

燃气电站技术规格书

Technical Specification for Natural Gas Power Station

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目 录

Content

| | |
|--|----|
| 1. 总则 General Principle..... | 4 |
| 2. 电站系统概述 Summary of Power Station System | 4 |
| 2.1 电站运行环境 Ambient Condition for Operation of Power Station | 4 |
| 2.2 电站基本规格 Basic Specification of Power Station | 4 |
| 3. 电站组成及功能 Composition and Functions of Power Station | 5 |
| 3.1、燃气发电机组（6套） Natural Gas Generator Set (6 Sets)..... | 5 |
| 3.1.1.1 机组主要参数 Main Parameters of Generator Set..... | 6 |
| 3.1.1.2 机组启动要求 Start Requirement of Generator Set | 6 |
| 3.1.1.3 机组运行方式 Running Mode of Generator Set..... | 6 |
| 3.1.1.4 机组调速性能 Governing Performance of Generator Set | 7 |
| 3.1.1.5 机组调压性能 Voltage Regulation Performance of Generator Set | 7 |
| 3.1.1.6 机组超载性能 Over Load Performance of Generator Set..... | 7 |
| 3.1.1.7 机组并车性能 Parallel Operation Performance of Generator Set..... | 7 |
| 3.1.1.8 机旁操作 Local Operation..... | 7 |
| 3.1.3. 发电机主要参数 Main Parameters of Generator..... | 10 |
| 3.1.4.机组控制柜 Control Cabinet of Generator Set..... | 10 |
| 3.1.5 消音器与排气管道 Silencer and Exhaust Pipe | 11 |
| 3.1.6 燃气管道 Natural Gas Pipe..... | 12 |
| 3.1.7 机组启动柜 GZ-B/3000A Start Cabinet of Generator Set GZ-B/3000A | 12 |
| 3.1.8 其它 Others | 12 |
| 3.1.9 机组用电负荷统计表 Electric Load Statistical Table of Generator Set | 13 |
| 3.2. 配套开关柜的技术条件 Technical Conditions of Switch Cabinet | 13 |
| 3.2.1 配置 Configuration..... | 13 |
| 3.3. 风冷水箱的技术条件 Technical Conditions of the Air-Cooled Radiator | 13 |
| 3.3.1 制作材料工艺 Material and Workmanship | 14 |
| 3.3.2 环境条件 Ambient Conditions..... | 14 |
| 3.3.3 技术要求 Technical Requirements | 14 |
| 3.3.4 结构形式 Structure Form | 15 |
| 3.3.5 设备参数 Parameter of Equipment | 15 |
| 3.3.6 质量检验 Testing On Quality | 15 |
| 3.4. 配套要求 Other Requirements..... | 16 |
| 3.5. 设备的通讯要求 Communication Requirements of Equipment..... | 17 |

4 供货范围 Scope of Supply..... 17

5. 试验与验收事项 Test and Acceptance 19

1. 总则

General Principle

1.1 本协议适用于 400V 天然气电站项目。

This technical specification is suitable for the project of natural gas power station 400V.

1.2 本电站供买方客户使用，总装机容量为 5MW (6X 1000 kW = 6 MW 满足要求，运行时五台并机使用，另一台备用)，气体机为 6 台 TBG620V16，发电机为 1FC6 562-LA4 (或同等功率性能)，额定电压为 0.4kV，频率 50Hz。

This power station for usage of buyer, total installation capacity is 5MW (6X1000kW = 6MW, which can meet the requirements, normally 5 generator sets parallel operation, another one standby), 6 sets of TBG620V16 natural gas engine, 1FC6 562-LA4 generator (or same power performance), rated voltage 0.4kV, frequency 50Hz.

1.3 按照中国国家标准 (GB)，制造厂企业标准以及制造厂选用的其它标准制造，并符合 ISO 及 IEC 的有关标准。

Manufacture according to the China national standard (GB), manufacturer standard and the other standards selected by manufacturer, and the relevant standards ISO&IEC.

2. 电站系统概述

Summary of Power Station System

2.1 电站运行环境

Operation Environment of Power Station

1) 环境温度: $\leq 40^{\circ}\text{C}$ ，最低温度 20°C

Environment temperature: $\leq 40^{\circ}\text{C}$, min. temperature 20°C

2) 相对湿度: $< 100\%$

Relative temperature: $< 100\%$

3) 海拔: $\leq 700\text{m}$

Altitude: $\leq 700\text{m}$

4) 位置: 有盐雾

Location: salt mist

5) 气候: 多雨

Climate: rainy

2.2 电站基本规格

Basic Specification of Power Station

1) 电站设备: 发电机组、辅助设施和监测控制设施。

Power station equipment: generator set, auxiliary facilities and monitoring and control facilities.

