

SPECIFICATIONS
OF
MITSUBISHI DIESEL ENGINE
MODEL : S12R-PTA2
FOR DIESEL GENERATOR SET

MITSUBISHI HEAVY INDUSTRIES,LTD
SAGAMIHARA MACHINERY WORKS

								APPROVED BY	DRAWN BY
				B	'99-5-31	OEM-A0041	Y.F.		
				DATE	23. JAN. 1998				

1. GENERAL

Object and use	:	Diesel generator
Color of painting	:	Mansel No. 7.5BG6/1.5
Applicable conditions		
Ambient temperature	:	5°C ~ 40°C
Altitude	:	1500m above sea level
Max ,humidity	:	85%
Place of installation	:	In door

Shop test

Diesel engine running tests shall be carried out by the following items.

Starting test		
Load test	:	1/4, 2/4, 3/4 Load each 5min
	:	4/4 Load 20min
Governor test	:	Governor test should be done along with respective governor controller

Safety stop device test

Guarantee

The guarantee shall be valid for the period of either 1 year or 1000Hr (at Hr counter) after installation, whichever is shorter.

The guarantee shall cover against manufacturer defect, materials and workmanship only, and shall not be applicable to damage sustained through mishandling of the equipment.

Standard

All items, unless otherwise specified, are in accordance with JIS and manufacturer's standards.

2. PRINCIPAL PARTICULARS

Model	:	MITSUBISHI S12R-PTA2
Type	:	4cycle stroke, water cooled diesel engine
Combustion chamber	:	Direct injection type
Aspiration	:	Turbocharged with after cooler
Number of cylinders	:	12-V
Bore × stroke	:	170mm × 180mm
Total displacement	:	49.03liter
Compression ratio	:	13.5 : 1
firing order	:	1 - 12 - 5 - 8 - 3 - 10 - 6 - 7 - 2 - 11 - 4 - 9
Direction of rotation	:	Counter clockwise as viewed from flywheel side
Engine dimensions (Approx.)	:	Length 2568mm
	:	width 1401mm
	:	Height 1565mm
Dry weight (Approx.)	:	4900kg (without accessories)
Fuel oil	:	ASTM D975 No. 2 - D or BS 2869 class A
Lubricating oil	:	API service CD class or CF class SAE No. 30 or No. 40

Output at ISO 3046 standard air conditions (25°C, 750mmHg, 30% Humid)

Stand-by rating	:	1723Hp/1500rpm 1903Hp/1800rpm
Prime rating	:	1562Hp/1500rpm 1729Hp/1800rpm
Fuel consumption ratio at Prime rating (allowance +5%)	:	158g/Hp-hr at 1500rpm 160g/Hp-hr at 1800rpm
Lub. oil consumption ratio at Prime rating	:	within 0.6g/Hp-hr

3. DESIGN FEATURES

Cylinder head	: Individual type, Iron casting, Corrosion resistant inserts for intake and exhaust valves.
Valve mechanism	: Two intake and exhaust valves by each cylinder (with valve rotators).
Cam shaft	: High - tensile strength steel forging.
Crank case (Cylinder block)	: Mono - block hanger type. High - tensile strength iron casting.
Cylinder liners	: Replaceable wet sleeve type.
Main bearings and Con - rod bearings	: Steel - backed tri - metal copper special alloy with thin lead - tin overlay.
Piston	: Aluminium alloy casting. Oiljet cooling with cooling channel. Ni - resist top ring insert. Two compression rings and one oil ring.
Piston pin	: Full floating type. High - tensile strength steel.
Connecting rod	: High - tensile strength steel forging. I beam section stem.
Crankshaft	: High - tensile strength steel forging. Induction hardened bearing journals. Counter weighted web.
Gear train	: Located at rear end of crankcase.
Turbocharger	: Exhaust gas turbine.
Lubricating system	: Forced lubricating by gear pump.
Cooling system	: Forced circulation of jacket water by centrifugal pump.
Fuel injection pump	: Bosch type multiple plunger with fuel feed pump.
Starting system	: Electric starting.
Stopping system	: Fuel cut type.

