下此键，机组报警消音。Alarm-remove Button , press this button, the generator's alarm sound will be removed.
- ◇ 翻页键  翻页，在参数设置中移动光标及改变光标所在位的数字。Page UP or Page Down Button .
- 当上电后,控制器将显示控制模式,这时按手动键将模式切换到手动状态,按下开机键,机组将按设置流程启动并运行,如果需要停机,按停机键,在运行过程中如果有异常运行发生,每一种异常情况都会显示在控制器显示屏上面,记录下并按停机键停机处理显示的异常情况。用于在运行过程查看所有运行参数和历史记录。When connected with power, the controller will display control mode, then press the manual button to switch to manual mode, press the Start button, the generator will run, if you need stop the generator, press the stop button. When generator is running, if there is abnormal operation occurs, each abnormal situation will be displayed on the controller screen and be recorded in the controller. You can view all operating parameters and history running records in the controller.

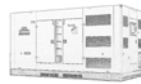
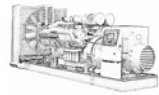
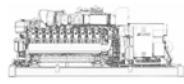
## 5. 报警参数及报警值 Alarm parameters and alarm-values

发电机电压高、低报警: Generator voltage high and low alarm:

充电机高、低电压报警: Generator Charger high and low voltage alarm:

发电机频率高、低报警 Generator high and low frequency alarm:

同步失败报警 Synchronization failure alarm



MSC 通讯失败报警 MSC Communication failure alarm

过载停机报警 Overload shutdown alarm

分闸失败报警 Switch-off failure alarm

合闸失败报警 Switch-on failure alarm

停机失败报警 Generator shutdown failure alarm

超速报警 Over-speed alarm

低速报警 Low speed alarm

传感信号丢失报警 Sensing signal lost alarm

水温高报警 High water temperature alarm

油压低报警 Low oil pressure alarm

启动失败报警 Starting failure alarm

充电失败报警 Charging failure alarm

## IV 机组日常维护保养及故障查询指南 Generator routine maintenance and troubleshooting guide

### 1. 天然气发电机组维护及保养 Natural gas generator maintenance

#### ➤ 日常维护: Routine Maintenance:

- ◇ 检查机油液位、冷却液液位、如果有必要则加入适当的容量; Check the oil and coolant level, if necessary, add the oil and coolant to the right amount;
- ◇ 清洁机组, 视检发电机组的泄漏和松动(螺栓、驱动皮带张紧度等); Clean the generator, use your eye to inspect generator's leaks or loose (such as bolts, drive belt tension degrees);
- ◇ 检查散热器; Check the radiator;
- ◇ 检查动力电缆、控制电缆和蓄电池电缆的连接情况; Check the connection of power cables, control cables and battery cables;
- ◇ 若长期不运行机组, 则应每周空载运行 30 分钟, 检查泄漏(天然气管路、冷却液、机油等)、振动、异响以及仪表等情况。(长期不运行机组, 应断开蓄电池电源以免造成蓄电池损坏)。If the generator is not running for long time, you should run the generator for 30 minutes every week with no load, and check for leaks (natural gas pipeline, coolant, oil, etc), vibration, noise, and so on. (If the generator is not running for long time, you should disconnect the battery power so as not to cause damage to the battery).



➤ **200 小时： 200 hours:**

- ◇ 更换： 机油滤清器、水滤器。 Replacement: oil filters, water filters;
- ◇ 检查： 空气滤清器、进气系统、点火系统、驱动皮带张紧度等。 Check: Air filters, air intake system, ignition system, drive belt tension and so on.

➤ **400 小时： 400 hours**

- ◇ 更换： 机油、机油滤清器、火花塞、水滤器、空气滤清器、天然气滤清器， Replacement: oil, oil filters, spark plugs, water filter , air filter , gas filter;
- ◇ 检查： 进气系统、点火系统、冷却液、驱动皮带张紧度等。 Check: air intake system, ignition system, the coolant, the drive belt tension, etc.

➤ **800 小时 800 hours**

- ◇ 更换： 机油、机油滤清器、水滤器、火花塞、空气滤清器、天然气滤清器。 Replacement: oil, oil filters, water filters, spark plugs, air filter, gas filter;
- ◇ 检查： 风扇轮毂、皮带轮张紧轮轴承、驱动皮带张紧度等、进气系统、点火系统、冷却液。 Check: the fan hub, pulleys tensioning wheel bearings, drive belt tension, intake system, ignition system, coolant;
- ◇ 调整： 气门间隙。 Adjustment: valve clearance.

➤ **1200 小时 1200 hours**

- ◇ 更换： 机油、机油滤清器、水滤器、火花塞、空气滤清器、天然气滤清器， 发动机散热皮带。 Replacement: oil, oil filters, water filters, spark plugs, air filter, gas filter, engine cooling belt;
- ◇ 检查： 风扇轮毂、皮带轮张紧轮轴承、皮带张紧状态、减震器、进气系统、点火系统、冷却液。 Check: the fan hub, pulleys tensioning wheel bearing, belt tension, shock absorbers, air intake system, ignition system, coolant;
- ◇ 清洗： 水箱散热片 Cleaning: Radiator cooling fin.

➤ **1600 小时 1600 hours**

- ◇ 更换： 机油、机油滤清器、水滤器、火花塞、空气滤清器、天然气滤清器、防冻液（视情况而定）， Replacement: Oil, oil filters, water filters, spark plugs, air filter, gas filter, antifreeze (depends on generator's actual conditions);
- ◇ 检查： 风扇轮毂、皮带轮张紧轮轴承、皮带张紧状态、减震器、进气系统、点火系统、防冻液。 Check: the fan hub, pulleys tensioning wheel bearing, belt tension, shock absorbers, air intake system, ignition system, antifreeze;
- ◇ 调整： 气门间隙。 Adjustment: valve clearance;
- ◇ 清洗： 水箱散热片。 Cleaning: Radiator cooling fin;
- ◇ 应注明保养时间以 400 小时递增。 Note that the maintenance time should be done every 400 hours.

➤ **5000 小时 5000 hours**

- ◇ 更换： 机油、机油滤清器、水滤器、火花塞、空气滤清器、天然气滤清器、橡胶部件、密封件。 Replacement: oil, oil filters, water filters, spark plugs, air filter, gas filter, rubber parts, seals.



