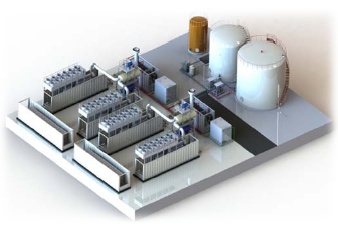
**5\*25MW Rental Power Plant Proposal**

**5\*25MW租凭电站方案**

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# GENERAL DESCRIPTION总则

1.1 GENERAL综述

（1）Scheme For Power plant 电站方案

According to user requirements: Rent 74.5MW generator set for power supply, 11KW 50Hz, power supply scheme is as follows:

The power station consists of 7 MAN10L3244, The 5MW dual-fuel generator set consists of 3 wartsila 12V46,10.5MW dual-fuel generator set +1 Mitsubishi 18KU30B,5MW dual-fuel generator set +1 Rolls-ROYCE BB3345 3.5MW dual-fuel generator set.

Total power :5MW\*7 +10.5MW\*3 +5MW\*1 +3.5MW=74.5MW

根据用户要求:租凭74.5MW发电机组,用于供电, 11KW 50Hz,供电方案如下:

发电站由7台MAN10L3244, 5MW双燃料发电机组和3台wartsila 12V46 ,10.5MW双燃料发电机组+1台三菱18KU30B ,5MW双燃料发电机组+1台Rolls-ROYCE BB3345 3.5MW双燃料发电机组组成.

总功率:5MW\*7台+10.5MW\*3台+5MW\*1台+3.5MW=74.5MW

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 序号No | 型号 参数TYPE DATA | 6000hr年90%发电量Annual output KWhr | 租金率rent rate RMB/KW,YEAR | 年租金Annual rent RMB/YEAR | 租期lease  年year | 总租金 total rent RMB |
| 1 | 5台MAN10L3244, 5M W双燃料发电机组=25MW | 150,000,000 |  |  | 5 |  |
| 2台wartsila 12V46 10.5MW+BB3345 3.5MW双燃料发电机组=24.5MW | 147000000 |  |  | 5 |  |
| 2台MAN10L3244, 5MW+ 1台wartsila 12V46 10.5MW+1台18KU30, 5MW双燃料发电机组=25MW | 150,000,000 |  |  | 5 |  |
| 合计74.5MW | 447,000,000 |  |  | 5 |  |
| 2 | 支付方式:预付2年租金,并提供5年租金毎年无条件支付的中国银行保函为押金,设备归还后.退回一年租金.  租期:5年时间从送达上海港起计算,直至送回到上海港止.  Payment terms: prepay the rent for two year, and provide the bank of China guarantee to pay the rent for five years every year unconditionally as the deposit, after the equipment is returned. Give back one year's rent.  Lease term :5 years from delivery to Shanghai port until return to Shanghai port. | | | | | |
| 3 | 海运,安装和材料,油罐,厂房基建,消防,照明,吊装,调试:需方负责.  5年租期满送回上海港:需方负责.  维保:日常保养由需方负责.  零备件:需方按实际购买.  供方调试工程师国内外往返机票、工作地的食宿、交通、医疗(28天隔离)等由需方承担。  Shipping, installation and materials, oil tanks, plant infrastructure, fire fighting, lighting, lifting, commissioning: buyer's responsibility.  Return to Shanghai port after 5 years of lease: buyer's responsibility.  Maintenance: The buyer is responsible for daily maintenance.  Spare parts: buyer according to the actual purchase.  Round-trip air tickets, accommodation, transportation and medical treatment (28 days isolation) of the supplier's engineers at home and abroad shall be borne by the buyers. | | | | | |
|  |  | | | | | |

## 1.2 DESIGN CONDITION AND PERFORMANCE DATA设计条件和工作特性

**(1) DESIGN AMBIENT CONDITION**

Refer to ISO 3046

The standard environmental condition:

|  |  |
| --- | --- |
| Environmental temperature | 25℃ |
| Barometric pressure | 1bar |
| RH (relative humidity) | 30％ |
| Gross Output AT Generator Terminal | 107.64MW |
| Fuel consumption at Generator Terminal | 189g/kW.h，tolerance +5% |
| Note: Tolerance + 5%, LCV= 42700 kJ/kg, Load 100%, 50 Hz, PF = 0.8 | |

**(1)设计环境条件**

参考ISO 3046

标准环境条件:

|  |  |
| --- | --- |
| 环境温度 | 25℃ |
| 大气压力 | 1bar |
| 相对湿度 | 30％ |
| 发电机端总输出功率 | 107.64MW |
| 发电机端的燃油消耗率 | 189g/kW.h，公差 +5% |
| 注：公差+ 5%，低热值=42700 kJ/kg， 100%负荷，50 Hz，PF = 0.8 | |

## 1.3 FUEL OIL FOR ENGINE发动机用的燃油

(1) HFO and DO

The viscosity of Diesel oil shall be of≥2 -15cSt at Engine inlet under the power plant operating.

(1) 重油/**柴油**

发动机运行时的柴油机进口柴油的粘度应该在≥2-15cSt

重油180燃料油质量标准  
项 目 限 度 检验方法  
密度（15℃，kg/l） 不高于0.985 ASTM D1298  
运动粘度（50℃，CST） 不高于180 ASTM D445  
灰分（m/m，%） 不高于0.10 ASTM D482  
残碳（m/m，%） 不高于14 ASTM D189  
倾点（℃） 不高于24 ASTM D97  
水分（V/V，%） 不高于0.5 ASTM D95  
闪点（℃） 不低于66 ASTM D93  
含硫（m/m，%） 不高于1.5 A STM D4294/D1552  
总机械杂质含量（m/m,%） 不高于0.10 ASTM D4870  
钒含量（PPM） 不高于150 ICP

轻柴油DO

|  |  |  |
| --- | --- | --- |
| Component | Unit | Value |
| 比重 (15°C) |  | 0.847 |
| 粘度 (30°C) | cst | 5.2 |
| 粘度 (100°C) | cst | 1.0 |
| 倾点 | °C | -5 |
| 闪点 | °C | 50 |
| 硫 | %wt | ≤0.5 |
| 水 | %wt | 0.02 |
| 钠 | ppm | 1.90 |
| 钾 | ppm | 2.40 |
| 钒 | ppm | 3.17 |
| 铅 |  |  |
| 低热值 | Kcal/kg | 10140 |
| 灰尘 | %wt | 微量 |

天然气

|  |  |  |
| --- | --- | --- |
| Item | Unit | Data |
| CO2 | %vol | 0.37 |
| N | %vol | 1.59 |
| CH4 | %vol | 97.64 |
| C2H6 | %vol | 0.40 |
| C3H8 | %vol | 微量 |
| i-C4H10 | %vol | 微量 |
| n-C4H10 | %vol | 微量 |
| 低热值 | Kcal/Nm3 | 7960 |
| 比重 |  | 0.568 |
| 温度 | ℃ |  |

(2)Exhaust qas and environmental impact mitiaatory svstem减排和降污染系统

Air pollution prevent防治空气污染

All diesel engines for the power plant are acquired international air pollution prevent certificate according to the provisions of Annex VI of the international Convention for the Prevention of Pollution from ships, 1973, as modified by the Protocols of 1978 and 1997 relating thereto and of the Technical Code on Control of Emission of Nitrogen Oxides From Marine Diesel Engines.

所有的柴油机均通过了 1973年国际防治船舶污染公约附则VI , 1978年和1997年修正案及船用柴 油机氮氧化物排放控制技术规则的国际防治空气污染证书。

Emission data as follows:排放参数

Applicable Nox emission limit (regulation 13 of Annex VI): 12.5g/kWh

规定Nox排放量(附则VI第13款)：12.5g/kWh

Engine's actual Nox Emission Value: 9.69g/kWh

柴油机实际Nox排放量：9.69g/kWh

10L3244 is Tier 2. The diesel engine has passed DNV test and has DNV certificate.

