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 125 years of manufacturing integrated engineered products. Its 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. Its products are found on the land, in the sea and in the air.

Of course, by constant attention to production efficiency and through exclusive technologies developed internally, we are continuing to develop technologies related to transportation innovations, national land and marine resources development, space 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 new title for our products—"GREEN Gas Turbines".

"Get Reliable Eco-friendly Energy Now"
History and Order Record of Kawasaki Gas Turbines

History

1943  Completed the first Gas Turbine engine for aircrafts in Japan
1952  Started overhauling jet engines
1972  Started development of industrial Gas Turbine
1974  Completed first S1A-01 type : 200 kW Gas Turbine
1977  First Kawasaki Gas Turbine genset : 200 kW delivered
1979  First genset to overseas customer delivered
1984  First Kawasaki Gas Turbine Co-generation system 2x1.0 MW delivered
1985  Accumulated delivery of 1,000th set
1988  1.5 MW M1A-13 type Gas Turbine introduced
1993  5.5 MW M7A-01 type Gas Turbine introduced
1995  1.5 MW M1A-13D Dry Low NOx type Gas Turbine introduced
1998  Overseas sales and service affiliates were established in the U.S., Germany and Malaysia
1999  6.5 MW M7A-02 type Gas Turbine introduced
      5.5 MW M7A-01D Dry Low NOx type Gas Turbine introduced
      Accumulated order of 5,000th engine
      Experimental ceramic Gas Turbine completed and achieved the world record of
      42.1% simple cycle efficiency for the 300 kW class
2000  18 MW L20A Gas Turbine completed
2001  Akashi Works NO.4 Power Plant GPC180D : 17.6 MW commercial start-up
      Ultra low NOx 1.5 MW M1A-13X type Gas Turbine introduced (XONONTM)
2005  Akashi Works Energy Center, which comprises 24.7 MW Combined Cycle and
      7.8 MW Flexible Heat and Power Gas Turbine Power Plant, start-up
2006  7.7 MW class M7A-03 type Gas Turbine introduced
2007  Received the 100th Order of the M7A Series
2009  15ppm M7A-03D type Gas Turbine introduced
2010  1.7 MW class M1A-17 type Gas Turbine introduced

Accumulated number of orders received

ISO 9001 / ISO14001 Certified

Gas Turbine Division is located in Akashi Works. It designs and manufactures the Gas Turbine Co-generation System, and is certified for ISO 9001, which is the international standard for quality assurance, and ISO 14001, which is the international standard for environmental management.
Baseload Model

The Kawasaki GPB Series is designed for baseload applications, for both parallel operation with the grid and island mode operation. In addition, the Kawasaki GPB Series is able to operate in Co-generation service, supplying both electricity and heat (steam, hot water, direct heat) by collecting waste heat with a heat recovery steam generator (HRSG), heat exchanger, or dryer, and in Combined Cycle with a steam turbine generator. With high total thermal efficiency, the Kawasaki GPB Series is capable of very efficient operation. The Kawasaki GPB Series is capable of automatic operation.

Basic Specifications

<table>
<thead>
<tr>
<th>Engine Series</th>
<th>Gas Turbine Model</th>
<th>Gas Turbine Generator Model</th>
<th>Maximum Continuous Electric Output kWe</th>
<th>Heat Rate kJ/kWe-hr</th>
<th>Thermal Efficiency %</th>
<th>Exhaust Gas Temperature °C</th>
<th>Exhaust Gas Mass Flow x10^3 kg/hr</th>
<th>NOx (02 : 15%) ppm</th>
<th>Approximate Package Dimension (L,W,H) m</th>
<th>Approximate Package Weight (dry) x10^3 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M1A-13A</td>
<td>GPB15</td>
<td>1,490</td>
<td>14,880</td>
<td>24.2</td>
<td>521</td>
<td>29.1</td>
<td>-</td>
<td>5.3 x 1.65 x 2.35</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>M1A-13D</td>
<td>GPB15D</td>
<td>1,490</td>
<td>15,030</td>
<td>24.0</td>
<td>531</td>
<td>28.8</td>
<td>-</td>
<td>5.9 x 2.0 x 3.7</td>
<td>17.2</td>
</tr>
<tr>
<td></td>
<td>M1A-13X</td>
<td>GPB15X</td>
<td>1,430</td>
<td>15,260</td>
<td>23.6</td>
<td>524</td>
<td>26.6</td>
<td>25</td>
<td>6.0 x 1.85 x 2.55</td>
<td>11.5</td>
</tr>
<tr>
<td></td>
<td>M1A-17D</td>
<td>GPB17</td>
<td>1,690</td>
<td>13,550</td>
<td>26.6</td>
<td>521</td>
<td>26.6</td>
<td>25</td>
<td>6.0 x 2.4 x 2.6</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>M1A-17</td>
<td>GPB17D</td>
<td>1,690</td>
<td>13,550</td>
<td>26.6</td>
<td>521</td>
<td>26.6</td>
<td>25</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>M1T-13A</td>
<td>GPB30</td>
<td>2,930</td>
<td>15,100</td>
<td>23.8</td>
<td>521</td>
<td>23.8</td>
<td>25</td>
<td>6.0 x 2.4 x 2.6</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>M1T-13D</td>
<td>GPB30D</td>
<td>2,930</td>
<td>15,240</td>
<td>23.6</td>
<td>531</td>
<td>23.6</td>
<td>25</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: Mark “D” means Dry Low Emission  
Mark “X” means XONONTM Combustor for ultra low NOx application

Condition: ISO Rating
1. Inlet Air Temperature : 15 °C
2. Atmospheric Pressure : 101.3 kPa
3. Inlet / Exhaust Pressure Losses : No Duct Loss
4. Fuel Type : Natural Gas (100% CH4)
5. LHV of Fuel : 35.9MJ/Nm3

KAWASAKI GREEN Gas Turbine Co-generation systems can be your energy solution as well as the solution for our global environment. With KAWASAKI GREEN Gas Turbine Co-generation technology, you can reduce 22,600tons of CO2 per year compared with thermal power plant with boiler.

For your energy and environmental solution, Get Reliable Eco-friendly Energy Now !!!

Reduction offset is the same as planting 1.6M Cedar trees per year!