- parts, seals;
- ✧ 检查：风扇轮毂、皮带轮张紧轮轴承、皮带张紧状态、减震器、进气系统、点火系统、防冻液、启动马达、连杆螺栓、主轴承螺栓、根据需要更换活塞环、主轴承、连杆轴承等；Check: the fan hub, pulleys tensioner bearing, belt tension, shock absorbers, air intake system, ignition system, antifreeze, starting motor, connecting rod bolts, main bearing bolts, and replace the piston rings, main bearing and connecting rod bearings on the basis of actual conditions;
  - ✧ 调整：气门间隙（视情况研磨阀门）。Adjustment: Valve clearance (grind the valve if requires);
  - ✧ 清洗：水箱散热片。Clean radiator cooling fin.
- **润滑油**：API 标准，应选用燃气机组专用的机油；美孚飞马 805 或其他燃气专用机油。**Lubricating oil**: API standard; Mobil Pegasus 805 gas engine oil or other brands specially for gas generator.
  - **防冻液**：乙烯乙二醇或丙烯乙二醇，浓度 40-60%。**Antifreeze**: ethylene glycol or propylene glycol, the concentration of 40-60 %.

## 2. 故障查询指南 Troubleshooting Guide

### ✧ 发动机部分 Engine Troubleshooting Guide

#### ➤ 不能盘动发动机或盘车转速过低 Engine failed to rotate or rotating speed too low

原因：Possible reasons	处理方法：Approaches
A) 电池充电不足 Battery insufficient charge	A、检查电解液位，如果需要则补足。给蓄电池充电，必要时更换蓄电池 Check the electrolyte level and if necessary add the electrolyte. Recharge the batteries, if necessary, replace the battery
B) 主开关断开 main breaker off	B、合上主开关 Switch on the main breaker
C) 接线盒中的一个半自动保险管脱开 semi-automatic fuse in junction box is disengaged	C、按下保险管上的按钮 使保险管复位 Press the button on the fuse to reset the fuse
D)接触不良/线路断路 poor contact/circuit break	D、排除任何断路/接触不良故障，检查接头有无氧化，如果必要则清洗 Exclude any bad contact/failure of circuit breaker, check whether the connectors is oxidized, clean it if necessary;
E)电源开关故障 Power switch fault	E、更换电源开关 Replace the power supply switch
F) 启动继电器故障 Start relay fault	F、更换启动继电器 Replace the start relay
G) 启动马达故障 Start motor fault	G、与经授权的人员联系 Contact your authorized repair personnel
H) 任何启动线路故障 Any start up circuit failure	H、检查所有其它启动线路 Check all circuit
I) 发动机中有水 water in the engine	I、与经授权的修理人员联系，不要企图启动发动机 Contact your authorized repair personnel, do not attempt to start the engine
J) 润滑油温度低 low lubricating oil temperature	J、安装油底壳润滑油加热器 Install oil heater
K) 使用错误类型的润滑油 Using the wrong type of lubricating oil	K、更换润滑油和滤清器/确保使用正确类型的润滑油 Use the right lubricating oil and change oil filter;
L) 影响发动机旋转的其它内外原因 Others	L、检查曲轴是否可以灵活盘动 Check the crankshaft to see whether it can be flexibly rotated





➤ **发动机启动困难或启动不了,但排气管冒烟 Engine has difficulty to start or not start , but the exhaust pipe smoke**

<p>原因: Possible reasons</p> <p>A) 启动马达驱动发动机转速太低 Driving engine speed by start motor is too low</p> <p>B) 发动机的驱动装置与发动机啮合 Engine drive devices engaged with Engine</p> <p>C) 错误使用冷启动装置 Use engine cold start device wrongfully</p> <p>D) 预热不足 Insufficient Preheating</p> <p>E) 点火高压线 High voltage ignition cable</p> <p>F) 火花塞 Spark plug</p> <p>G) 燃气中有水 Water in the gas</p> <p>I) 进气管路故障 Gas inlet pipe fault</p> <p>J) 混合器故障 Mixer fault</p> <p>K) 点火时间不对 Wrong igniting timing</p>	<p>处理方法 Approaches:</p> <p>A) 见“不能盘动发动机或盘车转速过低” see “Engine failed to rotate or rotating speed too low”</p> <p>B) 脱开发动机驱动装置 Disengage the engine drive devices</p> <p>C) 查看用户手册如何操作冷启动系统 View the user manual how to operate the cold start system</p> <p>D) 查看用户手册/检查半自动保险管, 如果需要则按下按钮复位, 检查电线、联锁按钮和预热继电器。如果需要更换预热元件, 与经授权人员联系 View the user manual/ Check the semi-automatic fuse tube, if necessary press the reset button; Check wires, interlock button and preheat relay device; If you need to replace the preheating units, contact an authorized personnel;</p> <p>E) 更换高压线 Replace high-voltage cables</p> <p>F) 更换火花塞 Replace the spark plugs</p> <p>G) 清理燃气中的水分 Remove water from the gas</p> <p>I) 检查进气管路 check the gas inlet pipe</p> <p>J) 检修混合器 check the mixer</p> <p>K) 检查去信号齿盘及调整点火角度 Adjust igniting angle</p>
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➤ **发动机可以盘动但不能启动,排气管无烟 Engine can rotate but cannot start , and the exhaust pipe has no smoke**

<p>原因: Possible reasons:</p> <p>A) 天然气供应是否正常 Gas supply is normal or not</p> <p>B) 零压电磁阀 Zero pressure solenoid valve</p> <p>C) 没有点火 No ignition</p> <p>E) 检查天然气中甲烷的含量 Check the methane content of natural gas</p> <p>F) 混合器膜片 Membranes in the mixer</p> <p>G) 天然气供气管路堵塞 Gas pipe blockage</p> <p>H) 天然气压力不足 Low gas pressure</p>	<p>处理方法: Approaches:</p> <p>A) 检查甲烷、压力等值是否达标 check whether the methane contents and gas pressure can meet the requirements or not</p> <p>B) 检查电磁阀, 如有必要则更换 check the zero pressure solenoid valve, replace it if necessary</p> <p>C) 检查点火系统 check the ignition system</p> <p>E) 甲烷含量必须 76% methane contents shall be above 76%</p> <p>F) 更换混合器膜片 Replace mixer membrane;</p> <p>G) 检查供气管路 Check gas pipe;</p> <p>H) 检查供气压力必须≥3Kpa 以上 Gas pressure should be above 3Kpa</p>
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➤ **发动机启动但不能保持运行 Engine starts but could not keep running**

