

JABATAN KERJA RAYA MALAYSIA



**UNIT STANDARD, PENGUJIAN & MAKMAL
CAWANGAN KEJURUTERAAN ELEKTRIK**

TECHNICAL INFORMATION ON THREE-PHASE GENERATOR SET

A. COMPANY

1. Name of Company : _____
2. Address : _____

3. Telephone No : _____
4. Fax No : _____

B. PRODUCT SPECIFICATION

1. Brand Name : _____
2. Model No : _____

3. Approval Standard : _____

4. Test Report No : _____

Catatan Pejabat

⓪ - Lulus

ⓧ - Kandas

5. General

- 5.1 A diesel engine directly coupled to a 3-phase alternator with auxiliary equipment. Yes No
- 5.2 Capable of delivering and maintaining a continuous power of not less than the kVA specified at 0.8 lagging power factor, 415 V, 3 phase, 4 wire and 50 Hz. Yes No
- 5.3 The operating conditions shall be:
- 5.3.1 Total barometric pressure: 750mm Hg. Yes No
- 5.3.2 Air temperature: 40^o C Yes No
- 5.3.3 Relative humidity: 95% Yes No
- 5.4 The engine and alternator must be provided with nameplates bearing serial numbers, ratings, registered supplier's name and address and date of commissioning. Yes No
- 5.5 The material, equipment and installation shall conform to the principles of the latest edition standards and codes of practice laid down by the MS, IEC, ISO and BS. Yes No
- 5.6 Comply with:
- 5.6.1 ISO 3046 Yes No
- 5.6.2 ISO 8528 Yes No
- 5.6.3 IEC 60034 Yes No
- 5.6.4 IEC 60034-22 Yes No
- 5.6.5 IEC 60085 Yes No
- 5.6.6 BS 4999-140 Yes No
- 5.6.7 (Please specify) Yes No

6 Generator Set

- 6.1 Designed for cold starting and capable of supplying the rated kVA specified in not more than 15 sec. from initiation of the starting procedure. Yes No
- 6.2 Performance class G2 of ISO 8528-5. Yes No
- 6.3 Mounted on a base frame and the mounting shall be of fully resilient type. Yes No

- 6.4 The base frame shall be provided with lifting points for transportation. Yes No O
- 6.5 Spring type vibration damper shall be installed and supplied together with generator set. Yes No O

7. Engine

- 7.1 Multi cylinder, vee/in line configuration, 4 stroke, direct injection, naturally aspirated or turbo charged, water-cooled with fan and radiator and instant starting. Yes No O
- 7.2 Speed shall be 1500 r.p.m. Yes No O
- 7.3 Comply with relevant parts of ISO 3046 and ISO 8528-2 as minimum requirements. Yes No O
- 7.4 Capable to meet any transient load requirements caused by motor starting and/or any load profile as specified and/or shown in the drawings. Yes No O
- 7.5 Able to withstand an overload of 10% at rated speed for 1 hour in any period of 12 hours consecutive running. Yes No O
- 7.6 Capable of sustaining indefinitely without deterioration to run under low load condition. Yes No O

8. Fuel System

- 8.1 Capable of operating on Class A fuel to BS 2869. Yes No O
- 8.2 Fuel pump shall be of the gear type. Yes No O
- 8.3 Fuel filter of heavy duty, replaceable and paper element type. Yes No O

9. Lubrication System

- 9.1 Complete with enclosed force-feed lubricating system by gear type oil pump with full flow replaceable paper element type oil filter. Yes No O
- 9.2 Oil pan shall be of the sump type. Yes No O

10. Engine Governing

- 10.1 Speed governing of the engine shall comply with ISO 3046-4. Yes No O
- 10.2 The governing accuracy of the engine shall be of performance class G2 within the operating limit values in accordance with ISO 8528-2. Yes No O
- 10.3 The speed droop shall be less than 5% with steady-state speed band of less than 1.5%. Yes No O

- 10.4 Governor shall be of proportional integral (PI) type. Yes No O
- 10.5 Governor shall be of proportional integral differential type (for parallel operation). Yes No O
- 10.6 Generator set is rated at or more than 1000 kVA or for parallel operation of two or more generator sets, the governor shall be of proportional integral differential (PID) electronic type. Yes No O

11.Engine Instrumentation

- 11.1 The instruments and gauges shall be of the flush mounting on the metal clad panel and shall include but not limited to the followings: -
- 11.1.1 Elapsed hours running meter. Yes No O
- 11.1.2 Lubricating oil pressure gauge. Yes No O
- 11.1.3 Cooling water temperature gauge. Yes No O
- 11.1.4 Tachometer. Yes No O

12.Alternator and Exciter

- 12.1 Screen protected, drip-proof, revolving fields, self-regulating, **brushless** (excitation system), salient pole type, directly coupled to the engine and fitted with exciter compliance to relevant parts of IEC 60034 and IEC 60034-22. Yes No O
- 12.2 Alternator shall be of 415V, 3 phase, 4 wire, 50 Hz and duty type S1 in accordance with IEC 60034-1. Yes No O
- 12.3 Capable of delivering its basic continuous rating not less than the rated kVA specified at 0.8 power factor lagging. Yes No O
- 12.4 Principal characteristics of the alternator shall comply with ISO 8528-3. Yes No O
- 12.5 Insulation of Class 'H' conforming to IEC 60085. Yes No O
- 12.6 Temperature rise limits of Class 'F' complying with IEC 60034-1. Yes No O
- 12.7 For rated capacity at and exceeding 1000 kVA, the alternator shall be fitted with winding heaters. Yes No O
- 12.8 Winding heaters shall complete with automatic thermostat control, maintaining the winding temperature at 5 °C above ambient temperature when the alternator is at standstill. Yes No O
- 12.9 Winding heaters shall be arranged for automatic disconnection when the alternator is in operation. Yes No O

