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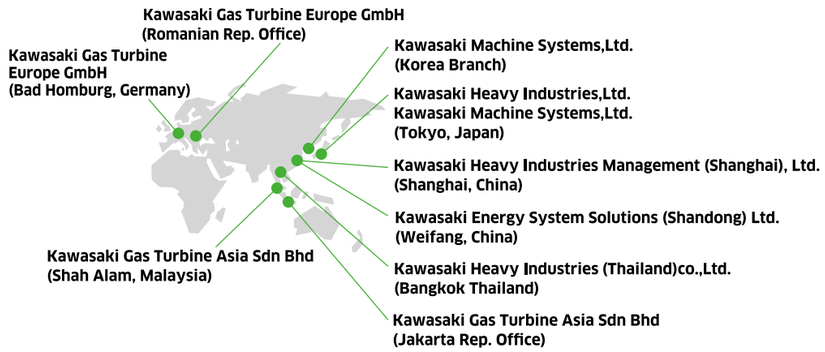
Kawasaki Energy System Solutions (Shandong) Ltd. (KESS)



ISO 9001 / ISO14001 Certified

The Energy System Division is located at Akashi Works in Japan. It designs and manufactures the Gas Turbine Co-generation System, and is certified for ISO 9001, the international standard of quality assurance, and ISO 14001, the international standard for environmental management.

Scan a QR code
for more detail

https://global.kawasaki.com/en/energy/gasengine_gasturbine/index.html

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Kawasaki
Powering your potential

KAWASAKI GAS TURBINE STANDBY GENERATOR SETS

GREEN Gas Turbines


L20A Gas Turbine


V2500 Turbofan
(International Aero Engines AG)


BK117 C-2 type


R142A Subway car for NYC


Wheel Loader 92ZV-2


Jet Ski® ULTRA260X

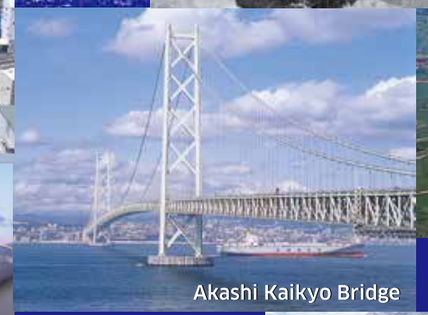

Industrial Robot


Boeing 787


(copyright Rolls-Royce plc)
Trent1000 Turbofan


A lime / limestone gypsum fuel gas desulfurization plant


High Speed Train "efSET"


Akashi Kaikyo Bridge


Wind Turbine generation plant


Ninja 1400GTR


Submarine


Two-stroke marine diesel engine


Gas Engine


Marine steam turbine (UA-type)


LNG Carrier

KAWASAKI HEAVY INDUSTRIES, LTD.
An Integrated Engineering Manufacturer Spreading Its Interests by Land, Sea and Air.

Kawasaki Heavy Industries, established in 1878, has a history of more than 140 years of manufacturing integrated engineered products.
Our business has expanded to include the manufacturing of ships, railway rolling stock, aircraft, gas turbines, many types of industrial plants, steel structures, general machinery and motorcycles.
Our products are found on the land, in the sea and in the air.
By constant attention to production efficiency and through exclusive technologies developed internally, we are continuing to develop additional technologies related to transportation innovations, national land and marine resources development, space exploration development, environmental controls, new energy development and biotechnology development.
The range of our technologies is greatly expanding to encompass large, diverse projects.

Kawasaki Gas Turbine places importance on "Efficient Energy Use", "Eco-friendly" and "Reliable Product Care for Total Life Cycle" as a philosophy of our products. To enhance this philosophy, we have introduced a title for our products....."GREEN Gas Turbines".

" Get Reliable Eco-friendly Energy Now "

INDEX

Unique Features of Kawasaki GPS Standby Gas Turbine Generator

Kawasaki GPS standby gas turbine generator has served as backup power solutions since 1976, with over 8000 packages delivered worldwide, and has proven itself with continued high reliability through all phases of operation.

Unique features of Kawasaki GPS standby gas turbine generator include:

1. High Startup Reliability

Continuous combustion systems with single can type combustors, provide very high startup reliability and prevent potential ignition failures sometimes experienced during startup on diesel engines.

2. Compact, light weight

The weight of Kawasaki gas turbine generator is approximately half of an equivalent diesel generator, whilst the required footprint is about one third. Kawasaki gas turbine generator provides installation flexibility in limited space, rooftop or basements, and enables to increase capacity from existing units.

3. Ease of Maintenance

Kawasaki gas turbine consists of a smaller number of parts compared with diesel engines and are not designed with any rubbing components such as reciprocating pistons in cylinders. Therefore, mechanical failures are fewer. Furthermore, lube oil endures longer which reduces lube oil replacement significantly. Fewer maintenance also reduces its downtime thus increases the unit availability.

4. Excellent Frequency Stability & 100% step loading

Due to high rotating speed and large inertia, Kawasaki gas turbine provides power generation with very stable frequency. Also, it enables 100% step loading within 5% frequency drop which helps the electrical system to be simple.

5. Clean Exhaust Gas

With more efficient and complete combustion, low exhaust gas emissions can be realized, providing more eco-friendly power generation, compared to diesel engines. Natural gas model or dual fuel model is also available.

6. Low Vibration, Excellent Earthquake-Proof

The in-house design of Kawasaki gas turbine provides for extremely low vibration characteristics of the rotating elements, and therefore, vibration mounting dampers, such as those used for diesel engines, are not required. This aspect eliminates the potential risk of resonance phenomenon with flexible mountings during catastrophic events such as an earthquake and provides continued high performance throughout the event.

7. Low-Noise Enclosure Design

Kawasaki's long experience in projects with strict site conditions provides the capability for excellent package noise-reduction designs, resulting in customized low-noise generator packages for use in hospital and urban applications.

8. No Requirement for Cooling Water

The self-cooling (air cooling) system eliminates the need for a separate cooling water system and realizes much higher reliability, without the potential risk of typical failures in water cooling systems such as freezing or loss of water.

