Technical Report

ISO/TR 10300-30

Second edition
2024-09

Calculation of load capacity of bevel gears —

Part 30:
ISO rating system for bevel and hypoid gears — Sample calculations

Calcul de la capacité de charge des engrenages coniques — Partie 30: Système d'évaluation ISO pour engrenages conique et hypoïde — Type de calculs

Reference number
ISO/TR 10300-30:2024(en)

Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 60, *Gears*, Subcommittee SC 2, *Gear capacity calculation*.

This second edition cancels and replaces the first edition (ISO/TR 10300-30:2017), which has been technically revised.

The main changes are as follows:

— all sample calculations have been revised according to ISO 10300-1:2023, ISO 10300-2:2023 and ISO 10300-3:2023;

— all sample calculations include localised calculation method for Method B1.

A list of all parts in the ISO 10300 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The ISO 10300 series consists of International Standards, Technical Specifications (TS) and Technical Reports (TR) under the general title *Calculation of load capacity of bevel gears* (see Table 1).

— International Standards contain calculation methods that are based on widely accepted practices and have been validated.

— TS contain calculation methods that are still subject to further development.

— TR contain data that is informative, such as example calculations.

The procedures specified in ISO 10300-1 to ISO 10300-19 cover fatigue analyses for gear rating. The procedures described in ISO 10300-20 to ISO 10300-29 are predominantly related to the tribological behaviour of the lubricated flank surface contact. ISO 10300-30 to ISO 10300-39 include example calculations. The ISO 10300 series allows the addition of new parts under appropriate numbers to reflect knowledge gained in the future.

Requesting standardized calculations according to the ISO 10300 series without referring to specific parts requires the use of only those parts that are currently designated as International Standards (see Table 1 for listing). When requesting further calculations, the relevant part or parts of the ISO 10300 series need to be specified. The use of a Technical Specification as acceptance criteria for a specific design needs to be agreed in advance between manufacturer and purchaser.

Table 1 — Overview of the ISO 10300 series

Calculation of load capacity of bevel gears	International Standard	Technical Specification	Technical Report
Part 1: Introduction and general influence factors	X		
Part 2: Calculation of surface durability (macropitting)	X		
Part 3: Calculation of tooth root strength	X		
Part 4 to 19: to be assigned			
Part 20: Calculation of scuffing load capacity – Flash temperature method		X	
Part 21 to 29: to be assigned			
Part 30: ISO rating system for bevel and hypoid gears — Sample calculations			X
Part 32: ISO rating system for bevel and hypoid gears — Sample calculation for scuffing load capacity			X
NOTE At the time of publication of this document, some of the parts listed here were under development. Consult the ISO website.			

This document was prepared with sample calculations for different bevel gear designs. They are intended for users of the ISO 10300 series to follow a whole calculation procedure formula by formula. Practical experience has shown that this way, to get into a complex subject, is very helpful.

However, this document is not intended for use by the average engineer. Rather, it is aimed at the well-versed engineer capable of selecting reasonable values for the parameters and factors in these formulae based on knowledge of similar designs and on awareness of the effects behind these formulae.

Calculation of load capacity of bevel gears —

Part 30: ISO rating system for bevel and hypoid gears — Sample calculations

1 Scope

This document provides sample calculations for the load capacity of different bevel gear designs, determined according to the methods and formulae of the ISO 10300 series. The initial geometric gear data necessary for these calculations are according to ISO 23509.

The term "bevel gear" is used to mean straight, helical (skew), spiral bevel, zerol and hypoid gear designs. Where this document pertains to one or more, but not all, the specific forms are identified.

The manufacturing process of forming the desired tooth form is not intended to imply any specific process, but rather to be general in nature and applicable to all calculation methods of the ISO 10300 series. The fact that there are bevel gear designs with tapered teeth and others where the tooth depth remains constant along the facewidth (uniform depth) does not require to apply Method B2 for the first and Method B1 for the second tooth configuration.

The rating system of the ISO 10300 series is based on virtual cylindrical gears and restricted to bevel gears whose virtual cylindrical gears have transverse contact ratios of $\varepsilon_{v\alpha} < 2$. Additionally, the given relations are valid for bevel gears of which the sum of profile shift coefficients of pinion and wheel is zero (see ISO 23509).

WARNING The user is cautioned that when the formulae are used for large average mean spiral angles, $(\beta_{m1} + \beta_{m2})/2 > 45°$, for effective pressure angles, $\alpha_e > 30°$ and/or for large facewidths, $b > 13\ m_{mn}$, to confirm the calculated results of the ISO 10300 series by experience.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10300-1:2023, *Calculation of load capacity of bevel gears — Part 1: Introduction and general influence factors*

ISO 10300-2:2023, *Calculation of load capacity of bevel gears — Part 2: Calculation of surface durability (macropitting)*

ISO 10300-3:2023, *Calculation of load capacity of bevel gears — Part 3: Calculation of tooth root strength*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10300-1, ISO 10300-2 and ISO 10300-3 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Symbols and abbreviated terms

For the purposes of this document, the symbols and units given in ISO 10300-1:2023, Table 1 and Table 2, ISO 10300-2:2023, Table 1 and Table 2, ISO 10300-3:2023, Table 1 and Table 2 as well as the abbreviated terms given in ISO 10300-2:2023, Table 3, and ISO 10300-3:2023, Table 3, apply.

Table 2 — Symbols and units used in ISO 10300 (all parts)

Symbol	Description or term	Unit
A	Auxiliary factor for calculating the dynamic factor K_{v-C}	—
A^*	Related area for calculating the load sharing factor Z_{LS}	mm
A_{sne}	Outer tooth thickness allowance	mm
a	Hypoid offset	mm
a_{rel}	Relative hypoid offset	—
a_v	Centre distance of virtual cylindrical gear pair	mm
a_{vn}	Centre distance of virtual cylindrical gear pair in normal section	mm
B	Accuracy grade according to ISO 17485	—
b	Facewidth	mm
b_b	Related base facewidth	—
b_{ce}	Calculated effective facewidth	mm
b_{eff}	Effective facewidth (e.g. measured length of contact pattern)	mm
b_v	Facewidth of virtual cylindrical gears	mm
$b_{v,eff}$	Effective facewidth of virtual cylindrical gears	mm
C_F	Correction factor of tooth stiffness for non-average conditions	—
C_{lb}	Correction factor for the length of contact lines	—
C_{ZL}, C_{ZR}, C_{ZV}	Constants for determining lubricant film factors	—
c_{ham}	Mean addendum factor of wheel	—
c_v	Empirical parameter to determine the dynamic factor	—
c_γ	Mean value of mesh stiffness per unit facewidth	N/(mm · µm)
$c_{\gamma 0}$	Mesh stiffness for average conditions	N/(mm · µm)
c'	Single stiffness	N/(mm · µm)
c_0'	Single stiffness for average conditions	N/(mm · µm)
d_e	Outer pitch diameter	mm
d_m	Mean pitch diameter	mm
d_T	Tolerance diameter according to ISO 17485	mm
d_v	Reference diameter of virtual cylindrical gear	mm
d_{va}	Tip diameter of virtual cylindrical gear	mm
d_{van}	Tip diameter of virtual cylindrical gear in normal section	mm
d_{vb}	Base diameter of virtual cylindrical gear	mm

