

## Introduction:

Suppliers should submit offers with guaranteed power KW & KVA at ISO conditions in addition to sound level at 100% load.

## **Technical Conditions for the Provision of Diesel Engine Generators Different Sizes, Prime Duty 380/220V (50Hz)**

### 1. Purpose

To supply generators with or without canopy. The generator sets are powered by diesel engines that operate on standard local fuel and should be class G2 according to ISO 8528.1 and ISO 8528.5

### 2. Site Conditions

2.1 Maximum relative humidity:	100%
2.2 Maximum ambient temperature:	60°C
2.3 Minimum ambient temperature:	-10°C

### 3. Generator Set Specifications

- 4.1 Must be brand new, not rebuilt nor refreshed.
- 4.2 The bidder must submit catalogues and data sheet along with his technical offer as per section 20 herein.
- 4.3 Nominal voltage 380/220V
- 4.4 Nominal Frequency is 50Hz
- 4.5 Nominal power factor is 0.8.
- 4.6 Governed engine speed is 1'500 rpm, electronic governor – speed control for gensets 100 KVA and above, for lower power as requested.
- 4.7 Precision mechanical (static and dynamic) balancing for both engine and alternator shall be performed at the assembling company or manufacturing company according to the relevant below international standards.
- 4.8 Capable of withstanding +10% of the nominal load for one hour every 12 continuous working hours.
- 4.9 Should be compatible with standards:
  - British Standard Institute (BSI):
    - BS 5514: Reciprocating internal Combustion Engines, Performance.
  - International for Standardization Organization:
    - ISO 3046: Reciprocating Internal Construction Engines, Performance.
    - ISO 8528: Reciprocating Internal Combustion Engine Driven Alternating Current Generating Sets

### 4. Sound Proof Canopy Specification (individually priced):

- 4.1 - Offers best cooling system by outlet and inlet duct
  - It can be installed at open lawns and rooftops.
  - Avoid the transfer of vibration from genset to enclosure and surrounding with the help of specially designed internal and external anti vibration pads.
  - Sound proof canopies incorporate the following features:
    - Body made from steel components thickness 2 mm treated for anticorrosion and painted for weatherproofing.
    - Weatherproof locks and hinges
    - Engine exhaust outlet
    - Fully weatherproof with IP 44
    - Quoted sound reduction level (70dB/90dB) to be established at 1m and 100% load.
    - Air intake baffle
    - Air outlet baffle
    - Large doors on each side allowing 180 degree opening rotation for access for maintenance.
    - A weatherproof, wear resistant nameplate should be mounted on the canopy mentioning the serial number and the model type for the genset, canopy, diesel engine, and the alternator
    - Battery should be fixed to the canopy by metal base
    - Four eye hook on each side (2 for 100 KVA or less) allowing easy crane loading.
    - The canopy should include a window to observe the parameters on the control panel without opening the door.
    - Small access hole to throw cables through for monitoring and testing
    - Prime and stand by power should be indicated on the exterior of the canopy.
    - Lube oil and cooling water drains piped to exterior of the enclosure.
    - Exhaust silencing system inside canopy for operator safety.
    - Fuel fill and battery can only be reached via lockable access doors.
    - Emergency pushbutton should be mounted outside the canopy.
    - Temperature difference between outside the canopy and air inlet at radiator should be below 7 degrees. This parameter is basic in avoiding overheat and efficiency loss in high temperature areas, the lower this temperature the better. It will be an important decisive factor in the awarding

## **5. Diesel Engine Specifications**

5.1 Must not be rebuilt or refreshed, of a genuine, recognized international brand (complete with genuine manufacturer's warranty and recognized after-sales support), and must not be more than three years old from the date of manufacture. The bidder must submit catalogues to clarify the manufacturer/ brand with its technical offer.