After exhaust SCR installation, it reaches Tier 3.

10L3244为 Tier 2,柴油机通过DNV测试,具有DNV证书,

配置尾气SCR装罝后,达到 Tier 3.



Noise噪音

The mechanical noise beside the diesel engine at a distance of 1 m is 112 dBA. The mechanical noise will be proofed and reduced by the main building.<85dbA

距柴油机1m处的机械噪音为112 dBA,主建能够筑起到隔离和减弱噪音的作用<85dbA。

The exhaust gas noise is reduced through a residential type silencer to 70dBA at a distance of 1 m. The exhaust gas from diesel generator flows to exhaust gas pipe (DN600), pass a tee joint, and then divides two ways. One flows to silencer through a butterfly valve, another flows to exhaust gas boiler. When the exhaust gas boiler works, the butterfly valve for silencer will close and the butterfly valve for exhaust gas boiler will open, and then exhaust gas will vent from the chimney on the boiler. When the boiler cannot work normally or the boiler need to be stopped, the butterfly for boiler will close and the butterfly valve for silencer will open, and then exhaust gas will vent from the chimney on the silencer.

住宅式消音器将排气噪音在1m处降至70dBAo排烟管(DN600),经T型接头分别与消音器蝶阀和废 气锅炉蝶阀连接。当废气锅炉工作时，消音器的蝶阀关闭，废气锅炉的蝶阀开启，废气经过废气锅炉 的烟囱排出。当废气锅炉不能正常工作，或需停止工作时，废气锅炉蝶阀关闭，消音器蝶阀开启，废 气通过消音器上的烟囱排出。

8 steam exhaust gas boilers are arranged for the power plant. One exhaust silencer (Residential type) is fitted to the each generator.

电站配置8台废气锅炉。每台机组配一个低噪音排气消音器。

## 1.4 LUBRICATING OIL FOR ENGINE发动机用的润滑油

The Lubricating oil for engine shall be selected from the list of recommended lubricating oil for engine, which shall be of SAE 40.

发动机用润滑油应该从发动机的推荐润滑油列表中选择，SAE 40。

## 

## 1.5 COOLING WATER FOR ENGINE发动机冷却水

The cooling water system is designed for using normal fresh water with corrosion inhibitor, in order to prevent incrustation and corrosion attack.

The following water quality shall be valid:

**For Engine (circulation water)**

|  |  |  |  |
| --- | --- | --- | --- |
| Property/ feature | Characteristics | Unit | Remark |
| Type of water | Distillate or freshwater, free from foreign matter.  Not to be used: Sea water, brackish water, river water, brines, industrial waste water and rain water | - | 1) 1°dH (German hardness):  10mg CaO/litre  17.9mg CaCO3/litre  0.357mval/litre  0.179mmol/litre  2) 1 mg/l 1 ppm |
| Total hardness | max. 10 | °dH 1) |
| PH-value | 6.5 - 8 | - |
| Chloride ion content | max.50 | mg/l 2) |

为了防止水锈和腐蚀，冷却水系统采用带有防腐剂的淡水。

以下是水质要求:

**发动机（循环水）**

|  |  |  |  |
| --- | --- | --- | --- |
|  | 要求 | 单位 | 备注 |
| 水的类型 | 蒸馏水或淡水，无杂质。  不能用：海水、淡盐水、河水、卤水、工业废水和雨水 | - | 1) 1°dH (德国硬度):  10mg CaO/litre  17.9mg CaCO3/litre  0.357mval/litre  0.179mmol/litre  2) 1 mg/l 1 ppm |
| 总硬度 | max. 10 | °dH 1) |
| PH值 | 6.5 - 8 | - |
| 氯离子含量 | max.50 | mg/l 2) |

## 1.6 STANDARDS标准

Unless there are specified standards or codes, all design, manufacturing, quality control and tests shall be in accordance with the applicable portions of below listed prominent international and national Standards and Manufacturer's Standards :

-MAN GB Chinese standards

除非有规定的标准和编码，所有的设计、制造、质量控制和测试应该与以下列出的国际、国家标准和制造商保准一致。

- MAN GB 中国国家标准

## 1.7 UNIT AND LANGUAGE单位和语言

**(1) Units**

In all correspondences of technical documents, schedules and drawings, metric units of all measurements shall be used.

**(2) Language**

The english language shall be used in all documents, drawings, name plates and correspondences between contractor and owner.

**(1)单位**

所有来往的技术文档、计划表和图纸中的测量值均采用公制单位。

**(2)语言**

承包人和业主之间，所有的文档、图纸、铭牌和函件均应采用英文。

## 1.8 TEST AND INSPECTION测试和检验

**Site test**

Owner shall perform commissioning and start-up with Contractor's technical assistance. Followings shall be checked before or during commissioning;

- Installation check

- Engine & generator coupling and alignment check

- Test to prove correct operation of interlocks, alarm and tripping circuits

- Safety device check

The performance test procedure will be submitted to the Owner.

在承包商的技术支持下，业主完成调试和启动。在调试前和调试期间检查项目如下：

-安装检查

-发动机和发电机的连接和定位检查

-测试为证明互锁、报警和脱扣的正确操作。

-安全设备检查

性能测试程序提交业主。

## 1.9 PAINTING涂装

All equipment will be painted in accordance with manufacturer's standard and painting color will be informed to the Owner.

所有设备的涂装依据制造商的标准，喷漆颜色通知业主。

# 2. CONFIGURE OF POWER PLANT SYSTEM电站系统配置

Configure of power plant system contains as follows:

|  |  |
| --- | --- |
| 1 | Generating sets |
| 2 | Mechanical auxiliary system |
| 3 | Electrical auxiliary system |

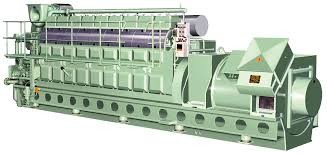
电站系统配置包含以下内容：

|  |  |
| --- | --- |
| 1 | 发电机组 |
| 2 | 机械辅助系统 |
| 3 | 电气辅助系统 |

## 2.1 GENERATING SETS发电机组

2.1.1  7sets MAN 10L3244

MAN Gen-set The generating sets mainly include engine, duplex bearing generator, high elasticity shaft coupling and public housing. Diesel and duplex bearing generator are connected by high elasticity shaft coupling, which are also supported and fixed by common bed.



Function of generating sets:

Rated power ---------------------------------------------------------------5400kW

Rated speed ---------------------------------------------------------------750rpm

Rated voltage --------------------------------------------------------------11kV

Rated frequency -----------------------------------------------------------50Hz

PF(Power factor) ----------------------------------------------------------0.8（lagging）

Boundary dimension）---------------------------------------------------约12750×3635×4840（mm）

Dry weight -------------------------------------------------------------------95 t

Steady-state voltage adjusting rate -----------------------------------≤2.5%

Transient voltage adjusting rate ---------------------------------------+20%~-15%

Sudden load changing voltage steady time ------------------------1.5S

Voltage fluctuation rate --------------------------------------------------0.5%

Steady-state frequency adjusting rate -------------------------------≤0.5%

Transient frequency adjusting rate -----------------------------------+10%~-7%

Sudden load changing frequency steady time ---------------------≤5S

Frequency fluctuation rate ----------------------------------------------≤0.5%

Waveform distortion ------------------------------------------------------≤3%

发电机组主要包含发动机、双轴承发电机、高弹性联轴器和公共底盘。发动机和双轴承发电机通过高弹性联轴器连接，被安装固定在公共底盘上。

额定功率---------------------------------------------------------------------5400kW

额定转速---------------------------------------------------------------------750rpm

额定电压--------------------------------------------------------------------11kV

额定频率--------------------------------------------------------------------50Hz

功率因数--------------------------------------------------------------------0.8（lagging）