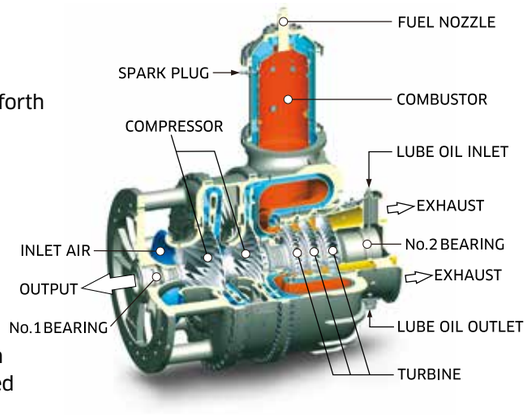
Kawasaki Gas Turbine

High-performance, single-shaft Kawasaki Gas Turbine provides high reliability

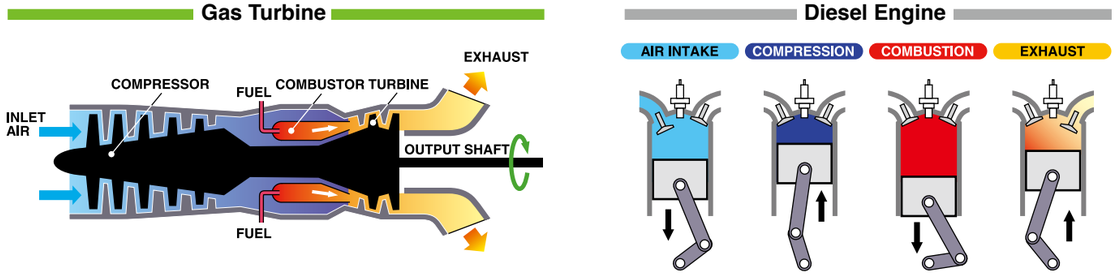
Just like a diesel or gasoline engine, a gas turbine is a type of internal combustion engine and operates using the cycle of intake, compression, combustion(expansion) and exhaust. One major difference, however, is that the basic movement. A gas turbine is rotary movement, in contrast to the back-and-forth movement of a reciprocating engine.

The basic principle of a gas turbine is as shown in the diagram below. Internal combustion processes are taking place at each specially designed components which work simultaneously. This principle enables gas turbine to produce higher power in compact body.

Kawasaki gas turbine is designed and manufactured by its own technology, and has improved performance as well as expanded its product lineup. Supplied reliable power over 40 years, Kawasaki became major standby generator supplier of its power range.



Differences in the combustion process between Gas Turbine and Diesel Engine

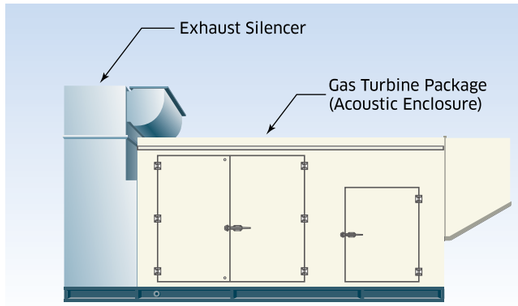


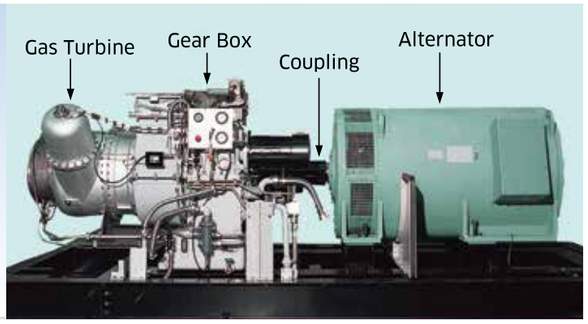
Comparison of Gas Turbine & Diesel Engine

Type	Gas Turbine		Diesel Engine	
Starting Reliability	Over 99%	◎	Around 95%	△
Steady State Speed Fluctuation	± 0.3%	◎	± 5%	×
Starting Time	Approx.35-40sec.	△	Approx.10-20sec.	◎
Installation Space	Small	◎	Large	×
Emissions (Diesel Oil)	NOx 120ppm (O_2 : 15%) CO 15ppm (O_2 : 15%)	◎	NOx 700ppm (O_2 : 15%) CO 500ppm (O_2 : 15%)	×
Noise Level	85dB(A) at 1m (option 75dB(A) at 1m)	◎	105～115dB(A) at 1m	△
Vibration Level	10～15 μm	◎	50～60 μm	△
Cooling Water	Not necessary	◎	Approx.200ton/h	△
Fuel Consumption	Large	△	Small	◎

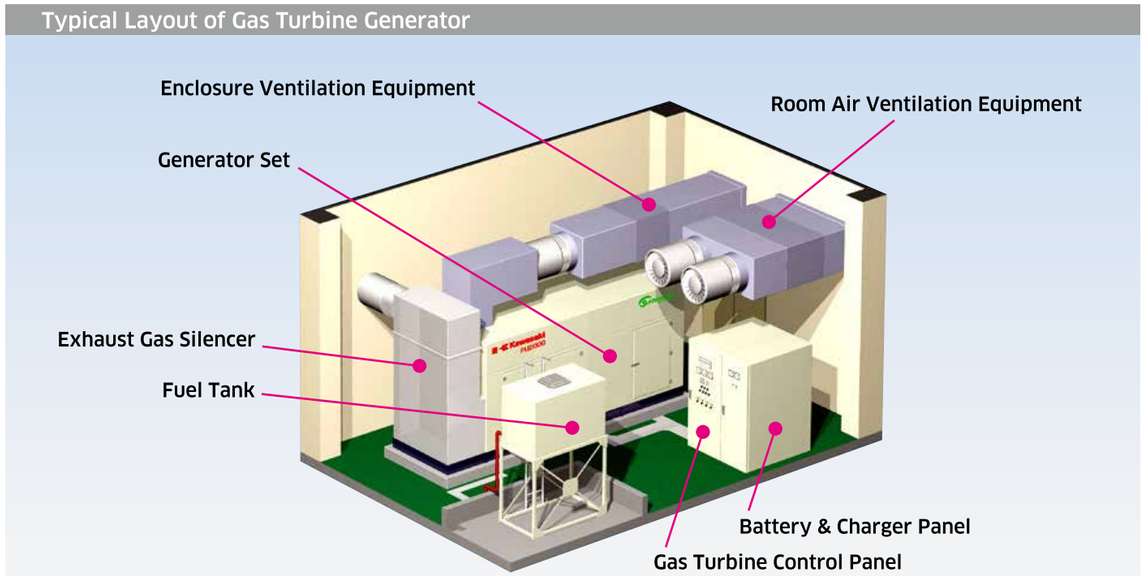
Kawasaki Standby Gas Turbine Generator (GPS Series)