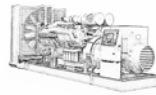
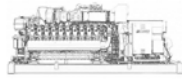
<p>原因: Possible reasons:</p> <p>A) 检查供气系统是否有泄漏 Check gas supply system for leaks</p> <p>B) 天然气中有水 Water in the gas</p> <p>C) 预热不足 Insufficient preheating</p> <p>D) 进气系统阻塞 Gas intake system blockage</p>	<p>处理方法: Approaches:</p> <p>A) 用肥皂泡检查各个供气管路连接口 Check the gas supply pipe interface with soap bubbles</p> <p>B) 检查清理, 并作好天然气脱水 Remove water from natural gas</p> <p>C) 增加预热时间 Increase the preheating time</p> <p>D) 检查进气系统 Check the gas intake system</p>
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➤ **冒蓝烟或冒白烟 Blue smoke or white smoke**

<p>原因: Possible reasons:</p> <p>A) 使用错误类型的润滑油 Use the wrong type of lubricating oil</p> <p>B) 冷却启动系统故障 Cold start system failure</p> <p>C) 发动机温度过低 Engine temperature too low</p> <p>D) 发动机润滑油过多 Excessive engine oil</p> <p>E) 涡轮增压器密封圈和轴承磨损 Turbocharger seal and bearing wear</p> <p>F) 发动机已到大修期限 Engine need overhauling</p> <p>G) 气缸头漏水 Leakage of cylinder head</p>	<p>处理方法 Approaches:</p> <p>A) 更换润滑油和滤清器/确保使用正确类型的润滑油 Change the lubricating oil and oil-filter and use the right type of lubricating oil</p> <p>B) 安装冷启动装置, 检查、修理, 如果必要则更换 Install the cold start device, check and repair it, replace it if necessary;</p> <p>C) 见“冷却液温度低于正常温度”Refer to the table “Coolant temperature is lower than normal temperature”</p> <p>D) 检查润滑油位 Check lubricating oil level</p> <p>E) 修理 / 更换涡轮增压器 Repair / replace turbocharger</p> <p>F) 大修发动机 Overhaul the engine</p> <p>G) 检查缸头和缸垫, 必要时更换 Check the cylinder head and cylinder head gasket, and replace if necessary</p>
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➤ **发动机达不到额定转速 Engine failed to reach rated speed**

<p>原因: Possible reasons:</p> <p>A) 相对于额定功率发动机负载过大 Overload</p> <p>B) 转速表有问题 Tachometer problem</p> <p>C) 调速器故障或设置不当 Speed governor fault or wrong setting of speed governor</p> <p>D) 天然气进气系统有堵塞 Gas inlet system blockage</p> <p>E) 调速器最高限速设置过低 Governor maximum speed limit set too low</p>	<p>处理方法: Approaches:</p> <p>A) 降低发电机组负载 Reduce generator load</p> <p>B) 用手持转速表或数字转速表检查 Checked with a hand-held tachometer or digital tachometers</p> <p>C) 检查/调整调速系统及控制线路 Check / adjust the speed control system and control circuit</p> <p>D) 检查进气管路有无阻塞, 如果必要则重新连接 Check the gas inlet pipe for blockage, reconnect it if necessary</p> <p>E) 检查/调整调速器 check/adjust the speed governor</p>
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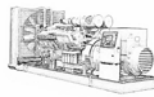
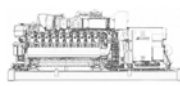


➤ **发动机不能停机 Engine failed to shutdown**

<p>原因: Possible reasons:</p> <p>A)接触不良/线路断路 Poor contact/circuit break</p> <p>B) 停机按钮故障 Generator Stop Button Fault</p> <p>C) 零压电磁阀故障 Zero pressure solenoid valve fault</p>	<p>处理方法: Approaches:</p> <p>A)排除任何断路/接触不良故障, 检查接头有无氧化, 如有必要则清洗 Exclude any poor contact failure, check whether the joints is oxidized, clean the joints if necessary</p> <p>B)更换停机按钮 Replace the generator stop button</p> <p>C)检查/更换零压电磁阀 Change/Repair the zero pressure solenoid valve</p>
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➤ **发电机组输出功率不足 Generator insufficient power output**

<p>原因: Possible reasons:</p> <p>A)相对于额定功率发动机负载过大 Overload</p> <p>B)海拔过高造成功率不足 Altitude too high</p> <p>C)进气管路管阻塞 Blockage of air intake pipe</p> <p>D)润滑油位过高 Lubricating oil level too high</p> <p>E)进气或排气系统阻塞 Intake or exhaust system blocking</p> <p>F)天然气中甲烷含量过低 Low methane contents</p> <p>I) 气门间隙不对 Wrong valve clearance</p> <p>J)进气温度过高(40 摄氏度以上) High intake air temperature(More than 40 degrees Celsius)</p> <p>K)进气温度过低 (0 摄氏度以下) Low intake air temperature(Below 0 degrees Celsius)</p> <p>L)涡轮增压器叶轮损坏或脏污 Turbocharger impeller is damaged or dirty</p> <p>M)点火故障 Ignition fault</p>	<p>处理方法 Approaches:</p> <p>A)降低负载 Reduce the load</p> <p>B)海拔超过 1000 米需要对发动机进行修正 If altitude over 1000 meters, engine need to be amended;</p> <p>C)检查进气有无阻塞, 并排除 Check whether the air intake pipe is blocked or not</p> <p>D)检查机油尺刻度和油底壳容积 Check the dipstick level and oil tank volume;</p> <p>E)检查进气和排气系统有无阻塞 Check whether the intake or exhaust system is blocked or not</p> <p>F)检查天然气甲烷含量, 如低于 65%, 会出现功率下降 Check the methane contents, if below 65%, power output will decrease</p> <p>I)调整/检查气门间隙 Adjust/check valve clearance</p> <p>J)降低环境温度, 并对发动机进行修正 Lower the ambient temperature, and modify the engine</p> <p>K)气温较低时将机罩下的空气引入发动机 When the temperature is low, bring the air from engine hood to intake system;</p> <p>L)涡轮增压器叶轮损坏或脏污 Repair, replace or clean the turbocharger</p> <p>M) 与经授权人员联系处理 Contact with authorized maintenance personnel</p>
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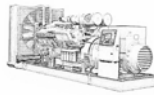
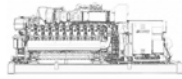


