



MS-Graessner GmbH & Co. KG

THE GEAR COMPANY

BEVEL*G***EAR**




Competence and Performance



www.graessner.de

General Advantages of Spiral, Hypoid and Zerol Bevel Gears

- High level of coverage due to the fact that several teeth are meshed simultaneously
- Resistant to elastic deformation of gears, shafts and bearings
- Circular arc gear teeth are more resistant to bending than straight and oblique gear teeth
- Very gentle transmission even at high-speed operation and under heavy load
- Noise and oscillation damped even at high peripheral speeds
- Gear sets can be assembled in your preferred direction of rotation
- > 97% efficiency depending upon layout and lubrication
- Due to convex tooth-loading the load is not concentrated on the tooth-ends
- All gear sets can be ground and/or lapped in pairs upon request

<p>Spiral bevel gears with circular arc teeth.</p> 	<p>Hypoid bevel gears are similar to spiral bevel gears, but with the drive pinion axially offset either above or below. This means a greater pinion diameter, longer life and more gentle tooth meshing.</p> 	<p>Zerol® bevel gears are a combination of spiral- and straight-tooth bevel gears with a central spiral angle of 0°.</p> 
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	Spiral bevel gear	Hypoid bevel gear	Zerol® bevel gear
For transmitting forces at an angle of 90° or any other angle	■	■	■
At high torques	■	■	
At low torques			■
Under heavy load	■	■	■
Under light load	■	■	■
For low-noise operation	■	■	
For low-vibration transmission	■	■	
For drives that have input and output on the same level	■		■
For drives that have input and output axially offset		■	
For unusually high gear reduction		■	
If the pinion is to be as large as possible		■	
For all applications with space and weight limits	■	■	■

Our Production Capabilities

Milled gear tooth cutting according to Gleason Gear tooth cutting quality ≤ 7 DIN 3965

	Module ms min.	Module ms max.	max. outer edge of gear \varnothing (A)	max. tooth width (B)	max. outer bevel distance	Shaft angle (B)	
						from	to
Spiral bevel gear	0.5	12.0	410 mm	66	280	10°	170°
Hypoid bevel gear	0.5	12.0	410 mm	66	280	-	-
Zerol® bevel gear	0.5	12.0	410 mm	66	280	10°	170°

(A) dependent on transmission ratio
(B) dependent on outer bevel distance

Ground gear tooth cutting according to Gleason Gear tooth cutting quality ≤ 5 DIN 3965

	Module ms min.	Module ms max.	max. outer edge of gear \varnothing (A)	max. tooth width (B)	max. outer bevel distance	Shaft angle (B)	
						from	to
Spiral bevel gear	0.8	10.0	280 mm	66	280	10°	170°
Hypoid bevel gear	0.8	10.0	280 mm	66	280	-	-
Zerol® bevel gear	0.8	10.0	280 mm	66	280	10°	170°

(A) dependent on transmission ratio
(B) dependent on outer bevel distance

Additional gear tooth parts and dimensions are available upon request.

Advantages of Ground Gear Tooth Cutting

- Precise transmission
- Very quiet running
- Little heat generation
- Flexible options to optimise noise via influencing the tooth flank geometry
- Tooth grinding in accordance with the UMC process (Universal Motion Concept) in the case of applications where noise is of paramount importance



Examples of Gear Tooth Parts



High-transmission hypoid gear set $i=30:1$
with typical shaft offset.

Spiral bevel gear pair with 45°
shaft angle.



The smaller the bevel gear, the
greater the know-how necessary.