5.2 Operates on the standard local fuel with the following specifications

- Specific gravity @ 15C° 0.820-0.870
- Flash point C° min 55
- Sulphur wt% Max 0.70
- Pour point C° Max -3 °C (Summer), 9 °C (Winter)
- Ash rate % Wt Max 0.01
- Copper Corrosion (3 hr at 50C°) NO.3a
- Water Vol% Max 0.05
- Sediment Vol% Max 0
- Conradson Carbon Residue (CCR) Wt% Max 0.35
- CFPP °C Max 0°C
- Caloric value Kcal/Kg. min 10500
- Distillation °C
- At 290°C 50% Vol min
- At 360°C 85% Vol min

5.3 The engine shall be four-stroke.

5.4 Capable of withstanding +10% of the nominal load for one hour every 12 continuous working hours

5.5 All parts of the engine should be original and genuine. Spares and consumables (including filters and fuel-water separators) should be of a brand expressly endorsed and recommended by the engine manufacturer

## **6. Engine Starter System**

6.1 Electrical starting system.

6.2 Engine driven battery-charging system

## **7. Engine cooling System**

7.1 Water – cooled (tropical radiator) or air cooled.

7.2 Thermostat controlled cooling system with gear driven water pump

7.3. Water level sensor connected to the control panel (individually priced)

7.4 Water jacket heater (individually priced)

## **8. Exhaust System**

8.1 The exhaust pipes shall be made from thermal painted or galvanized steel, thermally insulated, of a suitable thickness, with flexible connections and incorporate a silencer adapted to the noise attenuation requirements of the model (70dB/90dB).

8.2 The exhaust pipe should be 0.5 m long starting from the canopy and for genset with less than 100 kVA capacity and 1m long starting from canopy for Gensets capacity 100 kVA or more.

8.3 The suppliers shall provide outlet exhaust with protection canopy against water and birds and shall be equipped with a wire mesh.

8.4 Anticorrosion

## **9. Lubrication System**

Forced lubrication system by the use of a mechanical oil pump. The lubrication system shall include the following items:

- Pressure and temperature measurements.
- Oil drain valve to use for changeover oil
- Oil electrical heating (individually priced).
- Oil level dipstick
- Oil cooling heat exchanger
- Oil tank with extended drainage valve and filters.

## **10. Fuel Providing System**

10.1 The fuel should provide to the engine 8 hours of operation by using the daily fuel tank that is installed in the base of the canopy.

10.2 Operates on the standard local fuel.

10.3 The tank capacity in liters should be painted visibly

10.4 Mechanical fuel level gauge

10.5 Fuel level sensor connected to control panel

10.6 Engine should include all required filters/pre-filter such as fuel filter, internal water separator (or second fuel filter)

10.7 External fuel-water separator, with filter (individually priced)

10.8 The fuel pump should be gear driven.

10.9 Fuel tank drain to be connected to the outside

Inspection hole

10.10 Vent to be connected to the outside

## **11. Charged System**

11.1 Mounted air filter and turbocharger

## **12. Engine Rotation Speed Governor**

12.1 For gensets with 100 kVA capacity or more, the engine should be provided with the rotation speed governor (with electronic governor – speed control) to organize rotation speed between loads-no load operation.

12.2 The governor must be of a well-known internationally recognized (and ISO 9001:2015 certified) brand in this regard.

12.3 For gensets with less than 100 kVA capacity, a mechanical governor is accepted.

## **13. Flywheel**

13.1 High inertia balanced flywheel

## **14. Alternator**

14.1 Must not be rebuilt or refreshed, of a genuine, recognized international brand (complete with genuine manufacturer's warranty and recognized after-sales support), and must not be more than three years old from the date of manufacture. The bidder must submit catalogues to clarify the manufacturer/ brand along with its technical offer.

14.2 Three phase with neutral, 380/220V, 50Hz

14.3 Power factor not less than 80%.

14.4 Class H insulation or more (tropical).

14.5 Voltage regulator around 2.5% between load-no load operation.

14.6 Automated self-excitation

14.7 Alternator and engine are directly coupled, and the coupling shall be protected

14.8 Enclosure protection not less than IP23.

14.9 Automated self-ventilation.

14.10 Capable of withstanding +10% of the nominal load for one hour every 12 continuous working hours.

14.11 The starting KVA should be specified for the alternator at 10,20,30% of voltage drop.

## **15. Alternator Protection**

The alternator should provide with the following system protection:

15. 1 Increase and decrease voltage protection.

