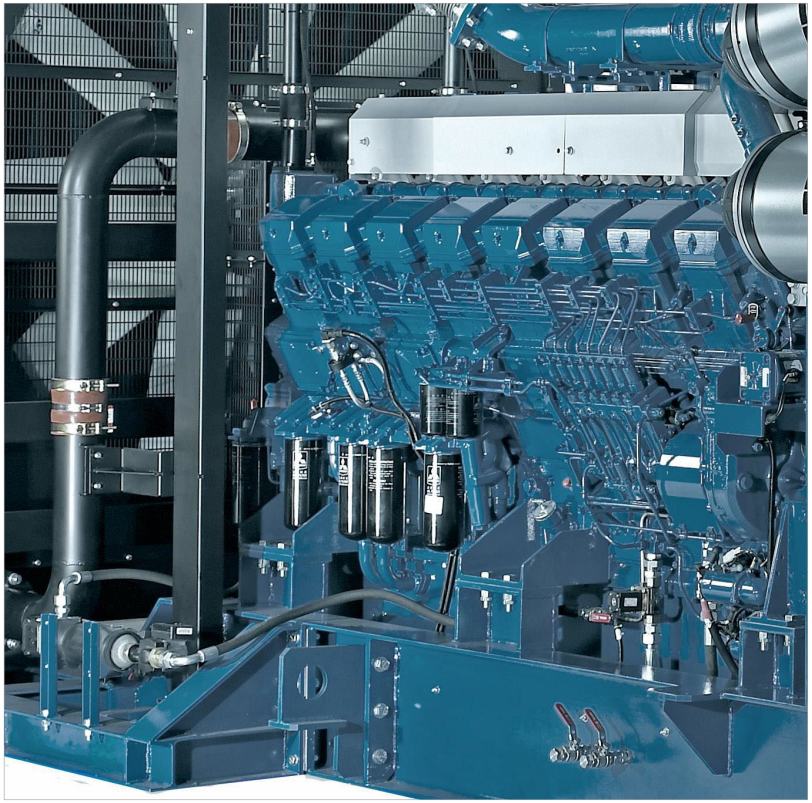
MOVE THE WORLD FORWARD MITSUBISHI HEAVY INDUSTRIES GROUP



CATALOGUE 2023

GENERATOR SET | MGS-G-EU

MITSUBISHI GAS GENSET, LOW AND HIGH VOLTAGE
Version: 1.1

MITSUBISHI GENERATOR SET

Table of Contents

1. Scope of Supply and Options

MITSUBISHI Gas generator set with standard embedded auto control and auxiliary panel.
Voltage 400V or 3 to 11kV, 3P+N, cos phi 0,8, Frequency 50 Hz
CE compliance : 2006/42/EC machinery

Included in standard scope

Remote auto start control panel with DEIF synchronizer for parallel mode / engine gas, ignition and detonation controllers / Mitsubishi PLC / touchscreen color HMI incl. harness assembly with industrial connectors (plug & play)
Auxiliary panel including 230/400Vac power supplies to genset auxiliaries and 24Vdc power source to PLC
Starting battery kit + batteries + 24Vdc charger
Engine coolant heater
Alternator space heater
Full instrument and protective devices set (oil, coolant, exhaust, cylinder, air, gas, air/fuel mixture – pressure – temperature – level – knock)
Complete gas train mounted on genset, ready to use (plug & play)
Air filter kit
Oil mist filtration kit (closed loop system)
Lube oil level regulator
Lube oil priming pump
Exhaust bellow (loose supply)
Gas flexible set (loose supply)
Cooling water bellow set (loose supply)
Temperature control valve (3 way type), HT and LT + temperature sensor set (loose supply)
Antivibration pads (loose supply)
Factory test report

Options available on request

Cooling water pumps, HT and LT
Remote radiator (horizontal dry air cooler) 35°C (40°C on request)
Exhaust muffler, 40 dB(A), horizontal with supports
Prechamber gas compressor, 150mb/3.5b, skid mounted
Gas metering system Cl. 0,5 with PTZ corrector
Lube oil service tank, 250L
Heat recovery skid (CHP hot water)
Switchgear panel (ACB, 3 poles 400V, motorized)
15" HMI with scada

Any other options or modification of the standard scope available on request.
The product as per the above Scope of supply is **'partly completed machinery'** as defined in the Machinery Directive 2006/42/EC. MTEE is prepared to issue EC Declaration of Incorporation.