Symbol	Description or term	Unit
d_{vbn}	Base diameter of virtual cylindrical gear in normal section	mm
d_{vf}	Root diameter of virtual cylindrical gear	mm
d_{vn}	Reference diameter of virtual cylindrical gear in normal section	mm
E	Modulus of elasticity, Young's modulus	N/mm²
E, G, H	Auxiliary variables for tooth form factor (Method B1)	—
e_{LS}	Exponent for the distribution of the load peaks along the lines of contact	—
F	Auxiliary variable for mid-zone factor	—
F_{mt}	Nominal tangential force at mid facewidth of the reference cone	N
F_{mtH}	Determinant tangential force at mid facewidth of the reference cone	N
F_n	Nominal normal force	N
F_{vmt}	Nominal tangential force of virtual cylindrical gears	N
f	Distance from the centre of the zone of action to a contact line	mm
f_{max}	Maximum distance to middle contact line	mm
f_{maxB}	Maximum distance to middle contact line at right side of the contact pattern	mm
f_{max0}	Maximum distance to middle contact line at left side of the contact pattern	mm
f_{pt}	Single pitch deviation	µm
$f_{p\,eff}$	Effective pitch deviation	µm
$f_{\alpha lim}$	Influence factor of limit pressure angle	
g_c	Length of contact line (Method B2)	mm
$g_{v\alpha}$	Length of path of contact of virtual cylindrical gear in transverse section	mm
$g_{v\alpha n}$	Related length of action in normal section	—
g_J	Length of action from mean point to point of load application (Method B2)	mm
g_η	Relative length of action within the contact ellipse	mm
HB	Brinell hardness	—
h_{am}	Mean addendum	mm
h_{a0}	Tool addendum	mm
h_{Fa}	Bending moment arm for tooth root stress (load application at tooth tip)	mm
h_{fm}	Mean dedendum	mm
h_{fP}	Dedendum of the basic rack profile	mm
h_m	Mean whole depth used for bevel spiral angle factor	mm
h_{vfm}	Relative mean virtual dedendum	—
h_N	Load height from critical section (Method B2)	mm
j_{en}	Outer normal backlash	mm

Symbol	Description or term	Unit
K	Constant; factor for calculating the dynamic factor K_{v-B}	—
K_A	Application factor	—
K_{F0}	Lengthwise curvature factor for bending stress	—
$K_{F\alpha}$	Transverse load factor for bending stress	—
$K_{F\alpha}*$	Preliminary transverse load factor for bending stress for non-hypoid gears	—
$K_{F\beta}$	Face load factor for bending stress	—
$K_{H\alpha}$	Transverse load factor for contact stress	—
$K_{H\alpha}*$	Preliminary transverse load factor for contact stress for non-hypoid gears	—
$K_{H\beta}$	Face load factor for contact stress	—
$K_{H\beta-be}$	Mounting factor	—
K_v	Dynamic factor	—
K_v*	Preliminary dynamic factor for non-hypoid gears	—
k'	Contact shift factor	—
k_c	Clearance factor	—
k_d	Depth factor	—
k_{hap}	Basic crown gear addendum factor (related to m_{mn})	—
k_{hfp}	Basic crown gear dedendum factor (related to m_{mn})	—
k_t	Circular thickness factor	—
l_b	Length of contact line (Method B1)	mm
l_{b0}	Theoretical length of contact line	mm
l_{bm}	Theoretical length of middle contact line	mm
m_{et}	Outer transverse module	mm
m_{mn}	Mean normal module	mm
m_{mt}	Mean transverse module	mm
m_{red}	Mass per unit facewidth reduced to the line of action of dynamically equivalent cylindrical gears	kg/mm
$m*$	Related individual gear mass per unit facewidth referred to the line of action	kg/mm
N	Reference speed related to resonance speed n_{E1}	—
N_L	Number of load cycles	—
n	Rotational speed	min^{-1}
n_{E1}	Resonance speed of pinion	min^{-1}
P	Nominal power	kW
p	Peak load	N/mm
p_{et}	Transverse base pitch (Method B2)	mm
p_{max}	Maximum peak load	N/mm
$p*$	Related peak load for calculating the load sharing factor (Method B1)	—

Symbol	Description or term	Unit
p_{mn}	Relative mean normal pitch	—
p_{nb}	Relative mean normal base pitch	—
p_{vet}	Transverse base pitch of virtual cylindrical gear (Method B1)	mm
q	Exponent in the formula for lengthwise curvature factor	—
q_{s}	Notch parameter	—
q_s	Notch parameter (Method B2)	—
Ra	= CLA = AA arithmetic average roughness	µm
R_{e}	Outer cone distance	mm
R_{m}	Mean cone distance	mm
R_{mpt}	Relative mean back cone distance	—
Rz	Mean roughness	µm
Rz_{10}	Mean roughness for gear pairs with relative curvature radius ρ_{rel} = 10 mm	µm
r_{c0}	Cutter radius	mm
r_{mf}	Tooth fillet radius at the root in mean section	mm
r_{mpt}	Mean pitch radius	mm
$r_{\mathrm{my\,0}}$	Mean transverse radius to point of load application (Method B2)	mm
r_{va}	Relative mean virtual tip radius	—
r_{vn}	Relative mean virtual pitch radius	—
S_{F}	Safety factor for bending stress (against breakage)	—
$S_{\mathrm{F\,min}}$	Minimum safety factor for bending stress	—
S_{H}	Safety factor for contact stress (against macropitting)	—
$S_{\mathrm{H\,min}}$	Minimum safety factor for contact stress	—
s_{Fn}	Tooth root chord in calculation section	mm
s_{mn}	Mean normal circular thickness	mm
s_{N}	One-half tooth thickness at critical section (Method B2)	mm
s_{pr}	Amount of protuberance at the tool	mm
$T_{1,2}$	Nominal torque of pinion and wheel	Nm
u	Gear ratio of bevel gear	—
u_{v}	Gear ratio of virtual cylindrical gear	—
v_{et}	Tangential speed at outer end (heel) of the reference cone	m/s
$v_{\mathrm{et\,max}}$	Maximum pitch line velocity at operating pitch diameter	m/s
v_{g}	Sliding velocity in the mean point P	m/s
$v_{\mathrm{g\,par}}$	Sliding velocity parallel to the contact line	m/s
$v_{\mathrm{g\,vert}}$	Sliding velocity vertical to the contact line	m/s
v_{mt}	Tangential speed at mid facewidth of the reference cone	m/s
v_{Σ}	Sum of velocities in the mean point P	m/s