2) 电站总容量: 5MW。

Total capacity of power station: 5MW

- 3) 上网容量: 除去自用电及环境修正等因素, 保证 0.4kV 最大上网容量 $6 \times 1000 \text{kW} = 6 \text{MW} > 5 \text{MW}$ (功率因数 0.8)。

The access capacity: eliminated auxiliary power and ambient modified factors, ensure that 0.4kV max. access capacity $6 \times 1000 \text{kW} = 6 \text{MW} > 5 \text{MW}$ (power factor 0.8)。

- 4) 发动机设置超负荷限位保护。

Engine will be set overload limit protection.

2.3 燃气条件

Natural Gas Conditions

燃气经处理后应达到无液态成分 (不含游离水、轻烃), 燃气中杂质粒度小于 0.005mm , 含量不大于 $0.03 \text{mg} / \text{m}^3$; 总硫含量不大于 $200 \text{mg} / \text{m}^3$ 、硫化氢含量 $\leq 20 \text{mg} / \text{m}^3$; CH_4 含量 $\geq 76\%$ 。燃气进口压力 $100\text{-}400 \text{kpa}$ 。

Natural gas after treatment should be no liquid composition (no free water, light hydrocarbon), particle size of gas impurity less than 0.005mm and the content not more than $0.03 \text{mg} / \text{m}^3$; the content of total sulfur not more than $200 \text{mg} / \text{m}^3$, the content of hydrogen sulfide $\leq 20 \text{mg} / \text{m}^3$; the content of CH_4 76% . Natural gas inlet pressure: $100\text{-}400 \text{kpa}$.

3. 电站组成及功能

Composition and Functions of Power Station

该电站以燃气箱式发电机组为主要设备, 由 6 台 TBG620V16 (1000kW) 燃气箱式发电机组及其辅助设施组成, 运行时 5 台燃气箱式发电机组, 另外一台备用。

This power station, the box-type gas generator set as the main equipment, it consists of 6 TBG620V16 (1000kW) box-type gas generator sets and the auxiliary facilities, 5 generator sets operated parallel, another one standby.

3.1 燃气发电机组 (6 套)

Natural Gas Generator Set (6 Sets)

一台 TBG620V16 燃气发电机组、一台机组控制柜、一台辅助控制柜、一台断路器开关柜, 以及散热器和燃气进气装置。机组机油预供泵等装置电源, 由用户提供。

Includes 1 set of TBG620V16 natural gas generator set, 1 set of control cabinet for generator set, 1 set of auxiliary control cabinet, 1 set of circuit breaker switch cabinet, 1 set of radiator and 1 set of gas inlet device. Power supplied by the user for oil priming pump etc.

3.1.1. 发电机组

Generator Set

3.1.1.1 机组主要参数

Main Parameters of Generator Set

- 1) 额定功率: 1000kW

Rated power: 1000kW

注: 该参数基于以下标准参考状况 (ISO3046-1: 2002; ISO15550: 2002)

Note: this parameter is based on the following standard reference conditions (ISO3046-1: 2002; ISO15550: 2002)

- a) 大气压力: 0.1MPa

Air pressure: 0.1MPa

- b) 环境温度: 40 °C

Ambient temperature: 40 °C

- c) 相对湿度: 30 %

Relevant temperature: 30 %

- d) 冷却水进空冷器温度: 25 °C

Air cooler water inlet temperature: 25 °C

- 2) 额定电压: AC400V

Rated voltage: AC400V

- 3) 额定频率: 50 Hz

Rated frequency: 50Hz

- 4) 额定转速: 1500 r/min

Rated speed: 1500 r/min

- 5) 功率因数: 0.8

Power factor: 0.8

- 6) 相数: 三相四线制

Phases: three-phase four wire system

- 7) 柴油机与双轴承发电机为高弹性联轴器式联接。

Diesel engine and the double bearing generator are connected by flexible coupling.

3.1.1.2 机组启动要求

Start Requirement of Generator Set

- 1) 燃气机采用 DC24V 电马达启动。

Natural gas generator set will be started by DC24V electric motor.

3.1.1.3 机组运行方式

Running Mode of Generator Set

- 1) 机组运行方式为机组并网运行。

Running mode of generator set will be parallel operation.

- 2) 并网运行时的各机组可定负荷及可定功率因数运行。

In parallel operation, each generator set can be operated in constant load and power factor.