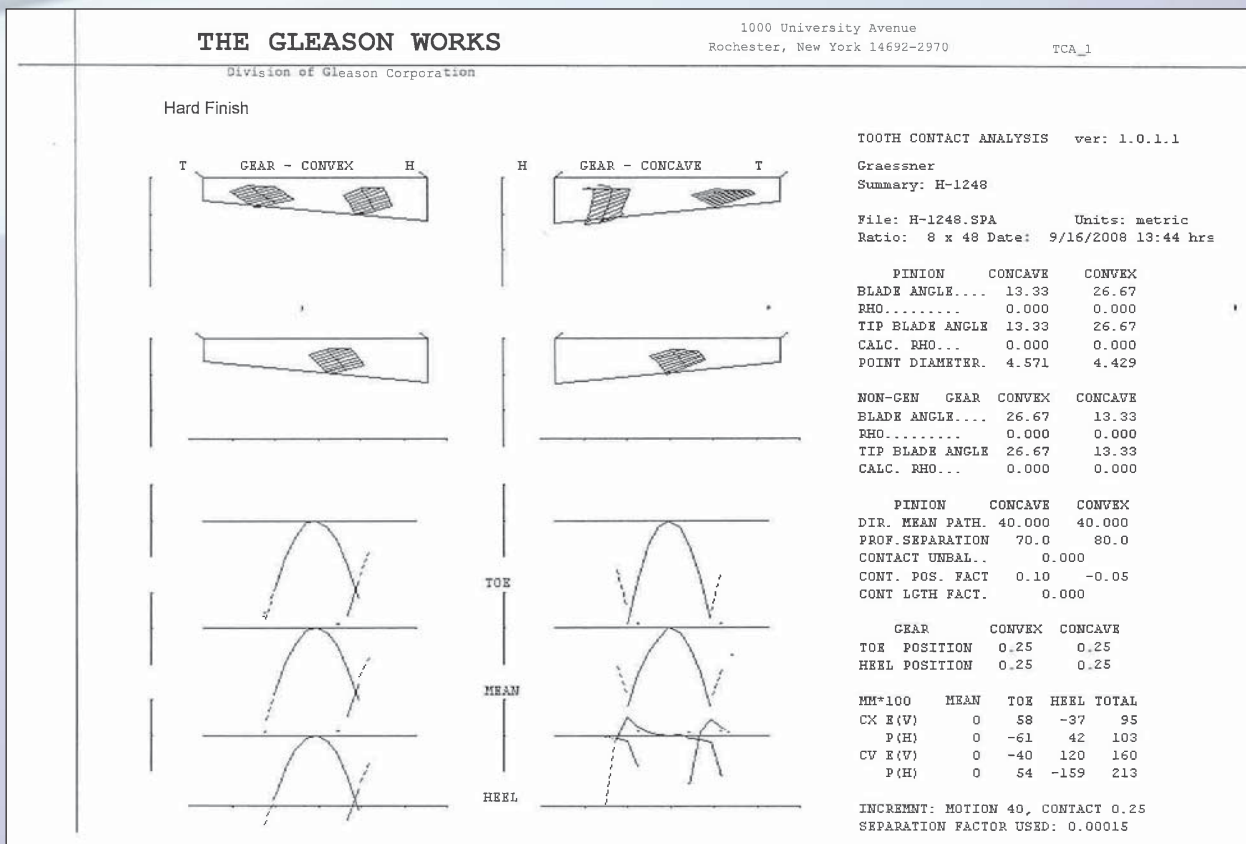
Driven by your requirements

Our engineering and special manufacturing techniques have helped us become precision manufacturer of bevel gear systems and bevel gearboxes for more than 60 years, as well as specialist in special gearboxes.

For us, individual solutions are standard. And instead of offering expertise that's confined to certain areas, like pure development for instance, we offer comprehensive know-how in all relevant areas – from the specifications and the first sketch up to the manufacturing of the zero series including intensive test operations.

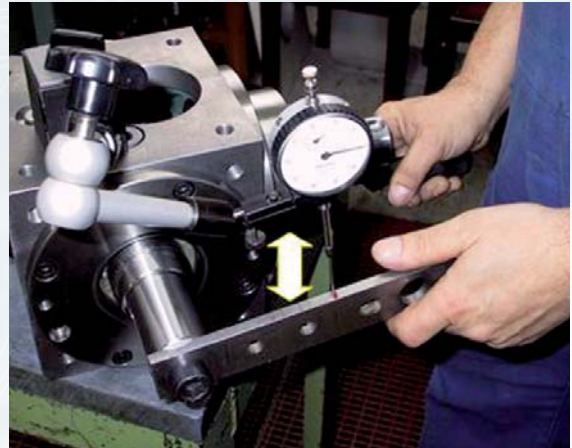
Our expertise also extends to a special in-house developed workflow management system: for optimal processes between all areas involved and the customer. Our quality management system thus guarantees highest quality and cost certainty.

Layout, evaluation and tooth contact pattern development for bevel gears in accordance with Gleason



Tips for Assembly

- The housing and all components must be cleaned.
- Attention should be paid to the bearing manufacturer's guidelines when assembling the rolling bearings
- Lapped gears must be assembled in pairs.
- The radial and axial contact surfaces should be inspected for radial and axial runout.
- The pinion should be assembled at the correct distance.
- The gear should be assembled with the recommended backlash.
- The pinion and gear must be secured against axial thrust in both directions.
- The tooth contact pattern should be inspected.
- Care should be taken that the toothed gears and bearings are sufficiently lubricated.
- Decisive for a precise, low-noise bevel gear pair is the optimum position of the tooth contact pattern.