- 12.10 Two winding heaters per phase shall be provided. One winding heater shall be connected for operation and the other is for replacement in case the first heater fails. Yes No
- 12.11 RTD of PT 100 shall be provided to monitor the winding temperatures during operation. Yes No
- 12.12 For parallel operation the voltage regulations shall comply with the requirements of BS 4999-140 and relevant parts of ISO 8528. Yes No
- 12.13 Voltage regulation shall be of solid-state transistor amplified type. Yes No
- 12.14 Voltage regulation conforming to performance class G2. Yes No
- 12.15 When driven at rated speed and operating with its normal excitation control system, shall be capable of maintaining the voltage under steady state conditions within $\pm 2.5\%$ ($\pm 1\%$ for parallel operation) of rated voltage for all loads between no-load and rated load at rated power factor. Yes No
- 12.16 Transient changes the voltage shall restore to within these limits in less than 1.5 seconds. Yes No
- 12.17 When driven at rated speed and giving its rated voltage on no load under its normal excitation control system is switched on to a sudden load application, the initial voltage drop shall be limited to 20 % of rated voltage and the voltage shall recover to rated voltage in less than 1.5 sec. Yes No
- 12.18 Normal voltage shall be variable by means of voltage trimmer within $\pm 5\%$ of rated voltage. Yes No
- 12.19 AVR shall be of 3 phase sensing electronic type equipped with radio frequency interference (RFI) suppressor to EMC compliance and encapsulated to provide protection against moisture and salt-spray. Yes No
- 12.20 AVR shall be mounted on anti-vibration mounts for mechanical protection from engine vibrations. Yes No

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SPECIFICATION CHECKLIST FOR THREE-PHASE GENERATOR SET

The generator set manufacturer/dealer is required to furnish the following information:

1. Manual to be provided:
 - a) Operation manual for engine
 - b) Operation manual for alternator
 - c) Servicing manual for engine
 - d) Servicing manual for alternator
 - e) Spare parts manual for engine
 - f) Spare parts manual for alternator

2. Spares and Stock position:

a) Size of stores:

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b) Quantity and amounts of stocks:

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3. Personnel:

Servicing staff: (set-up, nos. and including the grades)

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4. Servicing centres:

Nos. and places of all servicing centers in Malaysia.

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5. Load testing facilities in the factory:

a) Resistive load – maximum capacity that the generator set can be tested at unity power factor

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b) Inductive load – maximum capacity that the generator set can be tested at 0.8 power factor lagging

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6. To indicate the batteries capacity (Ah) for starting the generator set (refer to Lampiran 2). The batteries shall satisfy the requirements of Jabatan Bomba dan Penyelamat and Department of Environment.

7. To confirm whether the generator set can take care of thyristor load.

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(Please submit the relevant detail documents).

ENGINE: Jenama:
 Buatan:
 Speed: rpm
ALTERNATOR: Jenama:
 Buatan:
 Fasa / Voltan: ph. / V
 Frekuensi: Hz
 Insulation Class: Class
 Temperature Rise Class: Class
 Rating: Continuous

NO.	ENGINE		ALTERNATOR		GENERATOR SET				Voltage (Starter Motor)	Battery Capacity (Ah)	
	Model	Continuous Rating at Standard Reference Conditions (kW)	Model	Rated Output at 0.8 p.f (kVA)	Efficiency (%)	Model	Generator Set Rating at Standard Reference Conditions kW kVA	Generator Set Rating at Operating Conditions kW kVA			Aspiration**

* To submit the deration factor calculation
 ** N - Naturally Aspirated
 T - Turbo-Charged
 TA - Turbo-Charged After Cooled

Reference Conditions:
 Total barometric pressure: mm Hg
 Air temperature: °C
 Relative humidity: %

Operating Conditions:
 Total barometric pressure: 750 mm Hg
 Air temperature: 40 °C
 Relative humidity: 95%

CONDITION OF APPROVAL

The approval for the use of the Generator Set is subject to the following conditions:

1. The manufacturer/dealer cannot refuse to service or repair any generator set which are supplied and installed in any part of the country.
2. The manufacturer/dealer must carry enough stock of spare parts and maintain servicing gang and workshop facilities.
3. The accepted output rating of the generator set is for condition where altitude is up to approximately 100 m above sea level. For generator set to be installed at higher altitude, different derating factor has to be separately determined.
4. The manufacturer/dealer has to show the Sole Agent letter from principal company (i.e. current company from overseas).

Saya dengan ini mengaku keterangan yang diberikan oleh saya bagi pihak Syarikat adalah betul dan benar.

Cop Syarikat:

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Tarikh:

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ULASAN (Untuk diisi oleh Pejabat JKR sahaja)

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NOTA:

Untuk diisi seperti berikut:

– LULUS

- KANDAS