2. Rating definition for Mitsubishi MGS-G-EU

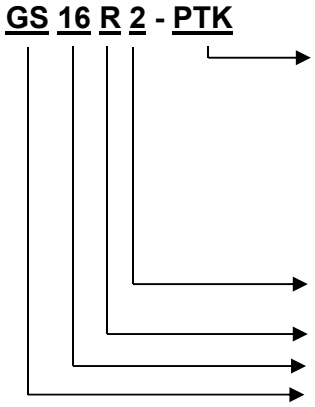
Symbol	Name of rating	Overload operation	Definition	Required condition for warranty (*1)						Application
				Load/operating hour (*2)			Overhaul interval (*3)			
				Ave. load factor /24hr	Ave. load factor /year	Operating Hr/year	Top	Full	Major	
COP	Continuous C	Not possible	Rating that can continuously generate power without limitation for operating hour per year under the required conditions for warranty in this document. COP as specified in ISO 8528:2005	100% or lower	100% or lower	Unlimited	Std : 8000 Hr	Std : 16000 Hr	Std : 60000 Hr	Base load with grid, Variable load with limited grid, Cogeneration System
				90% or lower	90% or lower		CBM : 12000 Hr	CBM : 24000 Hr	CBM : 60000 Hr	
				75% or lower	75% or lower		CBM : 15000 Hr	CBM : 30000 Hr	CBM : 60000 Hr	

(*1) This condition constitutes a part of required conditions for warranty (Barometric pressure: 100kPa, ambient temperature :298K, relative humidity :30%).
(*2) Average load factor (per day or year) shall be calculated as per the formula in ISO 8528:2005 'average power output(Ppp)'.
(*3)Refer to Operation Manual for more information regarding inspection and maintenance including items and descriptions.
Std = Standard maintenance program
CBM = Conditioned Based Maintenance program (applicable for 90% or 75% average load operation)

This document may be changed without prior notification.

3. Engine and MGS-G-EU model name explanation

MODEL NAME EXPLANATION (ENGINES)

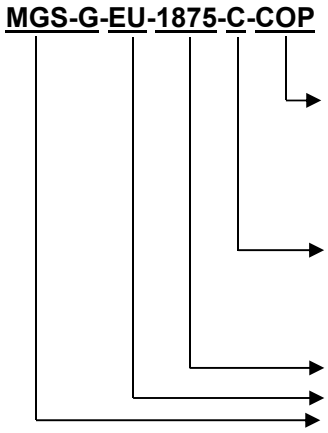


Type of cooling system:

PTA(2)	Charged air is cooled by engine jacket water.
PTAA(2)	Charged air is cooled by air-to-air cooler.
PTAW(2)	Double circuit cooling system for charged air and engine jacket water.
PTK	Charged air is cooled by raw water of max. 49°C.

Long stroke model
1500 rpm Series
No. of cylinders
G – Gas fuelled engine
S – Capital of Sagamihara

MODEL NAME EXPLANATION (GENERATOR SETS)



Rating according to rating definition table

LTP	Stand by operation E	Limited running time - No overload
PRP	Prime Power	Unlimited running time - 10% overload
DCP	Data Center Power	Unlimited running time - 10% overload
COP	Continuous Power C	Unlimited running time - No overload

Running time definition

B	Limited running time
C	Unlimited running time

MGS model rating, in kVA
Manufactured in Europe with CE compliance
Mitsubishi **G**enerator **S**eries, **G**as fuelled

MGS-G-EU (Low voltage 400V 50Hz)

MGS-G-EU model	Build in	Emission	Rating	MITSUBISHI Engine model	LEROY SOMER alternator				MECC ALTE alternator			
					Model	Volt/Amp	kWe	KVA	Model	Volt/Amp	kWe	KVA
Non emission series												
MGS-G-EU 1875 C	France	<350Mg NOX	COP	GS16R2-PTK	52.3 S7	400 / 2706	1500	1875	46 1 L4A	400 / 2706	1500	1875
MGS-G-EU 625 C	France	<350Mg NOX	COP	GS6R2-PTK	49.3 M6	400 / 902	500	625	40 2 L4	400 / 902	500	625

MGS-G-EU (High voltage 3kV 50Hz)

MGS-G-EU model	Build in	Emission	Rating	MITSUBISHI Engine model	LEROY SOMER alternator				MECC ALTE alternator			
					Model	Volt/Amp	kWe	KVA	Model	Volt/Amp	kWe	KVA
Non emission series												
MGS-G-EU 1875 C	France	<350Mg NOX	COP	GS16R2-PTK	53.2 VL7	3000 / 361	1500	1875	46 MV 1VL4	3000 / 361	1500	1875