● Compact, Kawasaki Gas Turbine Generator Package

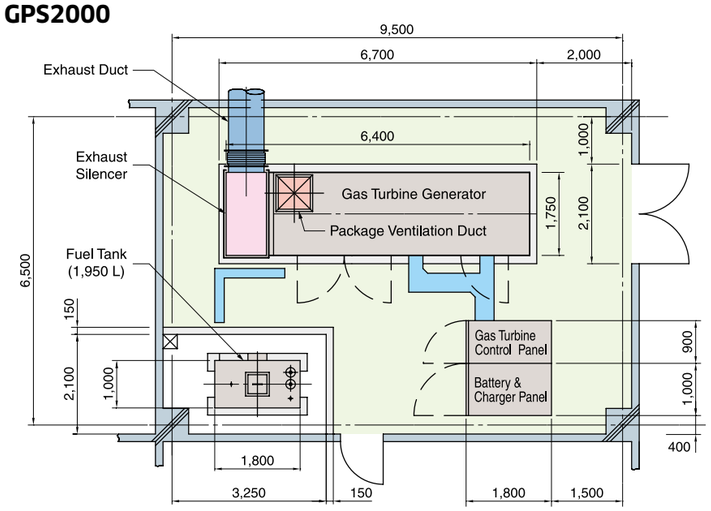




Typical Layout of Gas Turbine Generator



Referential Layout of GPS2000



Unique Features for Reliable Power Generation

High Startup Reliability

Startup reliability is one of the most important factors for backup power supply system. Kawasaki GPS has proved its high startup reliability with actual performance in the disastrous situations.

Case:1 **Great Hanshin Earthquake (Jan.17,1995)**

Early morning on January 17, 1995, a magnitude 7.2 earthquake hit the Hanshin area, causing a blackout that hit about 3 million households in the area.

Units at Standby 141 → Blackout 97 → Successful startup 93
Units at Standby 141 → No Blackout 44 → Startup failures 4 (*)

(*) Due to improper maintenance by its owner.

Case:2 **Tokyo Area Blackout (Aug.14, 2006)**

On August 14, 2006, a crane barge crashed into one of the main power lines in Tokyo, causing a blackout that affected 139,000 households.

Units at Standby 278 → Blackout 87 → Successful startup 87
Units at Standby 278 → No Blackout 191 → Startup failures 0

Case:3 **The Great East Japan Earthquake (Mar.11, 2011)**

On March 11, 2011, the earthquake with 7.9 on the Richter scale hit the East Japan area, causing a blackout that hit about 3 million households in this area. In the area of the blackout, 1,034 units out of 1,035 successfully worked.

Units at Standby 3,092 → Blackout 1,035 → Successful startup 1,034
Units at Standby 3,092 → No Blackout 2,057 → Startup failures 1 (*)

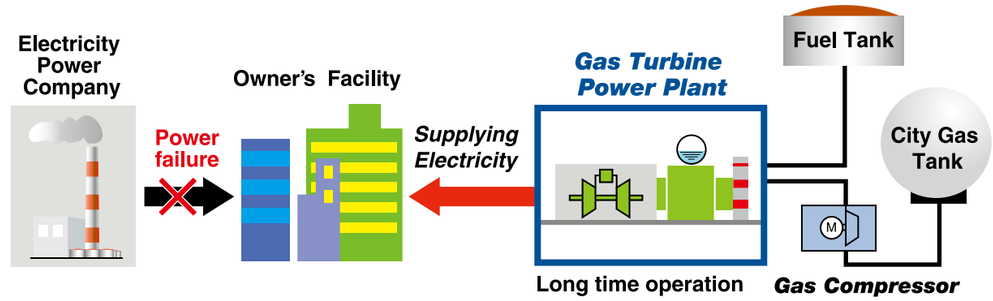
(*) Due to improper maintenance by its owner.

Fuel Flexibility

Kawasaki gas turbine enables the choice of diesel fuel and gas fuel. This dual fuel capability realizes high reliable power supply and long term operation compared with diesel engine generator.

On September 2, 2008, hurricane "Ike" hit Houston, TX, USA. Total financial damage caused by Ike was the 3rd largest damage caused by hurricanes in the north Atlantic area. Blackout lasted for 2 weeks, but gas supply line was available under the situation.

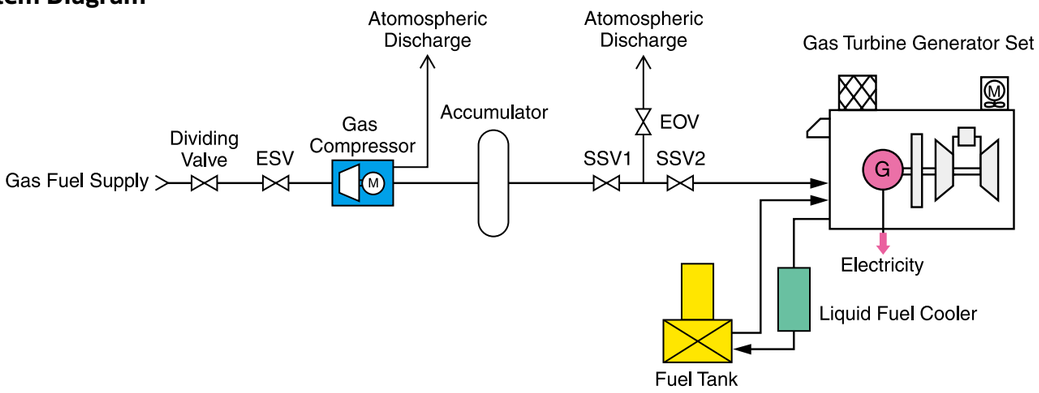
Liquid Fuel / Gas Fuel ► Power Generation



Benefits of Dual Fuel System

- Long time operation without large fuel storage tank.
- Higher reliable operation than single fuel system.
- Clean exhaust gas with gas fuel.

