

## Kawasaki M1T-33 gas turbine for PU6000 of standby generator set

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Kawasaki Heavy Industries Ltd.(KHI) has successfully developed its new M1T-33 gas turbine for use in standby generator set. This is the largest gas turbine for a standby generator application in Japan. The new turbine is installed in the PU6000 standby generator set featuring an electric output of 6000kVA and is designed to meet the recent market demand for larger standby equipment with shorter starting times.

Since KHI delivered its first standby gas turbine unit commercially in 1976, the company has accumulated more than 6000 units of delivery records. The M1T-33 gas turbine has been developed with the latest design technologies based on KHI's long years of experience in the industry.

The M1T-33 gas turbine is a twin type of the newly developed M1A-33 gas turbine that features a single shaft with two-stage centrifugal compressor, three-stage axial turbine and a single can type of combustor. Its appearance is shown in Figure 1 and its main specifications are listed in Table 1. The main characteristics are as follows.

(1) As a gas turbine using a centrifugal compressor, it is the largest class in the world.

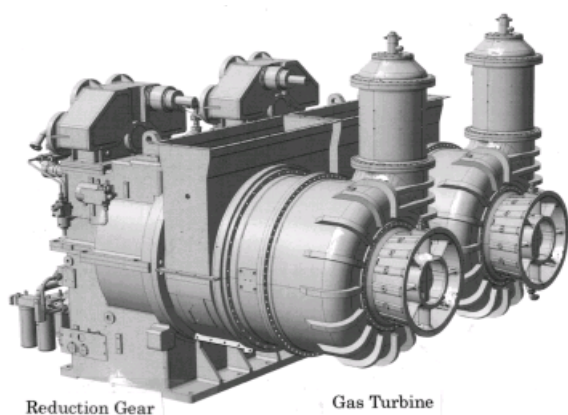


Figure 1 Appearance of M1T-33 gas turbine

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Table 1 Main specifications of M1T-33 gas turbine

Generator set	
Model	PU6000
Electric output *	6,000kVA (4,800kW)
Starting time	Within 40 sec
Fuel type	Kerosene, Diesel oil, High-grade heavy oil
Gas turbine	
Type	M1T-33
Power output *	5,200kW
Turbine speed	18,000rpm
Compressor	2-stage centrifugal type
Turbine	3-stage axial type
Combustor	Single can type
Reduction gear	Planetary + Spur gear

\* Output conditions: Ambient temp. 40°C  
Atmospheric press. 0.09964MPa

(2) High reliability and easy maintenance

Developed based on KHI's long years of experience in the industry, its high reliability has been proven by various endurance tests. By integrating the gas turbine and a reduction gear box, KHI reduced the number of parts and realized ease of operation and maintenance. In addition, KHI has made the package more compact even though the power output has increased.

(3) Superior start-up characteristics.

The duplex injection nozzle provides ideal fuel atomization at start-up and almost no ignition errors, thereby providing reliable starts. Also, KHI has achieved starting time within 40 seconds even though the size of the turbine has increased. Generally, the larger the size and the higher the output power of a turbine, the longer the starting time. KHI has overcome this issue with intensive experiments and simulation tests during the design stage leading to good results of running tests.

KHI has hitherto provided 19 types of standby generator units with outputs ranging from 187.5kVA (150kW) to 4500kVA (3600kW). With the introduction of the M1T-33 gas turbine, KHI expanded its product line and electric output range to 6000kVA (4800kW).