High Speed @ Power Gears
Oil & Gas, Power Generation, Process Industry
Our Experience makes your Application Dependable

The Genuine RENK TA Gears Famous for Reliability

Ever since 1935 RENK AG have been devoting intense efforts to the development and manufacture of high-speed gear units and as early as in 1939 bearing journal speeds of 110 m/s were attained and controlled to guarantee operational safety. In 2012 near to 5500 TA high-speed gear units were in service. Among these are gear units with circumferential speeds of 220 m/s and bearing journal speeds of 140 m/s. These gear units are used in almost any industry with focus on power station technology, process technology and chemical industry.

In the beginning the toothing was just “natural hard”. Since the late 1960ies RENK offers gear units with fully-hardened toothing exclusively (case-hardening). In this way the pitch line velocity has been reduced by 40%. The transmittable power has been increased by the factor of 4 with the same gear wheel dimensions. Today RENK manufactures high-speed gear units for power values of 140 MW. Since 1975 RENK holds the world record for the ultimate power transmitted in a gear stage.

The feasibility studies reached powers beyond 300 MW for generator drives. The essential feature of TA high-speed gear units are tailored to the relevant application, optimized center distance bearing dimensions and tooth width as well as standardized monitoring systems to satisfy maximum requirements. The target is low power loss, noise and vibration. As of the following high-speed gear unit variants our application specialist will consult you to find the best solution for your case.

- In house hardening
- Tooth quality 5 is standard, 4 or 3 is an option
- Load pattern: 100% under load
- Tooth width up to 1,000 mm

Latest state gear cutters and grinders are producing the product core: the gear set.
High-Speed Parallel Shaft Gear Unit Series TA

Characteristics and Design Variants

Gear units of series TA are of modular design allowing the best possible adaptation to the requirements of the shaft train.

1. Gear set
   - Toothing case-hardened and ground.
   - Integrated quill shaft on demand.
   - Flanged shafts on demand.

2. Gear unit casing
   - Fabricated partly double-walled, for noise-dampening.
   - etaX (reduces loss) technology on demand.

3. Radial bearings
   - Sleeve bearing geometry:
     - Cylindrical 2-lobe
     - 4-lobe
     - Offset
     - Double offset
   - Further developed by RENK:
     - ISOPRESS (reduced loss)
     - EXCO (reduced temperature)
     - Tilting pad bearings on demand.

4. Axial bearing
   - Self-aligning tilting pad bearing in with or without separate housing or tapered land type. Depending on speed and application tapered land shoulder bearings are the technical and commercial optimum. The axial bearing layout and design is recommended on individual basis. Instead of a flexible coupling an integrated quill shaft can be applied usually on the bull gear shaft. This makes the shaft train shorter and allows shock torque compensation.

5. Oil pump
   - Directly driven or via geared PTO on demand.

6. Turning device
   - With fully-automatic RENK SSS-overrunning clutch or with semi-automatic claw overrunning clutch on demand (ask for leaflet).

Application examples

The following examples are to be understood as standard solutions. Other combinations may prove preferable in the clarification phase:

- **Application**
- **Criterion**
- **Typ (ref. overleaf)**
- **Coupling (recommendation)**