外形尺寸（长x宽x高）-----------------------------------------------约12750×3635×4840（mm）

干量--------------------------------------------------------------------------95t

稳态电压调整率------------------------------------------------------------≤2.5%

瞬态电压调整率------------------------------------------------------------+20%~-15%

电压恢复时间---------------------------------------------------------------1.5S

电压波动率-------------------------------------------------------------------0.5%

稳态频率调整率-------------------------------------------------------------≤0.5%

瞬态频率调整率------------------------------------------------------------+10%~-7%

频率恢复时间---------------------------------------------------------------≤5S

频率波动率------------------------------------------------------------------≤0.5%

波形畸变率------------------------------------------------------------------≤3%

**Engine**

|  |  |
| --- | --- |
| Brand and model of engine | MAN 10L3244 |
| Pattern | L10, four stroke, direct injection, turbocharger, water cooled, compressed air starting |
| Cylinder bore | 320mm |
| Stroke | 440mm |
| Compressed ratio | 15.2 |
| MCR (Most Continuous Power) | 5600kW |
| Speed | 750r/min |
| Direction of rotation | Crankshaft clock-wise rotation (as viewed from output end) |
|  |  |
| Fuel consumption rate (When MCR happens) | 189g/kW.h，tolerance +5% |
| Air intake flow | 23.84kg/kW.h |
| Exhaust gas flow | 40.75t/ h |
| Exhaust gas temperature after supercharger | 350℃ |
| Supercharger air pressure | 3.04 bar |
| Supercharger air temperature before cylinder | 45~55℃ |
| Engine inlet lube pressure | 0.42~0.5MPa |
| Engine inlet lube temperature | 68~73℃ |
| H.T. water into-machine pressure | 0.2~0.5MPa |
| H.T. water out-machine temperature | 68~73℃ |
| L.T. water into-machine pressure | 0.25~0.45MPa |
| L.T. water into-machine temperature | 30~40℃ |
| Fuel into-machine pressure | 0.3~0.6MPa |

**发动机**

|  |  |
| --- | --- |
| 发动机品牌 | MAN 10L3244 |
| 模式 | L10、四冲程、直接喷射、增压中冷、压缩空气启动 |
| 缸径 | 320mm |
| 行程 | 440mm |
| 压缩比 | 15.2 |
| MCR (最大连续功率) | 5600kW |
| 转速 | 750r/min |
| 旋转方向 | 顺时针（从功率输出端） |
|  |  |
| 燃油消耗率（当MCR时） | 189g/kW.h，公差 +5% |
| 空气进气量 | 23.84kg/kW.h |
| 排气量 | 40.75t/ h |
| 增压器后排气温度 | 350℃ |
| 增压器空气压力 | 3.04 bar |
| 进缸前增压器空气温度 | 45~55℃ |
| 润滑油进机压力 | 0.42~0.5MPa |
| 润滑油进机温度 | 68~73℃ |
| 高温水进机压力 | 0.2~0.5MPa |
| 高温水出机温度 | 75~85℃ |
| 低温水进机压力 | 0.25~0.45Mpa |
| 低温水进机温度 | 30~40℃ |
| 燃油进机压力 | 0.3~0.6MPa |

**Alternator**

|  |  |
| --- | --- |
| Brand | KFC/ABB |
| Rated power | 5400kW |
| Rated voltage | 11kV |
| Rated frequency | 50Hz |
| Rated speed | 750 r/min |
| Direction of rotation | Counter clock-wise (as viewed from input end) |
| PF | 0.8(Lagging) |
| Efficiency | 96% |
| Grade of Protection | IP23 |
| Winding temperature sensory | 2×6Pt100 (sensory) (1 set standby) |
| Anti-freezing heater | AC230V |
| Coolant method | Self-fan coolant |
| AVR (Automatic Voltage Regulator) | Installed on generator |

**发电机**

|  |  |
| --- | --- |
| 品牌 | KFC/ABB |
| 额定功率 | 5400kW |
| 额定电压 | 11kV |
| 额定频率 | 50Hz |
| 转速 | 750 r/min |
| 旋转方向 | 顺指针（从输入端看） |
| 功率因数 | 0.8（滞后） |
| 效率 | 96% |
| 防护等级 | IP23 |
| 绕组温度传感器 | 2×6Pt100（传感器）（1套备用） |
| 防冷凝加热器 | AC230V |
| 冷却方式 | 风冷 |
| AVR（自动电压调节器） | 安装在发电机上 |

2.2.2 3sets warstila 12V46 10.5MW

Warsila Gen-set The generating sets mainly include engine, duplex bearing generator, high elasticity shaft coupling and public housing. Diesel and duplex bearing generator are connected by high elasticity shaft coupling, which are also supported and fixed by common bed.

Function of generating sets:

Rated power ---------------------------------------------------------------13137KVA

Rated speed ---------------------------------------------------------------500rpm

Rated voltage --------------------------------------------------------------11kV

Rated frequency -----------------------------------------------------------50Hz

PF(Power factor) ----------------------------------------------------------0.8（lagging）

Boundary dimension）---------------------------------------------------约10150×4045×5440（mm）

Dry weight -------------------------------------------------------------------170 t

Steady-state voltage adjusting rate -----------------------------------≤2.5%

Transient voltage adjusting rate ---------------------------------------+20%~-15%

Sudden load changing voltage steady time ------------------------1.5S

Voltage fluctuation rate --------------------------------------------------0.5%

Steady-state frequency adjusting rate -------------------------------≤0.5%

Transient frequency adjusting rate -----------------------------------+10%~-7%

Sudden load changing frequency steady time ---------------------≤5S

Frequency fluctuation rate ----------------------------------------------≤0.5%

Waveform distortion ------------------------------------------------------≤3%

Warsila发电机组主要包含发动机、双轴承发电机、高弹性联轴器和公共底盘。发动机和双轴承发电机通过高弹性联轴器连接，被安装固定在公共底盘上。

额定功率---------------------------------------------------------------------13137KVA

额定转速---------------------------------------------------------------------500rpm

额定电压--------------------------------------------------------------------11kV

额定频率--------------------------------------------------------------------50Hz

功率因数--------------------------------------------------------------------0.8（lagging）

外形尺寸（长x宽x高）-----------------------------------------------约10150×4045×5440（mm）

干量--------------------------------------------------------------------------170t

稳态电压调整率------------------------------------------------------------≤2.5%

瞬态电压调整率------------------------------------------------------------+20%~-15%

电压恢复时间---------------------------------------------------------------1.5S

电压波动率-------------------------------------------------------------------0.5%

稳态频率调整率-------------------------------------------------------------≤0.5%

瞬态频率调整率------------------------------------------------------------+10%~-7%

频率恢复时间---------------------------------------------------------------≤5S

频率波动率------------------------------------------------------------------≤0.5%

波形畸变率------------------------------------------------------------------≤3%

**2.1.1 Engine**

|  |  |
| --- | --- |
| Brand and model of engine | Warsila 12V46A |
| Pattern | V, four stroke, direct injection, turbocharger, water cooled, compressed air starting |
| Cylinder bore | 460mm |
| Stroke | 580mm |
| Compressed ratio | 15.2 |
| MCR (Most Continuous Power) | 10860kW |
| Speed | 500r/min |
| Direction of rotation | Crankshaft clock-wise rotation (as viewed from output end) |
|  |  |
| Fuel consumption rate (When MCR happens) | 183g/kW.h，tolerance +5% |
| Air intake flow | 43.84kg/kW.h |
| Exhaust gas flow | 84.75t/ h |
| Exhaust gas temperature after supercharger | 350℃ |
| Supercharger air pressure | 4.04 bar |
| Supercharger air temperature before cylinder | 45~55℃ |
| Engine inlet lube pressure | 0.42~0.5MPa |
| Engine inlet lube temperature | 68~73℃ |
| H.T. water into-machine pressure | 0.2~0.5MPa |
| H.T. water out-machine temperature | 68~73℃ |
| L.T. water into-machine pressure | 0.25~0.45MPa |
| L.T. water into-machine temperature | 30~40℃ |
| Fuel into-machine pressure | 0.3~0.6MPa |