Symbol	Description or term	Unit
$v_{\Sigma h}$	Sum of velocities in profile direction	m/s
$v_{\Sigma l}$	Sum of velocities in lengthwise direction	m/s
$v_{\Sigma\,vert}$	Sum of velocities vertical to the contact line	m/s
W_{m2}	Wheel mean slot width	mm
w	Angle of contact line relative to the root cone	°
x_{hm}	Profile shift coefficient	—
x_{sm}	Thickness modification coefficient (backlash included)	—
x_{smn}	Thickness modification coefficient (theoretical)	—
x_N	Tooth strength factor (Method B2)	mm
x_{oo}	Distance from mean section to point of load application	mm
Y_A	Root stress adjustment factor (Method B2)	—
Y_{BS}	Bevel spiral angle factor	—
Y_{Fa}	Tooth form factor for load application at the tooth tip (Method B1)	—
Y_{FS}	Combined tooth form factor for generated gears	—
Y_f	Stress concentration and stress correction factor (Method B2)	—
Y_i	Inertia factor (bending)	—
Y_J	Bending strength geometry factor (Method B2)	—
Y_{LS}	Load sharing factor (bending)	—
Y_{NT}	Life factor (bending)	—
$Y_{R\,rel\,T}$	Relative surface condition factor	—
Y_{Sa}	Stress correction factor for load application at the tooth tip	—
Y_{ST}	Stress correction factor for dimensions of the standard test gear	—
Y_X	Size factor for tooth root stress	—
$Y_{1,2}$	Tooth form factor of pinion and wheel (Method B2)	—
$Y_{\delta\,rel\,T}$	Relative notch sensitivity factor	—
Y_ε	Contact ratio factor for bending (Method B1)	—
y_p	Running-in allowance for pitch deviation related to the polished test piece	µm
y_J	Location of point of load application for maximum bending stress on path of action (Method B2)	mm
y_3	Location of point of load application on path of action for maximum root stress	mm
y_α	Running-in allowance for pitch error	µm
Z_A	Contact stress adjustment factor (Method B2)	—
Z_E	Elasticity factor	—
Z_{FW}	Facewidth factor	—
Z_{Hyp}	Hypoid factor	—

Symbol	Description or term	Unit
Z_I	Macropitting resistance geometry factor (Method B2)	—
Z_i	Inertia factor (macropitting)	—
Z_{KP}	Bevel gear factor (Method B1)	—
Z_L	Lubricant factor	—
Z_{LS}	Load sharing factor (Method B1)	—
$Z_{M\text{-}B}$	Mid zone factor	—
Z_{NT}	Life factor (macropitting)	—
Z_R	Roughness factor for contact stress	—
Z_S	Bevel slip factor	—
Z_v	Speed factor	—
Z_W	Work hardening factor	—
Z_X	Size factor	—
z	Number of teeth	—
z_v	Number of teeth of virtual cylindrical gear	—
z_{vn}	Number of teeth of virtual cylindrical gear in normal section	—
z_0	Number of blade groups of the cutter	—
α_a	Adjusted pressure angle (Method B2)	°
α_{an}	Normal pressure angle at tooth tip	°
$\alpha_{dD,C}$	Nominal design pressure angle for drive side/coast side	°
α_{et}	Effective pressure angle in transverse section	°
$\alpha_{eD,C}$	Effective pressure angle for drive side/coast side	°
α_f	Limit pressure angle in wheel root coordinates (Method B2)	°
α_{lim}	Limit pressure angle	°
$\alpha_{nD,C}$	Generated pressure angle for drive side/coast side	°
α_{vet}	Transverse pressure angle of virtual cylindrical gears	°
α_{Fan}	Load application angle at tooth tip of virtual cylindrical gear (Method B1)	°
α_L	Normal pressure angle at point of load application (Method B2)	°
β_{bm}	Mean base spiral angle	°
β_m	Mean spiral angle	°
β_v	Helix angle of virtual gear (Method B1), virtual spiral angle (Method B2)	°
β_{vb}	Helix angle at base circle of virtual cylindrical gear	°
β_B	Inclination angle of contact line	°
γ	Auxiliary angle for length of contact line calculation (Method B1)	°
γ'	Projected auxiliary angle for length of contact line	°
γ_a	Auxiliary angle for tooth form and tooth correction factor	°

Symbol	Description or term	Unit
δ	Pitch angle of bevel gear	°
δ_a	Face angle	°
δ_f	Root angle	°
$\varepsilon_{v\alpha}$	Transverse contact ratio of virtual cylindrical gears	—
$\varepsilon_{v\alpha n}$	Transverse contact ratio of virtual cylindrical gears in normal section	—
$\varepsilon_{v\beta}$	Face contact ratio of virtual cylindrical gears	—
$\varepsilon_{v\gamma}$	Virtual contact ratio (Method B1), modified contact ratio (Method B2)	—
ε_N	Load sharing ratio for bending (Method B2)	—
ε_{NI}	Load sharing ratio for macropitting (Method B2)	—
ζ_m	Pinion offset angle in axial plane	°
ζ_{mp}	Pinion offset angle in pitch plane	°
ζ_R	Pinion offset angle in root plane	°
θ	Auxiliary quantity for tooth form and tooth correction factors	—
θ_{mp}	Auxiliary angle for virtual facewidth (Method B1)	°
θ_{a2}	Addendum angle of wheel	°
θ_{f2}	Dedendum angle of wheel	°
θ_{v2}	Angular pitch of virtual cylindrical wheel	radiant
ν	Poisson’s ratio	—
ν_0	Lead angle of face hobbing cutter	°
ν_{40}, ν_{50}	Nominal kinematic viscosity of the oil at 40 °C and 50 °C, respectively	mm²/s
ξ	Assumed angle in locating weakest section	°
ξ_h	One half of angle subtended by normal circular tooth thickness at point of load application	°
ρ	Density of gear material	kg/mm³
ρ_{a0}	Cutter edge radius	mm
ρ_F	Fillet radius at point of contact of 30° tangent	mm
ρ_{Fn}	Fillet radius at point of contact of 30° tangent in normal section	mm
ρ_{fP}	Root fillet radius of basic rack for cylindrical gears	mm
ρ_{rel}	Radius of relative curvature vertical to contact line at virtual cylindrical gears	mm
ρ_t	Radius of relative profile curvature (Method B2)	mm
ρ_{va0}	Relative edge radius of tool	—
ρ'	Slip layer thickness	mm
Σ	Shaft angle	°
σ_F	Tooth root stress	N/mm²
σ_{F0}	Nominal tooth root stress	N/mm²
$\sigma_{F\,lim}$	Nominal stress number (bending)	N/mm²