<table>
<thead>
<tr>
<th>Application</th>
<th>Criterion</th>
<th>Typ (ref. overleaf)</th>
<th>Coupling (recommendation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-speed machine</td>
<td>Small to maximum power values, low axial forces. Axial bearing inside gear unit.</td>
<td>TA</td>
<td>Pinion side: axially flexible coupling (RAPLEX MTM, MTR, Diaphragm MCF). Gear side: axially stiff flexible coupling (RAPLEX MXL, MTP, curved tooth SBR, SRL). Flange coupling, if necessary with quill shaft (integrated).</td>
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<tr>
<td>Electric machine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Motor, Generator)</td>
<td></td>
<td>TA</td>
<td></td>
</tr>
<tr>
<td>and</td>
<td></td>
<td>(on compressor foundation)</td>
<td>Pinion side: flange coupling with quill shaft (external or integrated) or axially stiff flexible coupling (RAPLEX MTM, MTR, Diaphragm MCF). Gear side: flange coupling if necessary with quill shaft (integrated).</td>
</tr>
<tr>
<td>(Compressor, Turbine)</td>
<td></td>
<td>TAD</td>
<td></td>
</tr>
<tr>
<td>without axial bearing</td>
<td></td>
<td>(on-high-speed machine’s foundation)</td>
<td>Pinion side: axially stiff flexible coupling (RAPLEX MTM, MTR, Diaphragm MCF) or rigid. Gear side: flange coupling with quill shaft (external).</td>
</tr>
<tr>
<td>Electric machine</td>
<td>Small to high power values. Axial bearing inside gear unit.</td>
<td>TAE</td>
<td></td>
</tr>
<tr>
<td>(Motor, Generator)</td>
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<tr>
<td>(Compressor, Turbine)</td>
<td></td>
<td>(on compressor foundation)</td>
<td>Pinion side: axially stiff flexible coupling (RAPLEX MTM, MTR, Diaphragm MCF) or rigid. Gear side: flange coupling with quill shaft (external).</td>
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<tr>
<td>without separate axial bearing</td>
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<tr>
<td>High-speed machine</td>
<td>Medium to high power values and high axial thermal growth with/without axial bearing in gear unit</td>
<td>TAE</td>
<td>Pinion and gear side: axially stiff flexible coupling on gear side (MTL, MTK, SRLX). Or Flange coupling, if necessary with quill shaft (integrated). Gear side: flange coupling with quill shaft (external).</td>
</tr>
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<td>(Compressor, Turbine)</td>
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<td>(on-high-speed machine’s foundation)</td>
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<tr>
<td>Piston, Compressor</td>
<td></td>
<td>TR (2 stages)</td>
<td>Caution: proper axial prestress of dry couplings required.</td>
</tr>
</tbody>
</table>
High-speed Parallel Shaft
Gear Units TA ..X/TB ..X/TA..Xi

Gear Unit Casing, Noise Reduction and Instrumentation

The fabricated gear casing houses either four (TA) or six (TB) radial plain bearings in which the gear set is guided. Welded casings enable for the use at any ambient temperature.

- Double-walled design with maximum stiffness.
- Noise dampening without adverse effect on easy maintenance.
- If required the design can be adapted to customer requirements as to orientation of oil connection, shaft height center distance etc.

Optimization results in a selection of best possible bearing load, shaft bending and necessary oil expansion spaces (favorable powerloss) as well as pitch line velocity.

The oil distribution to each consumer (½ radial bearings, ½ axial bearings, turn drive) features oil quantities individually adjustable by orifices, accessible without unit disassembly. Welded casings are partly double walled for best noise dampening.

TAxi gear units have been specially designed to provide versatile instrument features such as:

- Temperature Probes (any quantity)
- Shaft vibration probes (up to 8)
- Phase angle/speed detectors (up to 4)
- Acceleration/velocity probes (any no.)

The specific feature the complete wiring on the lower casing. Fittings are from stainless steel, cables are run in heavy duty flexible conduit.

The heaviest bull gear for the world most powerfull compressor drive built by RENK transmits 108 MW at a weight of 6,900 kg
- The production of 100 MW load gears exceeds 130 units in 2012
- More than 5,500 RENK high speed gears have been supplied
High-Speed Parallel Shaft Gear Unit TA..Xi

Your application – our attention

Our Experience Helps to Find the Optimum Shaft Arrangement

The Genuine RENK TA Gears Famous for Reliability

Shaft arrangements:

The gear unit with double-helical toothing (axial tooth force compensation), with or without axial guide on the low-speed gear shaft.

TAE Single-helical toothing

The classical gear unit with single-helical toothing and free axial tooth forces which have to be absorbed by thrust bearings at the input and output shafts. The trust bearings can be arranged in the gear, driver or driven machine.

TAD Thrust collar technology

The thrust-collar gear unit with single-helical toothing, compensated axial tooth pressures and a guide bearing on the low-speed shaft to reduce the power loss.
Vacuum Technology for Reduced Losses and More Operational Safety

Irrespective of the type of toothing which is selected (spur, single or double helical) two phenomena are observed during the operation of high-speed high-power gear units which occur independently. Both have a disturbing effect on the tooth contact pattern which calls for countermeasures.

- Power loss by wisidag and bearing losses can be cut by up to 50%.
- Peak oil temperature can be reduced by more than 50 °C.
- Lifetime of oil and gearset can be increased.

- RENK reporting tool for lateral critical speed calculation has been improved since its introduction in 1984 so that automatic reports on realistic shaft and bearing data are provided – vibration problems are a matter of the past.
- The quotation includes a full set of calculations of all gear features. The quoted gear is next to what is build.
- RENK is one of the world’s leading makers of sleeve bearings – a Know How and Know Why you should participate in.