GM Blower

Gear-Increased Single-Stage Mixed-Flow Blower

KAWASAKI HEAVY INDUSTRIES. LTD.
Single-Stage Mixed-Flow Blower
Saves energy through improved aerodynamic performance and higher efficiency of speed-increasing gear

**Features**

**High efficiency**

Kawasaki’s unique mixed-flow design impeller makes gas to flow smoothly, reduces vortex flow and is more efficient than centrifugal design impellers.

- **Centrifugal impeller**
  - Airflow changes direction by 90°

- **Mixed-flow impeller**
  - Airflow smoothly in gently curving diagonal directions with decreased loss.

**Small Inertial Moment**

Compared with conventional centrifugal types, the diameter of the mixed-flow impeller is 30 to 40% smaller, so that GDF becomes smaller and a squirrel cage induction motor can be used. Also, if the power supply capacity allows, direct-on start is possible, enabling the use of less expensive electrical equipment with easier maintenance.

**Compact size, light weight and easy installation**

The blower is compact with its single-stage mixed-flow design that incorporates the integral speed-increasing gear and lubrication oil system. Since space required for installation is small, easy foundation and easy installation is possible with reasonable construction costs.

**Low vibration, low noise**

Vibration is extremely low due to the very precisely balanced lightweight rotor. Also, since the basic frequency of noise is high, attenuation is simple and noise can easily be eliminated.

**Completely oil free**

Since over-hang type shaft is applied, there is no bearing on the suction side. Suction area completely separated from the oil system enables to supply oil free. Also, a dry gas seal system can be applied for special gas applications.

**Saving energy**

Energy-saving effects are obtained through superior pneumatic performance and inlet vane control even when operating at points other than specified.

- **Estimated performance curve**

**Applications**

1. **Air supply for chemical, oil and steel manufacturing equipment**
   - For feed air supply, combustion processing, chemical reactions, blast furnaces, sulfur recovery plants, organic anhydride plants, maleic acid plants, acrylic acid plants, Carbon black plant, etc.

2. **Compression of various gas service**
   - For circulating processing gas, CO₂ gas, NH₃ gas, formaldehyde gas, off gas, CB gas, coke oven gas, etc.

3. **For food and pharmaceutical manufacturing**
   - For reactions, fermentation, pneumatic conveyors, waste liquid and waste water treatment, etc.

4. **For public works**
   - For waste water treatment, flue gas desulfurization and denitrification of thermal power plants, pressurizing air for shovels, pressurizing air for railways, supplying air to tunnel construction work, etc.

5. **For various operations**
   - For air curtains, air knives, drying, etc.

6. **Other applications**
   - For air conveyance of trash, powder and gran, air supply to factories, incinerators, etc.
Simple structure for high reliability and excellent performance

**Structure**

- Outlet Guide Vane: Installed and supported the rotor part before the impeller for flow control with sufficient parallelized efficiency.
- Diffuser: A variable outlet guide vane (OGV) is applied for small capacity blowers (SR type blowers).
- Outlet Guide Vane: Air from the diffuser is collected, sorted, and effectively discharged by the smooth spiral vanes.
- Impeller: The impeller shape is selected by CFD for further increase efficiency. Also, bending stress due to centrifugal force is minimized with an impeller shape that allows high-speed rotation. If required, the impeller can be tested at speeds of over 115% of the rated speed using a special spin test to confirm its strength. The impeller is made of aluminum alloys, zirconium alloys, or stainless steel according to the application.
- Speed increasing gear casing: The speed increasing gear casing is constructed of an upper half and lower half and has sufficient rigidity and strength to support the speed increasing gear through bearings. The upper casing can be removed independently and assembled from other parts, ensuring easy maintenance and inspection of the speed increasing gear.
- Shaft-driven oil pump: Oil seal, shaft coupling, and bearing are supported and fixed in the oil pump.
- Scroll casing: Suction

**Dimensions and weight**

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G1</th>
<th>H</th>
<th>I</th>
<th>L1/B</th>
<th>V1</th>
<th>Q1</th>
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<td>700</td>
<td>150</td>
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<td>1,760</td>
<td>700</td>
<td>700</td>
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</table>