Symbol	Description or term	Unit
σ_{FE}	Allowable stress number (bending)	N/mm²
σ_{FP}	Permissible tooth root stress	N/mm²
σ_{H}	Contact stress	N/mm²
$\sigma_{H\,lim}$	Allowable stress number for contact stress	N/mm²
σ_{HP}	Permissible contact stress	N/mm²
τ	Angle between tangent of root fillet at weakest point and centreline of tooth	°
ϕ	Auxiliary angle to determine the position of the pitch point	°
χ^{X}	Relative stress drop in notch root	mm^{-1}
χ_{T}^{X}	Relative stress drop in notch root of standardized test gear	mm^{-1}
ω	Angular velocity	rad/s
ω_{Σ}	Angle between the sum of velocities vector and the trace of pitch cone	°

Table 3 — Generally used subscripts in ISO 10300 (all parts)

Subscripts	Description
0	Tool
1	Pinion
2	Wheel
A, B, B1, B2, C	Value according to Method A, B, B1, B2 or C
D	Drive flank
C	Coast flank
T	Relative to standardized test gear dimensions
(1), (2)	Trials of interpolation

5 Application

5.1 General

This document provides four sample calculations:

— Sample 1 is a rating of a spiral bevel gear pair without hypoid offset according to Method B1, including the localised calculation method, and Method B2 (see Annex A);

— Sample 2 is a rating of a hypoid gear set according to Method B1, including the localised calculation method, and Method B2 (see Annex B);

— Sample 3 is a rating of a hypoid gear set according to Method B1, including the localised calculation method, and Method B2 (see Annex C);

— Sample 4 is a rating of a hypoid gear set according to Method B1, including the localised calculation method, and Method B2 (see Annex D).

— Figures E.1 to E.3 provide a graphical representation of the calculation results for Samples 1 to 4.

While this document states the results of calculations to a three decimal accuracy, the calculations themselves use more significant digits.

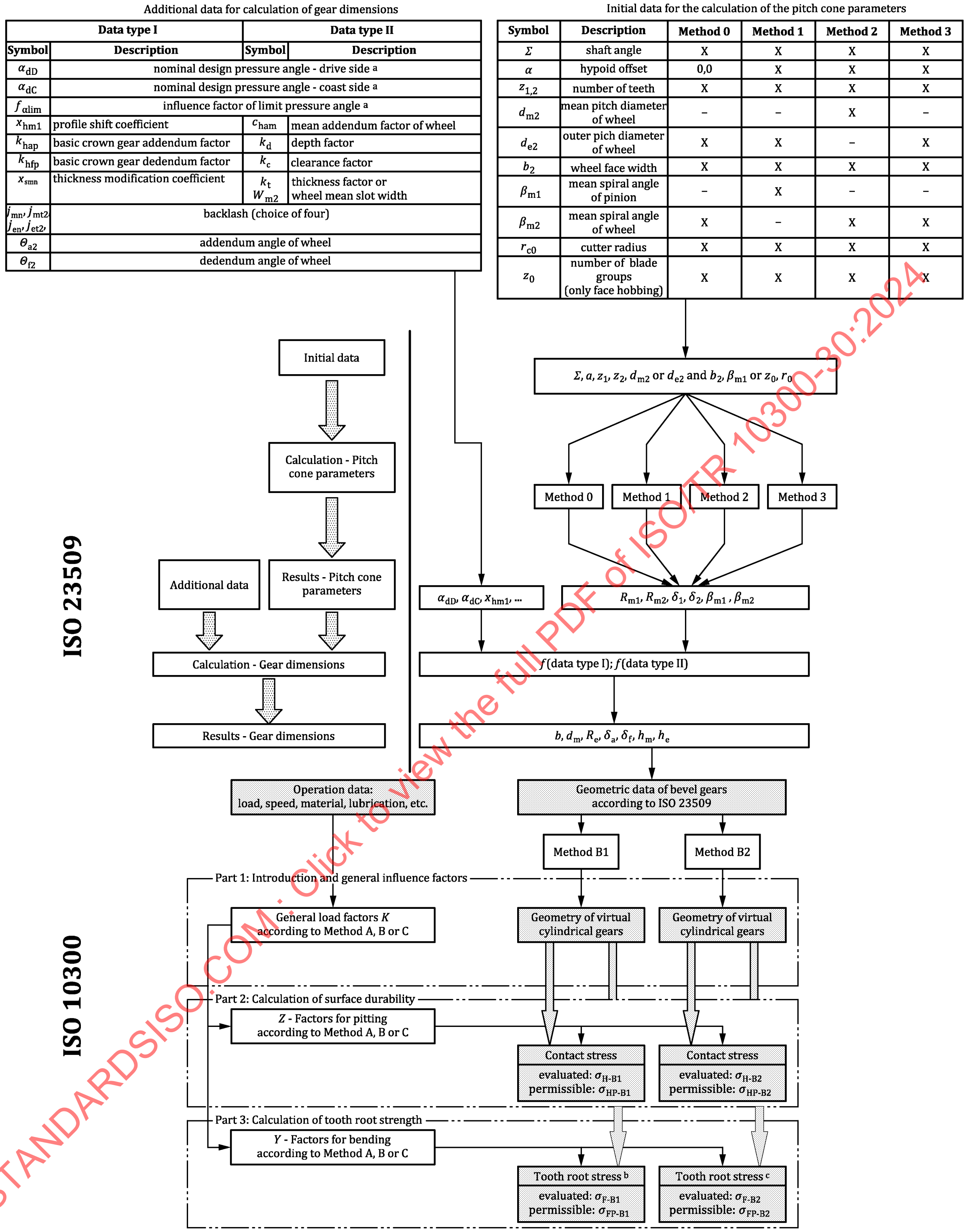
Table 4 refers to each table of the annexes showing the input parameters and calculation results for the different sample calculation steps.

