Comments on ISO 6336-2

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Abstract For loading capacity calculation of gears, a number of standards are used. In our country, the use of the standard ČSN 01 4686 is slowly coming to an end. Unfortunately, this standard does not cover the currently designed gears with non-standard profile. Consequently, designers go to other standards—DIN 3990 or ISO 6336. ISO 6336 was essentially taken as a replacement for the ending standard ČSN 01 4686. This paper deals with this standard, specifically with its second part. "Calculation of surface durability (pitting)" is the title of the second part of ISO 6336—"Calculation of load capacity of spur and helical gears". The standard was issued in 2006. This issue is still valid, supplemented in 2008 by Technical Corrigendum 1. It is a basic standard and at the same time a guideline for a very important calculation of the contact stress on the flanks of the teeth of gears. This article points to some details in the standard. It also shows an overview of typing errors in this part of the standard. It also states their correct wording.

Keywords ISO 6336 · Part 3 · Typos · Errors

1 Introduction

This latest edition of this part of the standard [1] is comparable to the previous edition (1996—31 pages, 2006—33 pages). Similarly, to the third part also from this part, both the simplified computation method C and the method D have been completely eliminated. The new standard is more sophisticated and takes better account of the influence of some factors. Additionally, Annex A is added to the standard to determine the exact start of involute.

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2 Typos and Errors

Page 7, Equation (7)—replace … σ_{HP} ref $Z_N = \sigma_{HP}$ ref (… with … $\sigma_{HP\ ref}$ $Z_N = \sigma_{HP\,ref}$ (…

Page 8, Eq. (12)—replace … σ_{HP} ref Z_N = … with … $\sigma_{HP\,ref}$ Z_N = …

Page 9, below the figure—replace… Y helix angle… with… X helix angle …

Page 9, below the figure—replace … X zone factor … with … Y zone factor …

Page 10, "Figure 3"—corrected dimension p_{bt} to the point B, (see Fig. 1 here).

Page 12, Eq. (23)—replace z with Z

Page 14, for roll angle is used ξ, although in the review in the 1. Part is ς.

Page 18, Table 2—remove two table cells, add the upper index ^{b} to the circles (see Fig. 2).

Page 20, Equation (37)—calculation of Z_L is not accurate for extreme values of υ.

Pages 20 and 21, for conversion it is advisable to use $\upsilon_{40} = 1.82411 \cdot \upsilon_{50\text{-}9}.3480569$

Page 27, Equation (57)—replace denominator 680 with 6800

Current Figure 11, in norm ISO 6336-2, (see Fig. 3)—to correct

Corrected Figure 11, (see Fig. 4)

Annex A—inappropriate symbols for the angles are not in accordance with habits

Equations A.5, A.6, A.10, A.13, A.14 replace … ϕ … with … φ …

Page 31, Figure A.2—replace … ρ_{fP} sinφ/cosβ … with … ρ_{fP} cosφ/cosβ …

Page 32, replace …υ … with …φ … (total 7 times)

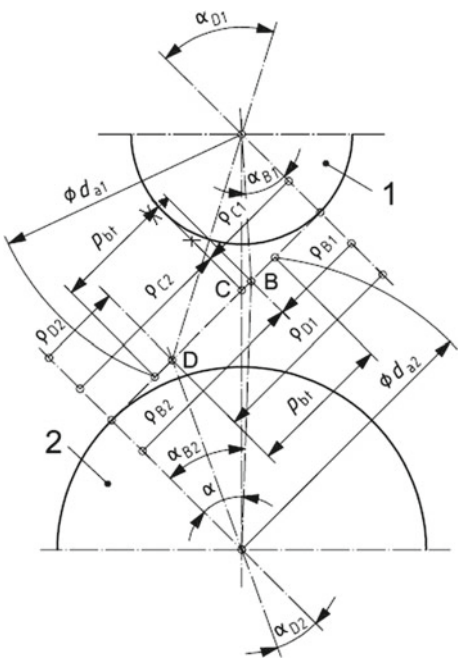

Fig. 1 "Figure 3" from ISO 6336-2 [2]

Material [a]	Number of load cycles	Life factor, Z_{NT}
St, V, GGG (perl., bai.), GTS (perl.), Eh, IF; only when a certain degree of pitting is permissible	$N_L \leqslant 6 \times 10^5$, static	1,6
	$N_L = 10^7$	1,3
	$N_L = 10^9$	1,0
	$N_L = 10^{10}$	0,85 up to 1,0 [b]
St, V, GGG (perl., bai.), GTS (perl.), Eh, IF	$N_L \leqslant 10^5$, static	1,6
	$N_L = 5 \times 10^7$	1,0
	~~$N_L = 10^9$~~	~~1,0~~
	$N_L = 10^{10}$	0,85 up to 1,0 ○
GG, GGG (ferr.), NT (nitr.), NV (nitr.)	$N_L \leqslant 10^5$, static	1,3
	$N_L = 2 \times 10^6$	1,0
	$N_L = 10^{10}$	0,85 up to 1,0 ○
NV (nitrocar.)	$N_L \leqslant 10^5$, static	1,1
	$N_L = 2 \times 10^6$	1,0
	$N_L = 10^{10}$	0,85 up to 1,0 ○

[a] See ISO 6336-1:2006, Table 2 for explanation of abbreviations used.

