

MITSUBISHI BASIC DIESEL GENERATOR SET

TECHNICAL SPECIFICATION



M12H-G (MGS1000B)

1. Generator Set Overview Specification

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

Generator Set	MGS Model	M12H-G (MGS1000B)				
	Frequency (Hz)	50				
	Voltage (V)	380				
	Duty	Standby	Prime	Standby	Prime	
	Rated Output ¹ (kVA)	1050	1000	1220	1100	
	(kW)	840	800	976	880	
Engine	Model	S12H-PTA-S				
	Speed (min ⁻¹)	1500				
	Output ² W/O Fan (kWm)	1071	977	1071	977	
	Fuel Consumption ³ (liter/hr) (% Load)	25%	77	75	85	79
		50%	124	119	139	128
		75%	171	165	195	178
		100%	220	211	252	230
	Lub.Oil Consumption (liter/hr) 100% Load	0.88	0.84	1.02	0.93	
Cooling System	Closed looped circuit by integral radiator					
Generator	Model (MG-)	S6E		S7C		
	Phase & Wire	3Phase 4 Wire				
	Power Factor	0.8 lagging				
D/G Set Dimension & Dry Weight	Length (mm)	4240		4265		
	Width (mm)	1965		1965		
	Height (mm)	2365		2365		
	Weight (kg)	7800		8900		
Generator Set	MGS Model	M12H-G (MGS1000B)				
	Frequency (Hz)	60				
	Voltage (V)	380		480		
	Duty	Standby	Prime	Standby	Prime	
	Rated Output ¹ (kVA)	1337.5	1212.5	1337.5	1200	
	(kW)	1070	970	1070	960	
Engine	Model	S12H-PTA-S				
	Speed (min ⁻¹)	1800				
	Output ² W/O Fan (kWm)	1176	1069	1176	1069	
	Fuel Consumption ³ (liter/hr) (% Load)	25%	104	98	104	97
		50%	164	152	164	151
		75%	228	210	228	208
		100%	295	270	295	267
	Lub.Oil Consumption (liter/hr) 100% Load	1.12	1.02	1.12	1.01	
Cooling System	Closed looped circuit by integral radiator					
Generator	Model (MG-)	S63G		S6F		
	Phase & Wire	3Phase 4 Wire				
	Power Factor	0.8 lagging				
D/G Set Dimension & Dry Weight	Length (mm)	4330		4240		
	Width (mm)	1965		1965		
	Height (mm)	2365		2365		
	Weight (kg)	8600		8450		

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

Note 2 Output at 40°C, 1000m ASL without fan

Note 3 Fuel oil consumption may differ subject to site condition and specification of fuel. Not guaranteed value.

2. RATING DEFINITION

Duty	Overload	Yearly Average Load Factor	Yearly Operating hours	Allowable Average Load Factor for 24 Hours
Standby	Not available	60% or lower	500 hours or lower	<ol style="list-style-type: none"> 1. 80% or lower 2. Over 90% load operation is acceptable for 12 hours per year
Prime	+10% Overload	60% or lower	500 hours or lower	<ol style="list-style-type: none"> 1. 90% or lower 2. Overload ($\leq 110\%$) allowed for 12 hours per year 3. Over 90% load is allowed for maximum 1 hour per 12 hours operation.

3. BASIC CONDITIONS

3.1 MEASUREMENT

SI unit shall be the standard unit of measurement to be used on equipment supplied by MITSUBISHI. English shall be the standard language to be used.

3.2 SHOP TEST

Following test items shall be carried out as standard manufacturer's shop test for MITSUBISHI diesel generator set

- (1) Starting and stopping test
- (2) Load test

MGS Rating	0% Load	25% Load	50% Load	75% Load	100% Load	110% Load
Standby	5 min	10 min	10 min	10 min	20 min	-
Prime	5 min	10 min	10 min	10 min	20 min	10 min

- (3) Governor test
- (4) Insulation and protection test

3.3 APPLICABLE STANDARD

MITSUBISHI diesel generator set is designed in accordance with JIS, JEC, JEM, IEC, ISO and manufacturer's standards unless otherwise specified.

- a) JIS : Japanese Industrial Standards
- b) JEC : Japanese Electrotechnical Committee
- c) JEM : The standard of Japanese Electrical Manufacturers Association
- d) IEC : International Electrotechnical Commission
- e) ISO : International Standard Organization

3.4 PAINTING

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

3.5 ENVIRONMENT ETC.

MITSUBISHI generator sets are designed to meet following operating conditions

- a) Relative humidity : Max. 85%
- b) Ambient Temperature : 5°C ~ 40°C
- c) Altitude above sea level : <1000m@40°C