Amount one cedar sinks per year: about 14kg of CO2  
(source : Environment Ministry Japan)
### M7A Gas Turbine Series

<table>
<thead>
<tr>
<th>M7A-01</th>
<th>M7A-01D</th>
<th>M7A-02</th>
<th>M7A-02D</th>
<th>M7A-03</th>
<th>M7A-03D</th>
<th>L20A</th>
</tr>
</thead>
<tbody>
<tr>
<td>M7A-01</td>
<td>M7A-01D</td>
<td>M7A-02</td>
<td>M7A-02D</td>
<td>M7A-03</td>
<td>M7A-03D</td>
<td>L20A</td>
</tr>
<tr>
<td>GPB60</td>
<td>GPB60D</td>
<td>GPB70</td>
<td>GPB70D</td>
<td>GPB80</td>
<td>GPB80D</td>
<td>GPB180D</td>
</tr>
<tr>
<td>5,530</td>
<td>5,400</td>
<td>6,800</td>
<td>6,740</td>
<td>7,450</td>
<td>7,440</td>
<td>18,420</td>
</tr>
<tr>
<td>12,140</td>
<td>12,300</td>
<td>11,870</td>
<td>11,890</td>
<td>10,870</td>
<td>10,880</td>
<td>10,530</td>
</tr>
<tr>
<td>29.6</td>
<td>29.2</td>
<td>30.3</td>
<td>30.2</td>
<td>33.1</td>
<td>33.1</td>
<td>34.2</td>
</tr>
<tr>
<td>545</td>
<td>542</td>
<td>516</td>
<td>513</td>
<td>510</td>
<td>509</td>
<td>542</td>
</tr>
<tr>
<td>78.3</td>
<td>78.3</td>
<td>97.2</td>
<td>97.2</td>
<td>98.3</td>
<td>98.2</td>
<td>215.3</td>
</tr>
<tr>
<td>10.4 x 2.0 x 3.6</td>
<td>11.5 x 2.8 x 3.6</td>
<td>11.5 x 2.8 x 3.6</td>
<td>17.2 x 3.5 x 3.4</td>
<td>51</td>
<td>54</td>
<td>65</td>
</tr>
</tbody>
</table>

### L20A Gas Turbine Series

<table>
<thead>
<tr>
<th>M7A-01</th>
<th>M7A-01D</th>
<th>M7A-02</th>
<th>M7A-02D</th>
<th>M7A-03</th>
<th>M7A-03D</th>
<th>L20A</th>
</tr>
</thead>
<tbody>
<tr>
<td>M7A-01</td>
<td>M7A-01D</td>
<td>M7A-02</td>
<td>M7A-02D</td>
<td>M7A-03</td>
<td>M7A-03D</td>
<td>L20A</td>
</tr>
<tr>
<td>GPB60</td>
<td>GPB60D</td>
<td>GPB70</td>
<td>GPB70D</td>
<td>GPB80</td>
<td>GPB80D</td>
<td>GPB180D</td>
</tr>
<tr>
<td>5,530</td>
<td>5,400</td>
<td>6,800</td>
<td>6,740</td>
<td>7,450</td>
<td>7,440</td>
<td>18,420</td>
</tr>
<tr>
<td>12,140</td>
<td>12,300</td>
<td>11,870</td>
<td>11,890</td>
<td>10,870</td>
<td>10,880</td>
<td>10,530</td>
</tr>
<tr>
<td>29.6</td>
<td>29.2</td>
<td>30.3</td>
<td>30.2</td>
<td>33.1</td>
<td>33.1</td>
<td>34.2</td>
</tr>
<tr>
<td>545</td>
<td>542</td>
<td>516</td>
<td>513</td>
<td>510</td>
<td>509</td>
<td>542</td>
</tr>
<tr>
<td>78.3</td>
<td>78.3</td>
<td>97.2</td>
<td>97.2</td>
<td>98.3</td>
<td>98.2</td>
<td>215.3</td>
</tr>
<tr>
<td>10.4 x 2.0 x 3.6</td>
<td>11.5 x 2.8 x 3.6</td>
<td>11.5 x 2.8 x 3.6</td>
<td>17.2 x 3.5 x 3.4</td>
<td>51</td>
<td>54</td>
<td>65</td>
</tr>
</tbody>
</table>

### Installation Example

**Centrifugal Turbine for M1A Gas Turbine Series**

**Axial Turbine for M7A & L20A Gas Turbine Series**

**Installation Example**
M1A Series Gas Turbine Generator Specifications

Nominal Performance
- Elevation: 0 m
- Inlet Air Temperature: 15 °C
- Inlet Air Pressure Loss: 0.98 kPa
- Exhaust Gas Pressure Loss: 2.45 kPa
- LHV of Natural Gas Fuel: 35.9 MJ/Nm³ (100% CH4)

Typical Steam Condition
- Steam Pressure: 0.83 MPaG
- Steam Temperature (Saturated): 177 °C
- Feed Water Temperature: 80 °C
- Blowdown from HRSG: 0 %

M1A/T-13 Series
- Standard Package Configuration
  - M1T Gas Turbine
    - Industrial Single-Shaft
    - Rotor Speed: 22,000 rpm
  - Compressor
    - 2 Stage Centrifugal
    - Pressure Ratio: 9.4 (-13A), 9.6 (-13D, -13X)
  - Combustor
    - 2 Stage Centrifugal
    - Pressure Ratio: 9.4 (-13A), 9.6 (-13D, -13X)
    - Steam Injection to Diffusion Combustor (-13A Option)
    - DLE (Dry Low Emission) (-13D)
    - XONONTM Ultra Low Emission (-13X)
    - Available Fuel: Natural Gas, Diesel Oil, Dual Fuel
  - Turbine
    - 3 Stage Axial Turbine
  - Coupling Shaft & Cover
    - Flexible Coupling with Shear Pin and Cover
  - Reduction Gear Box
    - Hypoid
    - Output Speed: 1,500 / 1,800 rpm (50/60 Hz)