3.1.1.4 机组调速

Governing of Generator Set

- 1) 海茵茨曼 DC6 电子调速器
- 1) HEINZMANN DC6 electronic speed governor

3.1.1.5 机组调压

Voltage Regulation of Generator Set

- 1) 机组具备自动调压能力。

Generator set with automatic voltage regulation capability.

3.1.1.6 机组超载性能

Overload Performance of Generator Set

- 1) 机组具备超负载 110% 额定功率运行的能力，只在台架试验时运行；正常使用过程中，不允许超负荷运行。

Generator set can be operated in 110% rated power, running in the bench test only; the course of normal use, overload operation is not allowed.

3.1.1.7 机组并车性能

Parallel Operation Performance of Generator Set

- 1) 有功功率分配差度：10%

The distribution deference of active power: 10%

- 2) 无功功率分配差度：10%

The distribution deference of wattles power: 10%

- 3) 负载转移能平稳转移自动功率分配

Load can be transferred smoothly with automatic power distribution

3.1.1.8 机旁操作

Generator Side Operation

机组在机旁配有机组控制柜，可以完成机组的起机、停机、调速、监控、合闸、分闸、保护并机、解列、负荷分配、报警等功能。

Generator set will be equipped with local control cabinet, can execute start, stop, speed governing, monitoring, closing, opening, protection, paralleling, splitting, load distribution, alarm and other functions for generator set.

3.1.1.9 机组高低温水质要求

Requirements of High and Low Temperature Water Quality

高低温进出水温度，机组冷却系统补水量冷却循环使用软化水（硬度0.7 – 5.3me/l，pH 值6 – 8.5，添加乳化剂，温度低时考虑使用防冻液），由软化水箱提供。机组正常工作时，高温循环水温应保持在75 – 85 摄氏度范围内，最高出水温度不要高于90 摄氏度，低温循环水温不宜超过45 摄氏度，不低于15 摄氏度。发动机运行过程中，为防止出现爆燃，中冷器进水温度不得超过50 摄氏度。

High and low temperature circulating inlet and outlet water temperature, water supply cooling cycle of cooling system using soft water (hardness 0.7 5.3me/l, pH 6 - 8.5, adding emulsifier, using antifreeze at low temperature), provided by the soft water tank. The course of normal use, high temperature circulating water temperature should be maintained at 75-85°C, the highest outlet water temperature should not higher than 90°C, low temperature circulating water temperature should not exceed 45°C and not less than 15°C. In the engine running, in order to prevent deflagration, air cooler water inlet temperature should not exceed 50°C.

3.1.2 机组发电原理和本体技术参数

Generating Principle and Technology Parameters

3.1.2.1 发电原理

Generating Principle

利用天然气（主要成分是甲烷）与一定比例的空气压入多个气缸内，燃烧后产生的热力推动带有曲柄连杆机构的活塞往复移动，多个曲柄连杆机构将机械动能传递给飞轮，通过飞轮将动能传递给同轴上的发电机转子，转子转动切割定子间产生的磁力线，从而输出稳定的电能。

Press natural gas (mainly methane) and a certain proportion of air into multi-cylinder, the heat produced by burning to push the piston with the mechanism of crank and connecting rod reciprocating, multi-mechanism of crank and connecting rod transmit the mechanical kinetic energy to the flywheel, the kinetic energy to the coaxial generator rotor through the flywheel, the rotation of rotor cutting the magnetic lines between stator, thus the power output stably.

3.1.2.2 机组配置

Configuration of Generator Set

燃气发电机组采用1000GF (1000kW/0.4kv)燃气发电机组，配置由燃气发动机TBG620V16和1FC6 562-LA4低压发电机。机组采用德国海茵茨曼生产的数字点火控制器，配置德国海茵茨曼开发的空燃比系统和电子调速系统，同时运用先进控制策略和控制设备，采用先进的闭环电控技术、增压器前混合技术、稀薄燃烧技术，在排气系统中，采用灭火星消音器以确保排出的物质不含火源，从而保证二次燃烧引发的空中安全事故。按照GB2820-1997、JB/T

9583.1-1999 和IEC439 电工标准生产，执行ISO9001。

The gas generator set is 1000GF (1000kW/0.4kv) gas generator set which is produced by DEUTZ-MWM licensee, it consists of gas engine TBG620V16 and low voltage generator 1FC6 562-LA4. The generator set adopts digital ignition controller manufactured by HEINZMANN Germany, configures the air-fuel ratio system and electronic control system developed by HEINZMANN Germany, and utilizes the advanced control strategy and equipments, the advanced technologies of closed loop control, mixed before turbocharger, lean combustion, in the exhaust system, adopts the spark arresting silencer to ensure that the discharged material does not contain the fire, so as to ensure the accidents of the secondary combustion not happen. Manufacture according to the GB2820-1997, JB/T 9583.1-1999 and IEC439 electrical standard, implementation of ISO9001.