MGS-G-EU (High voltage 6kV 50Hz)

MGS-G-EU model	Build in	Emission	Rating	MITSUBISHI Engine model	LEROY SOMER alternator				MECC ALTE alternator			
					Model	Volt/Amp	kWe	KVA	Model	Volt/Amp	kWe	KVA
Non emission series												
MGS-G-EU 1875 C	France	<350Mg NOX	COP	GS16R2-PTK	53.2 VL7	6000 / 180	1500	1875	46 MV 1VL4	6000 / 180	1500	1875

MGS-G-EU (High voltage 10kV 50Hz)

MGS-G-EU model	Build in	Emission	Rating	MITSUBISHI Engine model	LEROY SOMER alternator				MECC ALTE alternator			
					Model	Volt/Amp	kWe	KVA	Model	Volt/Amp	kWe	KVA
Non emission series												
MGS-G-EU 1875 C	France	<350Mg NOX	COP	GS16R2-PTK	53.2 VL7	10000 / 108	1500	1875	46 MV 1VL4	10000 / 108	1500	1875

MGS-G-EU (High voltage 11kV 50Hz)

MGS-G-EU model	Build in	Emission	Rating	MITSUBISHI Engine model	LEROY SOMER alternator				MECC ALTE alternator			
					Model	Volt/Amp	kWe	KVA	Model	Volt/Amp	kWe	KVA
Non emission series												
MGS-G-EU 1875 C	France	<350Mg NOX	COP	GS16R2-PTK	53.2 VL7	11000 / 98	1500	1875	46 MV 1VL4	11000 / 98	1500	1875

5. Output deration chart

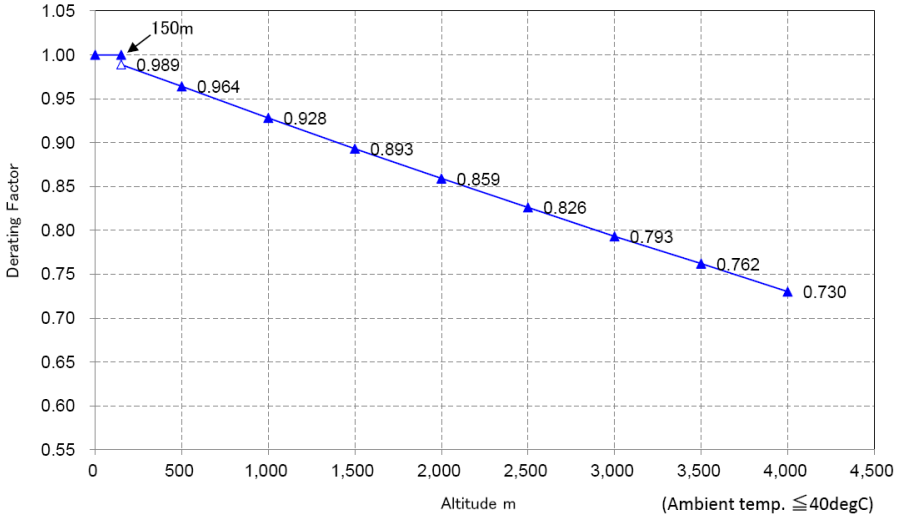
Power outputs of engines are normally shown at standard atmospheric conditions.
When the engine is operated under conditions different from the standard atmospheric conditions, the output must be adjusted, according to following charts.
Standard atmospheric conditions are:

- Temperature: 298K (25°C) nominal, 313K (40°C) as max
- Altitude lower than 150m
- Humidity: 30% nominal, 85% as max

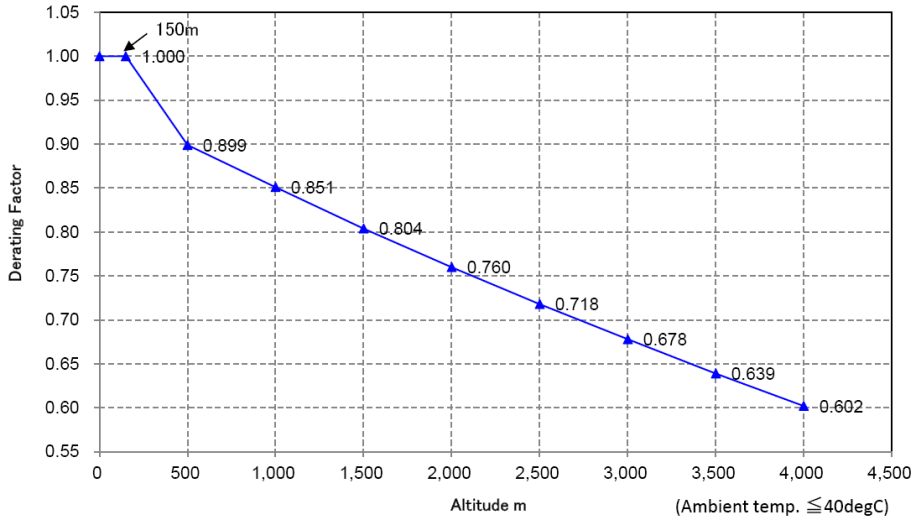
IF THE AMBIENT TEMPERATURE OR AMBIENT PRESSURE (ALTITUDE) CONDITIONS ARE DIFFERENT FROM THE STANDARD AS ABOVE, THE OUTPUT OF THE ENGINE MUST BE DE RATED.