15. 2 Low frequency and high frequency protection.

## **16. Gathering**

16.1 Alternator and engine are directly coupled.

16:2 Alternator must be coupled to the engine in a manner commensurate with possible synchronization applications.

## **17. Battery, cabling and circuit breaker:**

-- The battery should be dry type for sizes less than 100 kVA, and liquid type for sizes more than 100 kVA.

-- Battery charger (priced individually)

-- The circuit breaker should be 4 pole sized (upgrade individually priced to handle 110% of the rated current of alternator).

-- Ground cable same size than other cables from alternator to circuit breaker

-- Grounding of all elements in the genset to a point where ground connection will have to be performed.

-- An earth bus bar should be provided within the genset base; alternator and control panel should be connected with appropriate equipotential bonding cables to the earth bus bar.

-- The control panel should be earthed. Control panel door should be provided with an equipotential earth wire connection.

-- Cable sizes should be as per BS 7671

## **18. Control Panel**

The electrical panel shall be Deep Sea 7320 MK2 (or equivalent DSE model) – an upgrade to DSE 8610 (or equivalent DSE model) should be individually priced. Functions to include at least the following:

-- Measurement amperes per phase.

-- Temperature measurement

-- Actual power measurement

-- Power factor measurement

-- Oil pressure measurement

-- Indication lights with stickers for alarms.

-- Volt measurement

-- Frequency measurement

Compatible GSM Telemetry module shall be installed (Deep Sea 890 webnet or equivalent DSE model)

The following buttons operated:

-- Test button for indication lights to clarify indication at the malfunction screen

-- Omitted button, to remove the malfunction name from the malfunction screen

-- Switch off button for the sound alarm

-- Switch on/off button for the generator set

-- Emergency stop

## 19. Diesel Engine Protection

19.1 High water temperature protection (Sound and light alarm with identification sticker) then shut off and stop engine operate with clarify clear Indication at the malfunction screen. Protection should disconnect load first and then stop engine.

19.2 Low water level protection (Sound and light alarm with identification sticker) then shut off and stop engine operate with clarify clear Indication at the malfunction screen. Protection should disconnect load first and then stop engine.

19.3 Low lubrication oil pressure protection (Sound and light alarm Sound and light alarm with identification sticker) then shut off and stop engine operate with clarify clear Indication at the malfunction screen.

## 20. Spare Parts

20.1. Engine manufacturer's recommended spare parts (oil, fuel and air filters) shall be included for the first 1000 hours of operation

20.2. Fuses per type of fuse, 4 units

20.3. Droop kit (individually priced)

20.4. AVR AS440 (individually priced)

20.5. Fuel transfer pump (individually priced)

20.6. Totalizing panel for 2 cloned gensets (individually priced) - comprising Rittal enclosure, copper bus bar, Lovato DMG800 digital multi-meter.

20.7. ATS 4-pole (individually priced).

### DOCUMENTATION:

#### a. For tendering process evaluation

- Diesel genset specification compliance data sheet filled
- Genset Brochure
- Engine Data sheet
- Engine derating chart (not table)
- Alternator Data sheet
- Alternator derating chart or table
- Canopy data sheet (part number, dimensions, inlet and outlet dimensions, effect on engine performance, calculated restriction pressure, airflow, differential temperature between radiator inlet and ambient temperature...)
- Serial numbers document: a document to be generated by the supplier including month/year of manufacture, manufacturer, model and serial number for genset, canopy, engine and alternator.
- Circuit breaker data sheet and trip curve
- Insulation data sheet
- Coolant data sheet
- Oil data sheet
- Operating Manual
- Maintenance Manual
- Preventive maintenance instruction for both prime and emergency source of energy
- Trouble shooting Manual
- Wiring Diagram
- Illustrated parts catalog
- Calculations of cable sizing as per standards BS 7671
- Recommended spare parts list up to 5000 hours of operation
- Original certificates of origin of engine and alternator in paper as well as soft copy on CD/DVD.

#### b. Genset will not be considered delivered and acceptance test will not be performed until all documentation is accepted by third party inspectors.