3.1.2.3 燃气发动机主要参数

Main Parameter of Gas Engine

- 1) 型号: TBG620V16
Type: TBG620V16
- 2) 型式: 四冲程/涡轮增压/中冷/空燃比控制/风扇冷却/火花塞点火
Mode: four stroke/turbo/air-cooled/air fuel ratio control/fan cooling/spark plug ignition
- 3) 缸径: 170mm
Bore: 170mm
- 4) 行程: 195 mm
Stroke: 195mm
- 5) 缸数: 16
Number of cylinders: 16
- 6) 转速: 1500 r/min
Speed: 1500 r/min
- 7) 基本功率: 1280 kW
Basic power: 1280 kW

注: 该参数基于以下标准参考状况 (ISO3046-1: 2002; ISO15550: 2002)

Note: This parameter is based on the following standard reference conditions (ISO3046-1: 2002; ISO15550: 2002)

- a) 大气压力: 0.1MPa
Air pressure: 0.1MPa
- b) 环境温度: 25 °C
Ambient temperature: 25 °C
- c) 相对湿度: 30 %
Relative humidity: 30 %
- d) 冷却水进空冷器温度: 25 °C

Air cooler water inlet temperature: 25 °C

8) 压缩比: 9.7:1

Compression ratio: 9.7:1

9) 转向: 顺时针 (从飞轮端看)

Direction of rotation: clockwise (from flywheel end)

10) 燃料类型: 天然气、煤层气、垃圾填埋气

Fuel type: natural gas, coal-bed methane, landfill gas

11) 中冷器最大进水温度: 50°C

Air cooler water inlet max. temperature: 50°C

3.1.3. 发电机主要参数

Main Parameters of Generator

1) 型号: 1FC6 562-LA4 (或同等功率性能型号)

Type: 1FC6 562-LA4 (or the same power performance model)

2) 型式: 无刷三相交流同步

Mode: brushless three-phase synchronous

3) 电压: 400 V

Voltage: 400 V

4) 频率: 50 Hz

Frequency: 50Hz

5) 转速: 1500 r/min

Speed: 1500 r/min

6) 功率因数: 0.8

Power factor: 0.8

7) 功率: 1200 kW

Power: 1200 kW

8) 转向: 顺时针 (从法兰端看)

The direction of rotation: clockwise (from flange end)

9) 防护等级: IP 23, 风冷

Protection level: IP 23, air-cooled

10) 绝缘等级: H 级

Insulation level: H

3.1.4. 机组控制柜

Control Cabinet of Generator Set

每台机组旁设机旁控制柜一台, 使用液晶显示屏和中英文操作界面, 具有机组起动、停车、升/降速、紧急停车、报警指示、自动/手动机油预供、缸温检测、风机控制、空燃比控制、并网控制等功能; 具备超速安全保护、机油压力过低安全保护、油温、水温度高报警等功能。

Each generator set has a control cabinet with LCD screen and Chinese/English operation interface, the control cabinet has the functions of generator set start, stop, speed up/down,

emergency stop, alarm, automatic/manual pre-oil feeding, cylinder temperature detection, fan control, air fuel ratio control, grid connected control etc.; with the functions of overspeed protection, oil pressure low protection, oil and water temperature high alarm.

空燃比控制系统

Control system of air and gas ratio

通过采集发动机运行的相关参数对空燃比进行精确的控制。其内部参数一般在机组出厂前或现场调试期内由乙方根据用户燃气气源情况已调整好，一般不需要改动。

Air and gas ratio will be controlled accurately via engine operation parameter collection. The internal parameters has generally adjusted by maker according to the user's gas supply situation before the generator set leaving factory or in local debugging period, generally do not need to change.

风冷控制系统

Air cooling control system

内置手/自动转换水温风机控制系统，该控制系统与风机本体的传感器信号线和风机电源接线由乙方配置并安装。

Built in manual/Automatic conversion water temperature fan control system, sensor signal wires of the control system and fan and the fan power wiring are installed and configured by Party B.