**发动机**

|  |  |
| --- | --- |
| 发动机品牌 | Warsila 12V46A |
| 模式 | V、四冲程、直接喷射、增压中冷、压缩空气启动 |
| 缸径 | 460mm |
| 行程 | 580mm |
| 压缩比 | 15.2 |
| MCR (最大连续功率) | 10860kW |
| 转速 | 500r/min |
| 旋转方向 | 顺时针（从功率输出端） |
|  |  |
| 燃油消耗率（当MCR时） | 183g/kW.h，公差 +5% |
| 空气进气量 | 43.84kg/kW.h |
| 排气量 | 84.75t/ h |
| 增压器后排气温度 | 350℃ |
| 增压器空气压力 | 4.04 bar |
| 进缸前增压器空气温度 | 45~55℃ |
| 润滑油进机压力 | 0.42~0.5MPa |
| 润滑油进机温度 | 68~73℃ |
| 高温水进机压力 | 0.2~0.5MPa |
| 高温水出机温度 | 75~85℃ |
| 低温水进机压力 | 0.25~0.45Mpa |
| 低温水进机温度 | 30~40℃ |
| 燃油进机压力 | 0.3~0.6MPa |

**2.1.2 Alternator**

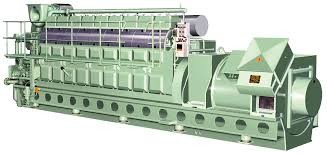
|  |  |
| --- | --- |
| Brand | ABB |
| Rated power | 13137KVA |
| Rated voltage | 11kV |
| Rated frequency | 50Hz |
| Rated speed | 500 r/min |
| Direction of rotation | Counter clock-wise (as viewed from input end) |
| PF | 0.8(Lagging) |
| Efficiency | 97% |
| Grade of Protection | IP23 |
| Winding temperature sensory | 2×6Pt100 (sensory) (1 set standby) |
| Anti-freezing heater | AC230V |
| Coolant method | Self-fan coolant |
| AVR (Automatic Voltage Regulator) | Installed on generator |

**发电机**

|  |  |
| --- | --- |
| 品牌 |  |
| 额定功率 | 13137KVA |
| 额定电压 | 11kV |
| 额定频率 | 50Hz |
| 转速 | 500 r/min |
| 旋转方向 | 顺指针（从输入端看） |
| 功率因数 | 0.8（滞后） |
| 效率 | 96% |
| 防护等级 | IP23 |
| 绕组温度传感器 | 2×6Pt100（传感器）（1套备用） |
| 防冷凝加热器 | AC230V |
| 冷却方式 | 风冷 |
| AVR（自动电压调节器） | 安装在发电机上 |

2.2.3 1sets \*18KU30B

Gen-set The generating sets mainly include engine, duplex bearing generator, high elasticity shaft coupling and public housing. Diesel and duplex bearing generator are connected by high elasticity shaft coupling, which are also supported and fixed by common bed.



Function of generating sets:

Rated power ---------------------------------------------------------------7600kW

Rated speed ---------------------------------------------------------------750rpm

Rated voltage --------------------------------------------------------------11kV

Rated frequency -----------------------------------------------------------50Hz

PF(Power factor) ----------------------------------------------------------0.8（lagging）

Boundary dimension）---------------------------------------------------约12890×3810×5930（mm）

Dry weight -------------------------------------------------------------------118 t

Steady-state voltage adjusting rate -----------------------------------≤2.5%

Transient voltage adjusting rate ---------------------------------------+20%~-15%

Sudden load changing voltage steady time ------------------------1.5S

Voltage fluctuation rate --------------------------------------------------0.5%

Steady-state frequency adjusting rate -------------------------------≤0.5%

Transient frequency adjusting rate -----------------------------------+10%~-7%

Sudden load changing frequency steady time ---------------------≤5S

Frequency fluctuation rate ----------------------------------------------≤0.5%

Waveform distortion ------------------------------------------------------≤3%

发电机组主要包含发动机、双轴承发电机、高弹性联轴器和公共底盘。发动机和双轴承发电机通过高弹性联轴器连接，被安装固定在公共底盘上。

额定功率---------------------------------------------------------------------7600kW

额定转速---------------------------------------------------------------------750rpm

额定电压--------------------------------------------------------------------11kV

额定频率--------------------------------------------------------------------50Hz

功率因数--------------------------------------------------------------------0.8（lagging）

外形尺寸（长x宽x高）-----------------------------------------------约12890×3810×5930（mm）

干量--------------------------------------------------------------------------118t

稳态电压调整率------------------------------------------------------------≤2.5%

瞬态电压调整率------------------------------------------------------------+20%~-15%

电压恢复时间---------------------------------------------------------------1.5S

电压波动率-------------------------------------------------------------------0.5%

稳态频率调整率-------------------------------------------------------------≤0.5%

瞬态频率调整率------------------------------------------------------------+10%~-7%

频率恢复时间---------------------------------------------------------------≤5S

频率波动率------------------------------------------------------------------≤0.5%

波形畸变率------------------------------------------------------------------≤3%

**Engine**

|  |  |
| --- | --- |
| Brand and model of engine | Mitsubishi 18KU30B |
| Pattern | V18, four stroke, direct injection, turbocharger, water cooled, compressed air starting |
| Cylinder bore | 320mm |
| Stroke | 420mm |
| Compressed ratio | 15.2 |
| MCR (Most Continuous Power) | 8350kW |
| Speed | 750r/min |
| Direction of rotation | Crankshaft clock-wise rotation (as viewed from output end) |
|  |  |
| Fuel consumption rate (When MCR happens) | 189g/kW.h，tolerance +5% |
| Air intake flow | 23.84kg/kW.h |
| Exhaust gas flow | 64.75t/ h |
| Exhaust gas temperature after supercharger | 350℃ |
| Supercharger air pressure | 4.04 bar |
| Supercharger air temperature before cylinder | 45~55℃ |
| Engine inlet lube pressure | 0.42~0.5MPa |
| Engine inlet lube temperature | 68~73℃ |
| H.T. water into-machine pressure | 0.2~0.5MPa |
| H.T. water out-machine temperature | 68~73℃ |
| L.T. water into-machine pressure | 0.25~0.45MPa |
| L.T. water into-machine temperature | 30~40℃ |
| Fuel into-machine pressure | 0.3~0.6MPa |

**发动机**

|  |  |
| --- | --- |
| 发动机品牌 | 三菱 18KU30B |
| 模式 | V18、四冲程、直接喷射、增压中冷、压缩空气启动 |
| 缸径 | 320mm |
| 行程 | 420mm |
| 压缩比 | 15.2 |
| MCR (最大连续功率) | 8350kW |
| 转速 | 750r/min |
| 旋转方向 | 顺时针（从功率输出端） |
|  |  |
| 燃油消耗率（当MCR时） | 189g/kW.h，公差 +5% |
| 空气进气量 | 23.84kg/kW.h |
| 排气量 | 64.75t/ h |
| 增压器后排气温度 | 350℃ |
| 增压器空气压力 | 4.04 bar |
| 进缸前增压器空气温度 | 45~55℃ |
| 润滑油进机压力 | 0.42~0.5MPa |
| 润滑油进机温度 | 68~73℃ |
| 高温水进机压力 | 0.2~0.5MPa |
| 高温水出机温度 | 75~85℃ |
| 低温水进机压力 | 0.25~0.45Mpa |
| 低温水进机温度 | 30~40℃ |
| 燃油进机压力 | 0.3~0.6MPa |

