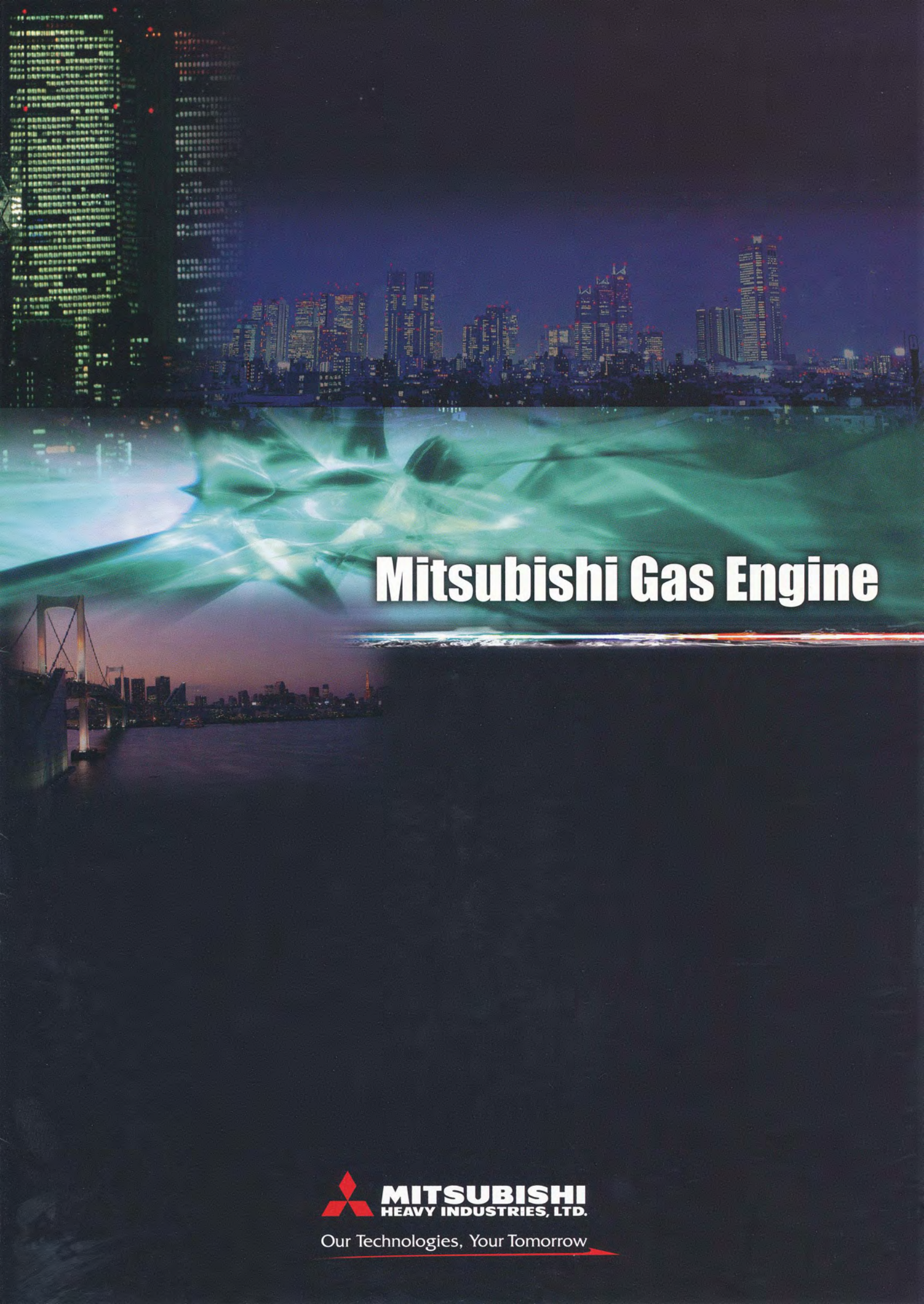


Mitsubishi Gas Engine

MITSUBISHI
HEAVY INDUSTRIES, LTD.