- High-speed rotor: One-piece shaft is used as high-speed rotor & pinion and the impeller is assembled at the top of the shaft. The rotor is made of chrome-molybdenum steel and is heat treated for sufficient strength, and it is dynamically balanced by a special balancing machine to assure stable rotation with a minimum of vibration. The thrust of the impeller is transmitted to the low-speed shaft, so no thrust bearing for the high-speed shaft is not required, which greatly reduces the mechanism (Note 3).
- Speed increasing gear: A helical gear is used, which brings the motor speed up to the impeller rotation speed in a single stage. Both main and gear are ground to high precision teeth, and surface hardening is applied. The speed increasing gear features excellent stability at high-speed rotation with little vibration and noise, assuring a long service life.
- Bearings: White metal-iron is used on carbon steel for the bearings. A special profile (for original design) of a tilting pad is used to ensure stability during high-speed operation.
Selecting the optimal blower for the application from a wide lineup of models

**Model selection**

- **Model selection diagram**
  - Various models such as GR3BR, GR3DR, GR3SH, GR3HR, GM2BR, GM2DR, GM2SH, GM2HR, GM4BR, GM4DR, GM4SH, GM4HR, GM5BR, GM5DR, GM5SH, GM5HR, GM6BR, GM6DR, GM6SH, GM6HR, GM7BR, GM7DR, GM7SH, GM7HR are compared.

- Pressure regulation valves are all integrated in the blower unit.

**Lubrication Oil system**

The GM blower adopts a shaft-driven oil pump. Lubrication components such as the oil tank, shaft-driven oil pump, electric auxiliary oil pump, oil cooler, oil filter, and pressure regulator valve are all integrated in the blower unit.

Since the blower is completely cleaned at the factory before shipment, no oiling work or flushing is required at the installation site. No overhead tank or accumulator, etc., for oil supply is required because the short coast-down time (due to the small inertial moment of the rotor) and because sufficient oil can be supplied by shaft-driven oil pump until the blower comes to a complete stop.

The auxiliary oil pump stays off during blower operation and operates temporarily only when the blower is starting and stopping.

**Operation system**

- **Operation sequence**
  - Blower start
  - Blower stop

**Safety equipment**

GM Blower is equipped with the safety devices listed in the table for safe operation.

<table>
<thead>
<tr>
<th>GM Blower Safety Devices</th>
<th>Alarm</th>
<th>Stop</th>
<th>Detector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Oil pressure</td>
<td>○</td>
<td>○</td>
<td>Pressure switch</td>
</tr>
<tr>
<td>High Oil temperature</td>
<td>○</td>
<td></td>
<td>Temperature switch</td>
</tr>
<tr>
<td>High Air temperature</td>
<td>○</td>
<td></td>
<td>Temperature switch</td>
</tr>
</tbody>
</table>
Standard supplies

1. Blower (with integral speed-increasing gear)
2. Base plate (with oil tank)
3. Lubrication Oil System
   - Shaft-driven main oil pump, electric auxiliary oil pump, oil cooler, oil filter,
     pressure regulator valve, oil level gauge, lubrication oil piping
4. Instruments
   - Oil pressure gauge, Oil pressure switch, Oil thermometer, dial thermometer with contact
     (Oil temperature x 1, Gas temperature x 1)
5. Shaft coupling
6. Foundation bolts, liners
7. Commissioning spare parts (gasket)
8. Special tools
9. Export Packing

Optional supplies

1. Main driver (motor, steam turbine)
2. High-pressure start panel, control panel, operation stand
3. Wiring and terminal box in blower unit
4. Flow control device, pressure control device
5. Anti-surge control device
6. Dry gas seal system
7. Special controlling device
8. Vibration monitoring device
9. Special instruments
10. Sound-proof cover
   (template, packer liners, rubber shock absorbers)
11. Suction-discharge and blow-off silencer
12. Suction filter
13. After-cooler
14. Suction and discharge flexible joints
15. Pipes and valves
16. Coupling cover
17. Companion flanges (with bolts, nuts and gaskets)
18. Spare bearings
19. Sole plate for main motor
20. Common bed
21. Installation parts
22. Witness inspection/test by the customer at our factory

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*Please understand that the content of this catalog is subject to change for improvement without prior notice.
*Colors and attached instruments shown in catalog photographs may differ from actual items.

Safety notes:
For safe usage, please be sure to read the "Instruction Manual" before operating the product. Incorrect handling of the product may cause an accident, fire, electric shock or trouble, which may result in injury or death.