Table 4 — Content of tables of Annexes A to D

Content of Table	Sample 1	Sample 2	Sample 3	Sample 4
Initial data for pitch cone parameters	Table A.1	Table B.1	Table C.1	Table D.1
Input data for tooth profile parameters	Table A.2	Table B.2	Table C.2	Table D.2
Geometric data from calculation according to ISO 23509	Table A.3	Table B.3	Table C.3	Table D.3
Operation parameters and additional considerations	Table A.4	Table B.4	Table C.4	Table D.4
Method B1				
Virtual cylindrical gears	Table A.5	Table B.5	Table C.5	Table D.5
General influence factors	Table A.6	Table B.6	Table C.6	Table D.6
Calculation of surface durability (macropitting)	Table A.7	Table B.7	Table C.7	Table D.7
Calculation of tooth root strength for pinion	Table A.8	Table B.8	Table C.8	Table D.8
Calculation of tooth root strength for wheel	Table A.9	Table B.9	Table C.9	Table D.9
Method B2				
Calculation of surface durability (macropitting)	Table A.10	Table B.10	Table C.10	Table D.10
Calculation of tooth root strength on pinion	Table A.11	—	—	—
Calculation of tooth root strength on pinion and wheel	—	Table B.11	Table C.11	Table D.11
Calculation of tooth root strength on wheel	Table A.12	—	—	—
Method B1 localised				
Virtual cylindrical gears	Table A.13	Table B.12	Table C.12	Table D.12
Local velocities and slip	Table A.14	Table B.13	Table C.13	Table D.13
Calculation of local surface durability (macropitting)	Table A.15	Table B.14	Table C.14	Table D.14

5.2 Structure of calculation methods

Figure 1 shows three boxes that represent the individual three parts of ISO 10300. However, these boxes are subdivided into a left side where influence factors are determined on the basis of mainly operational data according to Methods A, B or C (see ISO 10300-1:2023, 5.1) and a right side where separate calculation procedures are provided according to Method B1 and Method B2 which are assumed to have the same level B but different approaches. These two methods refer to the determination of virtual cylindrical gears in ISO 10300-1, the gear flank rating formulae in ISO 10300-2 and the gear tooth rating formulae in ISO 10300-3.



Additional data for calculation of gear dimensions

Symbol	Description (Data type I)	Symbol	Description (Data type II)
α_{dD}	nominal design pressure angle - drive side [a]		
α_{dC}	nominal design pressure angle - coast side [a]		
$f_{\alpha lim}$	influence factor of limit pressure angle [a]		
x_{hm1}	profile shift coefficient	c_{ham}	mean addendum factor of wheel
k_{hap}	basic crown gear addendum factor	k_d	depth factor
k_{hfp}	basic crown gear dedendum factor	k_c	clearance factor
x_{smn}	thickness modification coefficient	k_t W_{m2}	thickness factor or wheel mean slot width
$j_{mn}, j_{mt2}, j_{en}, j_{et2}$	backlash (choice of four)		
θ_{a2}	addendum angle of wheel		
θ_{f2}	dedendum angle of wheel		

Initial data for the calculation of the pitch cone parameters

Symbol	Description	Method 0	Method 1	Method 2	Method 3
Σ	shaft angle	X	X	X	X
a	hypoid offset	0,0	X	X	X
$z_{1,2}$	number of teeth	X	X	X	X
d_{m2}	mean pitch diameter of wheel	–	–	X	–
d_{e2}	outer pich diameter of wheel	X	X	–	X
b_2	wheel face width	X	X	X	X
β_{m1}	mean spiral angle of pinion	–	X	–	–
β_{m2}	mean spiral angle of wheel	X	–	X	X
r_{c0}	cutter radius	X	X	X	X
z_0	number of blade groups (only face hobbing)	X	X	X	X

a Generally drive and coast side pressure angles are balanced in initial design. However, some applications may be optimized with unbalanced pressure angles, see ISO 23059:2016, Annex C for guidance.

b One set of formulae for both, bevel and hypoid gears.

c Separate sets of formulae for bevel and for hypoid gears.

Figure 1 — Structure of calculation methods in ISO 10300 (all parts)

Annex A
(informative)

Sample 1: Rating of a spiral bevel gear pair without hypoid offset according to Method B1 and Method B2

A.1 Initial data

Sample 1 is for a spiral bevel gear pair without hypoid offset which uses Method 0 according to ISO 23509.

Table A.1 — Initial data for pitch cone parameters

Symbol	Description	Method 0	Method 1	Method 2	Method 3
Σ	Shaft angle	90°	X	X	X
a	Hypoid offset	0 mm	X	X	X
$z_{1,2}$	Number of teeth	14/39	X	X	X
d_{m2}	Mean pitch diameter of wheel	—	—	X	—
d_{e2}	Outer pitch diameter of wheel	176,893 mm	X	—	X
b_2	Wheel facewidth	25,4 mm	X	X	X
β_{m1}	Mean spiral angle of pinion	35°	X	—	—
β_{m2}	Mean spiral angle of wheel	35°	—	X	X
r_{c0}	Cutter radius	114,3 mm	X	X	X
z_0	Number of blade groups (only face hobbing)	—	—	X	X

Table A.2 — Input data for tooth profile parameters

Data type I		Data type II	
Symbol	**Description**	**Symbol**	**Description**
α_{dD}	20°		
α_{dC}	20°		
$f_{\alpha lim}$	0		
x_{hm1}	—	c_{ham}	0,247 37
k_{hap}	—	k_d	2,000
k_{hfp}	—	k_c	0,125
x_{smn}	—	k_t	0,091 5
		W_{m2}	—
j_{en}	0,127 mm		
θ_{a2}	2,134 2°		
θ_{f2}	6,493 4°		
$\rho_{a01D,C}$	0,8 mm/0,8 mm		
$\rho_{a02D,C}$	1,2 mm/1,2 mm		
$s_{pr1D,C}$	0 mm/0 mm		
$s_{pr2D,C}$	0 mm/0 mm		

Table A.3 and Table A.4 show geometric and operational data and text for explanation.

Table A.3 — Geometric data from calculation according to ISO 23509

Symbol	Description	Values	Symbol	Description	Value
$d_{m1,2}$	Mean pitch diameter of pinion/wheel	54,918 mm/ 152,987 mm	ζ_{mp}	Offset angle on pitch plane	0°
$h_{am1,2}$	Mean addendum of pinion/wheel	4,837 mm/ 1,590 mm	ζ_R	Pinion offset angle on root plane	0°
$h_{fm1,2}$	Mean dedendum of pinion/wheel	2,393 mm/ 5,640 mm	$R_{e1,2}$	Outer cone distance on pinion and wheel	93,973 mm
$\alpha_{eD,C}$	Effective pressure angle for drive side/coast side	20°/20°	$R_{m1,2}$	Mean cone distance on pinion and wheel	81,273 mm
$\alpha_{nD,C}$	Generated pressure angle for drive side/coast side	20°/20°	$\delta_{1,2}$	Pitch angle on pinion/wheel	19,747°/ 70,253°
α_{lim}	Limit pressure angle	0°	$\delta_{a1,2}$	Face angle on pinion/wheel	26,240°/ 72,387°
m_{mn}	Mean normal module	3,213 mm	$\delta_{f1,2}$	Root angle on pinion/wheel	17,613°/ 63,760°
k_{hfp}	Basic crown gear dedendum factor	1,25	$x_{sm1,2}$	Thickness modification coefficient on pinion/wheel	0,036/ −0,055
ζ_m	Pinion offset angle on axial plane	0,000°	m_{et2}	Outer transverse module	4,536 mm
$s_{mn1,2}$	Mean normal circular tooth thickness of pinion/wheel	6,464 mm/ 3,511 mm	—		

