

Tolerancing of bevel gears

Tolerances for shaft angle errors
and axes intersection point deviations

DIN
3965
Part 4

Toleranzen für Kegelradverzahnungen;
Toleranzen für Achsenwinkelabweichungen
und Achsenschnittpunktabweichungen

Supersedes September 1981 edition.

The accuracy of the bevel gear transmission housing is a major factor influencing the working load limit and running quality of the gearing. For the deviations of the housing parameters (position of gear axes), 12 accuracy grades for the axial position have been specified. These accuracy grades are not expected to correspond with the tolerance classes specified for bevel gears.

The permissible axes intersection point deviations (axial offset deviations) are also a function of the diameter of the larger gear of the pair.

Backlash has to be taken into account when specifying the tolerances. Deformation of the housing under load may greatly modify the deviations.

1 Scope and field of application

This standard specifies values for straight, skew and spiral bevel gears with and without axial offset, and with reference diameters up to 2500 mm.

The tolerances for the parameters specified in this standard are defined in DIN 3971, the values given in tables 1 and 2 applying to the gear pair. See also DIN 3965 Part 1.

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2 Tolerances

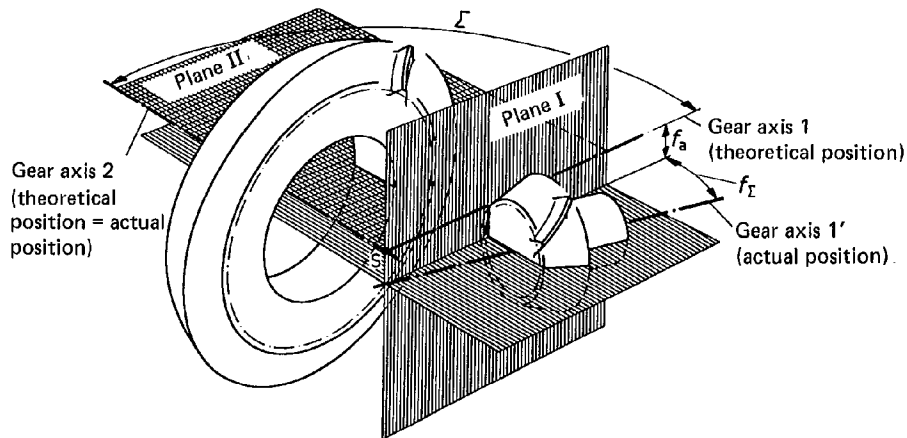


Figure 1. Deviations of position of bevel gear axes

Table 1. Permissible shaft angle errors, f_{Σ} , in angular seconds

Accuracy grade for axial position	1	2	3	4	5	6	7	8	9	10	11	12
f_{Σ}	—	—	—	± 16	± 20	± 25	± 32	± 40	± 50	± 63	± 80	± 100

Table 2. Permissible axes intersection point deviations axial, f_a , in μm

Accuracy grade for axial position		1	2	3	4	5	6	7	8	9	10	11	12
Mean reference diameter of gear, d_m , in mm	Up to 50	—	—	—	± 6	± 8	± 10	± 12	± 16	± 20	± 25	± 32	± 40
	Over 50 up to 125	—	—	—	± 8	± 10	± 12	± 16	± 20	± 25	± 32	± 40	± 50
	Over 125 up to 280	—	—	—	± 10	± 12	± 16	± 20	± 25	± 32	± 40	± 50	± 63
	Over 280 up to 560	—	—	—	± 12	± 16	± 20	± 25	± 32	± 40	± 50	± 63	± 80
	Over 560 up to 1000	—	—	—	± 16	± 20	± 25	± 32	± 40	± 50	± 63	± 80	± 100
	Over 1000 up to 1600	—	—	—	± 20	± 25	± 32	± 40	± 50	± 63	± 80	± 100	± 125
	Over 1600 up to 2500	—	—	—	± 25	± 32	± 40	± 50	± 63	± 80	± 100	± 125	± 160

Standards referred to

DIN 3965 Part 1 Tolerancing of bevel gears; basic concepts
DIN 3971 Terminology and parameters for bevel gears and bevel gear pairs

Previous editions

DIN 3965 Part 4: 09.81.

Amendments

The following amendments have been made in comparison with the September 1981 edition.

- a) The status of the standard is no longer that of a preliminary standard.
- b) The standard has been editorially revised.

Explanatory notes

The housing tolerances given in this standard have been specified to a fineness which cannot be technically realized at present, but which is likely to represent the fineness possible in future.

The concepts of axes intersection point, axial offset and shaft angle (see DIN 868) and of axes intersection point deviation and shaft angle error (see DIN 3971) have been established as follows.

Axial offset

The axial offset, a , of a hypoid gear pair is the distance between the two non-intersecting gear axes.
For a bevel gear pair a is equal to zero.

Shaft angle

The shaft angle, Σ , of a bevel gear pair is that angle between the two axes that faces the tooth engagement.
The shaft angle, Σ , of a hypoid gear pair is that angle between the non-intersecting gear axes that faces the tooth engagement.

Shaft angle error

The shaft angle error, f_{Σ} , is the difference between the shaft angle of the two gear shafts in their actual positions and the theoretical value of this angle.

Axes intersection point deviation

The axes intersection point deviation, f_a , of a bevel gear pair is the distance between the two non-intersecting gear axes in their actual positions.

The axes intersection point deviation, f_a , of a hypoid gear pair is the difference between the distance separating the two non-intersecting gear axes in their actual positions compared with the theoretical distance.

The permissible values of f_a given in this standard correspond to the axial position tolerances of cylindrical gear transmissions as specified in DIN 3964, but the f_a values are shifted by one accuracy grade towards larger deviations, and reduced by half. The tolerance system proposed for bevel gears is also intended to serve as a basis for international discussion.

International Patent Classification

F 16 H 55/08
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