A. Derating with altitude

(1) For GSR engine EXCEPT FOR the following models.
GS6R-PTK 305kWe/1200min^{-1},
GS12R-PTK 610kWe/1200min^{-1},
GS16R2-PTK 1500kWe/1500min^{-1}



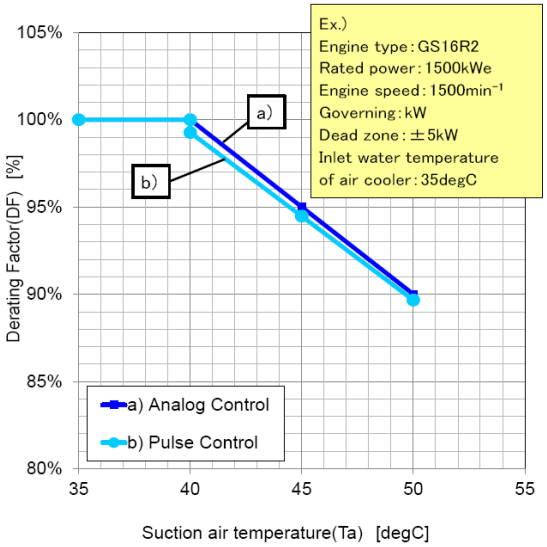
(2) For GSR engine of the following models.
GS6R-PTK 305kWe/1200min^{-1},
GS12R-PTK 610kWe/1200min^{-1},
GS16R2-PTK 1500kWe/1500min^{-1}



B. Derating with suction air temperature

(1) For GSR engine EXCEPT FOR the following models.

GS6R-PTK 305kWe/1200min^{-1},
GS6R2-PTK 315kWe/1000min^{-1},
GS6R2-PTK 380kWe/1200min^{-1},
GS12R-PTK 610kWe/1200min^{-1},
GS12R-PTK 700kWe/1500min^{-1}



	Calculating formula	Temperature range
a)	$DF = -Ta + 140$	40＜Ta≦50degC
b)	$DF = \left\{ \frac{(6-0.1\times P)}{10\times P} \times Ta + \frac{1.4\times P-35}{P} \right\} \times 100$	

Ta : Suction Air Temperature[degC] P : Rated Power[kWe]

- Derating factor between two adjoining plots can be calculated by linear interpolation.
- Derating factor for suction air temperature is different between analog control and pulse control.
- Please contact us if the altitude is more than 4000 m asl or if suction air temperature is more than 50°C.
- If the atmospheric conditions are outside the range of the output de rating chart, judgment is made on case by case basis.
- The output adjustment chart is used only for reducing the rated output, it must never be used for increasing the rated output
- This document is the extracted version of G0205-0001E. The content is subject to change without notice. Please refer to original document available on MEeS.

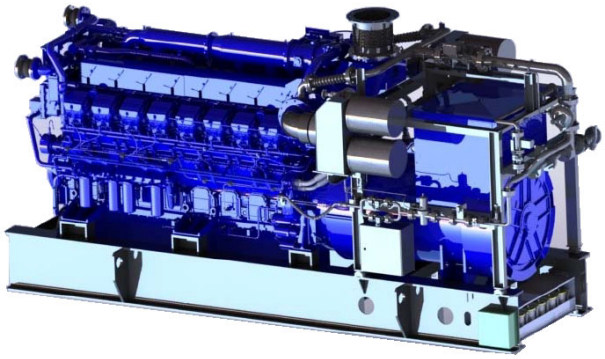
MITSUBISHI GENERATOR SET

MGS-G-EU

MITSUBISHI GAS GENERATOR SET

EU MADE (France)

Quality, reliability, performance, and partnership - Mitsubishi Heavy Industries Group.



