



Innovative Power Transmission



High Speed

@ Power Gears

Oil & Gas, Power Generation, Process Industry

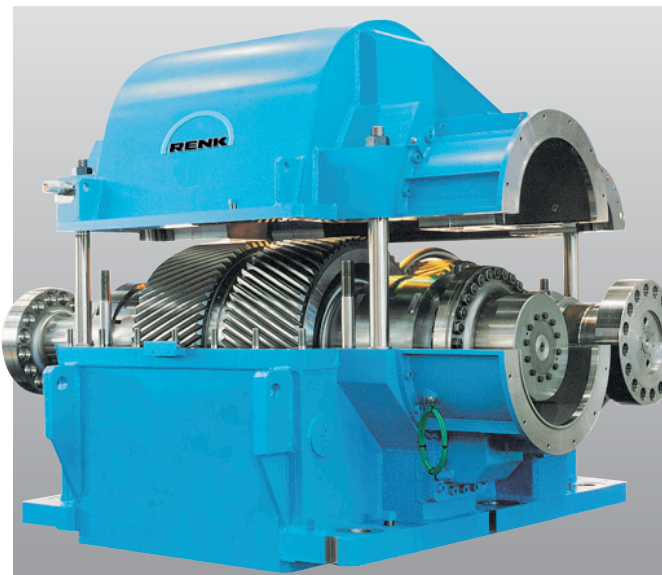
Our Experience makes your Application Dependable

The Genuine RENK TA Gears Famous for Reliability

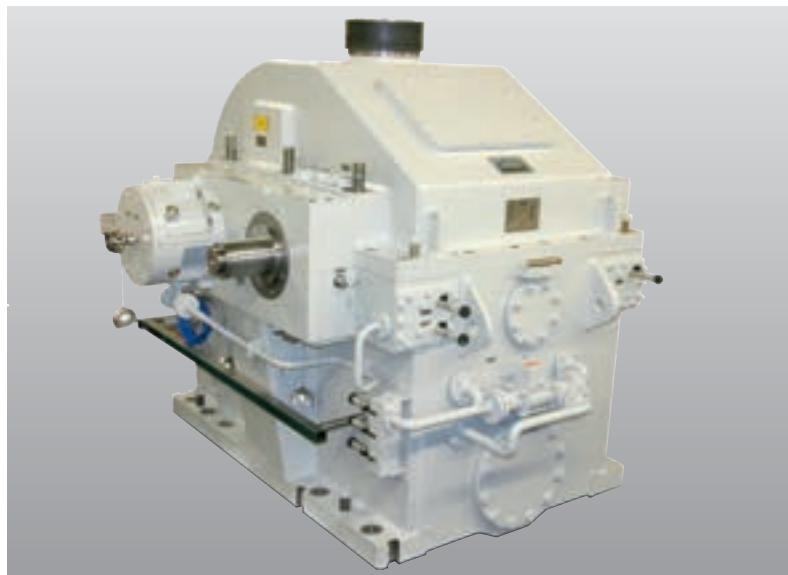
Ever since 1935 RENK AG have been devoting intense efforts to the development and manufacture of high-speed gear units and as early as in 1939 bearing journal speeds of 110 m/s were attained and controlled to guarantee operational safety. In 2012 near to 5500 TA high-speed gear units were in service. 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.



World record in power transmission:
137 MW Gasturbine Load Gear



High Speed Gear Unit Type TA50Xi

A large industrial machine is shown in a blue-tinted environment, processing two large, cylindrical metal gears. The gears have a complex, ribbed surface. The machine's components, including a robotic arm and various mechanical parts, are visible in the background.

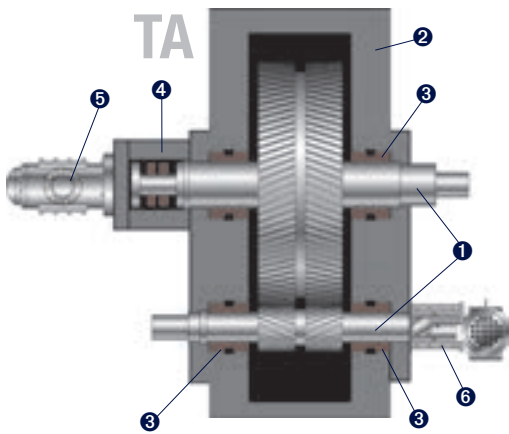
Latest state gear cutters and grinders are producing the product core: the gear set

- **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**

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.