System Diagram



Kawasaki GPS Product Lineup

Basic Specifications

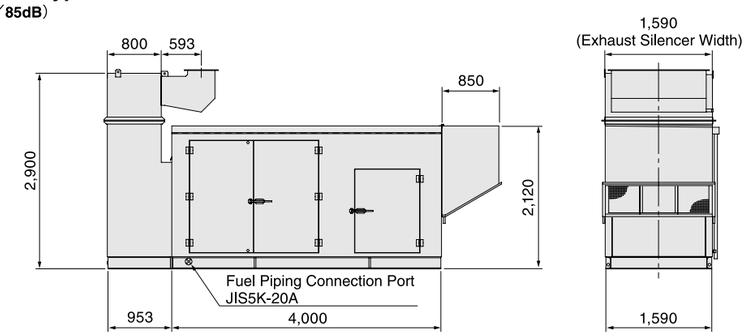
Item			GPS750	GPS1250	GPS1500	GPS2000	GPS2500	GPS3000	GPS4000	GPS5000	GPS6000
Generator Set ※1	Electric Output	(kW)	600	1,000	1,200	1,600	2,000	2,400	3,200	4,000	4,800
	Starting Time		Within 40-sec.			Within 40-sec.					
	Load Application Capacity		100% (Resistive load)			100% (Resistive load)					
	Freq. Deviation Transient		Within ±4.5% (with 100% block load on and off)			Within ±4.5% (with 100% block load on and off)				Within±5.0%	
	Steady State		Within ±0.3%			Within ±0.3%					
	Fuel Type		Kerosene, Diesel	Kerosene, Diesel, Gas (option)		Kerosene, Diesel, Gas (option)					
	※2 Fuel Consumption	(liter/hr)	305	525	620	695	1,065	1,245	1,390	1,835	2,050
Gas Turbine	Turbine Model		S2A-01	M1A-01	M1A-03	M1A-21	M1T-01S	M1T-03	M1T-21	M1T-33A	M1T-33
	Type		Heavy-duty, simple open cycle, single-shaft			Heavy-duty, simple open cycle, single-shaft					
	Turbine Speed	(rpm)	31,500	22,000		22,000				18,000	
	Output Speed	(rpm)	1,500 (50 Hz), 1,800 (60 Hz)			1,500 (50 Hz), 1,800 (60 Hz)					
	Dry Weight	(ton)	1.48	3.0		3.5	5.7		6.7	13.5	
	Lube Oil Type / Brand		Synthetic oil / Shell ASTO-500, Mobil jet II, Castrol AERO 5000, DP BPTO 2380			Synthetic oil / Shell ASTO-500, Mobil jet II, Castrol AERO 5000, DP BPTO 2380					
	Lube Oil Tank Capacity (approx.L)		66	100		165	160		160	370	
	Lube Oil Consumption (liter / hr)		0.08			0.08	0.16			0.2	
Alternator	Type		3-phase, open screen-protected, brushless, self-ventilated, synchronous			3-phase, open screen-protected, brushless, self-ventilated, synchronous					
	Output	(kVA)	750	1,250	1,500	2,000	2,500	3,000	4,000	5,000	6,000
	Voltage Regulation		Within ±2.5% (steady state from no-load to full-load, at pf = 0.8)			Within ±2.5% (steady state from no-load to full-load, at pf = 0.8)					
	Excitation System		Brushless by A.C. exciter and rotating diodes			Brushless by A.C. exciter and rotating diodes					
	※3 Standard Voltage		6.6kV			6.6kV					
Starting System			Electrical start with D.C. motors (Optional: Pneumatic start with air turbines)			Electrical start with D.C. motors (Optional: Pneumatic start with air turbines)					
Type of Batteries			Valve Regulated Lead-Acid (VRLA) Battery			Valve Regulated Lead-Acid (VRLA) Battery					
Generator Set Dimension (Indoor Type)	Length	(m)	4.0	4.9		5.4	5.8		6.0	7.7	
	Width	(m)	1.6	1.7		1.8	2.5			3.0	
	Height	(m)	2.1	2.5		2.6	2.9			3.6	
	Weight	(ton)	7.1	10.4	11.4	14.3	18.9	21.8	24.4	42.7	42.8
Noise Level at 1m	From Package		Approx. 85dBA in open air (Lower noise option)∗4			Approx. 85dBA in open air (Lower noise option)∗4					
	From Exhaust Silencer Outlet		Approx. 90dBA (optional system: 85 ~ 65dBA at 1 m with a secondary silencer)			Approx. 90dBA (optional system: 85 ~ 65dBA at 1 m with a secondary silencer)					

(Note) ∗ 1 : Output : Up to 40˚C of ambient temp., 150 m above sea level.
∗ 2 : Fuel Consumption : At full load, 15˚C , using diesel fuel oil, allowance is 5%.
Diesel Oil : Density 0.83 g/cm^3, LHV 42,700 kJ/kg
∗ 3 : Other voltage is available as option.
∗ 4 : Lower noise package is available as option. Please consult with Kawasaki.