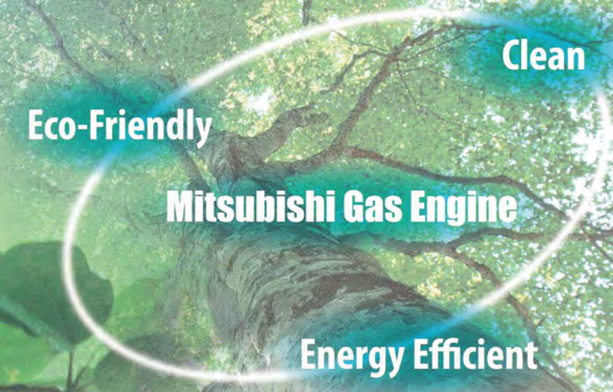
Our Technologies, Your Tomorrow

Natural-gas cogeneration systems are both fuel-efficient and eco-friendly. They emit relatively low quantities of the major greenhouse gases CO_2, NOx, and SOx.

Highly Efficient Energy Generation
Get maximum efficiency, at any scale of operation.

Highly Reliable
Backed by strong performance results and objective machine testing.

Eco-Friendly Technology
Our original technology can be used even in regions with strict NOx standards.



Lower Emission of Greenhouse Gases

Curtailment of emissions of CO_2 and other greenhouse gases is an important worldwide issue. Japan's industries and households have a large role to play in this effort. Mitsubishi gas cogeneration systems can make a significant contribution: they emit clean exhaust with low levels of CO_2, and they achieve high efficiencies by reusing their own generated heat.

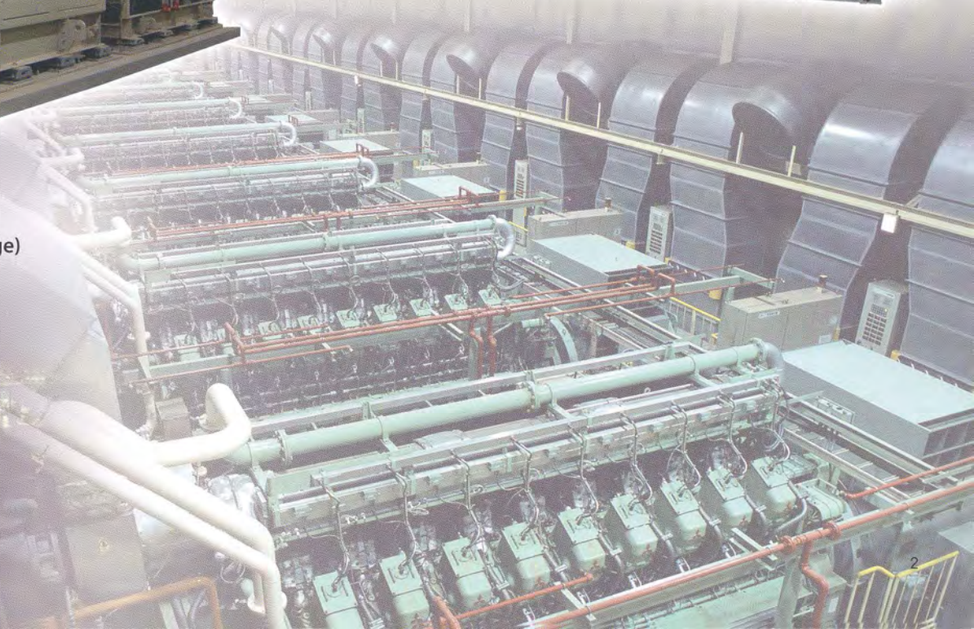
Energy Reduction

In today's world we are faced with the need to conserve energy and improve energy efficiency. Cogeneration systems are an essential part of this effort, as they can deliver overall energy efficiencies above 80%.

Savings

Cogeneration systems reduce dependence on industrial power, bringing your power costs down. And because they lead to less fuel use by conventional energy machinery, they can also reduce your energy costs. As a result of these savings, your business costs come down.

MEGA series
(Cogeneration Package)

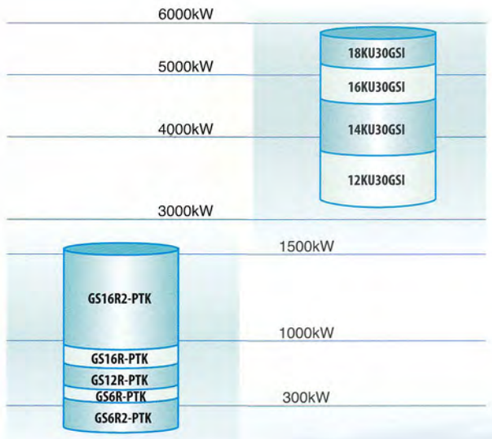


MHI Gas Engine Line-Up

Mitsubishi Miller Cycle Gas Engine GSR series

	GS6R2-PTK		GS6R-PTK		GS12R-PTK		GS16R-PTK		GS16R2-PTK	
	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz
Output (kW)	315	380	320	305	700	610	930	815	1500	1000
RPM (min^{-1})	1000	1200	1500	1200	1500	1200	1500	1200	1500	1200
Fuel consumption (Nm^3/h)	67.1	81.2	72.7	66.9	154.9	131.3	205.8	174.6	324.2	212.6
Voltage (kV)	11/6.6	11/6.6	11/6.6	11/6.6	11/6.6	11/6.6	11/6.6	11/6.6	11/6.6	11/6.6