M1A Gas Turbine Series

<table>
<thead>
<tr>
<th>Gas Turbine Model</th>
<th>M1A-13A</th>
<th>M1A-13D</th>
<th>M1A-13X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial Load @ AIT 15 °C %</td>
<td>100</td>
<td>75</td>
<td>50</td>
</tr>
<tr>
<td>Electric Output kW</td>
<td>1,450</td>
<td>1,090</td>
<td>730</td>
</tr>
<tr>
<td>Heat Rate kJ/kWe-hr</td>
<td>5.0</td>
<td>7.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Exhaust Gas Temperature °C</td>
<td>524</td>
<td>441</td>
<td>368</td>
</tr>
<tr>
<td>Exhaust Gas Mass Flow x10⁶ kg/hr</td>
<td>28.8</td>
<td>29.2</td>
<td>29.6</td>
</tr>
<tr>
<td>HRSG Steam Output (typical) x10⁶ kg/hr</td>
<td>5.0</td>
<td>3.8</td>
<td>2.8</td>
</tr>
<tr>
<td>Total Thermal Efficiency %</td>
<td>79.2</td>
<td>73.6</td>
<td>65.4</td>
</tr>
<tr>
<td>Inlet Air Temperature °C</td>
<td>1,620</td>
<td>1,450</td>
<td>1,120</td>
</tr>
<tr>
<td>Maximum Continuous Electric Output kW</td>
<td>14,690</td>
<td>15,130</td>
<td>16,880</td>
</tr>
<tr>
<td>Heat Rate kJ/kWe-hr</td>
<td>516</td>
<td>524</td>
<td>547</td>
</tr>
<tr>
<td>Exhaust Gas Temperature °C</td>
<td>30.9</td>
<td>28.8</td>
<td>25.2</td>
</tr>
<tr>
<td>Exhaust Gas Mass Flow x10⁶ kg/hr</td>
<td>5.2</td>
<td>5.0</td>
<td>4.8</td>
</tr>
<tr>
<td>HRSG Steam Output (typical) x10⁶ kg/hr</td>
<td>76.5</td>
<td>79.2</td>
<td>82.4</td>
</tr>
<tr>
<td>Total Thermal Efficiency %</td>
<td>77.8</td>
<td>79.7</td>
<td>82.8</td>
</tr>
</tbody>
</table>

Starting and Turning Motor System
- VFD Motor Drive
  - (Option: Air Starter, DC Motor)
- Turning Motor

Lube Oil System
- Lube Oil: Synthetic Ester Oil
- Turbine Driven Main Lube Pump
- Pre-Post Lube Pump
- Air Cooled Oil Cooler with Temp. Control Valve
- Water Cooled (Option)
- Integral Oil Reservoir: 210 liter (GPB15)
- 160 liter (GPB30)
- Simplex Filter (Option: Duplex Type)
- Stainless Steel Piping: Down Stream of Filter

Generator
- Continuous Duty Rating
- Air Cooled Open Drip-Proof Construction
- Water Cooled (Option)
- 3 Phase, 3 Wire (Option 4 Wire)
- Standard Voltage: 3.3 kV, 6.6 kV
- Power Factor: 90% (Option 85%, 80%)
- Bearing: Ball (Roller) Bearing
- Lubrication: Grease Pack
- IEC Standard, Class F Insulation with F rise
- Exciter: Diverted Field Brushless (Option PMG)

Enclosed Package
- Carbon Steel Common Base Frame
- Outdoor Carbon Steel, Acoustic Enclosure
- Noise Level: 85 dBA at 1 m to the side of Enclosure
- Maintenance Stage, Ladder, Beam (Option)

Intake Silencer & Filter
- Carbon Steel Outdoor
- 2 Stage Filter with Insect Screen
- Pulse Self Cleaning Filter (Option)
- Noise Level: 85 dBA in front of Filter

Exhaust Silencer and Stack (Option)
- Carbon Steel Outdoor
- Forced Ventilation Fan with Filter and Inlet Screen
- Maintenance Stage, Ladder, Beam (Option)

Controls
- Microprocessor Based PLC
  - (CPU, Power Module: Option Redundant)
- Gas Turbine and Generator Control
  - GT start / shutdown Control
  - Speed / kW / Power Factor Control
  - Auto Synchronizing and Auto Sharing
- Touch Panel Operation
- Industrial Ethernet
- Remote Monitoring (Option)
- Graphics Monitoring
- Historical Trend & Event Logger
- Daily and Monthly Reports

GPB17 Typical Layout : mm (Reference)
### M1A Gas Turbine Series

#### M1A-17 Series

<table>
<thead>
<tr>
<th>GPB17</th>
<th>M1A-17</th>
<th>M1A-17D</th>
<th>M1T-13A</th>
<th>M1T-13D</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>1,630</td>
<td>1,630</td>
<td>1,630</td>
<td>2,850</td>
<td>2,850</td>
</tr>
<tr>
<td>1,220</td>
<td>1,220</td>
<td>1,220</td>
<td>2,140</td>
<td>2,140</td>
</tr>
<tr>
<td>820</td>
<td>820</td>
<td>820</td>
<td>1,430</td>
<td>1,430</td>
</tr>
<tr>
<td>13,870</td>
<td>13,870</td>
<td>13,870</td>
<td>15,350</td>
<td>15,350</td>
</tr>
<tr>
<td>15,320</td>
<td>15,320</td>
<td>15,320</td>
<td>16,800</td>
<td>16,800</td>
</tr>
<tr>
<td>18,640</td>
<td>18,640</td>
<td>18,640</td>
<td>20,190</td>
<td>20,190</td>
</tr>
<tr>
<td>526</td>
<td>526</td>
<td>526</td>
<td>523</td>
<td>523</td>
</tr>
<tr>
<td>448</td>
<td>448</td>
<td>448</td>
<td>441</td>
<td>441</td>
</tr>
<tr>
<td>383</td>
<td>383</td>
<td>383</td>
<td>560</td>
<td>560</td>
</tr>
<tr>
<td>28.8</td>
<td>28.8</td>
<td>28.8</td>
<td>28.8</td>
<td>28.8</td>
</tr>
<tr>
<td>29.4</td>
<td>29.4</td>
<td>29.4</td>
<td>28.8</td>
<td>28.8</td>
</tr>
<tr>
<td>29.9</td>
<td>29.9</td>
<td>29.9</td>
<td>29.9</td>
<td>29.9</td>
</tr>
<tr>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
</tr>
<tr>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>80.1</td>
<td>80.1</td>
<td>80.1</td>
<td>94.35</td>
<td>94.35</td>
</tr>
<tr>
<td>74.9</td>
<td>74.9</td>
<td>74.9</td>
<td>99.9</td>
<td>99.9</td>
</tr>
<tr>
<td>67.7</td>
<td>67.7</td>
<td>67.7</td>
<td>82.1</td>
<td>82.1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>1,910</td>
<td>1,910</td>
<td>1,910</td>
<td>2,945</td>
<td>2,945</td>
</tr>
<tr>
<td>1,630</td>
<td>1,630</td>
<td>1,630</td>
<td>2,485</td>
<td>2,485</td>
</tr>
<tr>
<td>1,200</td>
<td>1,200</td>
<td>1,200</td>
<td>2,210</td>
<td>2,210</td>
</tr>
<tr>
<td>13,160</td>
<td>13,160</td>
<td>13,160</td>
<td>15,150</td>
<td>15,150</td>
</tr>
<tr>
<td>13,870</td>
<td>13,870</td>
<td>13,870</td>
<td>15,350</td>
<td>15,350</td>
</tr>
<tr>
<td>15,910</td>
<td>15,910</td>
<td>15,910</td>
<td>17,290</td>
<td>17,290</td>
</tr>
<tr>
<td>511</td>
<td>511</td>
<td>511</td>
<td>485</td>
<td>485</td>
</tr>
<tr>
<td>526</td>
<td>526</td>
<td>526</td>
<td>523</td>
<td>523</td>
</tr>
<tr>
<td>560</td>
<td>560</td>
<td>560</td>
<td>560</td>
<td>560</td>
</tr>
<tr>
<td>31.5</td>
<td>31.5</td>
<td>31.5</td>
<td>62.1</td>
<td>62.1</td>
</tr>
<tr>
<td>28.8</td>
<td>28.8</td>
<td>28.8</td>
<td>57.6</td>
<td>57.6</td>
</tr>
<tr>
<td>24.4</td>
<td>24.4</td>
<td>24.4</td>
<td>50.3</td>
<td>50.3</td>
</tr>
<tr>
<td>5.2</td>
<td>5.2</td>
<td>5.2</td>
<td>9.4</td>
<td>9.4</td>
</tr>
<tr>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>9.9</td>
<td>9.9</td>
</tr>
<tr>
<td>4.8</td>
<td>4.8</td>
<td>4.8</td>
<td>9.5</td>
<td>9.5</td>
</tr>
<tr>
<td>77.8</td>
<td>77.8</td>
<td>77.8</td>
<td>73.4</td>
<td>73.4</td>
</tr>
<tr>
<td>80.1</td>
<td>80.1</td>
<td>80.1</td>
<td>78.8</td>
<td>78.8</td>
</tr>
<tr>
<td>83.6</td>
<td>83.6</td>
<td>83.6</td>
<td>82.1</td>
<td>82.1</td>
</tr>
</tbody>
</table>