**Alternator**

|  |  |
| --- | --- |
| Brand | ABB |
| Rated power | 7600kW |
| Rated voltage | 11kV |
| Rated frequency | 50Hz |
| Rated speed | 750 r/min |
| Direction of rotation | Counter clock-wise (as viewed from input end) |
| PF | 0.8(Lagging) |
| Efficiency | 96% |
| Grade of Protection | IP44 |
| Winding temperature sensory | 2×6Pt100 (sensory) (1 set standby) |
| Anti-freezing heater | AC230V |
| Coolant method | Self-fan coolant |
| AVR (Automatic Voltage Regulator) | Installed on generator |

**发电机**

|  |  |
| --- | --- |
| 品牌 | ABB |
| 额定功率 | 7600kW |
| 额定电压 | 11kV |
| 额定频率 | 50Hz |
| 转速 | 750 r/min |
| 旋转方向 | 顺指针（从输入端看） |
| 功率因数 | 0.8（滞后） |
| 效率 | 96% |
| 防护等级 | IP244 |
| 绕组温度传感器 | 2×6Pt100（传感器）（1套备用） |
| 防冷凝加热器 | AC230V |
| 冷却方式 | 风冷 |
| AVR（自动电压调节器） | 安装在发电机上 |

## 2.2.4 1set Rolls-ROyce BB3345 3.5MW

# 

BB3345 3.5MW 发电机组技术参数

|  |  |  |
| --- | --- | --- |
| Project 项目 | unit单位 | technical parameter 技术参数 |
| model型号 |  | 3500GF |
| Cylinder arrangement  气缸排列形式 |  | L直列 |
| Rated power  额定功率 | kW | 3500 |
| Rated speed  额定转速 | rpm | 750 |
| rated voltage  额定电压 | kV | 10 |
| Rated current  额定电流 | A | 252.6 |
| frequency  频率 | Hz | 50Hz |
| power factor  功率因数 |  | 0.8 (lagging) |
| phase  相数 |  | 3-phase |
| Voltage volatility  电压波动率 | % | ±1 |
| Frequency volatility  频率波动率 | % | ±0.5 |
| Steady state voltage regulation  稳态电压调整率 | % | ±2.5 |
| Steady-state frequency regulation  稳态频率调整率 | % | 5 |
| Transient voltage regulation  瞬态电压调整率 | % | ±20～-15 |
| Stable time  稳定时间 | s | 5 |
| Voltage regulation mode  电压调整方式 |  | Auto AVR |
| Speed regulating mode of unit  机组调速方式 |  | Electronic speed 电子调速 |
| Frequency regulation mode  频率调整模式 |  | Automatic or manual自动或手动 |
| Unit lubrication mode  机组润滑方式 |  | Pressure, forced lubrication压力,强制润滑 |
| Lubricating oil type  滑油类型 |  | SAE 4030 |
| Start the way  启动方式 |  | compressed air 压缩空气 |
| Fuel oil type  燃料油类型 |  | HFO重油/柴油DO |
| Engine cooling mode  发动机冷却方式 |  | high and low temperature two, low temperature water close type cooling高低温两路，低温水由闭式冷却器 |
| Generator cooling  发电机冷却方式 |  | water cooling  水冷 |
| Insulation grade绝缘等级： |  | （F） |
| Protection grade防护等级： |  | IP23 |
| Unit fuel consumption  机组燃油消耗率 | g/kWh | 194g/kWh+5% |
| Lub-Oil consumption滑油消耗率 | g/kWh | 0.6-0.8 |
| Coupling type联接方式 |  | elastic coupling弹性联轴器 |
| Paint color according油漆颜色 |  | to owner's requirement根据业主要求 |
| Installation method安装方式 |  | common base elastic shock absorption installation  共同底座弹性减震安装 |
| Overall dimensions 外形尺寸 | mm | 9800×2500×4000 |
| net weight of the unit机组净重 | KG | 65000 |

## 2.2MECHANICAL AUXILIARY SYSTEM机械辅助系统

**2.2.1 LUBRICATING OIL SYSTEM**

The engine has it’s own internal lubricating oil system. Lube oil service tank is mounted on common-bed.

|  |  |
| --- | --- |
| Lube oil filter | Duplex type |
| Lube oil pump | Engine driven, mounted on engine |
| Lube oil cooler | Plate type, mounted on engine |
| Pre-lubricating pump | Electric Motor driven |
| Thermostatic valve | Mounted on engine |

**滑油系统**

发动机有自己的内部润滑油系统，润滑油工作油箱安装在机组的公共地盘上。

|  |  |
| --- | --- |
| 滑油滤清器 | 双联滤清器 |
| 滑油泵 | 机带 |
| 滑油冷却器 | 板式冷却器 |
| 滑油预供泵 | 电马达驱动 |
| 恒温阀 | 装机 |

**2.2.2 COOLING WATER SYSTEM**

The engine cooling water system consists of two cooling water circuits, which are Low temperature(LT) and High temperature(HT) water circuits. The heat transfer to engine cooling water is discharged to atmosphere by Radiator Cooling.

|  |  |
| --- | --- |
| Low temperature water circuit comprises: | |
| LTCW pump | Mounted on engine |
| Charge air cooler | Mounted on engine |
| Lubricating oil cooler | Plate type |
| LTCW radiator | Air cooling |
| LTCW expansion water tank |  |
| High temperature water circuit comprises: | |
| HTCW pump | Engine driven, mounted on engine |
| Engine water jackets/cylinder head | Mounted on engine |
| Thermostatic valve | Mounted on engine |
| HTCW expansion water tank |  |

**冷却水系统**

发动机冷却水系统由两路冷却水组成，低温冷却水和高温冷却水。传递发动机冷却水中的热量通过散热器释放到大气中。

|  |  |
| --- | --- |
| 低温水路的组成 | |
| 低温水泵 | 机带 |
| 中冷器 | 装机 |
| 滑油冷却器 | 板式 |
| 低温水散热器 | 水冷却塔 |
| 低温膨胀水箱 | 客户自制 |
| 高温水路的组成 | |
| 高温水泵 | 机带 |
| 发动机缸套/缸头 | 装机 |
| 恒温阀 | 装机 |
| 高温膨胀水箱 |  |

**2.2.4 COMPRESSED AIR SYSTEM**

The compressed air supply system consists of starting air receiver and air compressor as follows.

The compressed air supply system provides also the control air to the related auxiliaries through pressure-reducing valve.

|  |  |
| --- | --- |
| Engine starting | Compressed air, 7 bar |
| Air compressor | Electric Motor driven, 30 bar |
| Air receiver | Cylindrical, 30 bar |

**压缩空气系统**

压缩空气供应系统由启动空气瓶和空气压缩机组成。

压缩空气系统还通过减压阀提供相关辅助设备控制空气。

|  |  |
| --- | --- |
| 发动机启动 | 压缩空气，0.7MPa |
| 空气压缩机 | 电马达驱动3MPa |
| 空气瓶 | 圆柱型，3MPa |

**2.2.5INTAKE AIR SYSTEM**

Intake air filter is dry and washable type filter to be mounted on turbocharger.

**进气系统**

进气滤清器为干式、可洗型滤清器，安装在增压器上。

**2.2.6 EXHAUST GAS SYSTEM**

Exhaust gas of the engine flows out from turbocharger to atmosphere via expansion joint and silencer.

- Total pressure loss in the exhaust gas system : max. 2.5kPa

- Exhaust gas silencer : absorption & resonance Type

- Exhaust gas boiler unit : Smoke tube type,7 bar.