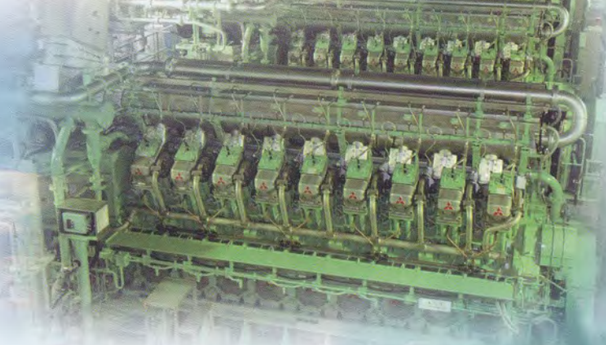
* Tolerance +5%
** Regulation of NOx emission is accordance with local regulation.
(Applicable 100 or 150 ppm, Without de-NOx system 450 ppm)
*** Fuel consumption: depends on LHV 40.6 MJ/Nm^3



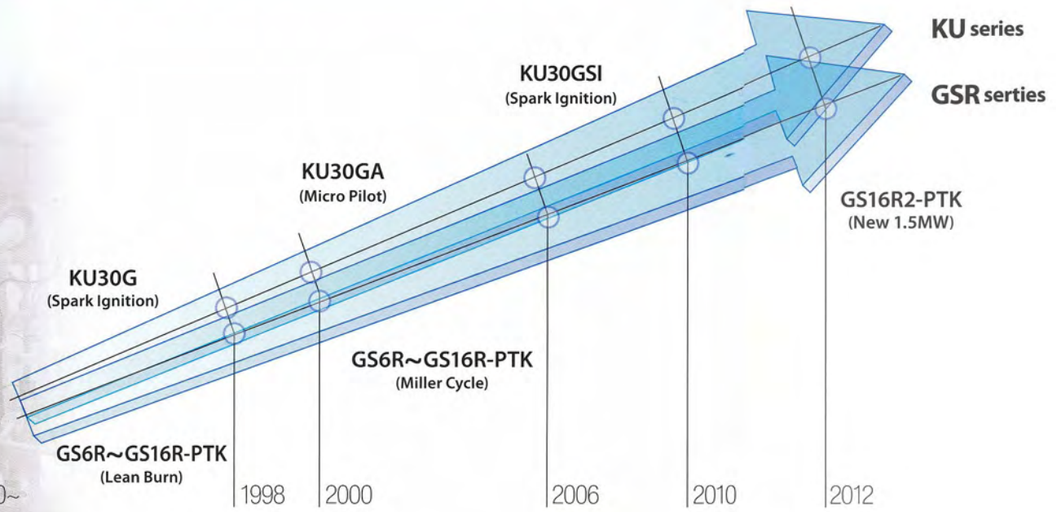
Mitsubishi KU30GSI series

	12KU30GSI		14KU30GSI		16KU30GSI		18KU30GSI	
	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz
Output (kW)	3800	3650	4450	4250	5100	4900	5750	5500
RPM (min^{-1})	750	720	750	720	750	720	750	720
Fuel consumption (Nm^3/h)	690	663	808	772	926	890	1045	999
Voltage (kV)	11/6.6	11/6.6	11/6.6	11/6.6	11/6.6	11/6.6	11/6.6	11/6.6

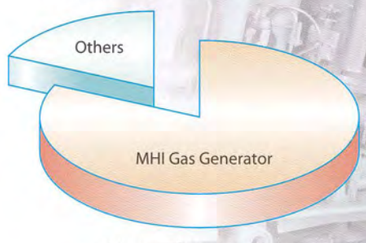
* Generation efficiency is based on the following conditions.
(1) Initial performance of the rated load
(2) Generator power factor: 90% or higher (lagging)
(3) Under standard atomospheric (par ISO 3046)
(4) Tolerance: +5%
(5) Methane number: 65 or higher, fuel gas lower heating value: 40,630 kJ/Nm^3
(6) NOx emission: 320 ppm
(7) Exhaust gas backpressure: 2.5 kPa or lower



MHI Gas Engine History and Share



MHI Gas Generator has more than 70% share in domestic market of over 1000kW class.