➤ **润滑压力过低 Low Lubricating oil pressure**

<p>原因: Possible reasons:</p> <p>A) 润滑油位不合适 Inappropriate lubricating level</p> <p>B) 润滑油压力表有问题 Lubricating oil pressure gauge fault</p> <p>C) 润滑油牌号不对 Wrong Lubricating oil</p> <p>D) 润滑油温度超过正常值 (120 摄氏度) Oil temperature exceeds normal value ( 120 degrees C )</p> <p>E) 润滑油滤清器脏污 Dirty oil filters</p> <p>F) 曲轴轴承磨损或损坏 rank bearing wear or damage</p> <p>G) 润滑油泵磨损 Lubricating oil pump wear or damage</p> <p>H) 减压阀不关闭 Pressure relief valve does not close</p> <p>I) 减压阀损坏 Pressure relief valve Fault</p> <p>J) 润滑油泵吸油管故障 Oil Pump suction pipe failure</p> <p>K) 油底壳吸滤器阻塞 Sump suction filter blocked</p>	<p>处理方法: Approaches:</p> <p>A、检查有无润滑油泄漏。添加或排放润滑油。Check for lubricating leaks. Add or discharge lubricating oil</p> <p>B、检查润滑油尺刻度 Check the oil scale</p> <p>C、更换润滑油, 检查润滑油牌号 Replace the oil</p> <p>D、检查、清理或更换润滑油冷却器 Check, clean or replace the lubricating oil cooler</p> <p>E、更换润滑油滤清器 Change the oil filter</p> <p>F、检查/更换曲轴轴承 Check / replace the crankshaft bearings</p> <p>G、检查、修理/更换润滑油泵 Inspect, repair/replace oil pumps</p> <p>H、更换减压阀 Replace the pressure relief valve</p> <p>I、更换减压阀 Replace the pressure relief valve</p> <p>J、检查、修理/更换吸油管清洗吸滤器 Inspect, repair / replace the suction tube and clean suction filter</p> <p>K、清洗油底壳及更换吸滤器 Clean and replace sump suction filter</p>
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➤ **润滑油压力过高 High Lubricating oil pressure**

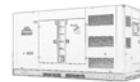
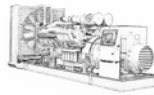
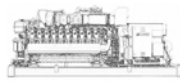
<p>原因: Possible reason:</p> <p>A) 限压阀不开启 Pressure limiting valve closed</p>	<p>处理方法: Approach:</p> <p>A) 更换减限压阀 Replace pressure limiting valve</p>
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➤ **冷却液温度高于正常温度 Engine coolant temperature high**

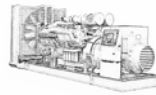
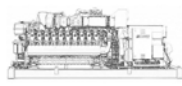
<p>原因: Possible reasons:</p> <p>A)冷却液位过低 coolant level too low</p> <p>B) 散热器阻塞或损坏 Radiator blockage or damage</p> <p>C)散热器软管凹陷或阻塞 Radiator hose sunken or blocked</p> <p>D)风扇传动皮带松弛 Fan drive belt slack</p> <p>E) 润滑油位不合适 Inappropriate lubricating oil level</p> <p>F)冷却风扇罩损坏或丢失 Cooling fan cover damaged or lost</p> <p>G)散热器压力盖有问题或型号不对 Radiator pressure cap have a problem, or the wrong type</p> <p>H)温度表有问题 Thermometers fault</p> <p>I) 散热器百页窗没有完全打开 Radiator louver not fully open</p> <p>J) 空气滤清器阻塞或型号不对 Blocking or wrong type of air filter</p> <p>K)排气管阻塞 Exhaust duct blocked</p> <p>L)风扇损坏 Fan damage</p> <p>M)散热器气路或水路阻塞 Radiator air- or water-way blocked</p> <p>N)系统中冷却液不足 Insufficient coolant in cooling system</p> <p>O) 冷却系统中有空气聚集 Air gathering in cooling system</p> <p>P)水泵故障 water pump fault</p> <p>Q)节温器故障/型号不对 Thermostat failure</p> <p>R) 点火时间不对 Wrong ignition timing</p> <p>S)配气正时不对 Valve timing wrong</p> <p>T)气缸垫漏气 Cylinder head gasket leak</p> <p>U)活塞损坏 Piston damage</p>	<p>处理方法: Approaches:</p> <p>A)添加冷却液 Add coolant</p> <p>B)按照用户手册中的说明清洗, 如果必要则修理 Clean it in accordance with the instructions in the user manual, repair it if necessary;</p> <p>C)检查软管。如果必要则更换 Check the hose, replace it if necessary;</p> <p>D)检查风扇皮带张紧度, 并将它拧紧 Check the fan belt tension and tighten it</p> <p>E)添加或排放润滑油。检查机油尺刻度 Add or drain oil. Check the dipstick scale</p> <p>F)检查风扇罩。修理、更换或重新安装 Check the cooling fan cover, replace it if necessary</p> <p>G)检查散热器压力盖。如果必要则更换 Check radiator pressure cap, replace it if necessary</p> <p>H)检测/修理温度表。如果必要则更换 Check the thermometers, replace it if necessary</p> <p>I)检查/修理百页窗。如果必要则更换 Check the radiator louver, replace it if necessary</p> <p>J)检查或更换空气滤清器 Check or replace the air filter;</p> <p>K)检查排气管有无阻塞, 检查尺寸是否合适 Check the exhaust duct is blocked or not, and check whether its size is appropriate</p> <p>L)更换风扇 Replace the fan</p> <p>M)检查并清理 Check and repair it</p> <p>N)添加冷却液 Add the coolant</p> <p>O)排出冷却系统中的空气 Discharge the air in the cooling system</p> <p>P)检查/修理或更换水泵 Check/repair/replace the water pump</p> <p>Q)检查/更换节温器 check/replace the thermostat</p> <p>R) 与经授权人员联系处理 Contact authorized maintenance personnel</p> <p>S)调整至规定数据 Adjust it to right data</p> <p>T)检查气缸垫 check the cylinder head gasket</p> <p>U)更换缸套和活塞。查出损坏的原因 Replace the cylinder liner and piston, and find out the cause of the damage</p>
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➤ **燃气消耗度超过正常水平 Excessive gas consumption**