General Arrangement of GPS Generator Set

GPS750

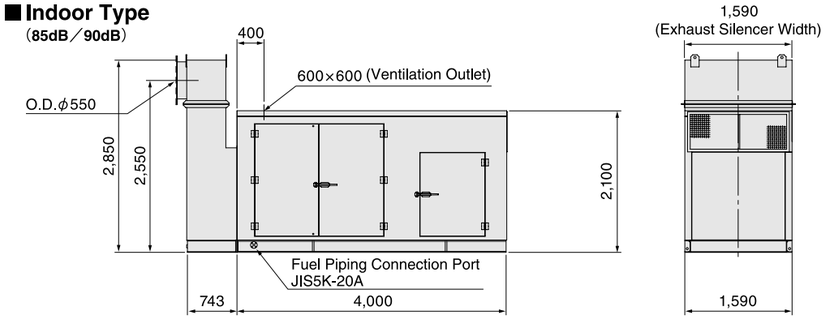
■ Outdoor Type
(85dB／85dB)



Weight (Unit: kg)

	Generator Set	Exhaust Silencer
GPS750	8,100	1,350

■ Indoor Type
(85dB／90dB)

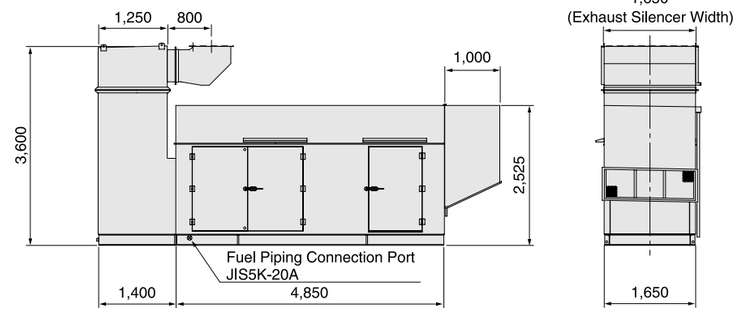


Weight (Unit: kg)

	Generator Set	Exhaust Silencer
GPS750	8,000	900

GPS1250/1500

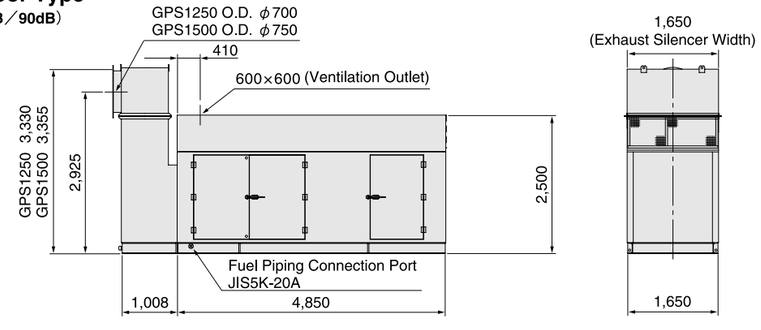
■ Outdoor Type
(85dB／85dB)



Weight (Unit: kg)

	Generator Set	Exhaust Silencer
GPS1250	13,220	2,420
GPS1500	14,220	2,420

■ Indoor Type
(85dB／90dB)

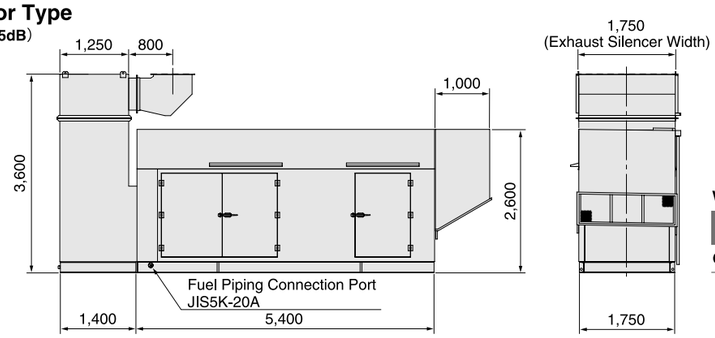


Weight (Unit: kg)

	Generator Set	Exhaust Silencer
GPS1250	12,000	1,650
GPS1500	13,000	1,650

GPS2000

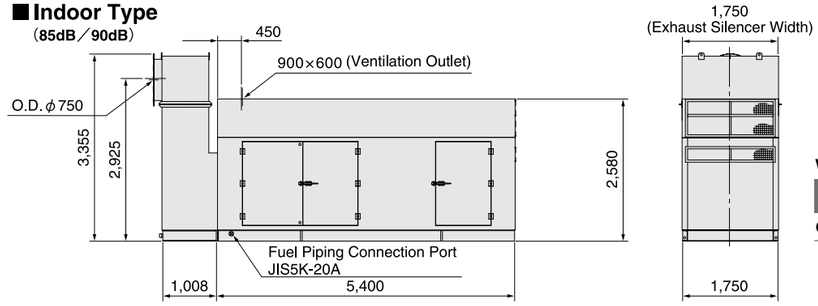
■ Outdoor Type
(85dB／85dB)



Weight (Unit: kg)

	Generator Set	Exhaust Silencer
GPS2000	16,800	2,300

■ Indoor Type
(85dB／90dB)

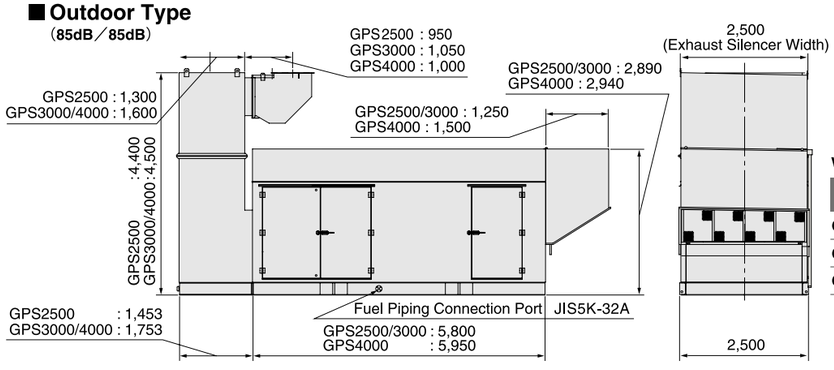


Weight (Unit: kg)