**排气系统**

发动机排气系统通过膨胀节和消音器从增压器流出到大气中去。

排气系统排气背压：最大2.5kPa

排气消音器：吸收共振型

排气锅炉：烟道型，0.7MPa

## 2.3 ELECTRICAL AUXILIARY SYSTEM电气系统

Electrical system mainly includes medium voltage system, low voltage system, control system, etc.

电气系统主要包括了中压系统、低压系统和控制系统等。

**2.3.1PLANT SYSTEM VOLTAGE**

|  |  |
| --- | --- |
| Generator | AC 11kV, 3PH, |
| Secondary distribution | AC 400V,3PH, |
| Motors | AC 400V,3PH, |
| AC control | AC 230V, 1PH, |
| DC control | DC 110V, 2W or 24V, |
| Grid | AC 11kV, 3PH, |

**电站系统电压**

|  |  |
| --- | --- |
| 发电机 | AC 11kV, 3PH, |
| 二次分配 | AC 400V,3PH, |
| 马达 | AC 400V,3PH, |
| 交流控制 | AC 230V, 1PH, |
| 直流控制 | DC 110V, 2W or 24V, |
| 电网 | AC 11kV, 3PH, |

**2.3.2 11kV SWITCHGEARS**

**General description**

1. 11kV switchgear shall be indoor, metal-enclosed, floor mounted, draw out type.

Meters, relays, switches and lamps will be flush mounted on the respective cubicle door or on control cabinet. The degree of protection enclosure will be of IP 41x.

1. The breakers shall be triple pole, single throw and vacuum circuit breaker
2. All the external cables will enter the switchgear through adequate openings at the bottom.
3. Current transformers(CT) will be epoxy-resin type. All current transformer secondary will be connected to short circuiting terminal blocks.
4. Potential transformers(PT) will be epoxy-resin type with primary and secondary fuses.
5. The accuracy class for CT & PT will be of 1.0 cl. for metering 5P20 for protection.
6. The vacuum circuit breaker operating and control circuit will be for 110V DC supplied from 110V DC station which is normally floated with battery and battery charger.
7. The switchgear cubicle will be provided with space heaters to prevent condensation of moisture within the switchgear.
8. For generator feeders, the necessary electrical parameters are to be measured or displayed in each generator control panel.

**Particulars**

|  |  |
| --- | --- |
| Type | KYN28-24 |
| Rated voltage | 24kV 3PH, 50Hz |
| Service voltage | 11kV 3PH, 50Hz |
| Ground system | Solidly grounded |
| Control power | DC110V |
| Switch gear main bus current | 630A/1250A |
| Material of busbar | Copper |
| Circuit breaker | Type: Draw out type, VCB  Rated voltage: 24kV, 3PH  Rated current: 630A  Rated interrupting current: 25kA |

**开关柜**

**综述**

1. 11kV开关柜是户内、金属密封、地板安装、抽出性型

仪表、继电器、转换开关和指示灯安装在各自的柜体面板和控制柜内。柜体的防护等级为IP4x。

1. 断路器是三极、单掷的真空断路器。
2. 所有的外部电缆通过底部足够的开孔进入开关柜。
3. 电流互感器（CT）为环氧树脂型。所有电流互感器的二次侧连接到短路的接线端子上。
4. 电压互感器（PT）带有一次和二次熔断器的环氧树脂型。
5. CT和PT的精度等级是为保护测量5P20用的1.0级。
6. 真空断路器的运行和控制线圈是来自于110V直流站供应的DC110V。
7. 开关柜内安装有空间加热器，以防止柜内的水汽凝结。
8. 对于发电机馈线，在每个发电机控制屏上测量和显示必要的电气参数。

**详情**

|  |  |
| --- | --- |
| 型号 | KYN28-24 |
| 额定电压 | 24kV 3PH, 50Hz |
| 供电电压 | 11kV 3PH, 50Hz |
| 接地系统 | 直接接地 |
| 控制电源 | DC110V |
| 开关主母线电流 | 630A/1250A |
| 母线材料 | 铜 |
| 断路器 | 型号：抽出型，真空断路器  额定电压：24kV, 3PH  额定电流：630A/1250A  额定分断电流：25kA |

**2.3.3 400V SWITCHGEARS/MCC/DISTRIBUTION BOARDS**

**General description**

1. L.V switchgear will be metal-enclosed, free-standing, dead front structure with electrically operated draw out type air circuit breaker suitable for indoor installation.
2. The air circuit breaker will be 3-pole, 600V class air circuit breaker (ACB) with suitable rating of continuous current rating and interrupting rating respectively.

**Specification**

|  |  |
| --- | --- |
| Type | Metal enclosed type for indoor service |
| Rated voltage | 600VAC,3PH,50Hz |
| Service voltage | 400VAC,3PH,50Hz |
| Ground system | Solidly grounded |
| Control power | 110VDC for ACB and 230VAC, 1Ph |
| Bus | Copper bus with current rating as required |
| Circuit breaker | Air circuit breaker |
| 1. Type : Draw out type 2. Rate voltage: 600V, 3PH, 50Hz 3. Rated current: 630A 4. Rated interrupting current : 65kA SYMM. 5. Operating type : Motor spring type 6. Over current trip : Direct acting trip device 7. No of poles: 3p |

**400V开关柜/MCC/配电板**

**综述**

1）低压开关柜是带有可操作的抽出式空气断路器，适合户内安装的，金属密封的、独立的、框架式结构。

2）空气断路器是3极，600V空气断路器(ACB)，带有连续和分断电流额定值合适的等级。

**规格**

|  |  |
| --- | --- |
| 型号 | 为屋内检修的金属密封型 |
| 额定电压 | 600VAC,3PH,50Hz |
| 供电电压 | 400VAC,3PH,50Hz |
| 接地系统 | 直接接地 |
| 控制电源 | 110VDC for ACB and 230VAC, 1Ph |
| 母线 | 按照规定额定电流的铜母线 |
| 断路器 | 空气断路器 |
| 1. 型号：抽出型 2. 额定电压: 600V, 3PH, 50Hz 3. 额定电流: 630A 4. 分断电流 : 65kA SYMM. 5. 操作形式：电马达弹簧型 6. 过流跳闸：直接动作脱扣装置 7. 极数: 3p |

**2.3.5 POWER TRANSFORMER**

**Particulars**

|  |  |
| --- | --- |
| Aux. Transformer | |
| a) Rated voltage |  |
| H.V | 11kV |
| L.V | 0.4kV |
| b) Winding |  |
| H.V | Delta |
| L.V | Wye |
| c) Vector group | Dyn11 |
| d) Capacity | 350kVA |
| e) Cooling | oil-immersed |
| f) Tap changer | NLTC 2 ×±2.5% TAPS |

**电力变压器**

**详情**

|  |  |
| --- | --- |
| 辅助变压器 | |
| a) 额定电压 |  |
| 高压侧 | 11kV |
| 低压侧 | 0.4kV |
| b)绕组 |  |
| 高压侧 | 三角形 |
| 低压侧 | 星形 |
| c)矢量组 | Dyn11 |
| d) 容量 | 350kVA |
| e)冷却 | 油浸式 |
| f)分接头 | NLTC 2 ×±2.5% TAPS |

**2.3.6 DC SYSTEM**

**Batteries**

|  |  |
| --- | --- |
| Rated voltage | 110V DC & 24V DC |
| Type | Lead-Acid |
| No. of cell | As required |
| Capacity | As required |
| No minal voltage | 12V/cell |
| Back-up time | 60 Minutes |
| \* Capacity shall be adjusted during the detail design | |