RATING

Generating set model	MGS-G-EU 625 / 1875-C
Generator voltage	400 V or HV up to 20 kV
Frequency	50 Hz
Generator output COP	500 / 1500 kWe 625 / 1875 KVA
Power factor – max/min	1/0.8
Duty	Base load
Rating	Continuous
Overload	Not available
Installation location	Indoor

DESIGN CONDITIONS

Ambient temp - avg/max	25/40°C
Ambient temp – min	-15°C
Altitude (maxi)	150 m a.s.l
Relative humidity (maxi)	85%
Fuel oil LHV	36470kJ/kg
Fuel gas	Natural gas
Lube oil consumption – max	0.3 g/kWh
Fuel gas methan number – min	80
Lube oil / Replacement interval	MOBIL PEGASUS 1005 / 2000 hr
NOx emission level (O2 5%)	500 mg/Nm3

ALTERNATOR DATA

Enclosed, self ventilated, self-regulated, brushless

Bearing configuration	Single/double (HV)
Insulation class	H
Temperature rise class	F
Cooling method	Air ICo1
Protection	IP23
Excitation system	Digital

PT100 for bearing and stator winding

AVR for single and parallel operation

Space heater

Set of CT's for measure or protection

Set of VT's for measure and protection (HV only)

ENGINE DATA

Engine model	GS6 / 16R2-PTK
Engine speed	1500 Rpm
Engine brake output	523 / 1563 kWm
Cylinder configuration	8l / 16 V
Total displacement	30 / 79.9 liters
Bore x Stroke	170 x 220 mm
Compression ratio	12.6 / 12:1
Turbocharged	4 cycles
Governor	Electronic
Cooling method (electric pump)	Water (loose radiator)
Starting method	Electrical 24 V DC
Gas pressure at gas line inlet	350 to 500 Kpa

CE COMPLIANCE

2006/42/EC : machinery

LANGUAGE – UNITS

Drawings, documents, nameplates in English

SI metric system

PERFORMANCES @ COP (LV : 400V)

Auxiliary consumption (Cooling & ventilation) avg/max	10/15 35/38 kW
Step up transformer losses	-
Gross generator output	500 / 1500 kW
Fuel gas input	1163 / 3409 kW
Fuel gas flow rate	115 / 337 Nm3/h
Electrical efficiency	43% / 44%
Exhaust gas temperature	415 / 400°C
Exhaust gas flow rate	2288 / 6773 Nm3/h
Air intake flow rate	42 / 120 m3/min
Noise level@ 1m - max	109 / 108 dB (A)

HEAT BALANCE

Heat rejection on Jacket water, HT circuit (recoverable)	257 / 532 kW
Heat rejection on lube oil and charge air, LT circuit (not recoverable)	47 / 457 kW
Heat rejection on exhaust (at 120°C)	260 / 729 kW
Thermal radiation (engine block)	36 / 47 kW
Thermal efficiency	44.5% / 37 %
Flow rate of HT cooling circuit	40 / 75 m3/h
Flow rate of LT cooling circuit	10 / 30 m3/h
Cooling water temperature at HT outlet – max	91°C +/-2
Cooling temperature at LT inlet – Avg / max	35/49 °C

TOLERANCES AND CONDITIONS

Efficiency data for average conditions (avg) – derating above 150 m asl or 40°C intake air temperature

Fuel input: 0/+5% (ISO3046/1). Submitted to fuel gas specification confirmation

Heat rejection data: 12 % .Add 17 % for radiator design

Exhaust gas flow / temperature: +/- 6% - +/- 8%

Pictures are not contractual and may include optional accessories

These data are not contractual. They can be modified by MTEE without prior notice

STANDARDS

I.S.O. : International Standard Organization

C.E.N. : European Standard Committee

I.E.C: International Electric Commission

J.I.S : Japanese Industrial Standards (for engine)

J.E.C: Japan. Electrotechnical committee (engine)

J.E.M: Japan Elec. Manufacturers Association (Eng.)