并网控制系统

Control system of on-grid

并网保护装置由功率管理模块进行管理。控制系统采用原装进口自动同步控制模块和软件，包括同步自检装置（并网），满足自动并网要求。控制系统装备进口原装自动同步控制模块，包括同步自检装置（并网），满足自动并网要求。

On-grid protector will be controlled by the power administration module. The control system adopts imported automatic synchronous control module and software, including synchronous checking device (grid), to meet the requirements of automatic grid. The control system equipped with imported automatic synchronous control module, including synchronous checking device (grid), to meet the requirements of automatic grid.

3.1.5 消音器与排气管道

Silencer and Exhaust Pipe

机组排气温度为600℃左右，排气管道为标称直径为DN300。

Exhaust temperature of generator set is 600℃, the nominal diameter of the exhaust pipe is DN300.

3.1.6 燃气管道

Gas Pipe

甲方满足乙方提供的机组燃气条件，乙方在机组进气侧加装过滤装置和机组专用阻火器，在机组本体与箱体间的燃气管道由乙方配置，并在箱外侧配置1套进气法兰（DN200），该管道和机组箱体密封性由乙方负责。

The buyer shall meet the gas conditions provided by maker, the maker will install filtering device in the air inlet side of the generator set and special flame arrester for generator set, the gas pipeline between generator set and the canopy is configured by maker, and equipped 1 set of air inlet flange (DN200) in the outside of the canopy, the maker should be responsible for the tightness of the pipeline in canopy.

3.1.7 机组启动柜 GZ-B/3000A

Start Cabinet of Generator Set GZ-B/3000A

乙方配置一台机组启动柜。启动柜功率：电源AC380/220V，功率72kW；外形尺寸：520mm宽×480mm深×800mm高。

The maker shall configure a start cabinet of generator set. Power of start cabinet: power supply AC380/220V, power 72kW; outline size: W×D×H 520mm×480mm×800mm.

3.1.8 其它

Others

机组启动要求：机组采用DC24V 直流电马达启动。

Start requirement of generator set: start by DC24V DC electric motor.

润滑油油耗与更换周期：发电功率与机油损耗不大于0.6g/kW，使用专业的燃气机组润滑油，第一次50小时更换机油，以后每运行500小时更换一次。正常运转应定期补充新润滑油，保证润滑油液面高度负荷要求。为避免使用不合格的机油造成机组损坏，机油更换的周期也可根据机油使用后的理化分析指标进行科学的判定。

Oil consumption and the replacement cycle: Generation power and oil consumption is not more than 0.6g/kW, using professional gas generator set oil, oil replacement after the first 50 hours operation, then replaced each 500 hours operation. The new lubricating oil should be added periodically under normal operation, to ensure the oil level reach the load demand. In order to avoid damage by use of the substandard oil, the oil change circle can also be a scientific determination according to the physical and chemical analysis index of the oil after use.

冷却系统除垢周期：一般每年进行一次彻底除垢。

Cooling system descaling cycle: in general every year conduct 1 time thorough cleaning.

年运行时间：乙方承诺机组年累计运转时间不低于6000时，气源原因除外。

Annual operating time: Party B promises generator set accumulative total running time of a year is not less than 6000h, except the gas source accident.

3.1.9 机组用电负荷统计表

Power Load Statistical Table of Generator Set

| 序号 No. | 名称 Designation | 功率/台 Power/Set | 单位 Unit | 数量 Quantity | 备注 Remark |
|-----------|--|-------------------|------------|----------------|---|
| 1 | 机油预供泵 Oil priming pump | 1.5kW | 台 Unit | 1 | 起动前短时工作 Short term work before start |
| 2 | 散热器 Radiator | 3kW | 台 Unit | 8 | 长期工作 Long term work |
| 4 | 高低温水泵 High low temperature water pump | 5.5kW | 台 Unit | 2 | 长期工作 Long term work |

3.2. 配套开关柜的技术条件

Technical Conditions of the Matching Switch Cabinet

每台机组配断路器柜一台，对机组进行保护。

Each generator set equipped with a circuit breaker cabinet to protect the generator set.

3.2.1 配置

Configuration

骨架外形尺寸：800mm 宽×1000mm 深×2200mm 高 外壳颜色由甲方提供。

Outline size of the skeleton: W×D×H 800mm×1000mm×2200mm shell color should be confirmed by buyer.

柜内主开关：采用知名断路器。

Main switch of the cabinet: famous circuit breaker.

机械寿命：不小于3 万次（以断路器的技术说明书和合格证上为准）。

Mechanical life: not less than 30000 times (as noted in the technical specification and certificate of the circuit breaker).

