

TECHNICAL SPECIFICATION OF MITSUBISHI BASIC DIESEL GENERATOR SET

This specification covers the indoor use MITSUBISHI diesel engine generator set and attached equipment,

	MGS Model	MGS1500C(M16R-G)
	Code Name	5C-7PE
Generator Set	Frequency (Hz)	50
	Voltage ¹ (V)	380
	Duty	Continuous
	Rated Output ¹ (kVA) (kW)	1550 1240
Engine	Model	S16R-PTA-S
	Speed (min ⁻¹)	1500
	Output ² (kWm)	1330
	Fuel Consumption ^{3,5} (liter/hr)	238
	Lub.Oil Consumption ⁴ (liter/hr)	1.18
	Cooling System	Cooling Fan & Radiator are out of MHI scope
Generator	Model	MG-7PE
	Phase & Wire	3Phase 4 Wire
	Power Factor	0.8 lagging
D/G Set Dimension & Weight	Length (mm)	4660
	Width (mm)	1975
	Height (mm)	2905
	Weight (kg)	12420

Note 1 For actual voltage and output, refer to the "Scope of supply" sheet

Note 2 Output at 40 deg C , 1000m ASL without Fan

Note 3 Fuel Consumption at 75% Load

Note 4 Lub. Oil Consumption at 100% Load

Note 5 Fuel Consumption may differ subject to site condition and specification of fuel.
Not guaranteed value

RATING DEFINITION

Duty	Continuous
Over Load	Not Available
Yearly Average Load Factor	Less than 100%
Yearly Operating Hours	Unlimited
Allowable Average Load Factor For 24 Hours	1) Less than 100%

1. BASIC CONDITIONS

1.1 MEASUREMENT

Unit of measurement, weight, and capacity concerning all of the equipment supplied by us, SI unit and English letter are used.

1.2 SHOP TEST

Diesel generator test shall be carried out on the following items at the manufacturer's shop.

(1) Starting and stopping test.

(2) Load test

0% Load	25% Load	50% Load	75% Load	100% Load
5 min	10 min	10 min	10 min	20 min

(3) Governor test.

(4) Insulation and alarm test.

Generator and switchboard test shall be carried out at generator manufacturer's shop. After the test, the test record shall be submitted.

1.3 Applicable standard

To be in accordance with JIS, JEC, JEM, IEC and manufacturer's standards unless otherwise specified

- a) J.I.S. : Japanese Industrial Standards
- b) J.E.C. : Standard of the Japanese Electrotechnical Committee
- c) J.E.M. : The standard of Japanese Electrical Manufacturers Association
- d) I.E.C. : International Electrotechnical Commission
- e) I.S.O. : International Organization for Standardization

1.4 PAINTING

Mitsubishi standard (Dark Blue) Munsell 6.0PB 4.4/5.2

1.5 ENVIRONMENT ETC.

Generator sets are designed under the following operating conditions

- a) Relative humidity : Max. 85%
- b) Ambient temperature : 40deg.C
- c) Altitude above sea level : Below 1000 meters

2. DIESEL ENGINE

2.1 Particulars of diesel engine

Engine model	S16R-PTA-S 4 cycle, direct injection, turbocharged, with air cooler
No. of cylinder	16-Vee
Bore / stroke (mm)	170 / 180
Total displacement	65.37 liter
Compression Ratio	14.0 : 1
Frequency regulation (as generator set)	Temporary 12% (100% throw off) 10% (50% throw in) Permanent5% Steady state Frequency band..... $\pm 0.25\%$ Other performance with ISO 8528 / V Class G2 governing
Governor	Electrical type
Fuel oil	Refer to Operation & Maintenance manual
Fuel injection pump	MHI PS8 type x 2
Fuel injection nozzle	Hole nozzle type
Fuel feed pump	Forced feeding by piston type pump
Fuel filter	Paper element type
Lubricating oil	Refer to Operation & Maintenance manual
Lubricating system	Forced lubricating by gear pump wet sump system
Lub. oil capacity	392.0 liter
Lub. oil filter	Full flow paper element type
Lub. oil cooler	Water cooled corrugated type
Coolant	Refer to Operation & Maintenance manual
Water pump	Centrifugal type driven by engine
Turbocharger	Exhaust gas turbine
Air cleaner	Paper element type
Starting system	Electric starting Starting motor capacity (DC24V) : $7.5\text{kW} \times 2$
Stopping system	Energize to run type solenoid on the fuel linkage

2.2 Engine Instrument

Engine instruments shall be installed in the generator panel.