	Generator Set	Exhaust Silencer
GPS2000	16,060	1,810

GPS2500/3000/4000

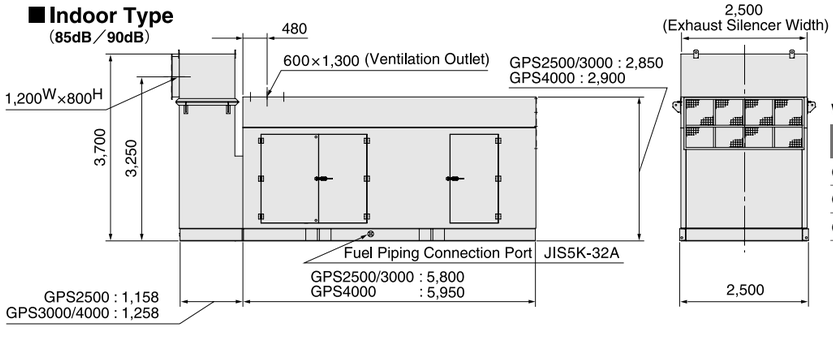
■ Outdoor Type
(85dB／85dB)



Weight (Unit: kg)

	Generator Set	Exhaust Silencer
GPS2500	24,150	4,800
GPS3000	27,150	4,900
GPS4000	29,650	4,900

■ Indoor Type
(85dB／90dB)



Weight (Unit: kg)

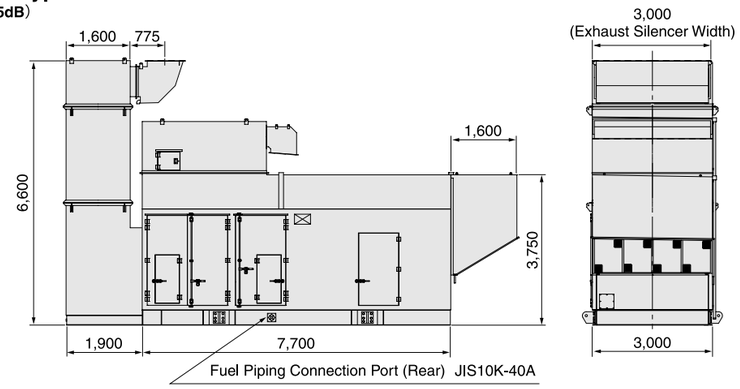
	Generator Set	Exhaust Silencer
GPS2500	22,000	3,100
GPS3000	25,050	3,250
GPS4000	27,650	3,250

(Note) ・dB values in ( ) are standard noise level. (Noise on equipment side / Noise on exhaust outlet)
・Lower noise package is available as option.
・Overall length and weight of equipment may change depending on specification of alternator.
・Weight of generator set includes weight of exhaust silencer.
・Dimensional unit is mm unless otherwise specified.

General Arrangement of GPS Generator Set

GPS5000/6000

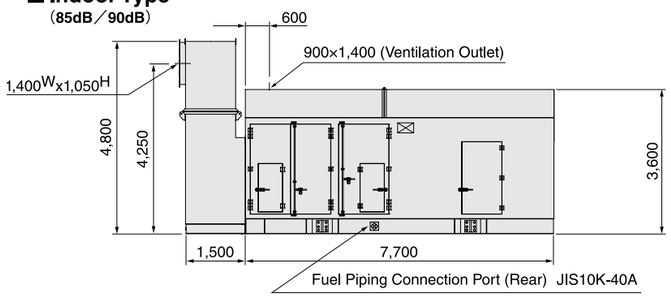
■ Outdoor Type
(85dB／85dB)

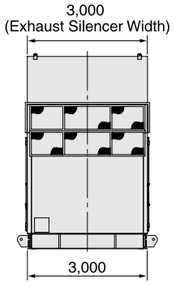


Weight (Unit: kg)

	Generator Set	Exhaust Silencer
GPS5000	55,470	8,270
GPS6000	55,570	8,270

■ Indoor Type
(85dB／90dB)





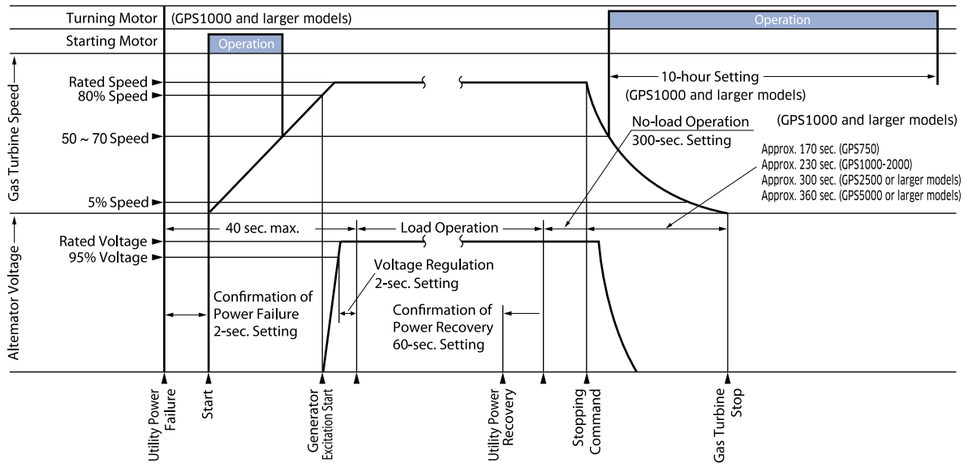
Weight (Unit: kg)

	Generator Set	Exhaust Silencer
GPS5000	48,000	5,300
GPS6000	48,100	5,300

(Note) · dB values in ( ) are standard noise level. (Noise on equipment side / Noise on exhaust outlet)
· Lower noise package is available as option.
· Overall length and weight of equipment may change depending on specification of alternator.
· Weight of generator set includes weight of exhaust silencer.
· Dimensional unit is mm unless otherwise specified.