Highest Share in Japan

GSR Cogeneration system

■ 50Hz

Item		Model	GS6R2-PTK		GS6R-PTK		GS12R-PTK		GS16R-PTK		GS16R2-PTK	
Unit			SGP M315-S	SGP M315-W	SGP M320-S	SGP M320-W	SGP M700-S	SGP M700-W	SGP M930-S	SGP M930-W	SGP M1500-S	SGP M1500-W
Generation efficiency		%	41.6**		39.0**		40.0**		40.0**		42.6*	
Generator output		kW	315		320		700		930		1500	
Heat recovery	Hot water supply	MJ/h	503.2	912.2	496.6	1007.7	1154.0	2119.7	1533.2	2796.5	1932.7	4191.5
	Steam supply	kg/h	172	—	197	—	388	—	491	—	896	—
Total efficiency		%	76.0	75.1	74.7	73.1	73.9	73.7	73.2	73.5	74.6	74.5

■ 60Hz

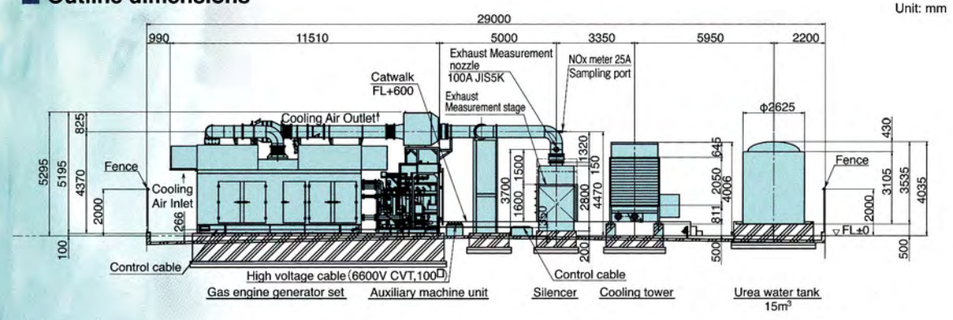
Item		Model	GS6R-PTK		GS6R2-PTK		GS12R-PTK		GS16R-PTK		GS16R2-PTK	
Unit			SGP M305-S	SGP M305-W	SGP M380-S	SGP M380-W	SGP M610-S	SGP M610-W	SGP M815-S	SGP M815-W	SGP M1000-S	SGP M1000-W
Generation efficiency		%	40.4**		41.5**		41.2**		41.4**		41.7**	
Generator output		kW	305		380		610		815		1000	
Heat recovery	Hot water supply	MJ/h	486.2	908.2	610.0	1190.0	966.5	1823.5	1287.4	2394.4	1213.8	2632.5
	Steam supply	kg/h	183	—	215	—	347	—	437	—	632	—
Total efficiency		%	75.2	73.8	76.4	77.6	75.7	75.4	75.1	75.2	74.2	72.2

* The generator efficiency is under conditions.
The metane number of fuel gas shall be 80.
The operating power factor of generator shall be 1.0.
Tolerance : +5%

** The generator efficiency is under conditions.
The metane number of fuel gas: 65
The operating power factor of generator: 0.9
Tolerance : +5%