**Battery Charger**

|  |  |
| --- | --- |
| TYPE | Metal-enclosed, indoor, floor mounted  Float charger combined booster charger |
| Quantity | One set for 110V DC system |
| Rated output | 24V DC, 50A & 110V DC, 50A |
| Feeder | Molded case circuit breaker |
| No. of pole | 2P |

**直流系统**

**蓄电池**

|  |  |
| --- | --- |
| 额定电压 | 110V DC & 24V DC |
| 类型 | 铅酸 |
| 电池组数目 | 按照需要 |
| 容量 | 按照需要 |
| 单元蓄电池电压 | 12V/块 |
| 备用时间 | 60分钟 |
| \* 容量根据详细设计调整 | |

**电池充电器**

|  |  |
| --- | --- |
| 类型 | 金属密封、户内、地板安装  浮充电结合大电流充电 |
| 数量 | 为110V直流系统的一套 |
| 额定输出 | 24V DC, 50A & 110V DC, 50A |
| 馈线 | 模式断路器 |
| 极数 | 2P |

**2.3.7 MOTOR**

**General Description**

1. AC motors will be suitable for operation on 3-phase, 400V, 50Hz.
2. Unless otherwise specified, all the AC motors will be squirrel cage induction motors suitable for full voltage direct starting.

|  |  |
| --- | --- |
| **Technical Specifications for LV Motors.** | |
| Rated voltage | 400V, 3PH, 50Hz |
| Enclosure | Indoor area  Outdoor area |
| Insulation class | F |
| Space heaters | Outdoor motors, 37.5KW & larger |
| Starting type | Direct on line starting |
| Others | Tropical design |

**2.3.7马达**

**总则**

1. 交流电动机适合3相400V/50Hz
2. 除非另有说明，所有的交流电动机采用鼠笼式感应电动机，适合于全压直接启动。

|  |  |
| --- | --- |
| **低压电动机的技术规格** | |
| 额定电压 | 400V, 3PH, 50Hz |
| 外壳 | 户内: IP54  户外: IP55 |
| 绝缘等级 | F |
| 空间加热器 | 户外电动机，37.5kW或更大 |
| 启动类型 | 直接启动 |
| 其他 | 热带设计 |

**2.3.8 Cables**

**2.3.8.1 HV Power Cables**

|  |  |
| --- | --- |
| Type | 24 kV, XLPE, PVC sheathed |
| Core | 3C |
| Minimum size | As per calculation |
| Conductor | Copper |

**2.3.8.2 L.V Power Cables**

|  |  |
| --- | --- |
| Type | 0.6/1.0kV XLPE, PVC sheathed |
| Core | Multiple (3C or 4C) |
| Conductor | Copper |

**2.3.8.3 Control Cables**

|  |  |
| --- | --- |
| Type | 600V CVV (PVC/PVC) |
| Shielding | As needed |
| Multiple Core | Multiple (2C through 30C) |
| Conductor | Copper |

**2.3.8.4Instrumentation cables**

|  |  |
| --- | --- |
| Type | 600V CVVS |
| Shielding | Shielded |
| Core | 1 pair and multi-pair |
| Conductor | Copper |

**电缆**

**2.3.8.1高压电源电缆**

|  |  |
| --- | --- |
| 类型 | 24 kV, XLPE, PVC 护套 |
| 芯数 | 3C或1C |
| 最小尺寸 | 根据计算 |
| 导体 | 铜 |

**2.3.8.2低压电源电缆**

|  |  |
| --- | --- |
| 类型 | 0.6/1.0KV XLPE, PVC 护套 |
| 芯数 | 多芯（2C、3C 或4C）或单芯（1C） |
| 导体 | 铜 |

**2.3.8.3控制电缆**

|  |  |
| --- | --- |
| 类型 | 600V CVV（PVC/PVC） |
| 屏蔽 |  |
| 芯数 | 多芯（2C-30C） |
| 导体 | 铜 |

**2.3.8.4仪表电缆**

|  |  |
| --- | --- |
| 类型 | 600V CVVS |
| 屏蔽 | 带屏蔽层 |
| 芯数 | 一对及多对 |
| 导体 | 铜 |

**2.3.10 Conduits and trays**

1) Cables will be installed in above ground conduits, cable trays, underground conduits

or cable trenches or direct buried.

2) Conduits will be rigid steel conduits.

3) Separate trays for instrumentation cables will be provided to separate them from

power cable.

4) Trays for cables for different voltage levels will be stacked in descending order with the

higher voltage above. Instrumentation trays will always be at the bottom.

5) Trays will be made of hot-dip galvanized steel for outdoor and indoor.

**管道和电缆桥架**

1）电缆可安装于地面管道、电缆桥架、地下管道或电缆槽上方，或直接埋入地面。

2）管道应为硬钢管。

3）应提供单独的仪表电缆桥架，将仪表电缆和电源电缆分开。

4）不同电压的电缆桥架按降序叠放，电压高的置于上方。仪表电缆架桥始终置于底部。

5) 室内外的架桥均应采用热浸锌钢。

**2.3.11 INSTRUMENT & CONTROL SYSTEM**

**2.3.11.1 ENGINE/ GENERATOR CONTROL PANEL**

Engine/ Generator control panel will be metal-enclosed, free-standing, IP40, indoor installation.

a) Control and Monitoring

- Engine RPM display

- T/C RPM display

- Engine pressure display

Starting air pressure

FO engine inlet pressure

LO engine inlet pressure

- Engine temperature display

FO engine inlet temperature

HT water outlet temperature

Exh. Gas T/C inlet temperature

- D/G set emergency stop

- Engine start and stop

- Engine speed control

- Generator voltage control

b) Annunciator

c) Synchronizing

d) Protection relay (Multi or single protective type)

- Under/ over voltage protection

- Reverse power protection

- Loss of excitation

- Over current protection

- Over current ground protection

- Under and over frequency protection

- Lock out relay(separate type)

- Differential Protective Relay(87G)

However, the above shall be adjusted subject to detail design

**2.3.11.1发动机/发电机控制屏**

发动机/发电机控制屏金属密封型、独立的、IP40、户内安装。

a)控制和监控

-发动机转速显示

-增压器转速显示

-发动机压力显示

启动空气压力

发动机燃油进机压力

润滑油进口压力

-发动机温度显示

发动机进口温度

高温水出机温度

增压器口的排气温度

-机组紧急停机按钮

-发动机启动和停机

-发动机转速控制

-发电机电压控制

b)报警器

c)同步

d)保护继电器（多个或单个保护型）

-欠/过压保护

-逆功保护

-失磁

-过流保护

-过流接地保护

-欠/过频保护

-闭锁继电器（分离型）

-差动保护(87G)

然而，以上要求根据详细设计调整。

**2.3.11.2 Field instrumentation**

Necessary local instrumentation for field tanks and pipe lines will be provided properly for efficient and reliable plant operation, subject to our standard. Instrumentation will be tropicalized to suitable the conditions of the plant environment.

But, the instruments for tanks will be supplied by tanks supplier when tanks are out of contractor`s scope Wherever possible, instruments which perform similar functions in similar applications will be of uniform type and manufacturer. However package mounted instruments will be subject to manufacture standard and practice.

Each instrument will be identified and tagged with a tag number, according to job standards. Local indicators will be graduated to in engineering units of the measures variable. Instrument scale ranges will be expressed in S.I. Engineering units.

All the instruments will be the industrial type and field proven design.