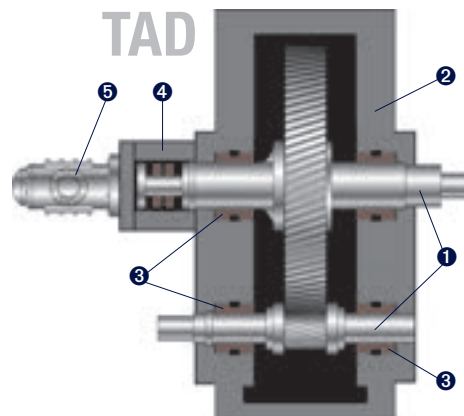


TA Double-Helical toothing

Suitable for the transmission of axial thrust e.g. from couplings or electric machines. Axial bearing preferably on the low speed shaft.

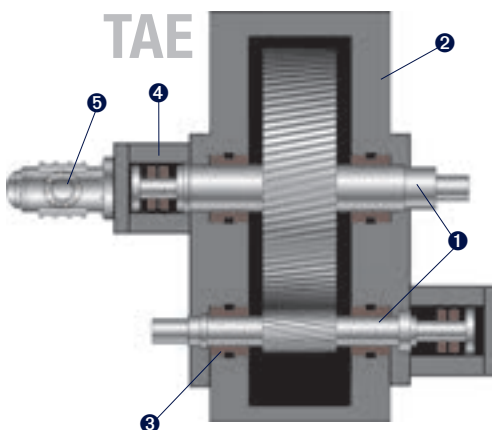
TAD Single-Helical toothing with Thrust Collar

Suitable for the transmission of high axial forces (compressor or turbine thrust). Axial bearing on the low-speed shaft.



TAE Single-Helical toothing

Suitable for the compensation of high axial thrust in combination with rigid couplings. Cost-effective variant if axial forces are absorbed by driver or driving machine. Axial bearings possible.



1 Gear set

- Toothing case-hardened and ground.
- Integrated quill shaft on demand.
- Flanged shaftend 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 per bearings on demand.