#### Starting and Turning Motor System
- VFD Motor Drive
- (Option: Air Starter, DC Motor)
- Turning Motor

#### Lube Oil System
- Lube Oil: Synthetic Esters Oil
- Turbine Driven Main Lube Pump
- Pre-Post Lube Pump
- Air Cooling Oil Cooler with Temp. Control Valve
- Water Cooled (Option)
- Integral Oil Reservoir
- Simplex Filter (Option: Duplex Type)
- Stainless Steel Piping: Downstream of Filter

#### Generator
- Continuous Duty Rating
- Air Cooled Open Drip-Proof Construction
- Water Cooled (Option)
- 3 Phase, 3 Wire (Option 4 Wire)
- Standard Voltage: 0.4kV, 3.3 kV, 6.6 kV
- Power Factor: 90% (Option 85%, 80%)
- Bearing: Ball (Roller) Bearing
- Lubrication: Grease Pack
- IEC Standard, Class F Insulation with F rise
- Exciter: Dielerted Field Brushless (Option PMG)

#### Enclosed Package
- Carbon Steel Common Base Frame
- Outdoor Carbon Steel, Acoustic Enclosure
- Noise Level: 85 dBA at 1 m to the side of Enclosure
- Forced Ventilation Fan with Filter and Inlet Screen
- Maintenance Stage, Ladder, Beam (Option)

#### Intake Silencer & Filter
- Carbon Steel Outdoor
- 2 Stage Filter with Insect Screen
- Pulse Self-Cleaning Filter (Option)
- Noise Level: 85 dBA in front of Filter

#### Exhaust Silencer and Stack (Option)
- Controls
- Microprocessor Based PLC (CPU, Power Module: Option Redundant)
- Gas Turbine and Generator Control
- GT start / shutdown Control
- Speed / kW / Power Factor Control
- Auto Synchronizing and Auto Sharing
- Touch Panel Operation
- Industrial Ethernet
- Remote Monitoring (Option)
- Graphics Monitoring
- Historical Trend & Event Logger
- Daily and Monthly Reports

---

#### GPB17 Package Layout: mm

(Reference)
M7A / L20A Series Gas Turbine Generator Specifications

Nominal Performance
- Elevation: 0 m
- Inlet Air Temperature: 15 °C
- Inlet Air Pressure Loss: 0.98 kPa
- Exhaust Gas Pressure Loss: 2.45 kPa (GPB60/60D), 3.43 kPa (GPB70/70D), 2.94 kPa (GPB80/80D)
- LHV of Natural Gas Fuel (100% CH4): 35.9 MJ/Nm³

Typical Steam Condition
- Steam Pressure: 0.83 MPaG
- Steam Temperature (Saturated): 177 °C
- Feed Water Temperature: 80°C
- Blowdown from HRSG: 0%

M7A Gas Turbine Series

<table>
<thead>
<tr>
<th></th>
<th>M7A-01</th>
<th>M7A-01D</th>
<th>M7A-02</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GPB60</td>
<td>GPB60D</td>
<td>GPB70</td>
</tr>
<tr>
<td>Partial Load @ Alt 15 °C %</td>
<td>100</td>
<td>75</td>
<td>50</td>
</tr>
<tr>
<td>Electric Output kWe</td>
<td>5,410</td>
<td>4,060</td>
<td>2,700</td>
</tr>
<tr>
<td>Heat Rate kJ/kWe-hr</td>
<td>12,300</td>
<td>13,470</td>
<td>15,900</td>
</tr>
<tr>
<td>Exhaust Gas Temperature °C</td>
<td>548</td>
<td>475</td>
<td>405</td>
</tr>
<tr>
<td>Exhaust Gas Mass Flow x10⁶ kg/hr</td>
<td>77.6</td>
<td>77.3</td>
<td>77.1</td>
</tr>
<tr>
<td>HRSG Steam Output (Typical*) x10⁶ kg/hr</td>
<td>14.5</td>
<td>11.6</td>
<td>8.8</td>
</tr>
<tr>
<td>Total Thermal Efficiency %</td>
<td>82.5</td>
<td>78.5</td>
<td>72.1</td>
</tr>
<tr>
<td>Inlet Air Temperature °C</td>
<td>0</td>
<td>15</td>
<td>40</td>
</tr>
<tr>
<td>Maximum Continuous Electric Output kWe</td>
<td>5,950</td>
<td>5,410</td>
<td>3,910</td>
</tr>
<tr>
<td>Heat Rate kJ/kWe-hr</td>
<td>11,970</td>
<td>12,300</td>
<td>13,900</td>
</tr>
<tr>
<td>Exhaust Gas Temperature °C</td>
<td>539</td>
<td>548</td>
<td>585</td>
</tr>
<tr>
<td>Exhaust Gas Mass Flow x10⁶ kg/hr</td>
<td>81.3</td>
<td>77.6</td>
<td>64.9</td>
</tr>
<tr>
<td>HRSG Steam Output (Typical*) x10⁶ kg/hr</td>
<td>14.8</td>
<td>14.5</td>
<td>13.7</td>
</tr>
<tr>
<td>Total Thermal Efficiency %</td>
<td>80.6</td>
<td>82.5</td>
<td>87.2</td>
</tr>
</tbody>
</table>