**2.3.11.2现场仪表**

应按照我们的标准，为油罐和管道提供必要的本地仪表，以确保电站的高效、可靠运行。仪表应适合热

带气候以适应电站环境条件。

但当油罐不在承包商供货范围内时，油罐的仪表应由油罐供应商提供。如有可能，应用于类似领域、功

能相近的仪表应为统一类型、由统一的生产商提供。但是，打包安装的仪表应受服从生产商的标准和惯例。

每台仪表都应通过鉴定并根据工作标准贴上标签号。本地指示器应使用工程单位，仪表刻度范围应采用

国际单位表示。

所有仪表均应为工业型，并经现场验证。

# 3.SCOPE OF SUPPLY供货范围

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ITEM No. 序号** | **DESCRIPTION 名称** | **SPECIFICATION 技术规格** | **REQUIRED  必需的** | | **SCOPE 责任方** | |
| **Qty 数量** | **Unit 单位** | **Supply供应商** | **OWNER 业主** |
| **1** | **GENERATOR SET 发电机组** |  | 14 |  |  |  |
| 1.1 | Diesel engine  柴油机 | MAN 18V3240 9000KW | 8 | Unit(s) | ■ |  |
|  | Diesel engine  柴油机 | MAN10L3244 5600KW | 5 | Unit(s) | ■ |  |
|  | Diesel engine  柴油机 | Mitsubishi 18KU30B 8350KW | 1 | Unit(s) | ■ |  |
| 1.2 | Alternator with AVR 发电机带AVR | 8730kW, 0.8PF, 11kV, 50Hz | 8 | Unit(s) | ■ |  |
|  | Alternator with AVR 发电机带AVR | ABB 5400kW, 0.8PF, 11kV, 50Hz | 5 | Unit(s) | ■ |  |
|  | Alternator with AVR 发电机带AVR | ABB 7600KW 11KV | 1 | Unit(s) | ■ |  |
| 1.3 | Common bed 公共底盘 | For engine and alternator, with lube oil sump tank | 14 | Unit(s) | ■ |  |
| 1.4 | Flexible coupling assembly 高弹性联轴器 |  | 14 | Set(s) | ■ |  |
| **2** | **MECHANICAL AUXILIARY SYSTEM 机械辅助设备** |  |  |  |  |  |
| **2.2** | **fuel SYSTEM  燃油系统** |  |  |  |  |  |
| 2.2.1 | 重油供应单元HFO supply unit | 5000m3/hr 1.0mpa | 6 | Unit(s) | ■ |  |
| 2.2.2 | 重油分离单元HFO separation unit | 2500m3/hr | 6 | Unit(s) | ■ |  |
| 2.3.3 | 废气锅炉exhaust gas boiler | 800t/hr 1.0mpa | 14 | Unit(s) | ■ |  |
| **2.4** | **LUBRICATING OIL( LO)SYSTEM  润滑油系统** |  |  |  |  |  |
| 2.4.1 | Lube Oil (Centrifuge) Separator unit  润滑油分离单元 | Effective capacity 0.8m3/h per separator. | 14 | Unit(s) | ■ |  |
| **2.5** | **COMPRESSED AIR SYSTEM 压缩空气系统** |  |  |  |  |  |
| 2.5.1 | Starting Air Compressor Unit 启动空气压缩机单元 | 37m3/h,30bar | 4 | Unit(s) | ■ |  |
| 2.5.2 | Starting Air Receiver Unit  启动空气瓶 | 500L, 30kg/cm2, with 40kg/cm2 relief valve. | 4 | Set(s) | ■ |  |
| 2.5.3 | Control Air Receiver Unit  控制空气瓶 | 300L, 30kg/cm2, with 40kg/cm2 relief valve. | 1 | Set(s) | ■ |  |
| **2.6** | **WATER COOLING SYSTEM  水冷却系统** |  |  |  |  |  |
| 2.6.1 | Radiator 散热器 |  | 14 | Unit(s) |  | ■ |
| 2.6.2 | HT Expansion Tank 高温水膨胀水箱 | 300L | 14 | Unit(s) |  | ■ |
| 2.6.3 | LT Expansion Tank 低温水膨胀水箱 | 300L | 14 | Unit(s) |  | ■ |
| **2.7** | **EXHAUST GAS SYSTEM  排气系统** |  |  |  |  |  |
| 2.7.1 | Silencer 消音器 |  | 14 | Pc(s) | ■ |  |
| 2.7.2 | Expansion Bellows 膨胀节 |  | 14 | Pc(s) | ■ |  |
| **2.8** | **INTAKE AIR SYSTEM 进气系统** |  |  |  |  |  |
| 2.8.1 | Air intake filter unit 空气进气滤清器单元 | Dry and washable type filter to be mounted on turbocharger. | 14 | Unit(s) | ■ |  |
| **2.9** | **OTHER EQUIPMENT AND MATERIALS  其他设备和材料** |  |  |  |  |  |
| 2.9.1 | System Piping & Fitting & Auxiliary material 系统管路、管件和辅助材料 | System Gauges\control & Fitting | 14 | Pc(s) |  | ■ |
| 2.9.2 | System Valves & Fitting 系统阀门和管件 |  | 14 | Pc(s) |  | ■ |
| 2.9.3 | System Gauges\control & Fitting 系统仪表、控制和管件 |  | 14 | Pc(s) |  | ■ |
| **3** | **ELECTRICAL AUXILIARY SYSTEM 电气辅助系统** |  |  |  |  |  |
| **3.1** | **MV ELECTRICAL SYSTEM 中压电气系统** |  |  |  |  |  |
| 3.1.1 | Generator Circuit Breaker Panel (GB) 发电机出线屏 | KYN28-24, 630A, 25KA | 8 | sets | ■ |  |
| 3.1.2 | Station service transformer 11KV Side CB Panel  厂用电变压器11kV进线屏 | KYN28-24, 630A, 25KA | 1 | sets | ■ |  |
| 3.1.3 | Station Service Transformer  厂用电变压器 | 500KVA, 11/0.4KV, Dyn11 | 1 | sets | ■ |  |
| **3.2** | **LV ELECTRICAL SYSTEM 低压电气系统** |  |  |  |  |  |
| 3.2.1 | LV Input CB Panel 低压进线屏 | ACB,0.4kV, 1000A, 60Hz | 2 | Unit | ■ |  |
| 3.2.3 | Auxiliary Equipment Control Panel 辅助设备控制屏 |  | 3 | Units | ■ |  |
| **3.3** | **CONTROL & PROTECTION SYSTEM  控制和保护系统** |  |  |  |  |  |
| 3.3.1 | Diesel Engine local control panel 柴油机就地控制屏 |  | 14 | Units | ■ |  |
| 3.3.2 | Central Operating System  集中操作系统 | Including parallel machine device 包括并机装置 | 2 | Unit | ■ |  |
| **3.4** | **DC SYSTEM 直流系统** |  |  |  |  |  |
| 3.4.1 | DC System Control Panel (DCC) 直流控制屏 |  | 2 | Unit | ■ |  |
| 3.4.2 | Accumulator Battery Panel  蓄电池屏 |  | 2 | Unit | ■ |  |
| **3.5** | **INSTALLATION MATERIALS 安装材料** |  |  |  |  |  |
| 3.5.1 | Power Cable  动力电缆 |  | 14 | lot |  | ■ |
| 3.5.2 | Control Cable 控制电缆 |  | 14 | lot |  | ■ |
| 3.5.3 | Cable Bridge & Stand & Install auxiliary materials 电缆桥架、支架和安装材料 |  | 14 | lot |  | ■ |
| **4** | **Spare Part 备件** |  |  |  |  |  |
| 4.1 | Standard Spare Parts for Engine 发动机标准备件 |  | 14 | Set(s) |  | ■ |
| 4.2 | Standard Spare Parts for Generator 发电机标准备件 |  | 14 | Set(s) |  | ■ |
| 4.3 | Standard Spare Parts for AUX. Equipment 辅助设备标准备件 |  | 14 | Set(s) |  | ■ |
| **5** | **Tool 工具** |  |  |  |  |  |
| 5.1 | Tools for Engine工具 |  | 4 | Set(s) | ■ |  |