4. STANDARD EQUIPMENTS

(1) power line system

Flywheel	: DWG.NO.37796-21001 SAE J620C 21in, except screw size
Flywheel housing	: DWG.NO.37796-21001 SAE J617b No.00, except screw size
Engine mounting	: DWG.NO.37796-14001 4 points mounting, C = 250mm
Torsional vibration damper	: Viscous type × 2pcs

(2) Air intake system

Air cleaner	: Not supply
Turbocharger	: MITSUBISHI TD Type Model : TD13L-48QRC(47) for 1500rpm TF15M-60QV(49) for 1800rpm
Air cooler	: Jacket water cooled type Plated element type
Air heater	: Not supply

(3) Exhaust system

Exhaust manifold	: Air cooled type with heat insulator
Muffler	: Not supply
Flexible pipe	: Not supply
Companion flange	: Not supply
Breather	: Up side direction type For blow - off to outside of engine room

(4) Lubricating system

Oil pump	:	Gear pump type
Capacity of oil pump	:	1500rpm : 480 liter/min 1800rpm : 580 liter/min
Lub. oil pressure	:	4.0 ~ 6.5kg/cm ²
Quantity of oil (Approx.)	:	Oil pan full level : 150 liter low level : 110 liter Others (filter etc.) : 30 liter Total : 180 liter
Lub. oil filter (Full flow)	:	DWG.NO.37796-40001 Paper element cartridge type × 4pcs filter mesh : 20 μ with by - pass alarm switch
Lub. oil filter (By - pass flow)	:	DWG.NO.37796-40001 Paper element cartridge type × 1pc filter mesh : 2 μ
Lub. oil cooler	:	Water cooled corrugated type with by - pass valve

(5) Cooling system

Water pump	:	Gear drive centrifugal type
Capacity of water pump	:	1500rpm : 1650 liter/min 1800rpm : 1850 liter/min
Thermostat	:	Wax pellet type Open at 71°C ~ 85°C
Fan	:	Pusher type steel fan 1524 diameter, Gear drive Fan speed ratio $i = 0.672$ for 1500rpm $i = 0.568$ for 1800rpm
Radiator piping	:	Not supply

(6) Fuel system

- Fuel inlet pipings : DWG.NO.37796-62101
With flexible hose (PT 3/4 joint)
- Fuel return pipings : DWG.NO.37796-61305
With flexible hose (PT 3/4 joint)
- Fuel overflow of Inj. Pump and fuel leak - off of Nozzle have to return to fuel tank
- Injection pump : Bosch type "PS6" without timer
- Feed pump : Piston type with priming pump
- Injection Nozzle : Hole type 0.325mm × 10 holes
- Fuel filter : DWG, No.37796-62002
: Paper element cartridge type filter mesh : 5 μ

(7) Control system

- Governor : DWG.NO.37796-63004
Electronic speed governor
Speed droop : 0 ~ 5% adjustable
- Actuator : DWG.NO.S13-1010
Supply voltage : DC24V ± 20%
Current consumption
At starting : 13A
Normal operation : 1 ~ 5A
Min. Supply voltage : DC16V50%ED
- Controller : DWG.NO.S13-1041 loose supply
Supply voltage : DC24V ± 20%
Current consumption : 100mA
- Connector : DWG.NO.S13-1020 loose supply
From actuator to controller
5000mm length
- Magnetic pick up : DWG.NO.S13-1400
With 2P-connector
- Cable : DWG.NO.S13-1410 loose supply
From magnetic pick up to controller
4000mm length

- (8) Starting system
- Starter switch : Not supply
 - Starting motor : DWG.NO.37796-66001
DC24V, 7.5KW × 2pcs
Reduction type with safety relay
with 2 poles connector (DWG.NO.S14-0320)
 - Safety relay : DWG.NO.S10-0150 loose supply
For Parallel running of starting motor
 - Current of starter : Rush 1250A
Cranking 400A
(Ambient temp : 5°C, Lub. oil : SAE No. 30)
 - Fuel limit solenoid : DWG.NO.37796-87503
DWG.NO.S13-0280
Fuel limit at engine starting
Energized to fuel control until rated speed
 - Alternator : DWG.NO.S10-0540
DC24V, 30A, with voltage regulator
with 2 poles connector (DWG.NO.S10-0550)
 - Recommended battery capacity : DC24V, 400AH
Not supply
 - Battery switch : Not supply
- (9) Stopping system
- Automatic stop : DWG.NO.37796-87503
Automatically shut - down by stop solenoid and
electronic governor power off simultaneously
 - Stop solenoid : DWG.NO.S13-0280
Energized to run type
DC24V, 31.2A(pull), 0.57A(hold)
 - Manual stop : By stop lever

(10) Safety device

- Alarm switches : DWG.NO.37796-90206
- Alarm and trip
 - Low oil press. switch : DWG.NO.S11-0794 (04442-25201)
Diaphragm type : 1.5kg/cm2 switch on
 - High water temp. switch : DWG.NO.S11-0551 (04442-34400)
Wax type : 95°C switch on
- Alarm
 - Oil filter alarm switch : DWG.NO.S11-1350
Piston type : 1.5kg/cm2 switch on
 - Oil filter alarm lamp : Not supply
 - Air filter alarm indicator : Not supply

(11) Others

- Turning device : DWG.NO.37796-71001
Gear type, for maintenance
- Service meter : Not supply
- Tools : DWG.NO.37796-91001 loose supply
- Spare parts : DWG.NO.37796-94003 loose supply