Manufacturers standards

GENERATOR SET EMBEDDED CONTROL PANEL

Manual start and stop by push buttons on the (AGC) Automatic Genset Controller (DEIF made)

Automatic start and stop sequence

Automatic engine protection

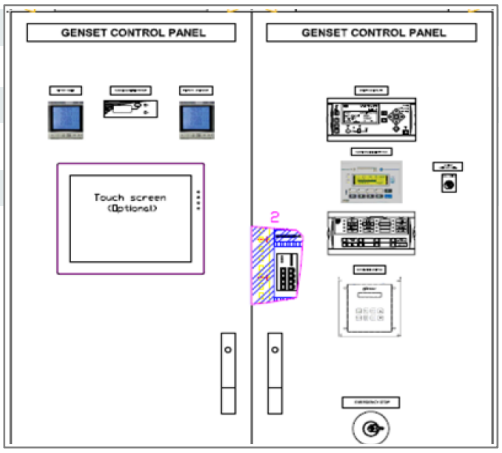
Manual and automatic synchronization and parallel operation of gensets

Manual and automatic load sharing of generating sets

Automatic start and stop according to increase or decrease of load demand

Automatic control of engine auxiliaries and power supply:

- Jacket water pump
- Intercooler water pump
- Jacket water heater
- Alternator heater
- Lube oil priming pump
- Radiator cooling fan
- Temperature control valves for jacket water and inter cooler
- Generating set ventilation fans



24 V DC energy block to supply PLC and panel equipment

24 V DC charger to supply engine starting batteries

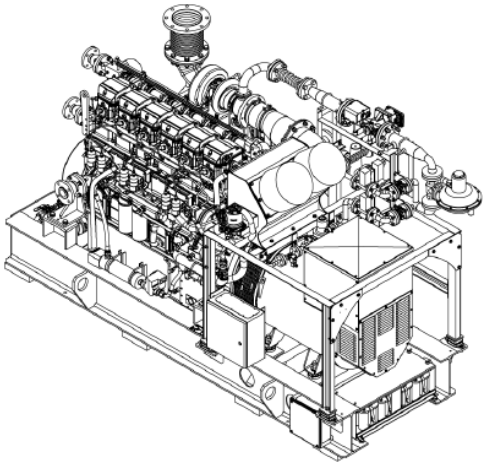
7" Human Machine Interface (HMI) for display and monitoring of operating data, alarms and history logs

Harness assembly for cable connection of control panel to genset

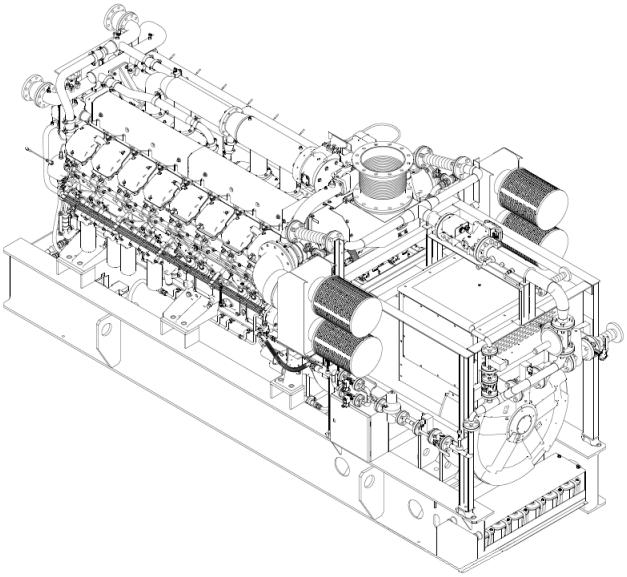
HMI is equipped with Ethernet TCP/IP com port for internet remote access

Generating set protection and alarm devices

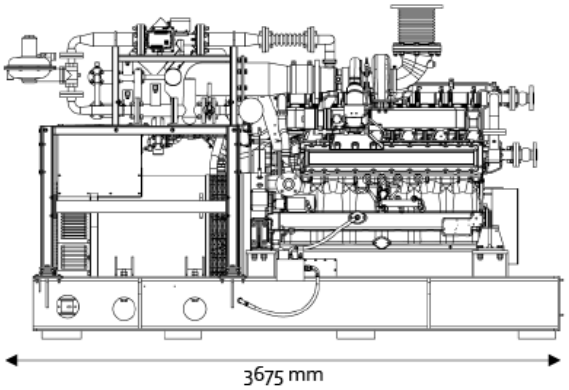
GENSET LAYOUT : MGS-G-EU 625-C / MGS-G-EU 1875-C