[b] The lower value of Z_{NT} may be used for critical service, where pitting must be minimal. Values between 0,85 and 1,0 may be used for general purpose gearing. With optimum lubrication, material, manufacturing and experience 1,0 may be used.

Fig. 2 Table 2 from ISO 6336-2

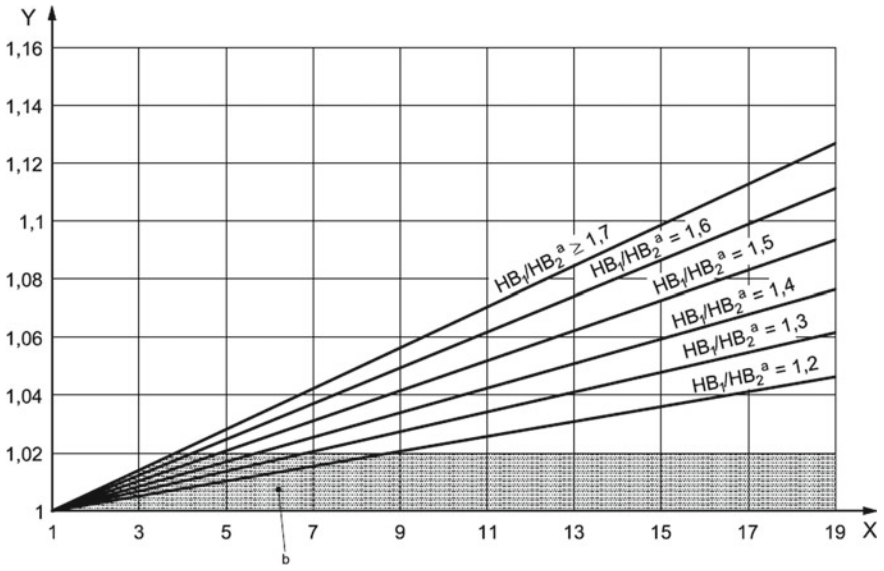

Fig. 3 Figure 11 from ISO 6336-2

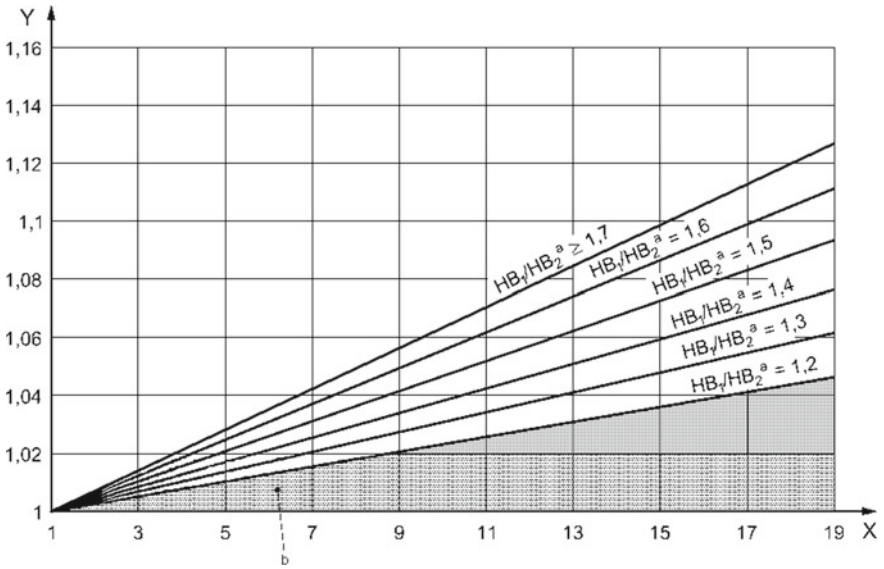

Fig. 4 Corrected Fig. 11 from the ISO 6336-2

3 Conclusion

The latest release of the second part of ISO 6336 is progress against the previous one. The calculation procedures for most of the factors are revised and refined. The scope was retained because the C and D computational methods were omitted. It is a pity that all bugs were not captured in the Technical Corrigendum 1. Nevertheless, this standard is a great asset. However, it would be appropriate to consider revising Annex A, which is unclear.

References

1. ISO 6336—3:2006(E) (2006) Calculation of load capacity of spur and helical gears—Part 2: Calculation of surface durability (pitting)
2. Linke H (2010) Stirnradvezahnung. Carl Hanser Verlag München