M7A Series Standard Package Configuration

- Gas Turbine: Industrial Single-Shaft
- Rotor Speed: 14,000 rpm (-01/-01D)
- Rotor Speed: 13,790 rpm (-02/-02D, -03D)
- Compressor: 12 Stage Axial Flow (-01/-01D)
- 11 Stage Axial Flow (-02/-02D, -03D)
- IGV & 3 Stage VSV
- Pressure Ratio: 13:1 (-01/-01D)
- 16:1 (-02/-02D, -03D)

- Combustor: 6 Can Combustors
- Dual Ignition System
- Conventional Diffusion (-01, -02)
- (Option De-NOx: Steam Injection Type)
- DLE (Dry Low Emission) (-01D, -02D, -03D)
- Available Fuel: Natural Gas, Diesel Oil (-01/-01D, -02/-02D, -03D)

- Turbine: 4 Stage Axial Turbine
- Flexible Coupling with Shear Pin and Cover
- Reduction Gear Box
- Epicyclic

GPB60/70/80 Package Layout : mm

Starting and Turning System
- VFD Motor Drive
- Lube Oil System
- Lube Oil: Turbine Oil ISO VG32
- Turbine Driven Main Lube Pump
- Pre-Post Lube Pump
- Emergency Lube Pump
- Air Cooled Oil Cooler with Temp. Control Valve
- Water Cooled (Option)
- Oil Heater (Cold Weather Option)
- Stainless Steel Piping: Down Stream of Filter
- Simplex Filter (Duplex Filter: Option)
- Oil Vapor Fan

Generator
- Continuous Duty Rating
- Air Cooled Open Drip-Proof Construction
- Water Cooled (Option)
- Integral Oil Reservoir, 2,200 liter
- Oil Heater (Cold Weather Option)
- Stainless Steel Piping: Down Stream of Filter
- Simplex Filter (Duplex Filter: Option)
- Oil Vapor Fan

Enclosed Package
- Carbon Steel Common Base Frame
- Outdoor Carbon Steel Acoustic Enclosure
- Noise Level: 85 dBA at 1 m to the side of Enclosure
- Forced Ventilation Fan with Filter and Inlet Screen
- Maintenance Stage, Ladder, Beam (Option)
- Intake Silencer & Filter
- Carbon Steel Outdoor
- 3 Stage Filter with Insect Screen
- Pulse Type Self Cleaning Filter (Option)
- Noise Level: 85 dBA in front of Filter

Exhaust Silencer Stack
- (Option)

Controls
- Microprocessor Based PLC
- CPU, Power Module: Option Redundant
- Gas Turbine and Generator Control
- GT start / shutdown Control
- Auto Synchronizing and Auto Sharing
- Remote Monitoring (Option)
- Graphics Monitoring
- Historical Trend & Event Logger
- Daily and Monthly Reports

- Dimension: GPB70/GPB80

---

*GPB60/70/80 Package Layout: mm (Reference)*

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

*Dimension: GPB70/GPB80*
### L20A Series
#### Standard Package Configuration
- **L20A Gas Turbine**
  - Industrial Single-Shaft
  - Rotor Speed: 9,420 rpm
- **Compressor**
  - 11 Stage Axial Flow
  - IGV & 4 Stage VSV
- **Combustor**
  - 8 Can Combustors
  - Dual Ignition System
- **Generator**
  - Continuous Duty Rating
  - 3 Phase, 3 Wire (Option 4 Wire)
  - Voltage: 6.6 kV, 11.0 kV
- **Lube Oil System**
  - Turbine Driven Main Lube Oil Pump
  - Pre-Post Lube Oil Pump
  - Emergency Lube Oil Pump
  - Water Cooled Oil Cooler with Temp. Control Valve
  - Integral Oil Reservoir
  - Stainless Steel Piping: Down Stream of Filter
  - Filter
  - Oil Vapor Fan

#### Enclosed Package
- Carbon Steel Common Base Frame
- Outdoor Carbon Steel Acoustic Enclosure
- Noise Level: 85 dBA at 1 m to the side of Enclosure
- Forced Ventilation Fan with Filter and Inlet Screen
- Maintenance Stage, Ladder, Beam (Option)

#### Intake Silencer & Filter
- Carbon Steel Outdoor
- 3 Stage Filter with Insect Screen
- Pulse Type Self Cleaning Filter (Option)
- Noise Level: 85 dBA in front of Filter

#### Exhaust Silencer Stack
- (Option)

#### Controls
- Microprocessor Based PLC
- Gas Turbine and Generator Control
  - GT start / Shutdown Control
  - Speed / kW / Power Factor Control
- Auto Synchronizing and Auto Sharing
- Touch Panel Operation
- Serial Link User Interface (Option)
- SCADA System (Option)
- Redundant Control System (Option)
- Remote Monitoring (Option)
- Graphics Monitoring
- Historical Trend & Event Logger
- Daily and Monthly Reports