4 Axial bearing

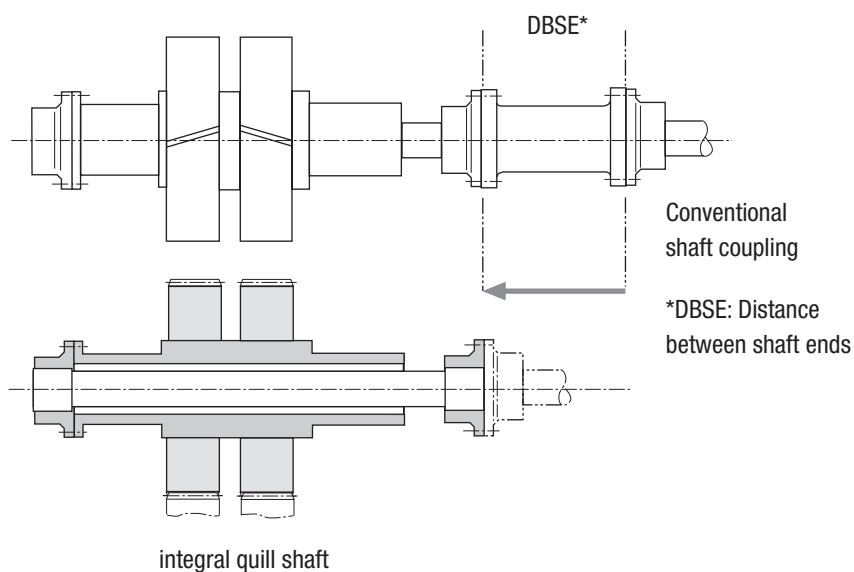
Self-aligning tilting pad bearing in with or without separate housing or tapered land type. Depending on speed and application tapered land shoulder bearings are the technical and commercial optimum. The axial bearing layout and design is recommended on individual basis. Instead of a flexible coupling 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)
High-speed machine (Compressor, Turbine) Electric machine (Motor, Generator)	Small to maximum power value, low axial forces. Axial bearing inside gear unit.	TA	Pinion side: axially flexible coupling (RAFLEX MTM, MTR, Diaphragm MCF). Gear side: axially stiff flexible coupling (RAFLEX MSL, MTP, curved tooth SBR, SRL). Flange coupling, if necessary with quill shaft (integrated).
High-speed machine (Compressor, Turbine) and Electric machine (Motor, Generator)	High and maximum power value. Axial bearing inside high-speed machine.	TA	Pinion side: flange coupling with quill shaft (external or integrated) or axially stiff flexible coupling (RAFLEX MTM, MTR, Diaphragm MCF). Gear side: flange coupling if necessary with quill shaft (integrated).
High-speed machine (Compressor, Turbine) without axial bearing Electric machine (Motor, Generator) without separate axial bearing	Small to high power values. Axial bearing inside gear unit.	TAD (on compressor foundation)	Pinion side: axially stiff flexible coupling (RAFLEX MTM, MTR, Diaphragm MCF) or rigid. Gear side: flange coupling with quill shaft (external).
High-speed machine (Compressor, Turbine) Electric machine (Motor, Generator)	Medium to high power values and high axial thermal growth with/without axial bearing in gear unit	TAE (on high-speed machine's foundation)	Pinion and gear side: axially stiff flexible coupling on gear side (MTL, MTK, SRLK). or Flange coupling, if necessary with quill shaft (integrated). Gear side: flange coupling with quill shaft (external).
Piston, Compressor		TB (2 stages)	Caution: proper axial prestress of dry couplings required.

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 ($\frac{1}{6}$ radial bearings, $\frac{1}{2}$ axial bearings, turn drive) features oil quantities individually adjustable by orificies, accessible without unit disassembly.

Welded casings are partly double walled for best noise dampening.

TAxis 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.



Cast casings are specifically rigid and noise optimized.



TA71 Gear unit being assembled

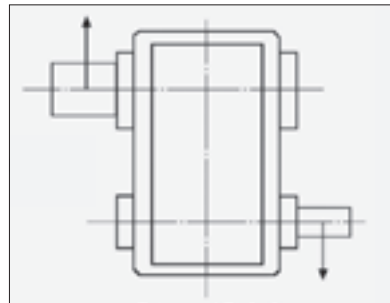
- The heaviest bull gear for the world most powerful compressor drive built by RENK transmits 108 MW at a weight of 6,900 kg
- The production of 100 MW load gears exceeds 130 units in 2012
- More than 5,500 RENK high speed gears have been supplied

High-Speed Parallel Shaft Gear Unit TA ..Xi

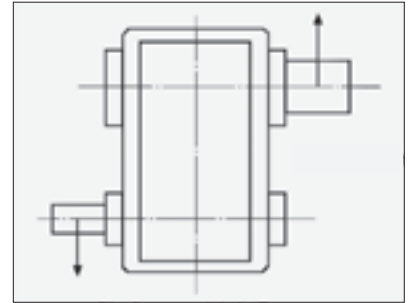
Your application – our attention

Shaft arrangements:

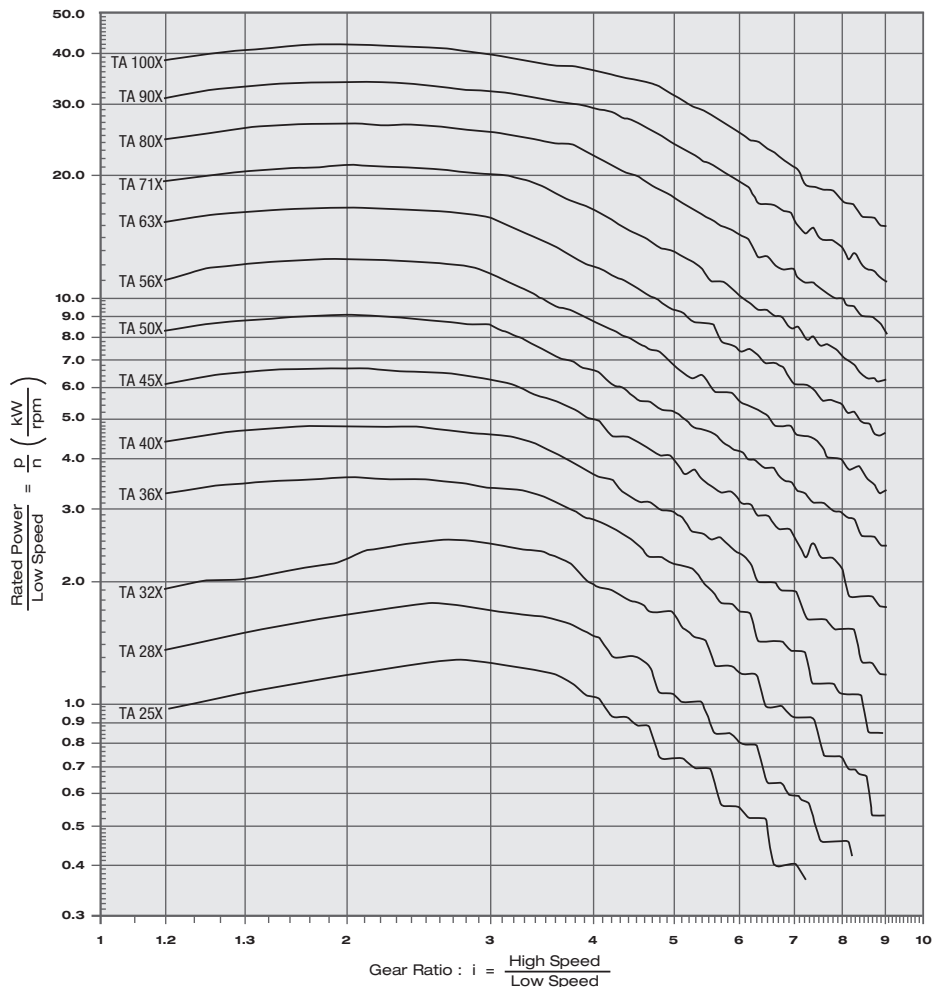
Size (A)	Gear (ratio)	M1 [mm]	M2 [mm]
TA 20X i	1.2 - 3.2	340	340
200	3.3 - 5.2	330	330
TA 25X i	1.2 - 3.0	450	450
	3.1 - 5.0	380	390
250	5.1 - 7.0	320	320
TA 32X i	1.2 - 3.0	515	515
	3.1 - 6.0	450	450
320	6.1 - 9.0	340	340
TA 36X i	1.2 - 3.0	550	550
	3.1 - 6.0	460	460
360	6.1 - 9.0	370	380
TA 40X i	1.2 - 3.0	585	590
	3.1 - 6.0	510	510
400	6.1 - 9.0	375	410
TA 45X i	1.2 - 3.0	635	640
	3.1 - 6.0	550	550
450	6.1 - 9.0	420	430
TA 50X	1.2 - 3.0	700	705
	3.1 - 6.0	570	575
500	6.1 - 9.0	460	480
TA 56X i	1.2 - 3.0	760	765
	3.1 - 6.0	610	620
560	6.1 - 9.0	490	500
TA 63X i	1.2 - 3.0	810	820
	3.1 - 6.0	645	650
630	6.1 - 9.0	540	550
TA 71X i	1.2 - 3.0	820	840
	3.1 - 6.0	675	680
710	6.1 - 9.0	565	580
TA 80X i	1.2 - 3.0	860	860
	3.1 - 6.0	720	730
800	6.1 - 9.0	630	650
TA 90X i	1.2 - 3.0	920	920
	3.1 - 6.0	785	800
900	6.1 - 9.0	650	660
TA 100X i	1.2 - 3.0	920	920
	3.1 - 6.0	830	840
1000	6.1 - 9.0	700	710