Table A.4 — Operation parameters and additional considerations

Symbol	Description	Value
Additional data		
	Wheel profile	Generated
	Roughing/finishing method	Face milling
$b_{2\text{eff}}$	Effective facewidth on wheel	$0{,}85 \cdot b_2$
	Profile crowning	Low
	Verification of contact pattern	Checked under light test load for each gear
	Mounting conditions of pinion and wheel	One member cantilever-mounted
Operation parameters		
T_1	Pinion torque	300 Nm
n_1	Pinion rotational speed	1 200 min^{-1}
K_A	Application factor	1,1
	Active flank	Drive
Material data for pinion and wheel (case hardened steel)		
E	Modulus of elasticity	210 000 N/mm^2
ν	Poisson’s ratio	0,3
$\sigma_{\text{H lim}}$	Allowable stress number (contact)	1 500 N/mm^2
$\sigma_{\text{F lim}}$	Nominal stress number (bending)	480 N/mm^2
	Surface hardness	Same for pinion and wheel
Quality parameters		
R_z	Flank roughness on pinion/wheel	8 µm/8 µm
R_z	Tooth root roughness on pinion/wheel	16 µm/16 µm
f_{pt}	Single pitch deviation on pinion/wheel	12 µm/26 µm
Lubrication parameters		
	Oil type	ISO-VG-150
	Oil temperature	90 °C

A.2 Calculation of Sample 1 according to Method B1

Table A.5 — Virtual cylindrical gears

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Virtual cylindrical gears in transverse section					
Reference diameter on pinion	$d_{v1} = \dfrac{d_{m1}}{\cos\delta_1}$	58,350 mm	E: A.1		
Reference diameter on wheel	$d_{v2} = u^2 \cdot d_{v1}$	452,804 mm	E: A.4		
Helix angle	$\beta_v = \dfrac{\beta_{m1} + \beta_{m2}}{2}$	35°	E: A.8		
Transverse pressure angle of virtual cylindrical gears	$\alpha_{vet} = \arctan(\tan\alpha_e / \cos\beta_v)$ since $\alpha_e = \alpha_{eD}$ for drive side	23,957°	E: A.10		
Transverse module	$m_{vt} = m_{mn} / \cos\beta_v$	3,923 mm	E: A.11		
Number of teeth on pinion	$z_{v1} = d_{v1} / m_{vt}$	14,875	E: A.12		
Number of teeth on wheel	$z_{v2} = d_{v2} / m_{vt}$	115,431	E: A.12		
Gear ratio	$u_v = z_{v2} / z_{v1}$	7,760	E: A.13		

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Auxiliary angle for virtual facewidth	$\vartheta_{mp} = \arctan(\sin\delta_2 \cdot \tan\zeta_m)$	0°	E: A.21		
Projected auxiliary angle for length of contact line	$\gamma' = \vartheta_{mp} - \zeta_{mp}/2$	0°	E: A.20		
Centre distance of virtual cylindrical gear pair	$a_v = (d_{v1} + d_{v2}) / 2$	255,577 mm	E: A.5		
Helix angle of virtual cylindrical gear at base circle	$\beta_{vb} = \arcsin(\sin\beta_v \cdot \cos\alpha_e)$ since $\alpha_e = \alpha_{eD}$ for drive side	32,615°	E: A.16		
Tip diameter on pinion	$d_{va1} = d_{v1} + 2\ h_{am1}$	68,023 mm	E: A.6		
Tip diameter on wheel	$d_{va2} = d_{v2} + 2\ h_{am2}$	455,984 mm	E: A.6		
Root diameter on pinion	$d_{vf1} = d_{v1} - 2\ h_{fm1}$	53,563 mm	E: A.7		
Root diameter on wheel	$d_{vf2} = d_{v2} - 2\ h_{fm2}$	441,524 mm	E: A.7		
Base diameter on pinion	$d_{vb1} = d_{v1} \cdot \cos\alpha_{vet}$	53,323 mm	E: A.9		
Base diameter on wheel	$d_{vb2} = d_{v2} \cdot \cos\alpha_{vet}$	413,796 mm	E: A.9		
Transverse base pitch	$p_{vet} = \pi \cdot m_{mn} \cdot \cos\alpha_{vet} / \cos\beta_v$	11,262 mm	E: A.17		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Length of path of contact of virtual cylindrical gear in transverse section	$g_{v\alpha}=\frac{1}{2}\cdot\left[\left(\sqrt{d_{va1}^2-d_{vb1}^2}-d_{v1}\cdot\sin\alpha_{vet}\right)+\left(\sqrt{d_{va2}^2-d_{vb2}^2}-d_{v2}\cdot\sin\alpha_{vet}\right)\right]$	13,120 mm	E: A.18		
Transverse contact ratio	$\varepsilon_{v\alpha} = g_{v\alpha}/p_{vet}$	1,165	E: A.23		
Effective facewidth with $b_{2\,eff} = 0{,}85 \cdot b_2$	$b_{v,eff}=\frac{\left(b_{2,eff}/\cos\left(\zeta_{mp}/2\right)-g_{v\alpha}\cdot\cos\alpha_{vet}\cdot\tan\left(\zeta_{mp}/2\right)\right)}{1-\tan\gamma'\cdot\tan\left(\zeta_{mp}/2\right)}$	21,590 mm	E: A.19		
Facewidth	$b_v=b_2\cdot\frac{b_{v,eff}}{b_{2,eff}}$	25,400 mm	E: A.22		
Virtual cylindrical gears in normal section					
Number of pinion teeth of virtual cylindrical gears	$z_{vn1}=\frac{z_{v1}}{\cos^2\beta_{vb}\cdot\cos\beta_v}$	25,594	E: A.41		
Number of wheel teeth of virtual cylindrical gears	$z_{vn2}=u_v\cdot z_{vn1}$	198,613	E: A.42		
Reference diameter on pinion	$d_{vn1}=z_{vn1}\cdot m_{mn}$	82,241 mm	E: A.43		
Reference diameter on wheel	$d_{vn2}=z_{vn2}\cdot m_{mn}$	638,207 mm	E: A.43		
Tip diameter on pinion	$d_{van1}=d_{vn1}+2h_{am1}$	91,915 mm	E: A.44		
Tip diameter on wheel	$d_{van2}=d_{vn2}+2h_{am2}$	641,387 mm	E: A.44		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Base diameter on pinion	$d_{\mathrm{vbn1}} = d_{\mathrm{vn1}} \cdot \cos\alpha_{\mathrm{e}}$	77,281 mm	E: A.45		
Base diameter on wheel	$d_{\mathrm{vbn2}} = d_{\mathrm{vn2}} \cdot \cos\alpha_{\mathrm{e}}$	599,719 mm	E: A.45		
Face contact ratio	$\varepsilon_{\mathrm{v}\beta} = \dfrac{b_{\mathrm{v,eff}} \cdot \sin\beta_{\mathrm{v}}}{\pi \cdot m_{\mathrm{mn}}}$	1,227	E: A.24		
Virtual contact ratio	$\varepsilon_{\mathrm{v}\gamma} = \varepsilon_{\mathrm{v}\alpha} + \varepsilon_{\mathrm{v}\beta}$	2,392	E: A.25		
Inclination angle of contact line	$\beta_{\mathrm{B}} = \arctan\left(\tan\beta_{\mathrm{v}} \cdot \sin\alpha_{\mathrm{e}}\right)$	13,468°	E: A.38		
Radius of relative curvature in normal section at the mean point	$\rho_{\mathrm{t}} = \left[\dfrac{1}{\cos\alpha_{\mathrm{nD}} \cdot \left(\tan\alpha_{\mathrm{nD}} - \tan\alpha_{\mathrm{lim}}\right) + \tan\zeta_{\mathrm{mp}} \cdot \tan\beta_{\mathrm{B}}} \cdot \dfrac{\cos\beta_{\mathrm{m1}} \cdot \cos\beta_{\mathrm{m2}}}{\cos\zeta_{\mathrm{mp}}} \cdot \left(\dfrac{1}{R_{\mathrm{m2}} \cdot \tan\delta_2} + \dfrac{1}{R_{\mathrm{m1}} \cdot \tan\delta_1}\right)\right]^{-1}$	13,173 mm	E: A.39		
Radius of relative curvature vertical to the contact line	$\rho_{\mathrm{rel}} = \lvert\rho_{\mathrm{t}}\rvert \cdot \left(\cos\beta_{\mathrm{B}}\right)^2$	12,459 mm	E: A.37		