5. ACCESSORIES (Loose supply parts for standard)

No.	PARTS No.	PATRS NAME	Q'TY	DWG.No.	
1	04410-33100	CONTROLLER	1	S13-1041	37796-63004
2	04410-32900	CONNECTOR, ACTUATOR	1	S13-1020	
3	04410-38500	CABLE, PICK UP	1	S13-1410	
4	04322-40100	RELAY, SAFETY	1	S10-0150	
5	F8665-02100	CONNECTOR	2	S14-0320	for starter
6	32B90-00300	CONNECTOR	1	S10-0550	for alternator

GENERAL ENGINE DATA

Type	4-Cycle, Water Cooled	
Aspiration	Turbo-Charged, After Cooler (Jacket water to Cooler)	
Cylinder Arrangement	60° V	
No. of Cylinders	12	
Bore mm(in.)	170	(6.69)
Stroke mm(in.)	180	(7.09)
Displacement liter(in ³)	49.03	(2992)
Compression Ratio	13.5:1	
Dry Weight - Engine only - kg(lb)	4880	(10760)
Wet Weight - Engine only - kg(lb)	5160	(11378)

PERFORMANCE DATA

Steady State Speed Stability Band at any Constant Load		
Hydraulic (std.) or Electric Governor - %	±0.25 or better	
Maximum Overspeed Capacity - rpm	2100	
Moment of inertia of Rotating Components - kgf·m ² (lbf·ft ²) (Includes Std. Flywheel)	75.3	(1787)
Cyclic Speed Variation with Flywheel at	1800rpm	1/507
	1500rpm	1/294

ENGINE MOUNTING

Maximum Bending Moment at Rear Face of Flywheel Housing - kgf·m(lbf·ft)	450	(3256)
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AIR INLET SYSTEM

Maximum Intake Air Restriction (Includes piping)		
With Clean Filter Element - mm H ₂ O (in. H ₂ O)	400	(15.7)
With Dirty Filter Element - mm H ₂ O (in. H ₂ O)	635	(25.0)

EXHAUST SYSTEM

Maximum Allowable Back Pressure - mm H ₂ O (in. H ₂ O)	600	(23.6)
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LUBRICATION SYSTEM

Oil Pressure at Idle - kgf/cm ² (psi)	2~3 (29~43)	
	at Rate Speed - kgf/cm ² (psi) 5~6.5 (71~93)	
Maximum Oil Temperature - °C(°F)	110	(230)
Oil Capacity of Standard Pan High - liter (U.S.gal)	150 (39.6)	
	Low - liter (U.S.gal) 108 (28.5)	
Total System Capacity (Includes Oil Filter) - liter (U.S.gal)	180 (47.6)	
Maximum Angle of Installation (Std. Pan) (Engine Only)	Front Down	6.5°
	Front Up	6.5°
	Side to Side	22.5°

COOLING SYSTEM

Coolant Capacity (Engine only) - liter (U.S.gal)	125	(33.0)
Maximum External Friction Head at Engine Outlet - kgf/cm ² (psi)	0.35	(5.0)
Maximum Static Head of Coolant above Crankshaft Center - m(ft)	10	(32.8)
Maximum Outlet Pressure of Engine Water Pump - kgf/cm ² (psi)	2	(28.6)
Standard Thermostat (modulating) Range - °C(°F)	71~85	(160~185)
Maximum Coolant Temperature at Engine Outlet - °C(°F)	98	(208)
Minimum Coolant Expansion Space - % of System Capacity	10	
Maximum Coolant Temperature at Intercooler Inlet, TK type - °C(°F)		
Maximum Air Restriction on Discharge Side of Radiator and Fan - mm H ₂ O(in. H ₂ O)	10	(0.4)

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FUEL SYSTEM

Fuel Injector	Mitsubishi PS6 Type x 2
Maximum Suction Head of Feed Pump - mm Hg (in. Hg)	75 (3.0)
Maximum Static Head of Return & Leak Pipe - mm Hg (in.Hg)	150 (5.9)

STARTING SYSTEM

Battery Charging Alternator - V-Ah	24-30
Starting Motor Capacity - V -kW	24-7.5 x 2
Maximum Allowable Resistance of Cranking Circuit - m Ω	1.5
Recommended Minimum Battery Capacity	
At 5° C (41° F) and above - Ah	300
Below 5° C (41° F) through - 5° C (23° F)	600

S12R-PTA2

SPECIFICATION SHEET

mitsubishi
DIESEL ENGINES

ENGINE RATING

All data represent net performance with standard accessories such as air cleaner, inlet /exhaust manifolds, fuel oil system, L.O. pump, etc. under the condition of 29.38 in. (746 mm) Hg barometric pressure, 85° F(29.4°C) ambient temperature and 0.38 in.(9.7mm) Hg vapor pressure.