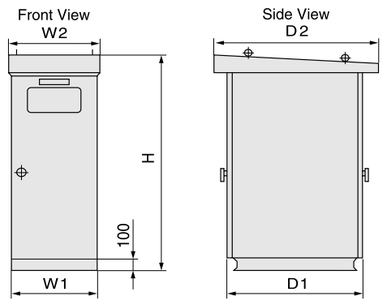
Control / Electrical System

Gas turbine control panel furnishes engine control, generator voltage control, metering, protection, and other control functions required for operating gas turbine generator.

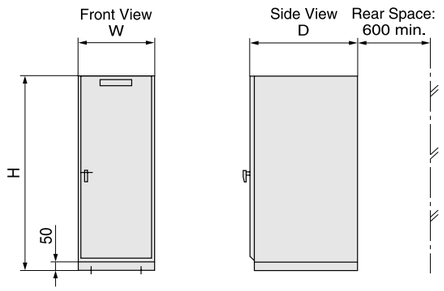


Control Panel

■ Outdoor Type



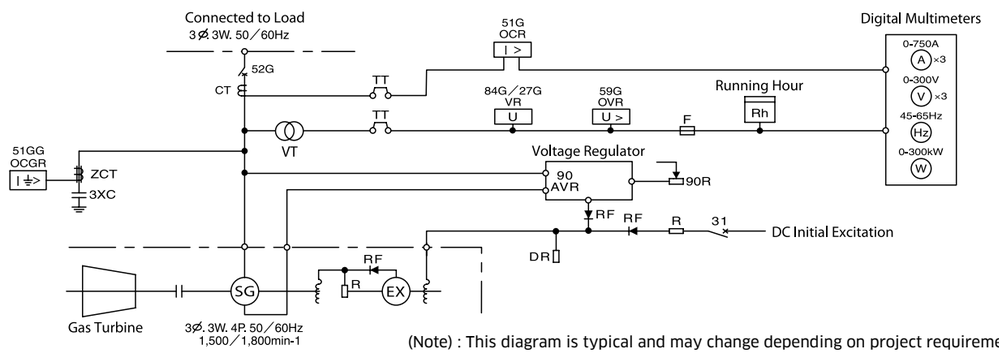
■ Indoor Type



(Unit: mm)

Model	Outdoor Type						Indoor Type			
	W1	W2	D1	D2	H	Weight (kg)	W	D	H	Weight (kg)
GPS750	1,000	1,040	2,000	2,300	2,450	1,100	900	1,800	2,350	900
GPS1250 / 1500 / 2000	1,000	1,040	2,000	2,300	2,450	1,100	900	1,800	2,350	900
GPS2500 / 3000 / 4000	1,000	1,040	2,000	2,300	2,450	1,100	900	1,800	2,350	900
GPS5000 / 6000	1,000	1,040	2,200	2,300	2,450	1,100	1,000	2,000	2,350	1,000

Single Line Diagram



(Note) : This diagram is typical and may change depending on project requirement basis.

Mobile / Trailer Model (MGP / TGP Series)

Kawasaki MGP/TGP Series are gas turbine generators mounted on trucks or trailers for mobile application. MGP/TGP integrate all necessary equipment and enable fully automatic operation without the need for external power supply. High durability against vibration and shock, and reliable operation are important for this application. Kawasaki MGP/TGP is designed to fully meet such demands.

Advantages

1. Developed with Vast Field Experience

Gas Turbines on trucks or trailers need to withstand large vibration/shock when the trucks run on roads.
Kawasaki meets mobile installation condition with gas turbines experience and technology from Kawasaki aircraft jet engines operating under similar severe environmental conditions.

2. Low Center of Gravity and Large Tumble-down Angle

Thanks to light weight of gas turbines, the center of gravity of MGP/TGP is low, and this makes it possible to have stable maneuverability.

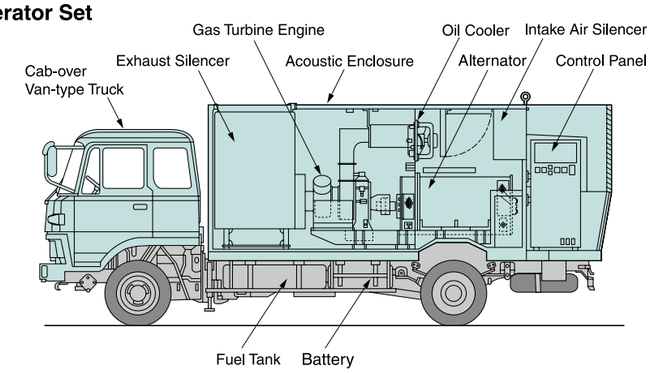
3. Compact Integration

MGP/TGP incorporate all necessary equipment, including fuel tank, batteries, exhaust silencer, cable reel, etc., inside a compact aluminum enclosure.
This feature enables easy maintenance.

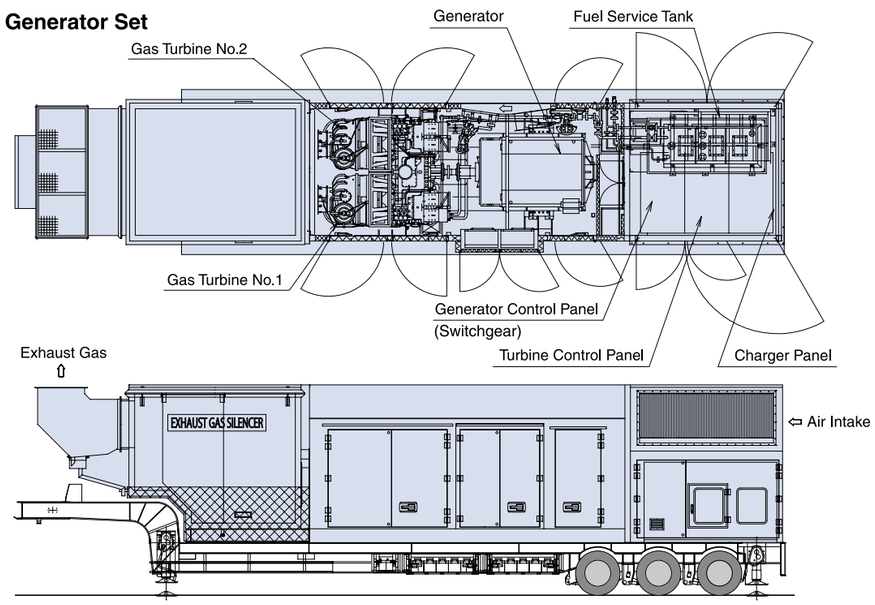
4. Blackout Start Capability

MGP/TGP can start up and supply electricity without any external utility supply, such as electric power and fuel.