Engine status are showed by graphical icon and digital indicator on LCD display of the generator panel.

3. AC GENERATOR

The brushless AC Generator coupled with the diesel engine and installed onto a common bed.

The AC Generator provided the following characteristics.

3.1 Particulars of the AC Generator

(1) Standard specification

Type	: Brushless, self excited, self ventilating and rotating field
Protection	: IP23
No. of pole	: 4 pole
Insulation	: Class "H"
Exciter	: Brushless
Bearing	: Single ball bearing

3.2 Characteristics (AC Generator)

(1) Steady state voltage regulation

Voltage Regulation will be $\pm 0.5\%$ when the load varies between no load and full load at power factors between 0.8 and 1.0 over a prime mover speed range of 4%.

(2) Transient Response

The Instantaneous Voltage Regulation will be within 25% and recoverable to within 3% of the final steady-state voltage in not more than 1sec., when full load at a power factor of 0.4 or less is suddenly applied to the AC Generator running at no load and rated frequency. However engine response may influence on recovery time.

(3) Voltage wave form

The wave form deviation of phase to phase voltage, as checked at the AC Generator terminals, is not greater than 5% at no-load rated voltage.

(4) Unbalanced loading

An acceptable value of negative phase sequence current is approximately 8% of rated current. Up to 25% load imbalance can be tolerated on a continuous basis.

(5) Temperature rise limits

The main windings of the AC Generator are designed for operation to Class F temperature rise limits.

(6) Insulation strength

The dielectric strength of the winding insulation system is checked during manufacture by conducting a High Voltage withstand test.

Main Stator winding : AC 2000V

Main Rotor winding : AC 1500V

(7) Overspeed

The AC Generator is capable of withstanding overspeeds to 125% of the rated speed for two minutes under no load.

(8) Voltage adjustment is typically $\pm 6\%$ using a remotely connected trimmer.

(9) Terminal box

The large fabricated sheet steel terminal box mounted on the AC Generator accommodates load output terminals and access cover.

4. GENERATOR CONTROL (MGS7310GCP)

4.1 General

Automatic start engine management and instrumentation system module in fabricated cubicle is installed on individual bracket with anti-vibration isolator.

4.2 Instruments and control accessories

Instruments are graphical icon on LCD display

- a) Generator running indicator
- b) Voltage adjuster
- c) Frequency adjuster
- d) Emergency stop switch
- e) Selector switch (STOP / RESET , ACTIVE , PANEL LOCK)
- f) Manual start button
- g) Manual stop button
- h) Common alarm indicator
- i) Transfer to generator button (manual mode only)
- j) Transfer to main button (manual mode only)
- k) Mute alarm button
- l) Manual Mode button
- m) Auto Mode button
- n) Menu navigation buttons
- o) Alarm indication on LCD (see 4.3)
- p) Status indicator (see 4.5)

q) Value display on LCD

- 1) Frequency / RPM
- 2) AC voltage Line-Neutral
- 3) AC voltage Line-Line
- 4) AC Line Current
- 5) Oil pressure
- 6) Coolant temperature
- 7) Oil temperature
- 8) Engine hours run
- 9) DC battery voltage
- 10) Generator frequency
- 11) Generator load / kW
- 12) Generator load / kVA
- 13) power factor / Pf
- 14) Generator load / kVA_r
- 15) Generator load / kWh , kVAh , kVA_rh
- 16) Generator phase sequence
- 17) Generator Nominal
- 18) Engine crankcase internal pressure ※
- 19) Exhaust gas temperature ※
- 20) Winding temperature (U,V,W) ※
- 21) Bearing temperature ※

※ These values shall be displayed on the alarm box adjacent to MGS7310GCP

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4.3 Fault operation

Fault operations shall be provided as follows;