4. DIESEL ENGINE

4.1 PARTICULARS OF DIESEL ENGINE

Engine model	S12H-PTA-S
	4 cycle, direct injection, turbocharged with air cooler
No. of cylinder	12-Vee
Bore / stroke (mm)	150 / 175
Total displacement	37.11 liter
Compression ratio	14 : 1
Frequency regulation	Transient 12% (100% off load) 10% (50% on load) Steady state Frequency band $\pm 0.33\%$ Other performance with ISO 8528/V Class G2 governing
Governor	Digital Electrical type
Fuel oil	Refer to Operation & Maintenance manual
Fuel injection pump	MHI Unit Injector x 12
Fuel injection nozzle	Hole nozzle type
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	200 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	Refer to table

Type	Rating	
	Standby	Prime
Turbo filter	Standard	
Paper element	Optional	

Starting system	Electric starting Starter motor capacity : 7.5kW x 2 (DC24V)
Stopping system	Energize to run type solenoid on fuel linkage

4.2 ENGINE INSTRUMENT

Engine instruments are installed and connected to the generator panel. Engine status is available on LCD screen and digital indicator of generator panel.

5. AC GENERATOR

Brushless AC Generator coupled with MITSUBISHI engine on rigid common bed is designed to have following characteristics.

5.1 PARTICULARS OF AC GENERATOR

(1) Standard specification

Type	: Brushless, self-excited, self-ventilated and rotating field
Protection	: IP23
Power factor	: 0.8 lagging
No. of pole	: 4 poles
Insulation	: Class H
Exciter	: Brushless
Bearing	: Single ball bearing
Accessories	: D-AVR

5.2 CHARACTERISTICS (AC GENERATOR)

(1) Steady state voltage regulation

Voltage regulation shall be within following specification when load varies between no load and full load subject to power factor between 0.8 to unity and engine governing of 4%.

D-AVR regulation	: $\pm 0.25\%$
Generator set	: $\pm 1.0\%$

(2) Transient response

The instantaneous voltage regulation shall be within 25% and recoverable to within 3% of the final steady state voltage within 1 second when full load at power factor of 0.4 or less is suddenly applied to AC Generator running at no load and rated frequency. However engine response may influence the recovery time.

(3) Voltage waveform

The phase to phase voltage waveform distortion measured at terminals shall not exceed 5% at no load, rated voltage.

(4) Unbalance loading

AC Generator is designed to accept negative phase sequence up to 8% of its rated current and able to withstand load imbalance up to 25% on continuous basis.

(5) Temperature rise limit

The AC Generator is designed to operate at following temperature rise classification for MGS use.

MGS B Standby:	Class H Peak
MGS B Prime:	Class H

- (6) Insulation strength
The insulation of AC Generator is carefully designed and tested with High Voltage Withstand Test (Hi-Pot) to meet industrial requirement as follow.
 - Main Stator winding: AC 2000V
 - Main Rotor Winding: AC1500V

- (7) Over speed
The AC Generator is designed to withstand 125% of its nominal speed for 2 minutes under no load condition.

- (8) Voltage adjustment
MGS is designed to allow a typical of $\pm 6\%$ voltage adjustment from rated voltage via a remotely connected trimmer.

- (9) Terminal box
Terminal box of AC Generator is made of large sheet steel, mounted on AC Generator to accommodate load output terminals via access cover.

6. GENERATOR CONTROL PANEL (MGS7310 MKII)

6.1 GENERAL

The MGS7310 MKII is an automatic start control module fitted to a well-designed panel made of metal sheet, sit on bracket with anti-vibration isolator to absorb the vibration generated from generator set.

6.2 INSTRUMENTS AND CONTROL ACCESSORIES

Following are list of instruments available on generator panel

- a) Generator run indicator
- b) Voltage adjuster
- c) Frequency adjuster
- d) Emergency stop push button
- e) Key switch (STOP/RESET | ACTIVE | PANEL LOCK)
- f) Manual start button
- g) Manual stop/reset button
- h) Transfer to generator button (manual mode only)
- i) Open generator button (manual mode only)
- j) Alarm mute/Lamp test button
- k) Manual mode button
- l) Auto mode button
- m) Menu navigation buttons
- n) Remote start present indicator
- o) Generator ready indicator
- p) Lubrication oil filter clogged indicator
- q) Electrical trip indicator
- r) Alarm indication on LCD (refer to section 6.3)
- s) MGS Status indicator (refer to section 6.6)

- t) Generator set parameters displayed on LCD
- 1) Engine speed
 - 2) Oil pressure
 - 3) Coolant temperature
 - 4) Oil temperature [†]
 - 5) Engine hour run
 - 6) DC battery voltage
 - 7) AC voltage, phase-neutral
 - 8) AC voltage, phase-phase
 - 9) AC line current
 - 10) Generator frequency
 - 11) Generator load (kW, kVA, kVA_r)
 - 12) Generator accumulated load (kWh, kVAh, kVA_rh)
 - 13) Generator nominal voltage
 - 14) Generator nominal frequency
 - 15) Generator phase rotation
 - 16) Power factor
 - 17) Exhaust gas temperature ^λ
 - 18) Winding temperature (U,V,W) ^λ
 - 19) Bearing temperature ^λ
 - 20) Engine crankcase internal pressure ^{※λ}
- ※ This value shall be displayed on terminal box adjacent to MGS7310 MKII panel.
- λ Optional item upon request for all MGS.
- † Optional item upon request for all MGS excluding MGS2800B,C, where it is standard item.