Services

Gear repairs

- Damage assessment and diagnosis
- In-house repairs
- Repairs on clients' premises

Gear inspection

- Inspection
- Maintenance
- Life-span maintenance inspections on clients' premises



Replacement parts

- Seal kits, bearing sets, bevel gears, shafts, lubricants

Tools

- Assembly and disassembly tools

Training

- Fit for repairs
- Disassembly and assembly
- Recognition and assessment of damage
- Communication of settings data
- Assessment and correction of tooth contact pattern



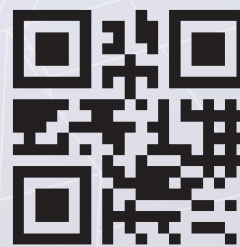
Advice

- Answers to all questions surrounding gears and their implementation
- Information and assistance on finding gears and replacement parts



Germany

MS-GRAESSNER GmbH & Co. KG
THE GEAR COMPANY
Kuchenäcker 11
72135 Dettenhausen
Tel.: +49 (0) 71 57 123-0
Fax: +49 (0) 71 57 123-212
E-Mail: mail@graessner.de
www.graessner.de



Austria

GRAESSNER GmbH
Perfektastraße 61
Objekt 6/2
1230 Wien
Tel.: +43 (1) 699 24 30-0
Fax: +43 (1) 699 24 30-20
E-Mail: graessner@graessner.at
www.graessner.at

You can find more information on the MS-GRAESSNER international sales network at: www.graessner.com

BEVEL GEAR



Spiral, Hypoid and Zerol Bevel Gears

- Standard range of products and custom-made versions
- Module ms from 0.5 to 12
- Diameters up to 410 mm
- Shaft angles from 10° to 170°
- More than 60 years of experience
- In-house gearing calculations
- We manufacture to your drawing or advise you of possible alternatives
- Milled or ground gear tooth cutting

POWER GEAR



The high performance bevel gearbox

- High torque, small size
- For highest input speeds
- Ratios from $i = 1:1$ to $5:1$
- Torques up to 7000 Nm
- Output via solid and hollow shaft
- Motor mounting either directly or via coupling and lantern
- Variable ratios and uniform dimensions

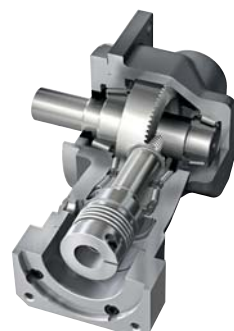
DYNA GEAR



The highly dynamic servo right angle gearbox

- Hypoid gearing
- High input speeds at medium to high torques
- Ratios single-stage $i = 3:1$ to $30:1$
- Ratios, two-stage, up to $150:1$
- Torques up to 1440 Nm
- Flexible motor mounting via coupling and lantern
- Low backlash < 2 arcmin
- Variable ratios and uniform dimensions

DYNA GEAR ^{Economy} The cost-effective servo right angle gearbox



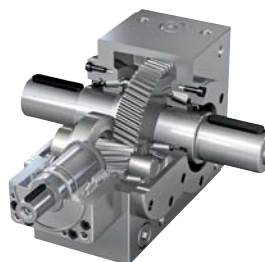
- Hypoid gearing
- High input speeds at medium torques
- Ratios single-stage $i = 5:1, 8:1, 10:1$ and $15:1$
- Torques up to 260 Nm
- Flexible motor mounting via coupling and flange
- Backlash < 6 arcmin
- Variable ratios and uniform dimensions

DESIGN GEAR The customised gearbox



- Single-stage gearbox available as gear-change or reversing gearbox
- Forced oil circulation lubrication system gearbox for high speeds and torques
- Labyrinth sealed gearbox with an efficiency of $> 99\%$
- Special gearbox with additional functional elements
- Endless possibilities on request

KS TWIN GEAR The bevel helical gearbox



- Two-stage bevel helical gearbox with ratios of up to $75:1$
- Torques up to 7500 Nm
- Torsional backlash < 6 arcmin
- Compact design
- Motor mounting either directly or via coupling and lantern
- High torsional stiffness
- High input speeds at high torques
- Variable ratios and uniform dimensions