<p>原因: Possible reasons:</p> <p>A)空气滤清器阻塞或型号不对 Air filter blocked or wrong type of air filter</p> <p>B)机组负载过小 Generator load is small</p> <p>C)发动机温度过低 Engine temperature is too low</p> <p>D)气门间隙不对 Valve clearance is wrong</p> <p>E)压力调节器: 有故障或设置不当 Improper settings or fault of pressure regulator</p> <p>F)点火定时不对 Wrong ignition timing</p> <p>G)混合器故障, 导致燃料过浓 Mixer failure leads to high gas concentration</p> <p>H)气温过高或海拔过高引起空气不足 high temperature or high altitude resulting in insufficient air</p> <p>I)发动机过载 Engine overload</p> <p>J)外或内部燃料泄漏 Gas leaks</p> <p>K)排气管受阻 Exhaust pipe blocked</p> <p>L)冷启动系统故障 Cold start system failure</p>	<p>处理方法: Approaches:</p> <p>A)查出原因/如果必要则更换 Find out the reasons, replace the air filter if necessary</p> <p>B)建议使用额定负载的 75%左右为最佳 Suggest the generator run at 75% of rated power</p> <p>C)见“冷却液温度低于正常温度”Please refer to the table“coolant temperature lower than normal temperature”</p> <p>D)调整/检查气门间隙 Check and adjust the valve clearance</p> <p>E)修理/重新调整 Repair/adjust the pressure regulator</p> <p>F)与经授权人员联系处理 Contact authorized maintenance personnel</p> <p>G)检查混合器 Check the mixer</p> <p>H)根据发动机销售手册中的修正方法进行修正 Adjust it in accordance with the instructions in the user manual</p> <p>I)检查额定功率和最大负载, 如果必要则降低负载 Check the power rating and maximum load , if necessary, reduce the load</p> <p>J)排除泄漏 Solve the leak problem</p> <p>K)检查排气管有无阻塞, 检查尺寸是否合适 check the exhaust pipe blockage and check whether the pipe size is appropriate or not</p> <p>L)安装冷启动装置, 检查、修理, 如果必要则更换 Install the cold start system, check and repair, if necessary, replace it.</p>
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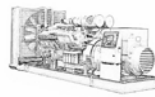
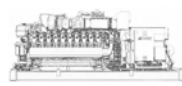


➤ **发动机敲缸 Engine Knocking**

<p>原因: Possible reasons:</p> <p>A)负载过大 Load is too large</p> <p>B)点火时间 Ignition timing</p> <p>C)冷启动系统故障 Cold start system failure</p> <p>E) 发动机温度过高 Engine temperature too high</p> <p>F) 气门间隙不对 Wrong valve clearance</p> <p>G)润滑油过多或使用的润滑油规格不对 Excessive lubricating oil or wrong type of lubricating oil</p> <p>H) 气门卡滞 Valve stuck and stagnated</p> <p>I)曲轴轴承磨损或损坏 Crank bearing wear or damage</p> <p>J)气门弹簧折断 Valve spring broken</p>	<p>处理方法: Approaches:</p> <p>A)检查机组额定功率和最大功率, 适当降低负载 Check the power rating and maximum load, reduce the load if necessary</p> <p>B) 与经授权人员联系处理 Contact authorized maintenance personnel</p> <p>C)安装冷启动装置, 检查、修理, 如果必要则更换 Install the cold start system, check and repair, if necessary, replace it.</p> <p>E)见“发动机温度超过正常温度” Please refer to “Engine temperature above normal temperature”</p> <p>F)调整/检查气门间隙 Check/adjust valve clearance</p> <p>G)查看使用手册中正确的润滑油容量和规格 Please refer to the instructions in the user manual</p> <p>H)清理/更换或重磨气门 Clean/replace/re-grind the valve</p> <p>I)更换曲轴轴承, 检查润滑油更换周期 Replace the crank bearing and check the lubricating oil replacing intervals</p> <p>J)更换气门弹簧 Replace the valve spring</p>
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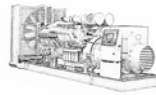
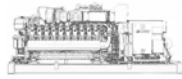
➤ **润滑油消耗率过大 Excessive lubricating oil consumption rate**

<p>原因: Possible reasons:</p> <p>A)涡轮增压器密封圈和轴承磨损 Turbocharger seal and bearing wear</p> <p>B)活塞环磨损或折断 Piston Ring worn or broken</p> <p>C)缸套和活塞磨损或拉伤 Cylinder and piston wear or damage</p> <p>D)润滑油牌号不对 Wrong type of lubricating oil</p>	<p>处理方法: Approaches:</p> <p>A)修理/更换涡轮增压器, 检查润滑油 Repair/Replace Turbocharger</p> <p>B)参看“活塞、活塞环、轴承和轴颈磨损” 更换周期 Please refer to “Pistons, piston rings , bearings and journal wear”</p> <p>C)见“活塞、活塞环、轴承和轴颈磨损” Please refer to “Pistons, piston rings , bearings and journal wear”</p> <p>D)更换润滑油/滤清器, 确保使用正确的润滑油 Replace the oil /oil-filter, be sure to use the correct oil</p>
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➤ **发动机运行不稳 Engine run not stable**

<p>原因: Possible reasons:</p> <p>A) 供气压力不稳定 Unstable Gas Pressure</p> <p>B) 供气和进气管路有堵塞现象 Gas supply and gas inlet pipe clogging</p> <p>C) 天然气混合器脏污 Dirty gas mixer</p> <p>D) 调速器调整/装配不对 Governor adjustment / assembly wrong</p> <p>E) 调速系统有干扰 Speed control system is disturbed</p> <p>F) 空气滤清器阻塞或型号不对 Blocking or wrong type of air filter</p> <p>G) 发动机转速控制系统运动部件卡滞 Engine speed control system moving parts stuck/stagnated</p> <p>H) 转速传感器故障 Speed sensor fault</p> <p>I) 发动机温度过高 Engine temperature is too high</p> <p>J) 气门间隙不正确 Incorrect valve clearance</p> <p>K) 润滑油过多, 或使用的润滑油品种牌号不对 Excessive lubricating oil, or incorrect type of lubricating oil</p> <p>L) 冷启动系统有故障 Cold start system fault</p> <p>M) 排气管堵塞 Exhaust pipe clogging</p> <p>N) 气门卡滞 Valve stuck/stagnated</p> <p>O) 气门弹簧折断 Valve spring broken</p> <p>P) 点火时间不正确 Wrong ignition timing</p> <p>Q) 天然气甲烷含量不足 Low methane content</p>	<p>处理方法: Approaches:</p> <p>A) 检查供气管路及检测产气压力 Check the gas supply pipeline and test gas pressure</p> <p>B) 检查/修理供气系统, 如果必要则更换 Check / repair the gas supply system , replace it if necessary</p> <p>C) 清理或更换天然气混合器 Clean or replace the mixer</p> <p>D) 调整/重新安装调速器 Adjust/reinstall the speed governor</p> <p>E) 检查隔离有可能干扰调速器工作的高压线或其他 Check and isolate the high-voltage cable which may interfere with speed governor's work</p> <p>F) 更换空气滤清器/确保安装型号正确的空气滤清器 Replace the air filter / Be sure to install the correct type air filter</p> <p>G) 检查排除 Check and troubleshoot</p> <p>H) 更换转速传感器 Replace a new speed sensor</p> <p>I) 见“冷却液温度高于正常温度” Please refer to “Engine coolant temperature high”</p> <p>J) 检查/调气门间隙 Check/Adjust valve clearance</p> <p>K) 检查并调整油量或更换润滑油品种、牌号 Check or adjust or replace the lubricating oil amount or grades</p> <p>L) 检查、修理冷启动装置, 必要时更换. Check/Repair cold start system, replace it if necessary</p> <p>M) 检查并排除堵塞。检查排气管尺寸是否正确 Check and eliminate clogging. Check whether the exhaust pipe size is correct or not</p> <p>N) 清理气门杆及导管孔 Clean valve stem and valve guider</p> <p>O) 更换气门弹簧 Replace a new valve spring</p> <p>P) 与经授权人员联系处理 Contact authorized maintenance personnel</p> <p>Q) 检查并校正 Check methane contents</p>
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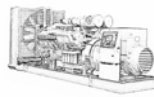
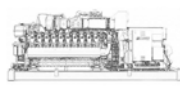