6.3 ALARM LIST

Generator set protection shall be according to following table.

Item	Value	Light Fault	Heavy Fault	Engine Stop	Indication
Battery over voltage	31.2V	O	-	-	O
Battery under voltage	18V	O	-	-	O
Bearing temperature high ⁹	80°C	O	-	-	O
Charge alternator failure	19.2V	O	-	-	O
Coolant level low ⁹	-	O	-	-	O
Coolant temperature high, first	95°C	O	-	-	O
Coolant temperature high, second	101°C	-	O	O	O
Electrical trip ³	-	-	O	O	O
Emergency stop	-	-	O	O	O
Engine crankcase internal pressure high ⁹	1.5kPa	-	O	O	O
Engine over speed, first	110%	O	-	-	O
Engine over speed, second	115% ⁴	-	O	O	O
Engine under speed, first	80%	O	-	-	O
Engine under speed, second	60%	-	O	O	O
Exhaust temperature high ⁹	550°C ⁵	O	-	-	O
Fail to start	-	-	O	O	O
Fail to stop	30 sec	O	-	-	O
Generator over current	NOTE 8	-	O	O	O
Generator over frequency, first	110%	O	-	-	O
Generator over frequency, second	115% ⁴	-	O	O	O
Generator under frequency, first	85%	O	-	-	O
Generator under frequency, second	60%	-	O	O	O
Generator over voltage, first	115%	O	-	-	O
Generator over voltage, second	130%	-	O	O	O
Generator under voltage, first	80%	O	-	-	O
Generator under voltage second	70%	-	O	O	O
Generator power	NOTE 8	O	-	-	O
Loss of magnetic pickup signal	-	O	-	-	O
L.O filter clogged	0.15MPa	O	-	-	O
Mag. pickup open circuit	-	O	-	-	O
Negative phase sequence	8% (1h)	O	-	-	O
Oil pressure low, first	400kPa ⁶	O	-	-	O
Oil pressure low, second	150kPa	-	O	O	O
Oil pressure sender open circuit	-	-	O	O	O
Oil temperature high, first ^{7,9}	105°C	O	-	-	O
Oil temperature high, second ^{7,9}	110°C	-	O	O	O
Winding temperature high (U,V,W) ⁹	NOTE 8	O	-	-	O

NOTE:

1. "O" marks are applicable items.
2. "-" marks are not applicable items.
3. Engine will stop after cooling down in the event of electrical trip.
4. This value is 112% for MGS2800B,C.
5. This value is 600°C for MGS2000B (S16R-PTA2-S) and MGS1400B.
6. This value is 350kPa for MGS0900B,C.
7. This item is standard for MGS2800B,C
8. Refer to table below for respective alarm trip setting value

Items	Standby	Prime
Generator over current	102%	112%
Generator power	105%	115%
Winding temperature	170°C	145°C

9. This item is optional, installed upon request.

6.4 AUXILIARY INPUT SIGNALS

Following are inputs to control panel catered to fulfil customer's basic need.

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

6.5 AUXILIARY OUTPUT SIGNALS

Following are outputs (DC 24V) from control panel available for customer.

1. CB open command (pulse)
 2. CB close command (pulse)
 3. Common shutdown
 4. Common warning
 5. kW overload
 6. System in auto mode
 7. Low speed detection
 8. Audible alarm (only when audible alarm is installed)
 9. Common electrical trip *
 10. Energize to stop *
 11. Fail to start alarm *
 12. Common alarm *
 13. Fail to start alarm *
 14. Over speed shutdown *
 15. Emergency stop *
 16. Oil pressure low shutdown *
 17. Coolant temperature high shutdown *
- * require optional 2157 expansion relay unit

6.6 MGS STATUS INDICATOR

Following status will be indicated on LCD reflecting MGS status

1. Generator at rest
2. Generator available
3. On load
4. Generator stopping
5. Cooling down
6. Generator stopped
7. Generator lock out

6.7 OPERATION

MGS7310MKII generator control panel is pre-installed with a 3 position key switch.

Description of each position is as follow.

- STOP/RESET:
Engine in stop mode and MGS7310 MKII controller is reset.
- ACTIVE:
All buttons on MGS7310 MKII is available for operator to control
- PANEL LOCK:
Function of all buttons are disabled except for navigation buttons.

Start or stop of MGS operation may be performed by operator from control panel in MANUAL MODE. Alternatively, it could be performed remotely by system via remote start/stop signal in AUTO MODE. Should fault condition occur, MGS7310 MKII control panel will stop the MGS automatically.

7. REQUIREMENT FOR FUEL OIL, COOLANT AND LUBRICANT OIL

7.1 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.

7.2 COOLING SYSTEM

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

7.3 LUBRICATING SYSTEM

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

Do not use CE and CF-4 lubrication oil for MITSUBISHI high-speed diesel engines.

- End of Specification -