Shaft assembly R-L



Shaft assembly L-R

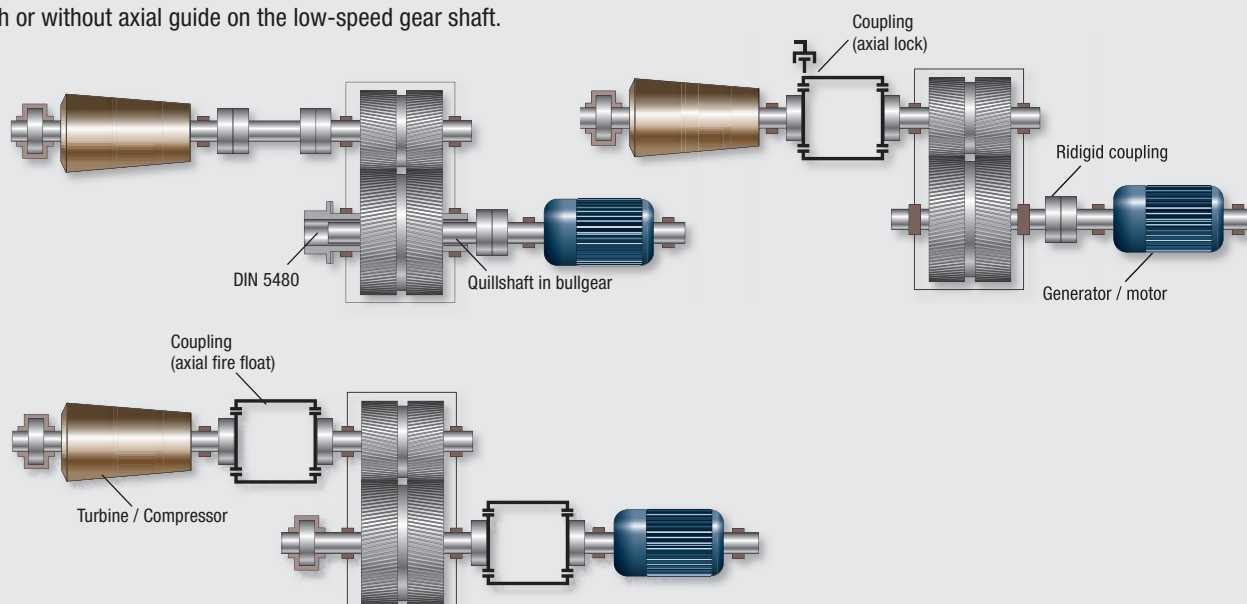


Our Experience Helps to Find the Optimum Shaft Arrangement

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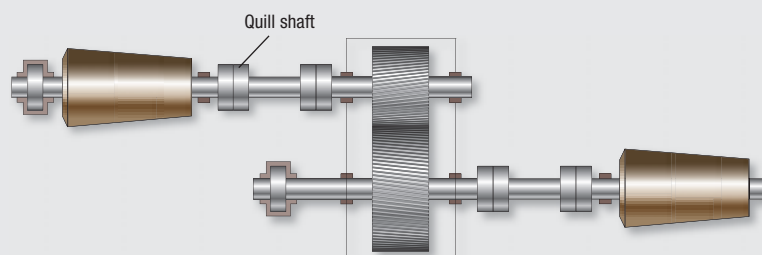
Shaft arrangements:

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



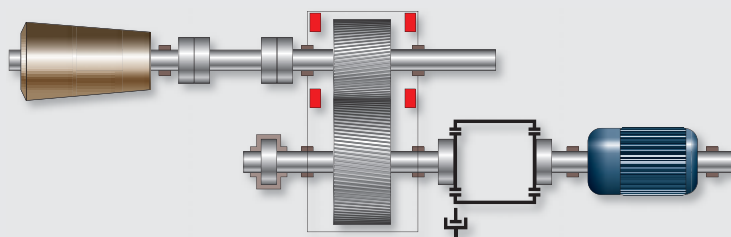
TAE Single-helical toothing

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 thrust 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 phenomenons 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 windage 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.**





Test stand etax – Gear unit

- **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 worlds leading makers of sleeve bearings – a Know How and Know Why you should participate in.**



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