➤ **发动机振动 Engine vibration**

<p>原因: Possible Reasons:</p> <p>A) 天然气气质含量不稳定 Gas quality is not stable</p> <p>B) 转速控制系统有故障 Speed control system fault</p> <p>C) 转速传感器有故障 Speed sensor fault</p> <p>D) 天然气压力波动大 Gas pressure fluctuation is big</p> <p>E) 发动机装配故障 Engine assembly fault</p> <p>F) 点火时间不正确 Wrong ignition timing</p> <p>G) 飞轮壳、飞轮同轴度不符合要求 Flywheel housing and flywheel concentricity not meet the requirements</p> <p>H) 点火线圈、高压线故障 High voltage ignition coils failure</p> <p>I) 混合器有故障 Gas mixer fault</p>	<p>处理方法: Approaches:</p> <p>A) 检查并校正 Check the gas contents and correct it</p> <p>B) 检查调整并与经授权人员联系处理 Check and contact authorized maintenance personnel</p> <p>C) 检查更换传感器 Check and replace the speed sensor</p> <p>D) 检查并校正 Check the gas pressure and correct it</p> <p>E) 与授权修理人员联系 Contact authorized maintenance personnel</p> <p>F) 与授权修理人员联系 Contact authorized maintenance personnel</p> <p>G) 与授权修理人员联系 Contact authorized maintenance personnel</p> <p>H) 检查出有故障的更换 Check and replace the defective parts</p> <p>I) 调整或更换 Check or replace the mixer</p>
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➤ **发动机游车 Engine speed fluctuates when throttle is in a fixed position**

<p>原因: Possible reasons:</p> <p>A) 供气压力与气质含量不稳定 Unstable gas pressure and gas quality</p> <p>B) 混合器故障 Mixer fault</p> <p>C) 调速系统设置或故障 Improper speed control system setting or fault</p> <p>D) 转速传感器故障 Speed sensor fault</p>	<p>处理方法: Approaches</p> <p>A) 检查并校正 Check and correct</p> <p>B) 调整或更换 Adjust or replace the mixer</p> <p>C) 调整参数或更换 Adjust the setting parameters or replace a new speed control system</p> <p>D) 更换转速传感器 Replace a new speed sensor</p>
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➤ **活塞、活塞环、轴承和轴颈磨损、缸套磨损 Pistons, piston rings , bearings and journal wear , cylinder liner wear**

<p>原因： Possible reasons:</p> <p>A)空气滤清器和涡轮增压器之间漏气 Leak between the air filter and turbocharger</p> <p>B)天然气中含硫量太高 High sulfur content in natural gas</p>	<p>处理方法： Approaches:</p> <p>A)如果必要，更换零件。确保空气滤清器和涡轮增压器之间不会漏气 Replace the spare parts if necessary. Ensure that no leakage between the air filter and turbocharger</p> <p>B、检查天然气中的含硫量。最高含硫量不超过 200 毫克/m<sup>3</sup> Check the sulfur content of natural gas . Maximum sulfur content should not exceed 200 mg / m<sup>3</sup></p>
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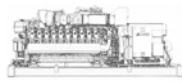
➤ **曲轴箱气压过高 Crankcase pressure is too high**

<p>原因： Possible reasons:</p> <p>A)通气管阻塞 Vent pipe blocked</p> <p>B)缸套磨损 Cylinder liner wear</p> <p>C)活塞环卡滞、磨损或折断 Piston ring stuck, worn or broken</p> <p>D)气门杆和/或气门导管磨损 Valve stem and/or valve guide wear</p> <p>E)活塞损坏 Piston damage</p>	<p>处理方法： Approaches:</p> <p>A)检查通气管是否阻塞 Check whether vent pipe is blocked</p> <p>B)见“活塞、活塞环、轴承和轴颈磨损” Please refer to “Pistons, piston rings , bearings and journal wear”</p> <p>C)见“活塞、活塞环、轴承和轴颈磨损” Please refer to “Pistons, piston rings , bearings and journal wear”</p> <p>D)更换气门和/或气门导管 Replace the valve stem and/or valve guide</p> <p>E)见“活塞、活塞环、轴承和轴颈磨损” Please refer to “Pistons, piston rings , bearings and journal wear”</p>
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➤ **压缩压力低 Low compression pressure**

<p>原因： Possible reasons:</p> <p>A)空气滤清器或进气系统阻塞 Air filter or intake system blocked</p> <p>B)气门间隙不对 Wrong valve clearance</p> <p>C)配气正时不对 Wrong valve timing</p> <p>D)气缸垫漏气 Cylinder gasket leak</p> <p>E)气门开闭不灵活 Valve opening and closing is not flexible</p> <p>F)缸套磨损 Cylinder liner wear</p> <p>G)气门和气门座之间漏气 Leak between the valve and valve seat</p> <p>H)活塞环卡滞、磨损或折断 Piston ring stuck, worn or broken</p>	<p>处理方法： Approaches:</p> <p>A)清理进气系统/更换空气滤清器 clean air intake system /change new air filter</p> <p>B)检查/调整气门间隙 check/adjust valve clearance</p> <p>C)调整至规定数据 Adjust valve timing to right data</p> <p>D)查看维修手册怎样测量平面度和更换气缸垫 Please refer to maintenance manual how to measure flatness and replace the cylinder head gasket</p> <p>E)清理、更换或重磨气门 Clean, replace or re-grind the valve</p>
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I)气门杆和/或气门导管磨损 Valve stem and/or valve guide wear J)气门弹簧折断 Valve spring broken	F)见“活塞、活塞环、轴承和轴颈磨损” Please refer to “Pistons, piston rings , bearings and journal wear” G)更换/重磨气门和气门座 Replace/regrind the valve and valve seat H)更换活塞环 Replace piston ring I)更换气门和气门导管 Replace the valve and valve guide J)更换气门弹簧 Replace the valve spring
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## 发电机部分 Alternator Troubleshooting Guide