● **MGP Series Generator Set**



● **TGP Series Generator Set**



Basic Specifications

Item			Model	MGP 750	MGP 1000	MGP 1250	MGP 1500	MGP 2000	TGP 2500	TGP 3000	TGP 4000
＊1	Output	(kW) 40°C		600	800	1000	1,200	1,600	2,000	2,400	3,200
	Fuel			Kerosene, Diesel							
Generator Sets	Load Application Allowance			100% (Resistance Load)							
	Freq. Deviation Transient			Within ±4.5% (with100% block load on and off)							
		Steady State		Within ± 0.3%							
	Fuel Consumption (l/h)	Kerosene		320	490	555	655	735	1,125	1,310	1,465
		Diesel Oil		305	465	525	620	695	1,065	1,245	1,390
Truck / Trailer	Type			Truck					Trailer		
	Dimensions Including Truck	Max. Length (m)		11.0				12.0	9.9 (not including cockpit)		
		Max. Width (m)		2.5							
		Max. Height (m)		3.4					3.6		
	Total Weight	(ton)		Less than 20 tons	Less than 22 tons			Less than 25 tons	Less than 33 tons		
Noise Level at 1 m		(dBA)		85							

(Note)
＊1 : Output : Up to 40°C of ambient temp., 150 m above sea level.

■ Installation Example

TGP3000

MGP1250

MGP2000

MGP2000

Maintenance and Customer Support

Easy Maintenance

Kawasaki GPS requires very little maintenance due to its small number of components.
Also,fewer oil replacement reduces environmental impact as well as customer's burden.
Monthly start-stop test is sufficient as periodic check. Extended service agreement is available for all other required maintenance.

High Skill Engineers

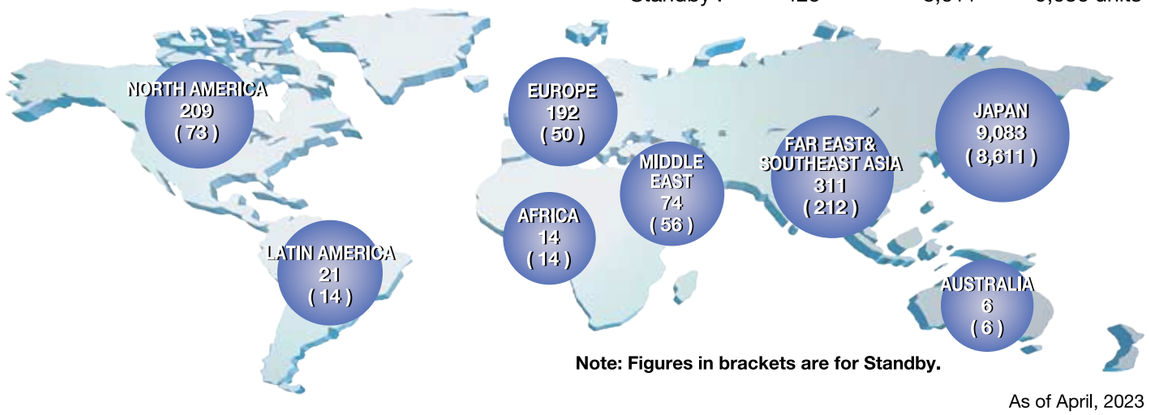
Kawasaki's service group is highly skilled.
Our engineers and technicians train at our assembly and overhaul facility to ensure that they have the latest technique and knowledge to perform all the required field maintenance.

Support from Worldwide Branches

Kawasaki has five direct branches and five spare parts centers in addition to our local service providers around the world to respond to the customer's needs immediately.
Each branch has capability to review and solve any issues that may arise.
We fully support customers worldwide.

Kawasaki Gas Turbine Worldwide Installation

	International	Japan	Total
Standby+Cogen :	827	9,083	9,910 units
Standby :	425	8,611	9,036 units



Note: Figures in brackets are for Standby.

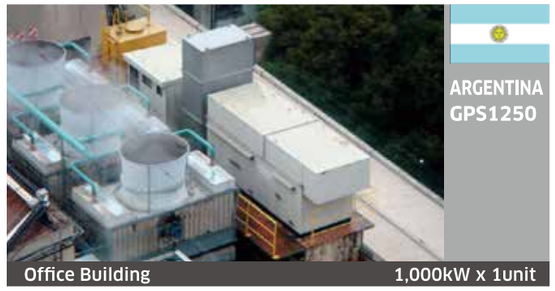
As of April, 2023

■ Typical Reference

JAPAN
GPS4000
Factory 3,200kW x 1unit

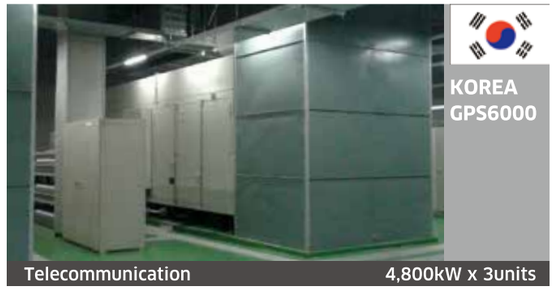
JAPAN
GPS6000
LNG Plant 4,800kW x 2units

USA
GPS4500
Data Center 3,600kW x 2units



ARGENTINA
GPS1250
Office Building 1,000kW x 1unit

MALAYSIA
GPS1250
Chemical Plant 1,000kW x 1unit



KOREA
GPS6000
Telecommunication 4,800kW x 3units