### L20A Gas Turbine Series

<table>
<thead>
<tr>
<th>M7A -02D</th>
<th>M7A -03</th>
<th>M7A -03D</th>
<th>L20A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GPB80D</strong></td>
<td><strong>GPB80</strong></td>
<td><strong>GPB80D</strong></td>
<td><strong>GPB180</strong> / <strong>180D</strong></td>
</tr>
<tr>
<td>100</td>
<td>75</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>7,310</td>
<td>5,480</td>
<td>3,650</td>
<td>7,250</td>
</tr>
<tr>
<td>6,530</td>
<td>4,890</td>
<td>3,260</td>
<td>7,800</td>
</tr>
<tr>
<td>10,970</td>
<td>11,780</td>
<td>13,910</td>
<td>10,100</td>
</tr>
<tr>
<td>12,090</td>
<td>14,660</td>
<td>18,780</td>
<td>11,010</td>
</tr>
<tr>
<td>516</td>
<td>487</td>
<td>494</td>
<td>512</td>
</tr>
<tr>
<td>95.8</td>
<td>91.2</td>
<td>87.2</td>
<td>96.8</td>
</tr>
<tr>
<td>16.2</td>
<td>14.2</td>
<td>13.8</td>
<td>16.2</td>
</tr>
<tr>
<td>79.8</td>
<td>72.8</td>
<td>74.1</td>
<td>82.1</td>
</tr>
<tr>
<td>0</td>
<td>15</td>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>7,070</td>
<td>6,530</td>
<td>5,010</td>
<td>7,800</td>
</tr>
<tr>
<td>12,090</td>
<td>12,090</td>
<td>13,280</td>
<td>10,820</td>
</tr>
<tr>
<td>511</td>
<td>516</td>
<td>538</td>
<td>507</td>
</tr>
<tr>
<td>100.4</td>
<td>97.2</td>
<td>83.5</td>
<td>100.0</td>
</tr>
<tr>
<td>16.5</td>
<td>16.2</td>
<td>15.8</td>
<td>16.5</td>
</tr>
<tr>
<td>77.5</td>
<td>79.8</td>
<td>84.8</td>
<td>80.5</td>
</tr>
</tbody>
</table>

- **Nominal Performance**
  - Elevation: 0 m
  - Inlet Air Temperature: 15 °C
  - Inlet Air Pressure Loss: 0.98 kPa
  - Exhaust Gas Pressure Loss: 3.43 kPa (GPB180/180D)
  - LHV of Natural Gas Fuel: 35.9 MJ/Nm³ (100% CH4)
  - Available Fuel: Natural Gas
  - Steam Pressure: 0.83 MPaG
  - Steam Temperature (Saturated): 177 °C
  - Feed Water Temperature: 80 °C
  - Blowdown from HRSG: 0%

- **Typical Steam Condition**
  - Steam Pressure: 0.83 MPaG
  - Steam Temperature (Saturated): 177 °C
  - Feed Water Temperature: 80 °C
  - Blowdown from HRSG: 0%

- **Maximum Output**
  - Heat Rate: 14 MW
  - Maximum Output: 19,320 MW
  - Heat Rate: 14 MW
  - Maximum Output: 19,320 MW

- **Intake Silencer & Filter**
  - Carbon Steel Outdoor
  - 3 Stage Filter with Insect Screen
  - Pulse Type Self Cleaning Filter (Option)
  - Noise Level: 85 dBA in front of Filter

- **Exhaust Silencer Stack**
  - (Option)

- **Lube Oil System**
  - Turbine Driven Main Lube Oil Pump
  - Pre-Post Lube Oil Pump
  - Emergency Lube Oil Pump
  - Water Cooled Oil Cooler with Temp. Control Valve
  - Integral Oil Reservoir
  - Stainless Steel Piping: Down Stream of Filter
  - Filter
  - Oil Vapor Fan

- **Generator**
  - Continuous Duty Rating
  - 3 Phase, 3 Wire (Option 4 Wire)
  - Voltage: 6.6 kV, 11.0 kV
  - Power Factor: 90% (Option 85%, 80%)
  - IEC Standard, Class F Insulation with B rise
  - Exciter: Brushless PMG

- **Enclosed Package**
  - Carbon Steel Common Base Frame
  - Outdoor Carbon Steel Acoustic Enclosure
  - Noise Level: 85 dBA at 1 m to the side of Enclosure
  - Forced Ventilation Fan with Filter and Inlet Screen
  - Maintenance Stage, Ladder, Beam (Option)

- **Intake Silencer & Filter**
  - Carbon Steel Outdoor
  - 3 Stage Filter with Insect Screen
  - Pulse Type Self Cleaning Filter (Option)
  - Noise Level: 85 dBA in front of Filter

- **Exhaust Silencer Stack** (Option)

- **Controls**
  - Microprocessor Based PLC
  - Gas Turbine and Generator Control
  - GT start / Shutdown Control
  - Speed / kW / Power Factor Control
  - Auto Synchronizing and Auto Sharing
  - Touch Panel Operation
  - Serial Link User Interface (Option)
  - SCADA System (Option)
  - Redundant Control System (Option)
  - Remote Monitoring (Option)
  - Graphics Monitoring
  - Historical Trend & Event Logger
  - Daily and Monthly Reports

---

**GPB180 Package Layout:**

- Enclosures
- Ventilation Air outlet
- G/T Intake
- G/T Exhaust gas outlet

---

**L20A Gas Turbine Series**

- **GPB180**
  - Industrial Single-Shaft
  - Rotor Speed: 9,420 rpm
  - Compressor: 11 Stage Axial Flow
  - IGV & 4 Stage VSV
  - Combustor: 8 Can Combustors
  - Dual Ignition System
  - Conventional Diffusion (GPB180)
  - DLE (Dry Low Emission) (GPB180D)
  - Available Fuel: Natural Gas
  - Turbine: 3 Stage Axial Turbine
  - Coupling Shaft & Cover: Flexible Coupling with Shear Pin and Cover
  - Reduction Gear Box: Parallel Shaft
  - Intake Silencer & Filter: Carbon Steel Outdoor
  - Intake Silencer & Filter: 3 Stage Filter with Insect Screen
  - Intake Silencer & Filter: Pulse Type Self Cleaning Filter (Option)
  - Intake Silencer & Filter: Noise Level: 85 dBA in front of Filter
  - Exhaust Silencer Stack (Option)
  - Controls: Microprocessor Based PLC
  - Controls: Gas Turbine and Generator Control
  - Controls: GT start / Shutdown Control
  - Controls: Speed / kW / Power Factor Control
  - Controls: Auto Synchronizing and Auto Sharing
  - Controls: Touch Panel Operation
  - Controls: Serial Link User Interface (Option)
  - Controls: SCADA System (Option)
  - Controls: Redundant Control System (Option)
  - Controls: Remote Monitoring (Option)
  - Controls: Graphics Monitoring
  - Controls: Historical Trend & Event Logger
  - Controls: Daily and Monthly Reports