### 机组运行时无电压输出 When generator in running, no output voltage

- 检查 AVR 之 K1-K2 接线是否正确及牢靠； Check whether K1-K2 wiring of AVR is correct and reliable;
- 检查天然气发电机组的转速； Check gas engine speed;
- 检查发电机的剩磁电压，必要时充磁； Check the remanence voltage of the alternator and, if necessary, magnetized the alternator;
- 按励磁分离试验法的步骤检查发电机和 AVR。 Check Alternator and AVR by excitation separation test method.

### 机组输出电压不稳定 Generator output voltage is unstable

- 检查机组的转速是否稳定； Check engine speed is stable or not;
- 检查稳定性的设置是否正确。 Check the stability setting is correct or not.

### 输出电压过高 Generator output voltage too high

- 检查机组的转速是否过高； Check whether engine speed is too high;
- 检查机组所带负载是否为容性负载（功率因数超前）。 Check whether generator's load is capacitive loads or not (power factor lead).

### 空载时电压过低 No-load with low voltage

- 检查机组的转速是否过低； Check whether engine speed is too slow;
- 检查 AVR 之 K<sub>1</sub>-K<sub>2</sub> 接线或外接手动微调是否连接完好。 Check the K1-K2 of AVR wiring or



check whether external manual fine-tuning is properly connected or not.

### 带载时电压过低 Voltage too low when generator under load

- 检查机组的转速是否正常； Check whether engine's speed is normal;
- 检查 AVR 之 UFRO 设定是否正确； Check whether the UFRO setting of AVR is correct;
- 按励磁分离试验法的步骤检查发电机 AVR 是否正常； Check AVR by excitation separation test method;
- 旋转二极管损坏。Rotating - diode is damaged.

## ≡ 电控部分 Electrical Control Troubleshooting Guide

当按下启动按键 **I** 时，机组不启动 When you press the start button **I**, the generator does not start

- 检查电源开关的连接是否良好 Check whether the power switch connection is good;
- 检查有否故障指示，必要时修复故障，并将对应故障信息复位 Check for any fault indications and, if necessary, repair the fault, and finally you should reset all these fault info;
- 检查电池电压，如电压太低，则需对电池重新充电到满，如电压值正常，则需按图纸逐步检查电压信号是否被正确送到所有控制环节，如油门电磁阀和启动马达等 Check the battery voltage, if the voltage is too low, you need to recharge the battery to full; if the voltage values is normal, you need to check whether the voltage signal is correctly sent to all control parts, such as the throttle solenoid valve, starting motor, etc.;
- 检查紧急停机按钮是否已放松 Check whether the emergency stop button has been relaxed.

当“START”信号正确输入，但手动/自动均无法启动 When the "START" signal is entered correctly, but in manual/automatic modes were unable to start

- 检查紧急停机按钮是否已放松 Check whether the emergency stop button has been relaxed 检查控制器电源是否正常 Check whether the controller power supply is normal
- 检查有否故障指示，必要时修复故障，并将对应故障信息复位 Check for any fault indications and, if necessary, repair the fault, and reset the fault information;



- 检查电池电压，如电压太低，则需对电池重新充电到满，如电压值正常，则需按图纸逐步检查电压信号是否被正确送到所有控制环节，如油门电磁阀和启动马达等 Check the battery voltage, if the voltage is too low, you need to recharge the battery to full; if the voltage values is normal, you need to check whether the voltage signal is correctly sent to all control parts, such as the throttle solenoid valve, starting motor, etc.;
- 如电控部分所有外联线没有问题，则应更换相应电控单 If all external wiring connections of electrical control parts are good, you should replace the corresponding electronic control unit.

### 高水温故障报警/停机 High temperature fault alarm /shutdown

- 检查机组是否过载 Check whether the generator is overload;
- 检查散热器是否堵塞 Check whether the radiator is blocked;
- 检查风扇皮带的松紧度 Check the fan belt tightness;
- 待机组完全冷却后，检查冷却水的水位是否足够 After the generator is completely cooled, check whether the water level in the cooling water is adequate;
- 检查水温传感器是否损坏 Check whether the water temperature sensor is damaged;
- 对 9902 电控系统，检查高水温报警/停机的设定限值是否正确合理 For 9902 electronic control system, check whether the high temperature alarm/shutdown set value limit is reasonable and correct;
- 检查节温阀能否正确打开 Check whether the thermostat valve opens correctly;
- 检查水泵与水箱间的间隙是否正确 Check the gap between the pump and the tank is correct or not;
- 确认机房内温度不高出 40 °C Confirm the generator room temperature is not higher than 40 °C

### 低油压故障报警/停机 Low oil pressure fault alarm /shutdown

- 检查机油油位 Check oil level
- 检查机油品质及粘度 Check engine oil quality and viscosity
- 检查机油温度 Check engine oil temperature
- 检查油压传感器是否损坏 Check whether the oil pressure sensor is damaged
- 对 9902 电控系统，检查低油压报警/停机的设定限值是否正确合理 For 9902 electronic control system, check whether the low oil pressure alarm/shutdown set value limit is reasonable and correct



- 检查机油滤清器及油路是否被堵塞 Check whether oil filter and oilway is clogged.

### 超速故障停机 Generator shutdown caused by overspeed

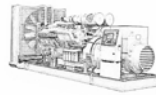
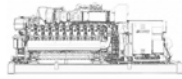
- 检查转速仪表指示有无异常 Check whether the speed meter is normal;
- 对机械式调速机构，检查油门拉杆是否灵活，并确保正确调节 For generator with mechanical governor, check in a right way to see whether the throttle lever is flexible;
- 对电子式调速系统，检查油门拉杆是否灵活，检查执行机构是否正确动作，并确保 EPG 正确调节 For generator with electronic governor, check whether the throttle lever is flexible and whether the actuator operates in a right way, also you should ensure proper EPG adjustment;
- 重新校正和调节超速保护限值 Recalibrate and re-adjust the over-speed protection limit value;
- 对 9902 电控系统，检查超速保护停机的设定限值是否正确合理 For 9902 electronic control system, check whether overspeed protection shutdown limit value is reasonable;
- 故障排除后，将控制屏上的报警信号复位 After troubleshooting, the control alarm signal should be reset.

