Rotating Machinery Division

- Motors: MV motors for industrial Market
  (From 75kW / Frame250 Up to 100MW)
- Head Office: Tokyo
- Plants: Keihin & Nagasaki

Head Office (Tokyo)

Fuchu (VFD)

Keihin (motors)

Nagasaki (motors)
Typical High Speed Ranges

![Graph showing the typical high speed ranges for synchronous and induction motors. The graph plots capacity (MW) against rotating speed (min⁻¹). The synchronous motor area is blue, and the induction motor area is green. The graph illustrates the typical ranges for each type of motor.](image-url)
High Speed Motors Examples

- 30MW-5250rpm-SM
- 4200kW-4900rpm-SM
- 3500kW-8000rpm-IM
- 3300kW-11430rpm-IM
- 1840kW-11900rpm-IM

Rotating speed [rpm] vs Capacity [MW]

Graph showing various motor examples with their corresponding capacities and rotating speeds.
**High Speed Motor Benefits**

- Gear-less drive
- Flexible operation
- Easy maintenance
- High reliability
- Continuous Operation
- Global Service

- Gear losses, costs, reduced lube oil system.
- Variable speed drive
- VFD has less than 30 minute MTTR.
- TMEIC VFD has very high reliability
- System is designed for running 5 years without maintenance.
- Electric Drives are easily supported 24 x 7 with people and remote diagnostics.
Features of Super High Speed Motor
Ex- Certifications for Oil & Gas Applications

**Ex-certifications**
- **Exp** - Pressurized for Zone 1 & 2  Frame: No limitation
- **Exd** - Flameproof Enclosure for Zone 1 & 2  Frame: up to 400
- **Exe** - Increased Safety for Zone 1 & 2  Frame: No limitation
- **Exn** - Non Sparking for Zone 2  Frame: No limitation

**Machines**
- Induction Motors (Squirrel Cage & Wound Rotor)
- Brush-less Synchronous Motors
- Variable Speed & Constant Speed
CASE EXPERIENCES

Super High Speed Induction Motor with Magnetic Bearings

Applied for Gas pipeline booster compressor in Russia

4000kW-8200min⁻¹
Gas pipeline booster compressor in Russia

4MW Induction Motor with Magnetic Bearings
Gas pipeline booster compressor in Russia

- Magnetic Bearing
  - Bearing maker: S2M

- Sleeve Bearing
  - (Forced lubricated tilting pad type)
  - Bearing maker: RENK

Bearing Design for High-speed Operation
Gas pipeline booster compressor in Russia

Rotor Fabrication and Assembly

Magnetic Bearing
Gas pipeline booster compressor in Russia

Test Stand for prototype machine

- Magnet Bearing
- Control Cabinet
- Inverter
- Defensive Wall
- Air Duct
- 8MW Motor
CASE EXPERIENCES

2-pole Synchronous Motor

25MW-3600min-1
25MW High Speed Motor

<table>
<thead>
<tr>
<th>Type</th>
<th>TEWAC</th>
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<tbody>
<tr>
<td>Drive</td>
<td>7000V VFD (TMdrive-XL85)</td>
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<tr>
<td>Bearing</td>
<td>Sleeve bearing (Bracket type)</td>
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<td>Standards</td>
<td>IEC 60034-1 / API546</td>
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<tr>
<td>Area Classification</td>
<td>Exp</td>
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<td>Voltage</td>
<td>7.0kV</td>
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<tr>
<td>Output</td>
<td>25,000kW, 2500 – 3780 RPM</td>
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</tbody>
</table>
25MW High Speed Motor

Cooling fan blade

FEM model
Vibration mode

FEM model

Deformation analysis
Retaining ring
25MW High Speed Motor

Back-to-back tests
25MW High Speed Motor

Back-to-back tests

25 MW
6653 V
3601 min-1
CASE EXPERIENCES

East – West Gas Pipeline, China

2-pole 18 MW

Synchronous Motor
Gas Pipeline Compressor Drives in China
Gas Pipeline Compressor Drives in China

Main Equipments

Total 12 sets (4 sets per station)

• 2P-18MW-5200/5460rpm-Exp-Synchronous Motor
• 20MVA Variable Speed Drive (TMEIC Tmdrive-XL75)