Item	Value	Eng. stop	Light Fault	Heavy Fault	Indication
Charge Alternator Failure	19.2V	—	×	—	×
Battery Under Voltage	18V	—	×	—	×
Battery Over Voltage	31.2 V	—	×	—	×
Fail to Stop	30sec	—	×	—	×
Generator Over Current	100%	×	—	×	×
Negative Phase Sequence	8% (1h)	—	×	—	×
Generator Power	105%	—	×	—	×
Fail to Start	80sec	×	—	×	×
Emergency Stop	—	×	—	×	×
Oil Pressure Low First	400kPa	—	×	—	×
Oil Pressure Low Second	150kPa	×	—	×	×
Coolant Temperature High First	95°C	—	×	—	×
Coolant Temperature High Second	101°C	×	—	×	×
Oil Temperature High First	105°C	—	×	—	×
Oil Temperature High Second	110°C	×	—	×	×
Exhaust Gas Temperature High	550°C	—	×	—	×
Winding Temperature High (U,V,W)	120°C	—	×	—	×
Bearing Temperature High	80°C	—	×	—	×
Engine Over Speed First	110%	—	×	—	×
Engine Over Speed Second	115%	×	—	×	×
Engine Under Speed First	80%	—	×	—	×
Engine Under Speed Second	60%	×	—	×	×
Generator Over Frequency	110%	—	×	—	×
Generator Under Frequency	85%	—	×	—	×
Generator Over Voltage First	115%	—	×	—	×
Generator Over Voltage Second	130%	×	—	×	×
Generator Under Voltage First	80%	—	×	—	×
Generator Under Voltage Second	70%	×	—	×	×
Oil pressure Sensor Open Circuit	—	×	—	×	×
Loss of Magnetic Pickup Signal	—	×	—	×	×
L.O. Filter Clogged	0.15MPa	—	×	—	×
Electrical Trip ³	—	×	—	×	×
High Crank case internal pressure	1.5kPa	×	—	×	×
Coolant Level Low	—	—	×	—	×

NOTE : 1. “×” marks are applicable items.

2. “—” marks are not applicable items.

3. Eng stop by Electrical trip signal will be done after Eng cooled.

4.4 Auxiliary input signals

If the functions as follows are necessary, please input external command signals to the control panel.

- (1) Remote start/stop
- (2) Electrical trip
- (3) CB close status (Generator closed auxiliary)

4.5 Status indicator

- (1) Remote start present
- (2) Generator ready
- (3) LO filter clogged
- (4) Electrical trip

4.6 Auxiliary output signals

These signals are output from control panel as 24V DC .

- (1) COMMON Shutdown alarm signal (for CB Trip)
- (2) kW Overload alarm
- (3) Low speed detection
- (4) CB close command (pulse)
- (5) CB open command (pulse)
- (6) AUTO Mode
- (7) Common Electrical Trip ※
- (8) Energize to stop ※ (Not applicable when audible alarm in use)
- (9) Common warning ※
- (10) Failed to start alarm ※
- (11) Over speed shutdown ※
- (12) Emergency stop ※
- (13) Low oil pressure ※
- (14) High water temperature ※

※ Require optional 2157 relay unit

4.7 Operation

Generator control panel has three positions of key switch.

Each position is written in below.

- STOP / RESET : Engine stop and controller reset operation are available.

- ACTIVE : Auto and manual mode can be selected by auto and manual button on controller.

- PANEL LOCK : Even if auto or manual button is pushed, mode selection is not applicable.

Engine start and stop shall be done by operator. When engine trouble occurred engine should be stopped by generator panel automatically.

Remote start and stop control are available, when auto mode is selected by auto mode button.

5. LIMITING REQUIREMENT FOR FUEL OIL, COOLANT AND LUBRICATION OIL

5.1 Fuel system

Fuel to meet the fuel specifications. Refer to Operation & Maintenance manual.
Fuel tank and fuel pipes to be free of dirt, water or other foreign substances.

5.2 Cooling system

Coolant to meet the coolant specifications. Refer to Operation & Maintenance manual.

5.3 Lubrication system

Engine oil to meet the engine oil specifications. Refer to Operation & Maintenance manual.

Do not use CE and CF-4 lube oils for Mitsubishi high-speed diesel engines.

6. RECOMMENDATION FOR INSTALLATION

6.1 The DG (Diesel Generator Set) room

The wall is necessary to prevent hot air recirculation from the exhaust muffler into radiator.

6.2 The exhaust gas pipe in the DG room

The exhaust gas pipe must be covered with the heat insulating material to prevent hot air flow from exhaust gas pipe into radiator

6.3 The vibration isolator

The vibration isolator must be installed according to APPENDIX-1

6.4 Radiator cleaning

The periodical cleaning is necessary to prevent the overheating according to APPENDIX-2

- End of Specification -