### 电压高报警 High voltage alarm

- 测量机组输出电压的实际值 Measure the generator's output voltage actual value;
- 确认显示仪表没有偏差 Confirm the display instrument is normal;
- 如电压实际偏高，则可按步骤详细检查及重新调整 AVR If the actual output voltage is high, you can check and readjust the AVR;
- 确认负载性质为非容性，功率因数没有超前 Confirm that the load is non- capacitive load, and the power factor not advance;
- 确认机组转速/频率正常 Confirm whether generator's speed / frequency is normal;
- 如电压实值正常，可检查电压显示的电路部分是否正确 If the voltage real value is normal, check whether the voltage display circuit is correct;
- 对 9902 电控系统，检查电压高报警的设定限值是否正确合理 For 9902 electronic control system, check whether the voltage alarm set value limit is reasonable and correct.

### 电压低报警 Low-voltage alarm

- 测量机组输出电压的实际值 Measure the generator's output voltage actual value;



- 确认显示仪表没有偏差 Confirm the display instrument is normal;
- 如电压实际偏低，则可按步骤详细检查及重新调整 AVR If the actual output voltage is low, you can check and readjust the AVR;
- 确认机组转速/频率正常 Confirm whether generator's speed / frequency is normal;
- 如电压实值正常，可检查电压显示的电路部分是否正确 If the voltage real value is normal, check whether the voltage display circuit is correct;
- 重点检查发电机终端盒后壁上的三个熔丝是否正常及连接牢靠 Focus your attention to check whether the 3 fuses on the rear wall of alternator terminal box is properly and securely connected;
- 确认三相电压值没有较大偏差 Confirm there is no significant variances for three phase voltage value;
- 确认没有缺相现象 Verify there is no phase missing;
- 确认当发生报警时，负载变化幅度不大 Confirm when the alarm occurs, the load fluctuation is not big;
- 确认机组没有超负载运行 Confirm that the generator is not overloaded;
- 对 9902 电控系统，检查电压高低报警的设定限值是否正确合理 For 9902 electronic control system, check whether the voltage alarm set value limit is reasonable and correct.

### 机组不能带载 Generators cannot load

- 检查电压是否正常 Check whether the voltage is normal;
- 检查负载性质，确认没有超载及功率因数超前现象 Check the nature of the load , make sure that there is no overloading and power factor lead;
- 确认空气开关手柄向上及各项设定正确合理 Confirm air switch handle up and all settings are correct and reasonable;
- 对于配套了 ATS 的用户，应重点检查 ATS 及相关部分 For generators with ATS, you should focus on examination of ATS and relevant parts;
- 检查 ATS 控制转换的所有接线，并确保无误 Check all ATS control conversion wiring and be sure that they are rightly connected;
- 确认 ATS 转换控制开关没有在“MAINS”位置 Confirm that the ATS control switch is not in " MAINS " position;
- 当 ATS 转换控制开关在“AUTO”位置时，确认所接入市电没有正常电压 When the ATS control switch in the " AUTO " position, confirm that no normal voltage from the mains;
- 确认机组电力正确引入 ATS 之机组端 Verify that the generator power is correctly





introduced to generator end of ATS;

- 确认 ATS 之主交流接触器操纵灵活，无卡死现象 Confirm that the primary AC contactor of ATS can be flexibly handled, no phenomenon of stuck.

### 不能手动停机 Generator manual shutdown failure

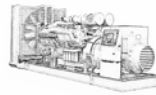
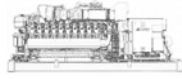
- 检查钥匙开关和控制开关的位置是否正确 Check whether the key switch and control switch position is correct;
- 确认电气控制部分全部正常 Make sure that the electrical control parts are all normal;
- 检查零压电磁阀是否正常（不能关断），必要时更换 Check whether zero pressure solenoid valve is normal ( not turned off) , and replace it if necessary;
- 对电子调速系统机组，确认电调 ECU 各项设定正确合理 For generators with electronic speed control systems, confirm that the settings of ESC ECU are reasonable;
- 对于 9902，确认机组是在手动模式下运行 For 9902, confirm that the generator is running in manual mode;
- 检查确认机组控制工作是否正常，必要时更换 Check whether generator's control units are working properly, and replace them if necessary.

### 自动模式下，机组无法实现自动停机 Generator shutdown failure in Auto mode

- 确认市电完全恢复正常 Make sure that the power from mains completely back to normal;
- 确认无市电感应器已动作 Confirm that no electricity sensor has been activated;
- 确认机组的自动停机延时已计完 Make sure the generator's automatic shutdown delay has been counted out;
- 检查零压电磁阀是否正常(不能关断),必要时更换 Check whether zero pressure solenoid valve is normal ( not turned off) , and replace it if necessary;
- 对电子调速系统机组，确认电调 ECU 各项设定正确合理 For generators with electronic speed control systems, confirm that the settings of ESC ECU are reasonable;
- 检查确认机组控制工作是否正常，必要时更换 Check whether generator's control units are working properly, and replace them if necessary.

### 不能实现远程监控 Remote monitor failure

- 确认监控软件已正确安装进远程 PC Confirm whether monitoring software is



properly installed into the remote PC;

- 确认监控界面之通讯参数设定与实际连接形式正确对应 Make sure that the communication parameter setting of monitoring interface correctly corresponds with the actual connection;
- 当为拨号方式的通讯时，确认机组端 MODEM 已被 9902 正确检测，确认远端 MODEM 设定正确 When for dial-up mode of communication, confirm whether generator-end MODEM has been detected correctly by 9902, verify that the remote MODEM are set correctly;
- 确认通讯线路正确可靠，无占线 Confirm correct and reliable communication lines , no busy signal;
- 确认机组端通讯口已正确连接通讯模块 Confirm generator-end communication port is properly connected with communication module;

#### **不能实现远程紧急停机 Generator remote shutdown failure**

- 确认已正常实现机组的远程通讯 Confirm whether remote communication has successfully achieved;
- 确认 9902 内已加装通信协议适配器,并正确连接 Confirm that adapter already installed in the 9902, and properly connected;
- 确认通信模块相关接线正确、无遗漏 Make sure the communication module related wiring is correct and complete;
- 确认机组为自动备用模式 Confirm that the generator in auto standby mode;
- 确认遥控密码正确输入 Confirm that the remote password is entered correctly.