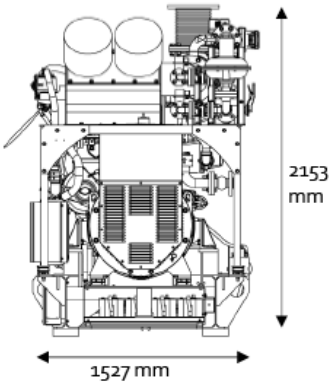


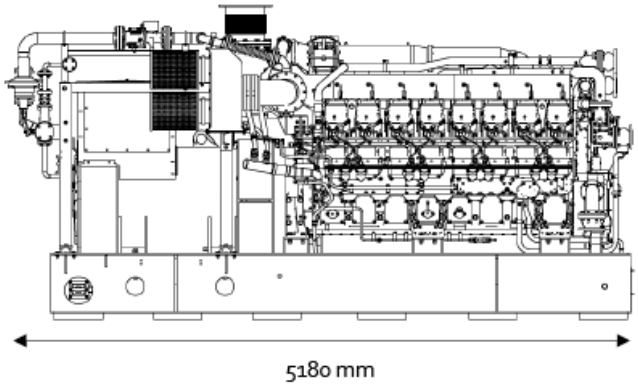
Dry Weight = 5690Kg

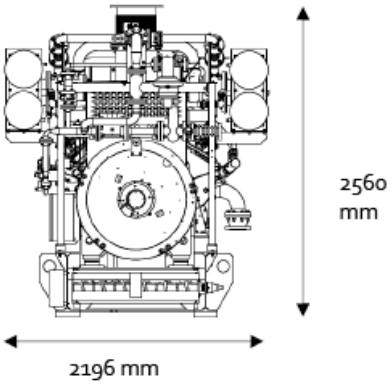


Dry Weight = 14000Kg









SCOPE OF SUPPLY

● Standard item
o Option
- Not included or not applicable

	Open skid set		Containerized set	
	LV	HV	LV	HV
Steel base frame with engine-alternator	●	-	●	-
Elastic suspensions of the generating set	●	-	●	-
Starting batteries and cables	●	-	●	-
High Voltage (HV) alternator 3 to 11 kV with 100V VTs	-	o	-	o
Pump for lube oil priming	●	-	●	-
Jacket water heating + alternator heating	●	-	●	-
Fuel main and pre chamber gas train fitted on generating set	●	-	●	-
Oil mist separator	●	-	●	-
Dry air filter, high efficiency on turbocharger	●	-	●	-
Electrical jacket water pump (loose supply for open skid)	o	-	●	-
Electrical Intercooler pump (loose supply for open skid)	o	-	●	-
Remote external dry air cooler	o	-	●	-
Temp. control valve for jacket water (loose supply for open skid)	●	-	●	-
Temp. control valve for Inter cooler (loose supply for open skid)	●	-	●	-
Remote box for radiator fan (feeders and meter)	o	-	●	-
Generating set remote control panel (GCP)	●	-	●	-
Harness assembly for GCP with connectors (mounted on genset side)	●	-	●	-
Remote Generating set protection Circuit Breaker (LV, HV)	o	-	●	-
Generating set factory tests (standard program)	●	-	●	-
Generating set finishing color: Blue RAL 5010	●	-	●	-
Exhaust silencer 30 to 50 dB(A) attenuation (loose supply for open skid)	o	-	●	-
Exhaust bellow on turbocharger outlet	●	-	●	-
Automatic filling device on engine sump	●	-	●	-
Lube oil service tank 200 liter capacity (loose supply for open skid)	o	-	●	-
Set of flexible connections for engine	●	-	●	-
Engine standard tools for routine maintenance	●	-	●	-
Step up transformer LV / HV 10 to 20 kV	-	o	-	o
LV connection busbar from alternator to transformer	-	o	-	o
Sound proofed generating set container	-	-	●	-
Elbow pipe between the engine and the silencer	-	-	●	-
Water pipes from engine to dry air cooler	-	-	●	-
Cooling circuit degassing and priming pipes	-	-	●	-
Lube oil pipes from service tank to engine sump filling device	-	-	●	-
LV cables from alternator to protection circuit breaker	-	-	●	-
HV cables from transformer to protection circuit breaker	-	-	-	o
Fuel gas flow meter fitted on gas train	o	-	o	-
Scada system, Integrated in genset control panel (15" touch screen)	o	-	o	-
Gas compressor for pre chamber gas train in case of site low press	o	-	o	-
Oversized dry air cooler for high ambient temp	o	-	o	-
CHP hot water production module 70/90°C	o	-	o	-
Thermal metering	o	-	o	-
On site assistance for supervisory, commissioning and training	o	-	o	-
Alternator according to specific country grid code	o	-	o	-