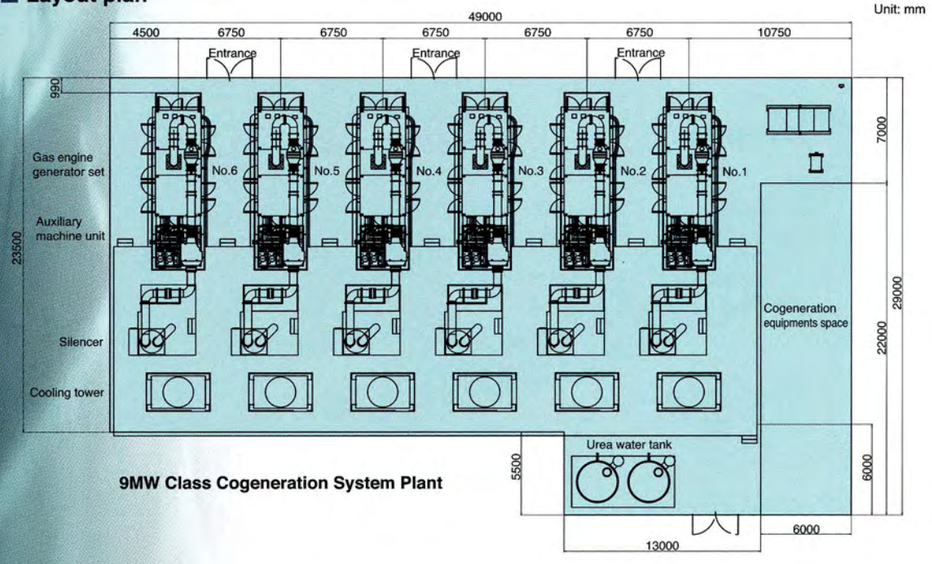
■ Outline dimensions

Unit: mm



■ Layout plan

Unit: mm



9MW Class Cogeneration System Plant

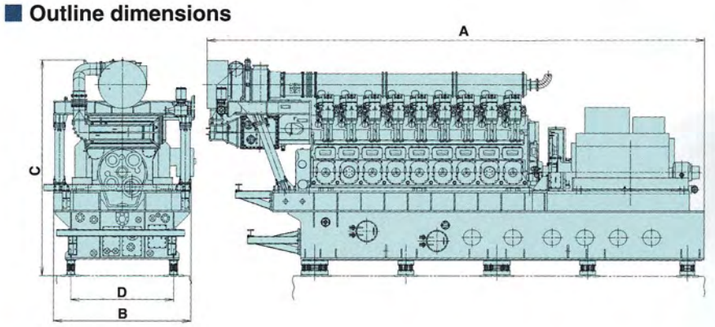
KU30GSI Cogeneration system

			12KU30GSI		14KU30GSI		16KU30GSI		18KU30GSI	
Generator frequency		Hz	50	60	50	60	50	60	50	60
Number of cylinders			12		14		16		18	
Bore×stroke		mm	300×380							
RPM		min⁻¹	750	720	750	720	750	720	750	720
Generator rated output		kW	3800	3650	4450	4250	5100	4900	5750	5500
Generation effeciency*		%	48.8							
Heat recovery	Heat recovery	kW	1077	1032	1259	1203	1447	1385	1629	1556
	Steam of exhaust bas boiler**	kg/h	1700	1630	1990	1900	2290	2120	2590	2390
Total effeciency		%	>76.5							
Engine weight		ton	40		48		54		60	

* Generation efficiency is based on the following conditions.
(1) Initial performance of the rated load
(2) Generator power factor: 90% or higher (lagging)
(3) Under standard atomospheric (par ISO 3046)
(4) Tolerance: +5%
(5) Methane number: 65 or higher, fuel gas lower heating value: 40,630 kJ/Nm³
(6) NOx emission: 320 ppm
(7) Exhaust gas backpressure: 2.5 kPa or lower

** Steam generation is based on the following conditions.
(1) Pressure: 0.78MPaG, saturated steam
(2) Feed-water temperture: 60 (It is heated by the cooling system of the engine.)
(3) Continuous blow rate: 0%