Table A.6 — General influence factors

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Nominal tangential force of bevel gears	$F_{\mathrm{mt}1,2} = \dfrac{2\,000 \cdot T_{1,2}}{d_{\mathrm{m}1,2}}$	10 925,3 N	E: 1		
Nominal tangential force of virtual cylindrical gears	$F_{\mathrm{vmt}} = F_{\mathrm{mt}1} \cdot \dfrac{\cos \beta_{\mathrm{v}}}{\cos \beta_{\mathrm{m}1}}$	10 925,3 N	E: 2		
Nominal tangential speed at mean point of the pinion	$v_{\mathrm{mt}1} = \dfrac{d_{\mathrm{m}1} \cdot n_1}{19\,098}$	3,451 m/s	E: 5		
Nominal tangential speed at mean point of the wheel	$v_{\mathrm{mt}2} = \dfrac{d_{\mathrm{m}2} \cdot n_2}{19\,098}$	3,451 m/s	E: 5		
Correction factor for non-average conditions for $F_{\mathrm{vmt}} K_{\mathrm{A}} / b_{\mathrm{v,eff}} \geq$ 100 N/mm	C_{F}	1,000	E: 12		
Mean value of mesh stiffness per unit face width	$c_{\gamma} = c_{\gamma 0} \cdot C_{\mathrm{F}}$	20 N/(mm · µm)	E: 11		
Single stiffness	$c' = c'_0 \cdot C_{\mathrm{F}}$	14 N/(mm · µm)	E: 18		
Max. single pitch deviation as given in Table A.4.	f_{pt}	26 µm			

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Running-in allowance for case hardened and nitrided gears	$y_\alpha = 0{,}075 \cdot f_{pt}$	1,950 µm	E: 51		
Effective pitch deviation with $y_p = y_\alpha$	$f_{p,eff} = f_{pt} - y_p$	24,050 µm	E: 17		
Relative pinion mass per unit facewidth reduced to the line of action	$m_1^* = \frac{1}{8} \cdot \rho \cdot \pi \cdot \frac{d_{m1}^2}{\cos^2[(\alpha_{nD} + \alpha_{nC})/2]}$ where ρ is the density of the gear material (for steel $\rho = 7{,}86 \cdot 10^{-6}$ kg/mm^3)	0,010 kg/mm	E: 14		
Relative wheel mass per unit facewidth reduced to the line of action	$m_2^* = \frac{1}{8} \cdot \rho \cdot \pi \cdot \frac{d_{m2}^2}{\cos^2[(\alpha_{nD} + \alpha_{nC})/2]}$ where ρ is the density of the gear material (for steel $\rho = 7{,}86 \cdot 10^{-6}$ kg/mm^3)	0,078 kg/mm	E: 14		
Mass reduced to the line of action of the dynamically equivalent cylindrical gear pair	$m_{red} = \frac{m_1^* \cdot m_2^*}{m_1^* + m_2^*}$	0,009 kg/mm	E: 10		
Resonance speed of pinion	$n_{E1} = \frac{30 \cdot 10^3}{\pi \cdot z_1} \cdot \sqrt{\frac{c_\gamma}{m_{red}}}$	32 314 min^{-1}	E: 9		
Dimensionless reference speed	$N = \frac{n_1}{n_{E1}}$	0,037	E: 8		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
For virtual contact ratio, $\varepsilon_{v\gamma}$ = 2,392 > 2	$c_{v1,2} = c_{v1} + c_{v2}$	0,593	T: 3		
	c_{v3}	0,115	T: 3		
	c_{v4}	0,473	T: 3		
	$c_{v5,6}$	0,654	T: 3		
	c_{v7}	0,993	T: 3		
Constant for the dynamic factor with K_A = 1,1 as given in Table A.4.	$K = \frac{b_v \cdot f_{p,eff} \cdot c'}{F_{vmt} \cdot K_A} \cdot c_{v1,2} + c_{v3}$	0,537	E: 16		
Dynamic factor	$K_{v-B} = N \cdot K + 1$	1,020	E: 15		
Determination of the length of contact lines					
For virtual contact ratio, $\varepsilon_{v\beta}$ = 1,227, $\varepsilon_{v\beta} \geq 1$	$f_t = +p_{vet} \cos\beta_{vb}$	9,486 mm	T: A.2		
	f_m	0,000 mm	T: A.2		
	$f_r = -p_{vet} \cos\beta_{vb}$	−9,486 mm	T: A.2		
Maximum distances from middle contact line	$f_{maxB} = \frac{1}{2} \cdot \left[g_{v\alpha} + b_{v,eff} \cdot \left(\tan\gamma + \tan\beta_{vb} \right) \right] \cdot \cos\beta_{vb}$	11,344 mm	E: A.33		
	$f_{max0} = \frac{1}{2} \cdot \left[g_{v\alpha} - b_{v,eff} \cdot \left(\tan\gamma + \tan\beta_{vb} \right) \right] \cdot \cos\beta_{vb}$	−0,293 mm	E: A.34		
	$f_{max} = f_{maxB}$ since $f_{maxB} > f_{max0}$	11,344 mm			