3.3. 卧式风冷水箱的技术条件

Technical Conditions of the Horizontal Air-Cooled Water Tank

机组的空气冷却系统由乙方配套提供，该组风机提供的风量满足机组在经济运行发电功率为1100kW 时的风量，保证长期稳定运行，卧式散热器成套装置型号：TBG620V16T（3300mm 长×2152mm 宽×2375mm 高）。

The air cooling system of generator set is supported by Party B, this group of fans should provide the air volume meet the demand of generator set working in economic operation power 1100kW, and ensure long term stable operation, horizontal radiator matching device model: TBG620V16T (L×W×H: 3300mm×2152mm× 2375mm).

3.3.1 制作材料工艺

Process of the Materials

该铜管铝翅片散热器采用大型空调常用的成熟的胀接工艺，水室两端采用铜钢焊接工艺；运用该技术生产的铜管铝翅片散热器系列产品，铜制散热管具有抗腐蚀、防结垢、不易堵塞等特点，外部与空调用铝箔牢靠胀接后整机具有重量轻、绿色无污染、散热效率高等优点，是传统全铜扁管或全铝扁管散热器产品的替代产品，散热管与卧式风冷水箱框架为可拆卸形安装。散热器（含风机）总成与发电机组采用法兰连接。

The copper tube aluminum fin radiator use of the mature expansion connecting process that is a common process of large air-conditioning, the both ends of the water chamber adopt welding process of copper and steel; the copper tube aluminum fin radiator series using this technology, the copper heat pipes with the characteristics of corrosion resistant, anti fouling, hard to be blocked etc., external and air-conditioning are expansion connected by aluminum foil firmly, the radiator has the advantages of light weight, green without pollution, high heat dissipation efficiency etc., it is the substitute product of the traditional radiator with flat copper pipe or aluminum pipe, the radiating pipe and the frame of horizontal air-cooled water tank are dismountable type installation. Radiator (including fan) connected with generator set by flange.

3.3.2 环境条件

Ambient Condition

散热器在环境温度: < +45℃

Radiator at ambient temperature: <+45℃

相对湿度: 相对湿度 < 80% (20℃时)

Relative humidity: <80% (20 °C)

海拔高度: ≤1000

Altitude: ≤ 1000

机组在标准环境、额定工况下运行，散热器能够满足机组冷却的要求。

Generator set is operating under the standard environment, rated conditions, the radiator can meet the cooling requirements.

3.3.3 技术要求

Technical Requirement

散热器达到的技术要求:

The radiator meets these technical requirement:

高温水流量: 816.7L/min

High temperature water flow: 816.7L/min

低温水流量: 900L/min

Low temperature water flow: 900L/min

散热器表面漆颜色: 乳白色

The paint color of the radiator surface: white

散热器风扇开启为手/自动转换温度控制

Radiator fan open by manual/automatic conversion temperature control

散热器部件为室外安装, 满足防水、防尘等要求

Radiator components are installed outdoor and met the requirements of waterproof, dustproof etc.

在高温循环水出发动机进卧式散热器水温度不高于90℃时, 在低温循环水出发动机进卧式散热器水温度不高于50℃时(以上数据为标准环境数据, 根据外界环境温度的变化, 温度等参数可能有所变化)。

In the high temperature circulating, the temperature of the water from engine into horizontal radiator is not higher than 90℃; in the low temperature circulating, the temperature of the water from engine into horizontal radiator is not higher than 50℃ (the above data as the standard data, the temperature may change according to the change of environmental temperature).

3.3.4 结构形式

Structure Form

高低温上下叠加卧式结构。

Horizontal structure with high and low temperature circle overlapping.

3.3.5 设备参数

Device Parameter

风机要求采用防水、防尘低噪低转速高绕组电机, 每台散热器配电动风机, 参数如下:

The requirements of Fan are waterproof, dustproof, low noise and speed, high winding motor, each radiator equipped with electric fan, parameters are as follows:

电机功率: 3KW

Motor power: 3KW

电机电压: 380V

Motor voltage: 380V

3.3.6 质量检验

Test on Quality

散热器气密性检查;

Radiator air tightness check;

散热器尺寸检查;

Radiator size check;

风量检查。

Air volume check.

因各地水质不同，为延长散热器使用寿命，特别注明要加注PH值在6-8之间散热器专用软化水。

Because of the local water quality vary, for prolong the service life of the radiator, special warned to inject the special radiator soft water with PH value within 6-8.

随机文件及技术资料：机组所有随机文件及技术资料，包括铭牌、设备使用维护说明书、零部件图册、电气接线图、机组安装空间尺寸要求及安装方位要求、合格证书等。

Attachment documents and technical data: all attachment documents and technical data of the generator set, including the nameplate, equipment use and maintenance instruction, spare parts list, electrical wiring diagram, requirements of installation space size and position, certificates etc.