■ Outline dimensions

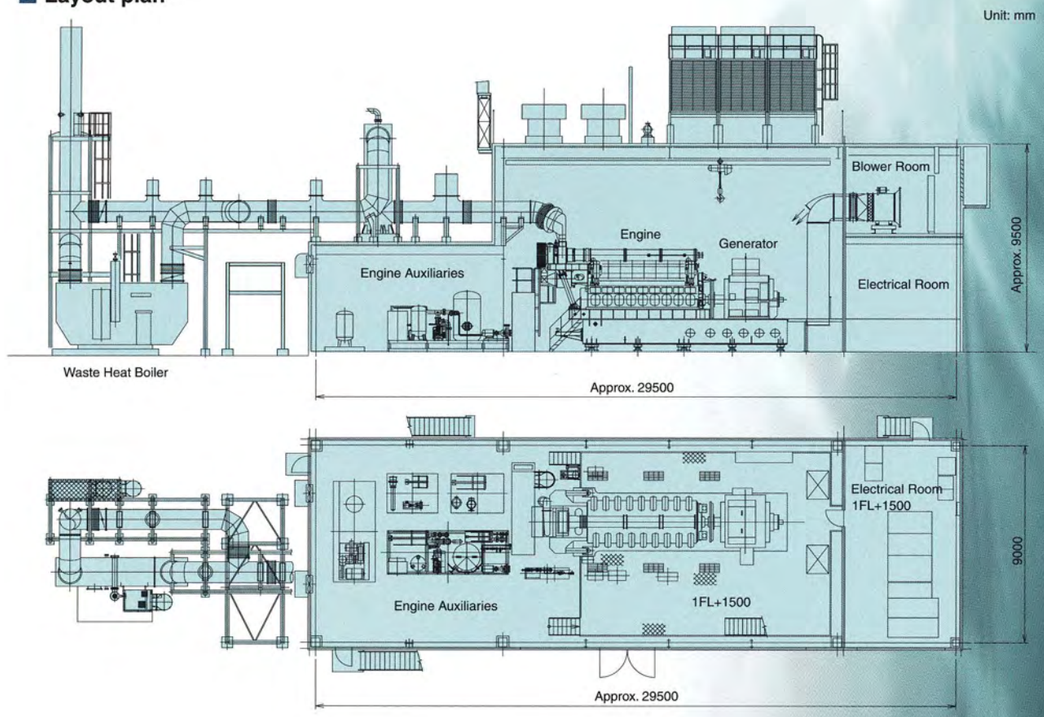


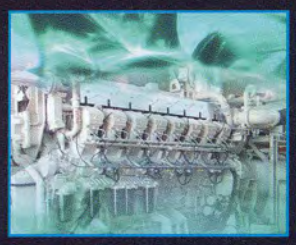
Unit: mm

	A	B	C	D
12KU30GSI	9850	3180	4980	2380
14KU30GSI	10390	3180	4980	2380
16KU30GSI	10930	3180	4980	2380
18KU30GSI	11470	3180	4980	2380

■ Layout plan

Unit: mm





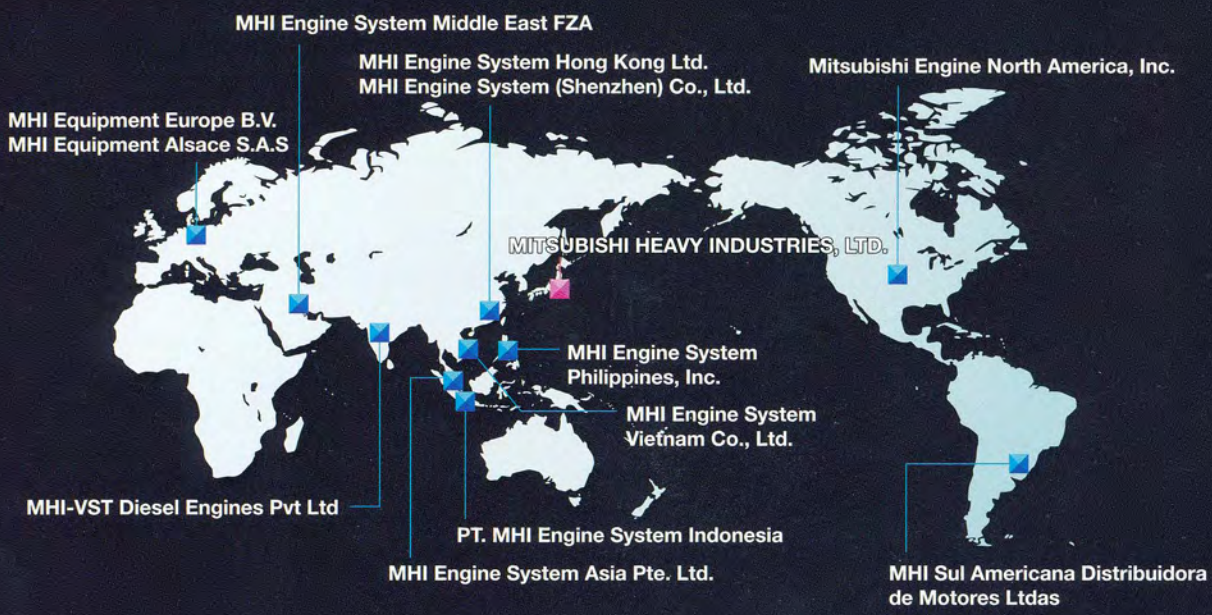
Mitsubishi Gas Engine

MEGANINJA DEBUT!

Mitsubishi Energy Gas Package NINJA Series

Quick Mobility
Quick Installation
Quick Commissioning

World Wide Service Network



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DNV MGMT. SYS. RvA C 425 ISO 14001 REGISTERED FIRM DNV Certification B.V., THE NETHERLANDS

⚠ Please read the accompanying instruction manual and all caution labels before operating equipment.

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