---

**L20A Gas Turbine Series**

- **GPB180**
  - Industrial Single-Shaft
  - Rotor Speed: 9,420 rpm
  - Compressor: 11 Stage Axial Flow
  - IGV & 4 Stage VSV
  - Combustor: 8 Can Combustors
  - Dual Ignition System
  - Conventional Diffusion (GPB180)
  - DLE (Dry Low Emission) (GPB180D)
  - Available Fuel: Natural Gas
  - Turbine: 3 Stage Axial Turbine
  - Coupling Shaft & Cover: Flexible Coupling with Shear Pin and Cover
  - Reduction Gear Box: Parallel Shaft
  - Intake Silencer & Filter: Carbon Steel Outdoor
  - Intake Silencer & Filter: 3 Stage Filter with Insect Screen
  - Intake Silencer & Filter: Pulse Type Self Cleaning Filter (Option)
  - Intake Silencer & Filter: Noise Level: 85 dBA in front of Filter
  - Exhaust Silencer Stack (Option)
  - Controls: Microprocessor Based PLC
  - Controls: Gas Turbine and Generator Control
  - Controls: GT start / Shutdown Control
  - Controls: Speed / kW / Power Factor Control
  - Controls: Auto Synchronizing and Auto Sharing
  - Controls: Touch Panel Operation
  - Controls: Serial Link User Interface (Option)
  - Controls: SCADA System (Option)
  - Controls: Redundant Control System (Option)
  - Controls: Remote Monitoring (Option)
  - Controls: Graphics Monitoring
  - Controls: Historical Trend & Event Logger
  - Controls: Daily and Monthly Reports
Standby Model Introduction

Excellent Features of Kawasaki Standby Gas Turbine Generators

Kawasaki has installed over 7,000 units rated from 200kVA to 6,000kVA all over the world. The reliability of Kawasaki’s Stand-by Gas Turbine has allowed Kawasaki to install them in Internet Data Centers, Hospitals and critical locations where uninterrupted power is paramount.

- High performance, low cost gas turbine solution
- Dual fuel capable (Gas and Fuel Oil)
- Low noise signature for quiet operations
- Low radiated vibration
- No cooling water required
- High starting reliability and rapid startup
- Maintenance simplicity
- Space-saving design, and easy transportation and installation (MWe Footprint)
- Clean exhaust contributes to environmental conservation

Great Hanshin Earthquake (Jan 17.1995)

On the early morning of Jan.17.1995, the huge earthquake (magnitude 7.2) hit the Hanshin area, and black out hit about 3 million households in the area.

The Results of Kawasaki Standby Gas Turbine start-up

<table>
<thead>
<tr>
<th>Object number</th>
<th>Black out</th>
<th>Normal start-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>141</td>
<td>97</td>
<td>93</td>
</tr>
<tr>
<td>No Black out</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Start-up failures</td>
<td>4 (*)</td>
<td></td>
</tr>
</tbody>
</table>

100% Start-up Reliability!

(※) By external factor out of Kawasaki’s responsibility.
The mission of iDC is 24 hours/365 days service to Customer.

What iDC demands for standby generator?

Kawasaki’s Standby Gas Turbine has the ability to meet Various iDC facility’s demand. Kawasaki has a 95% share for iDC in Japan.

Components of IDC Facility
1. Power Receiving
2. Standby Generator
3. UPS
4. PDU
5. Server
6. Air Conditioning
7. Fire Fighting
8. Grounding

Electric Power Supply is critical

Typical Arrangement of iDC Components

Examples of installation for iDC

Indoor installation
Outdoor installation
Roof-top installation
Standby Model (GPS Series)

Standby gensets must start and supply power in the event of the loss of power from the utility. These functions depend greatly on the prime-mover of the standby system. Starting and providing power are often more important than financial conditions such as the initial cost of equipment.

Kawasaki standby GPS Series are suitable for standby power supply when utility power fails. All the models are designed for automatic operation (start/power supply/stop) and equipped with alarm/protection systems.

### Basic Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>GPS750</th>
<th>GPS1250</th>
<th>GPS1500</th>
<th>GPS2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric output (kW)</td>
<td>600</td>
<td>1,000</td>
<td>1,200</td>
<td>1,600</td>
</tr>
<tr>
<td>Starting time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load application capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freq. deviation transient</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steady state</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fuel consumption (liter/hr)</strong></td>
<td>305</td>
<td>525</td>
<td>620</td>
<td>695</td>
</tr>
<tr>
<td>Gas turbine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>S2A-01</td>
<td>M1A-01</td>
<td>M1A-03</td>
<td>M1A-23</td>
</tr>
<tr>
<td>Turbine model</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbine speed (rpm)</td>
<td>31,500</td>
<td>22,000</td>
<td>1,500</td>
<td>2,000</td>
</tr>
<tr>
<td>Output speed (rpm)</td>
<td>1,500</td>
<td>1,800</td>
<td>60 Hz</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Dry weight (ton)</td>
<td>1.48</td>
<td>3.0</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>Lube oil type/brand</td>
<td>Synthetic oil/Shell/ASTO-500, Mobil Jet II, Castrol AERO 5000, DP BPTO 2380</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lube oil tank capacity (approx.)</td>
<td>66</td>
<td>100</td>
<td>210</td>
<td></td>
</tr>
<tr>
<td>Lube oil consumption (liter/hr)</td>
<td>0.08</td>
<td></td>
<td>0.16</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
- Output: Up to 40 °C of ambient temp., 150 m sea level
- **Fuel consumption:** At full load, 15 °C, using diesel fuel oil, allowance is 5%
- Above specifications subject to change without notice.

### Typical Standby/Peakcut Gas Turbine Layout

Gas turbine package with exhaust silencer

<table>
<thead>
<tr>
<th>Exhaust silencer</th>
<th>Gas turbine package (acoustic enclosure)</th>
</tr>
</thead>
</table>

**Internal view of gas turbine package**

- Gas turbine
- Power section
- Gear box
- Coupling
- Alternator
- Skid

Approx. 85 dBA in open air (optional system: 80–70 dBA)

Approx. 90 dBA (optional system: 85–65 dBA at 1 m with a secondary silencer)
### Typical Timing Chart Of Operation

<table>
<thead>
<tr>
<th>Operation</th>
<th>GPS2500</th>
<th>GPS3000</th>
<th>GPS4000</th>
<th>GPS5000</th>
<th>GPS6000</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPM</td>
<td>1,065</td>
<td>1,245</td>
<td>1,390</td>
<td>1,835</td>
<td>2,055</td>
</tr>
<tr>
<td>TURBINE SPEED</td>
<td>M1T-01S</td>
<td>M1T-03</td>
<td>M1T-23</td>
<td>M1T-33A</td>
<td>M1T-33</td>
</tr>
<tr>
<td>VOLT</td>
<td>2,500</td>
<td>3,000</td>
<td>4,000</td>
<td>5,000</td>
<td>6,000</td>
</tr>
<tr>
<td>GENERATOR VOLT</td>
<td>160</td>
<td>240</td>
<td>360</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Rated 95%**: Within ±4.5% (with 100% block load on and off)
- **Rated 95%**: Within ±0.3%
- **Kerosene, Diesel oil**: Time lag 2 sec.
- **Bypass fuel valve close**: Time lag 60 sec.
- **Start fuel valve**: Time lag 40 sec.
- **Ignition plug**: Time lag 2 sec.
- **Starter motor**: 2 sec.
- **Start fuel valve**: 30 sec.
- **Bypass fuel valve**: 10 Hr
- **Utility failure**: Ready to re-start
- **Utility supply**: Complete stop
- **Bypass fuel valve close**: Final stop