3.4. 配套要求

Other Requirements

3.4.1 机组燃气系统安装于发动发电单元内，配置了阀门、、电磁阀、流量阀、混合器、阻火器等。

Gas system of generator sets are installed inside generating unit, equipped with valve, solenoid valve, flow valve, mixer and back-fire relief valve.

3.4.2 工作资料

Working data

技术协议确定后，乙方向甲方提供设计用工作资料：机组基础图，

The maker will supply working data such as basic diagram of generator set after technical specification confirmed by both sides.

机组箱体各出口定位尺寸图、外形图。

Every outlet dimension drawing and outline drawing of generator set

3.4.3 随机文件及技术资料

Documentation and technical data

1) 随机技术文件（含控制柜与高压柜控制原理图） 1 本/机

Documentation (include schematic diagram of control cabinet and high voltage cabinet) 1 copy/set

2) 燃气机、发电机组合格证书 各1 份/机

Quality certificate for gas engine and generator each 1 copy/set

| | |
|--|--------------|
| 3) 备件图册 | 1 份/机 |
| Spare parts catalogue | 1 copy/set |
| 4) 燃气发动机使用维修说明书 | 2本/机 |
| Service manual of gas engine | 2 copies/set |
| 5) 机旁控制箱电气原理图及外部接线图、说明书 | 2 套/机 |
| LOP schematic diagram, wiring diagram and manual | 2 copies/set |
| 6) 燃气发动机组使用说明书 | 1 本/机 |
| Operation manual of gas engine | 1 copy/set |
| 7) 装箱清单 | 1 份/机 |
| Packing list | 1 copy/set |

3.5. 设备的通讯要求

Communication Requirement of equipment

机旁控制柜和高压进线柜具有远传通讯接口（标准RS485 或配其转换接口），可以通过MODBUS 通讯协议至集控台，实现中央监控。监控参数：高温冷却水进、出水温度；低温冷却水进、出水温度；发动机转速；排温；机油温度；机油压力；机组有功和无功功率；频率；电压；电流；合闸/分闸指示；分项故障报警指示；机组停机。

Local control cabinet and the high-voltage lines into the cabinet with a remote communication interface (standard RS485 or with the conversion interface), through the MODBUS protocol to the console, actualize central Monitoring and controlling.

Parameter monitor: high temperature cooling water inlet, water outlet temperature, low temperature cooling water inlet and outlet temperature, engine speed, exhaust gas temperature, oil temperature, oil pressure; the active and inactive power, frequency, voltage, current, closing/opening indicator, partial failure alarm indication, stop of generator set.

4 供货范围

Scope of Supply

| 序号 No. | 名称 Description | 型号规格 Type or specification | 数量 Qty | 备注 Remark |
|-----------|--|----------------------------------|--------------|--------------|
| 一 | 发电单元 Generating unit | | | |
| A | 机组本体及其各接口 Generator set and interface | | | |
| 1 | 发动机 Gas engine | TBG620V16 | 6台 6 sets | |
| 2 | 发电机 Generator | 1FC6 562-LA4 | 6台 6 sets | |

| | | | | |
|---|--|--|-----------------|-----------------|
| 3 | 高弹性联轴器 Flexible coupling | | 6套 6 sets | |
| 4 | 发电机组底座 Common frame | | 6套 6 sets | |
| 5 | 法兰、弯头 Flange and bend | DN40 、 DN80 、 DN250等 | 6套 6 sets | |
| 6 | 机油预供泵 Oil priming pump | | 6套 6 sets | |
| 7 | 减震块 Resilient mountings | | 6套 6 sets | |
| B | 电气部分 Electrical unit | | | |
| 1 | 机组控制柜 Control cabinet | | 6台 6 sets | |
| 2 | 辅助配电柜 Auxiliary switchboard cabinet | | 6台 6 sets | |
| 3 | 断路器开关柜 Breaker switchboard cabinet | | 6台 6 sets | |
| 4 | 电力电缆 Electricity Cable | YJVR-0.6/1.0kV 1×185mm ² | 1200米 1200 m | 机组到负载之间电缆由甲方负责。 |
| 5 | 控制电缆 Control cable | | 6套 6 sets | |
| 6 | 铜接线端子 Copper terminal | 185mm ² | 140个 140 pcs | |
| 7 | 电缆填料函 Gland of cable | | 1套 1 set | |
| C | 冷却 Cooling system | | | |
| 1 | 散热器 Radiator | | 6台 6 sets | |
| 2 | 高温水泵 HT water pump | | 6台 6 sets | |
| 3 | 低温水泵 LT water pump | | 6台 6 sets | |
| D | 排气系统 Exhaust gas system | | | |
| 4 | 消音器 Silencer | AR300 | 6台 6 sets | |
| 5 | 排气管路 Exhaust gas pipeline | | 6套 6 sets | |
| E | 进气系统 Air intake system | | | |
| 1 | 阀门 Valve | | 6套 6 sets | |
| 2 | 过滤器 Filter | | 6台 6 sets | |