ITEM	UNIT	STAND-BY POWER			PRIME POWER		
		60Hz	50Hz		60Hz	50Hz	
Engine Speed	rpm	1800	1500		1800	1500	
No. of Cylinders		12					
Bore	mm (in.)	170 (6.69)					
Stroke	mm (in.)	180 (7.09)					
Displacement	liter (in. ³)	49.03 (2992)					
Brake Horse power without Fan	HP (kW)	1971 (1470)	1763 (1315)		1796 (1340)	1602 (1195)	
Brake Mean Effective Pressure without Fan	kgf/cm ² (psi)	20.4 (290)	21.9 (311)		18.6 (264)	19.9 (283)	
Mean Piston Speed	m/s (ft/min)	10.8 (2126)	9.0 (1772)		10.8 (2126)	9.0 (1772)	
Maximum Regenerative Power Absorption Capacity without Fan	HP (kW)	193 (144)	141 (105)		193 (144)	141 (105)	
Intake Air flow	m ³ /min (CFM)	121 (4273)	105 (3708)		109 (3849)	96 (3390)	
Exhaust Gas Flow	m ³ /min (CFM)	320 (11299)	279 (9851)		290 (10240)	253 (8933)	
Coolant Flow	liter/min (U.S. GPM)	1850 (489)	1650 (436)		1850 (489)	1650 (436)	
Coolant Flow to Intercooler (TK only)	liter/min (U.S. GPM)						
Cooling Air Flow (Std. Fan)	m ³ /min (CFM)	1800 (63558)	1800 (63558)		1800 (63558)	1800 (63558)	
Fan Loss Horse Power (Std. Fan)	HP (kW)	67 (50)	40 (30)		67 (50)	40 (30)	
Radiated Heat to Ambient	kcal/hr (BTU/min)	91072 (6023)	79303 (5245)		82436 (5452)	72061 (4766)	
Heat Rejection to Coolant	kcal/hr (BTU/min)	758934 (50195)	660861 (43708)		686970 (45435)	600510 (39717)	
Heat Rejection to Inter Cooler (TK Version)	kcal/hr (BTU/min)						
Heat Rejection to Exhaust	kcal/hr (BTU/min)	921463 (60944)	772431 (51088)		826458 (54661)	701891 (46422)	
Noise Level (1 m height & distance) (excludes, Intake, Exhaust & Fan)	dB(A)	110	107		108	105	

The specifications are subject to change without notice.

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As stated above, to derate is to reduce the rated output. The following chart indicates the necessary reductions in percentage with reference to the standard conditions for derating (the most right column of the above chart).

Derating chart

Ambient condition	Engine type			Remarks
	With turbo charger (T)	With turbo charger and aftercooler(TA)	With turbo charger and intercooler(TK)	
Atmospheric temperature	6.5% reduction for each 10°C rise	4% reduction for each 10°C rise		
Barometric pressure or altitude	2.5% reduction for each 300 meter rise in altitude			
Relative humidity	Derating not required			
Coolant temperature			3.5% reduction for each 10°C rise	Applicable from 32°C until 50°C

Note:

1. This derating chart is based on the simplified computation conforming to ISO 3046/1, and provides approximate values good enough for practical purposes. For closer values, compute by the formulas given in this ISO code.
2. The percentages given in this chart must never be used in "uprating".

MHI derating info

MHI EQUIPMENT EUROPE B.V.
P.o.BOX 30101
NL 1303 AC ALMERE



**DERATING OF DIESEL ENGINE OUTPUT
BY AMBIENT CONDITIONS.**

Sales literatures, published by the engine manufactures, show the rated outputs of the engines applicable to the "standard ambient (sea level) conditions". This makes it necessary to derate the rated output so that the engine can be applied to the actual working conditions. How to derate the output will be explained.

1) Standard ambient conditions as the basis of derating

Standard ambient conditions specified by the following and those which are used by MHI for the purpose of derating the SB-, SA-, SN-, SU- and SR-series industrial diesel engines are listed in this chart:

Ambient conditions	Standard ambient conditions			
	JISD1005	SAE816b	ISO 3046/1 (BS5514/I)	For derating (MHI)
Atmospheric temperature	20°C	29.4°C	27°C	40°C
Barometric pressure	760 mmHg	746 mmHg	750 mmHg	634 mmHg
Relative humidity	65%	31.5%	60%	-----
Coolant temperature	TA	---	77°C	80°C
	TK	---	27°C	32°C

2) Derating method

For the subject engines, their ratings shown in the literatures hold good, as far as their horsepower capability is concerned, if they are to serve under conditions no less favourable than what is indicated in the most right column. Where the conditions are less favourable concerning the atmospheric temperature, barometric pressure and coolant temperature, derating is necessary.