#### Note:
- **Supplied with GPS1250 or larger model**.
- **70% rpm for GPS250 or GPS500**
- **70 sec for GPS250 and GPS500**

### Electrical Start
- With D.C. motors (Optional: Pneumatic start with air turbines)
- Lead-acid stationary or automotive batteries (Optional: Alkaline Ni-Cd batteries, others)

### Electrical Characteristics
- **Within ±1.5% (steady state from no-load to full-load, at pf = 0.8)**
- **Brushless by A.C. exciter and rotating diodes**

### Operational Features
- **Heavy-duty, simple open cycle, single-shaft**
- **3-phase, open screen-protected, brushless, self-ventilated, synchronous**

### Performance Specifications
- **Vacuum oil, Shell/ASTO-500, Mobil jet II, Castrol AERO 5000, DP BPTO 2380**
- **Within ±5.0%**

---

### Engine Types
- **GPS1250**: Roof installation
- **GPS4000**: Outdoor installation
- **GPS5000**: Outdoor installation
- **GPS6000**: Outdoor installation

---
Kawasaki MGP/TGP Series gas turbines are mounted on trucks or on trailers for mobile generator sets. The MGP/TGP Series generator sets integrate all necessary equipment including fully automatic operation without external energy supply. Better maneuverability, high durability against vibration and shock, and reliable operation are important for this application. Kawasaki MGP/TGP Series are fully designed to meet such demands.

• Particular Advantages

1. Developed with vast field experience
Gas turbines on trucks or on trailers receive large vibration and shock when they run on roads. Kawasaki industrial trailer mounted gas turbines are incorporated with the experience and technology from Kawasaki aircraft jet engines which are operated under such severe environmental conditions.

2. Low center of gravity and large tumble-down angle
Due to light weight of gas turbines, the center of gravity of gensets is lower and this makes it possible to have stable maneuverability.

3. Compact integration
All necessary equipment is incorporated in the gensets, including the fuel tank, batteries, exhaust silencer, cable reel, etc., with a compact aluminum enclosure. Thus, there is easy maintenance of the gensets.

4. Black start capability
Without external supply of electric power, fuel oil, etc., it can start-up and supply electricity.

MGP series generator set

TGP series generator set
**MGP/TGP Series Specifications**

### System Specifications (Typical)

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

**Note**

(*1) Output: Up to 40 °C of ambient temp., 150 m sea level
(*2) Other models are available. Output range is between 150 kW and 3,200 kW.

---

**Installation Example**

- MGP2000 mobile set
- MGP1250 mobile set
- TGP2000 trailer set
- MGP1250 trailer set
Kawasaki Techno-Net

- **Full Time Support**
- **Maintenance Management**
  - Predictive services based on trending data and asset maintenance management
  - ✔️ What to do ✔️ When to do it ✔️ How to do it ✔️ Who’s to do it

- **Improvement of Availability and Quality of Maintenance**
  - Minimum down time and good quality with adequate maintenance strategies and execution.

- **Remote Maintenance System by a GT Expert**
  - Proven effectiveness by most Kawasaki remote maintenance users
  - Fleet wide analysis

Techno-Net system monitors Gas Turbine Plant in any region of the world for all the time

Three main roles of Techno-Net system

<table>
<thead>
<tr>
<th>Global remote monitoring</th>
<th>Preventing serious failures</th>
<th>Maintenance management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote monitoring through the Internet</td>
<td>Enforced monitoring and diagnosis</td>
<td>Adequate management of maintenance</td>
</tr>
</tbody>
</table>

Connection of centers through the internet

- Customer Support Dept (Japan)
- Remote Monitoring Server (Japan)
- KMS (Shanghai Rep.Office)
- KGE (Europe)
- KHI-ME (Middle East FZE)
- KGA (South East Asia)
- KGT-A (North America)

Internet/Intranet
- The world business centers in the USA, Germany, Malaysia, and Japan are connected by the Internet and by the KHI intranet and monitor gas turbines remotely and globally.

Attended monitoring and diagnosis
- All system data is monitored and recorded hourly, as well as all start signals and first out malfunction signals.
- Predictive and preventative maintenance is accomplished by analysis of thermal cycles and unit vibration.
Installation Examples

Kawasaki Gas Turbine has been installed to:

- Data Center
- Food Process
- Tire Manufacturer
- Paper Mill
- College Campus
- District heat & cooling
- Hospital
- Oil & Gas

AND MORE!!!
KAWASAKI HEAVY INDUSTRIES, LTD.

www.khi.co.jp/gasturbine/index_e.html

Kawasaki Heavy Industries, Ltd. Gas Turbine Division
Phone: +81-3-3435-2232 Fax: +81-3-3435-2592

Kawasaki Machine Systems, Ltd. (Asia Division)
Phone: +81-3-3435-2977 Fax: +81-3-3435-2592

Kawasaki Gas Turbine Asia Sdn Bhd : (KGA)
Phone: +60-3-5569-2882 Fax: +60-3-5569-3093
www.kga.com.my

Kawasaki Gas Turbine Europe GmbH : (KGE)
Phone: +49-6172-7363-0 Fax: +49-6172-7363-55
www.kawasaki-gasturbine.de

Kawasaki Gas Turbines-Americas : (KGT-A)
Phone: +1-281-970-3255 Fax: +1-281-970-6465
www.kawasaki-gasturbines.com

Kawasaki Machine Systems, Ltd. (Shanghai Rep.Office)
Phone: +86-21-3366-3500 Fax: +86-21-3366-3505

Kawasaki Heavy Industries Middle East FZE : (KHI-ME)
Phone: +971-4-214-6727 Fax: +971-4-214-6729

Kawasaki Gas Turbines-Americas
(Houston, TX)

Kawasaki Gas Turbine Europe GmbH
(Frankfurt, Germany)

Kawasaki Heavy Industries, Ltd.
(Tokyo, Japan)

Kawasaki Machine Systems, Ltd.
(Shanghai Rep. Office)

Kawasaki Heavy Industries Middle East FZE
(Dubai, UAE)

Kawasaki Gas Turbine Asia Sdn Bhd
(Shah Alam, Malaysia)