| | | | | |
|---|-------------------------------|-------|----------------|---|
| 3 | 电磁阀 Solenoid valve | | 6台 6 sets | |
| 4 | 流量阀 Flow quantity valve | | 6台 6 sets | |
| 5 | 混合器 Mixer | | 6台 6 sets | |
| 6 | 阻火器 Back-fire relief valve | | 6台 6 sets | |
| 7 | 其他配套件 Others | | 6套 6 sets | 气源到发电单元燃气入口之间管道由甲方负责 Pipeline from gas source to inlet of gas generator sets should be made by buyer |
| F | 启动系统 Starting system | | | |
| 1 | 启动柜 Starting cabinet | | 2台 2 sets | |
| 2 | 蓄电池 Charging battery | 195Ah | 12组 12 sets | |
| 二 | 集控单元 Control unit | | | |
| 1 | 集控台 Console | | 1台 1 setg | |

5. 试验与验收事项

Test and Acceptance

乙方负责发电机组的调试及指导安装工作。

The maker will be responsible for commission and guide to installation.

乙方在机组出厂前对机组设备进行组装调试，以保证机组出厂后的稳定运行。机组出厂试验前一周内乙方通知甲方派人进行出厂前的验收，验收标准按照工厂相关标准执行。验收后乙方向甲方传真发货详细清单，包括主件、附件、备品备件、专用工具、技术资料、调试报告、合格证、协议中配套电缆及其附件等，乙方所有清单上的物品应一次性到货，便于乙方快速安装调试。

The maker will execute commission of generator set before ex-works ensure reliable operation after delivery. The maker will inform the buyer to take part in test and acceptance before test in factory in 1 week, test and acceptance according to factory 's standard. After test and acceptance, the maker will send the detailed packing list to buyer, includes main equipment, accessories, spare parts, special tools, documentation, test record, quality certificate and other accessories, the buyer will check the scope of delivery according to packing list so that quick installation and commission.

甲方提供符合机组运行要求的燃气、冷却水（或防冻液）及其他机组

The buyer or user must provide gas, cooling water (or anti-freeze fluid) or other auxiliaries according to maker's requirement.

试验必须的条件，设备安装完成后乙方负责空载试验，单机试验时间1 小时，试验项目包括机组的起动性能、空载特性、外观，发动机超速及低油压试验等。空载试验合格后双方在试验项目验收结果处签字。

Necessary test requirement, the maker will be responsible for no load test after installation, single operation 1 hour. Test includes starting performance, no load performance, exterior feature, over speed and low oil pressure etc, the test record should be signed to confirm by both sides after no load test.

空载试验合格后进行带负载试验，同时由甲方负责与当地电力部门协商，确定具体并网调试日期。试验中甲乙双方人员共同参与。

Load test will be done after no load test, meanwhile the buyer or user will be responsible for negotiation with Local Electric Dpt. to confirm the date of on-grid. Both sides will take part in test.

单机试验时间为48 小时，试验项目包括机组的起动、负荷、运行稳定性、自动同步等。并网运行试验穿插于单机试验中，试验项目包括机组自动同步并网、合闸，带载工况下的满负荷特性、持续负荷特性等。负载试验完毕后，双方在验收单上签字。发电机组经空载试验，带负载试验，单机运行试验，并网运行试验完成后，满负荷（90%）连续运行72 小时（或者根据气量情况调整）视为调试验收合格。甲乙双方共同签字确认。

Single operation test will be 48 hours, include start, loading, steady operation, automatic synchronization. On-grid test will be inserted to single operation test, include automatic on-grid, close, full load operation, continuous loading test. Test record will be signed by both sides after test finish. After finish no load test, load test, single operation test, on-grid test, full load (90%) continuous operation for 72 hours (or according to gas supply condition), that means eligible test. Both sides sign to confirm.

双方约定的其它事项

Others

乙方负责供货范围内设备的运输，其过程中安全由运输车辆所属单位负责，在施工现场内，甲方负责。

The maker will be responsible for safety of equipment before delivery, the buyer will be responsible for safety of equipment after received equipment, include in the period of local installation.