CONTACTS DETAILS

MITSUBISHI TURBOCHARGER AND ENGINE EUROPE

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59 770 MARLY
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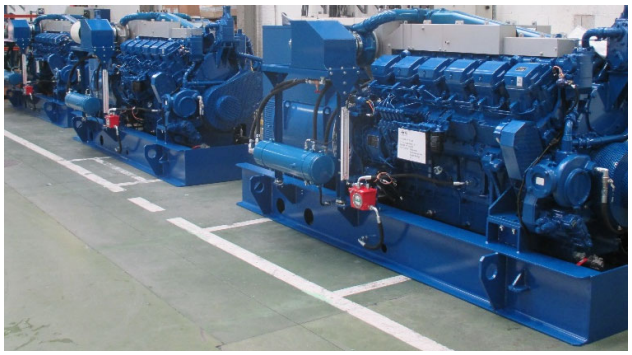
e-mail : mteef@mtee.eu
Web : www.mtee.eu

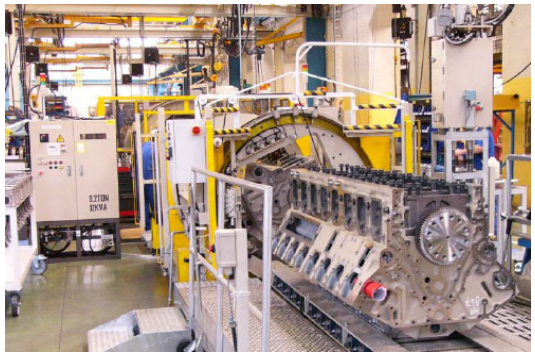
LRQA CERTIFIED ISO 9001 MGMT. SYS. RvA C 010

[Space for stamp with Dealer contact information]

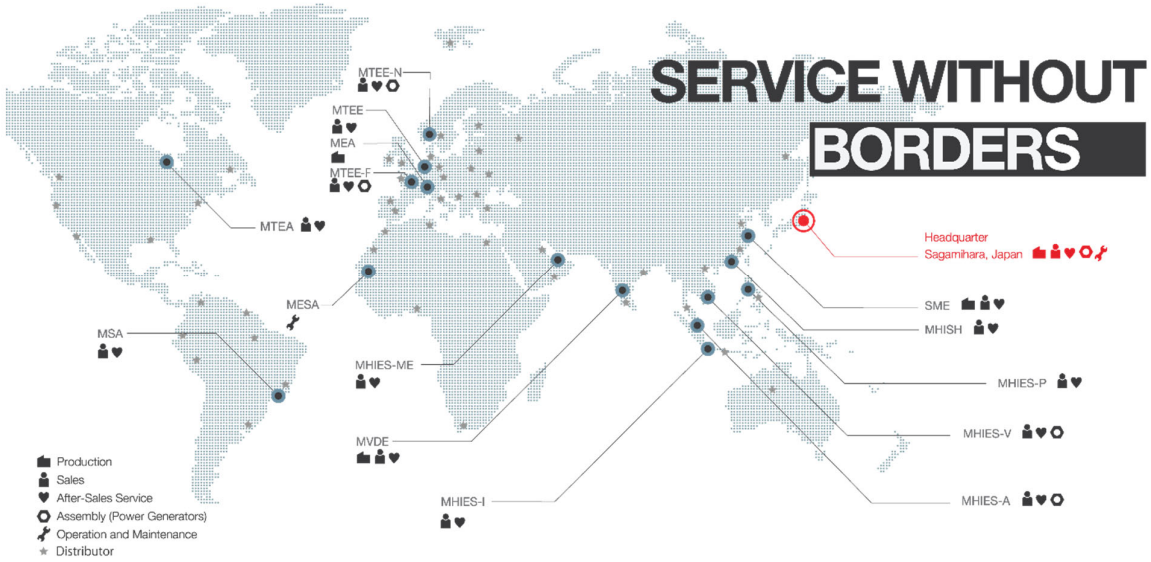
More information
Contact your local Mitsubishi Engine & Energy dealer for more information regarding Mitsubishi Generator Sets and optional equipment.
Or visit https://engine-genset.mhi.com/

MITSUBISHI engines and gensets are produced in France according to the highest quality standards of Mitsubishi Heavy Industries Engine and Turbocharger, Japan. We develop and produce high-quality products based on our technical competence cultivated over many years and provide a consistent solution for power generation including after-sales services.





Our wide area network is based on Mitsubishi subsidiaries, distributors and local partners. We are committed in providing best support at the stage of installation, commissionning, training and servicing of our products.



LRQA CERTIFIED ISO 9001 MGMT. SYS. RvA C 010

LRQA CERTIFIED ISO 14001 MGMT. SYS. RvA C 010

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MOVE THE WORLD FORWARD MITSUBISHI HEAVY INDUSTRIES GROUP