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Theoretical length of contact line	$l_{b0} = \sqrt{\left(x_1 - x_2\right)^2 + \left(y_1 - y_2\right)^2}$	24,345 mm	E: A.32		
Theoretical length of middle contact line calculated with $f = f_m$ for contact stress as specified in ISO 10300−2:2023, 6.1	$x_1 = \dfrac{f \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right) + \dfrac{1}{2} \cdot \left(g_{v\alpha} + b_{v,eff} \cdot \tan\gamma\right)}{\tan\gamma + \tan\beta_{vb}}$	21,047 mm	E: A.29		
	$x_2 = \dfrac{f \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right) - \dfrac{1}{2} \cdot \left(g_{v\alpha} - b_{v,eff} \cdot \tan\gamma\right)}{\tan\gamma + \tan\beta_{vb}}$	0,543 mm	E: A.30		
	$y_1 = -x_1 \cdot \tan\beta_{vb} + f \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right)$	−6,560 mm	E: A.31		
	$y_2 = -x_2 \cdot \tan\beta_{vb} + f \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right)$	6,560 mm	E: A.31		
Correction factor	$C_{lb} = \sqrt{\left(1 - \left(\dfrac{f}{f_{max}}\right)^2\right) \cdot \left(1 - \sqrt{\dfrac{b_{v,eff}}{b_v}}\right)^2}$	0,078	E: A.36		
Length of contact line	$l_b = l_{b0}\left(1 - C_{lb}\right)$	22,442 mm	E: A.26		
Length of middle contact line	$l_{bm} = l_b$	22,442 mm			

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Load sharing factor (macropitting)					
Exponent for calculation of parabolic distribution of peak loads	e_{LS}	3		T: 5	
Related peak load	$p^* = 1 - \left(\frac{\lvert f \rvert}{\lvert f_{max} \rvert} \right)^{e_{LS}}$	—		E: 7 F: 2	
Related peak load at tip contact line	$p_t{}^* = 1 - \left(\frac{\lvert f_t \rvert}{\lvert f_{max} \rvert} \right)^{e_{LS}}$	0,415			
Related peak load at middle contact line	$p_m{}^* = 1 - \left(\frac{\lvert f_m \rvert}{\lvert f_{max} \rvert} \right)^{e_{LS}}$	1,000			
Related peak load at root contact line	$p_r{}^* = 1 - \left(\frac{\lvert f_r \rvert}{\lvert f_{max} \rvert} \right)^{e_{LS}}$	0,415			
Related area	$A^* = \frac{1}{4} p^* \cdot l_b \cdot \pi$	—		E: 8 F: 2	
Related area at tip contact line	$A_t^* = \frac{1}{4} p_t^* \cdot l_{bt} \cdot \pi$	1,277 mm			

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Related area at middle contact line	$A_m^* = \frac{1}{4} p_m^* \cdot l_{\text{bm}} \cdot \pi$	17,626 mm			
Related area at root contact line	$A_r^* = \frac{1}{4} p_r^* \cdot l_{\text{br}} \cdot \pi$	1,277 mm			
Load sharing factor	$Z_{\text{LS}} = \sqrt{\frac{A_{\text{m}}^*}{A_{\text{t}}^* + A_{\text{m}}^* + A_{\text{r}}^*}}$	0,935		E: 10	
Face load factors (Calculation according to Method C)					
Load distribution factor	$K_{\text{H}\beta-\text{C}} = 1{,}5 \cdot K_{\text{H}\beta-\text{be}}$	1,650	E: 28		
with	$K_{\text{H}\beta\text{-be}}$	1,100	T:4		
Load distribution factor	$K_{\text{F}\beta-\text{C}} = K_{\text{H}\beta-\text{C}} / K_{\text{F0}}$	1,650	E: 32		
with	K_{F0}	1,000	E: 33		
Transverse load factors (Calculation according to Method B)					
Determinant tangential force at mid facewidth on the pitch cone	$F_{\text{mtH}} = F_{\text{vmt}} \cdot K_{\text{A}} \cdot K_{\text{v}} \cdot K_{\text{H}\beta}$	20 225,0 N	E: 47		
Transverse load factors for bevel gear with virtual contact ratio $\varepsilon_{\text{v}\gamma} = 2{,}392 > 2$	$K_{\text{H}\alpha-\text{B}}^* = K_{\text{F}\alpha-\text{B}}^* = 0{,}9 + 0{,}4 \cdot \sqrt{\frac{2 \cdot (\varepsilon_{\text{v}\gamma} - 1)}{\varepsilon_{\text{v}\gamma}}} \cdot \frac{c_\gamma \cdot (f_{\text{pt}} - y_\alpha)}{F_{\text{mtH}} / b_{\text{v}}}$	1,161	E: 48		
Relative hypoid offset	$a_{\text{rel}} = \frac{2 \cdot \lvert a \rvert}{d_{\text{m2}}}$	0,000	E: 41		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Transverse load factors	$K_{\mathrm{H}\alpha}=K_{\mathrm{F}\alpha}=K_{\mathrm{H}\alpha}^{*}-\frac{K_{\mathrm{H}\alpha}^{*}-1}{0,1}\cdot a_{\mathrm{rel}}$	1,161	E: 40		

Table A.7 — Calculation of surface durability (macropitting)

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Z-factors					
Factors for calculation of mid-zone factor for $\varepsilon_{v\beta} = 1{,}227 \geq 1$	$F_1 = \varepsilon_{v\alpha}$	1,165		T: 4	
	$F_2 = \varepsilon_{v\alpha}$	1,165		T: 4	
Mid-zone factor	$Z_{M-B} = \dfrac{\tan \alpha_{vet}}{\sqrt{\left[\sqrt{\left(\dfrac{d_{va1}}{d_{vb1}}\right)^2 - 1} - F_1 \cdot \dfrac{\pi}{z_{v1}}\right] \cdot \left[\sqrt{\left(\dfrac{d_{va2}}{d_{vb2}}\right)^2 - 1} - F_2 \cdot \dfrac{\pi}{z_{v2}}\right]}}$	0,916		E: 6	
Elasticity factor	$Z_E = \sqrt{\dfrac{1}{\pi \cdot \left[\dfrac{\left(1-\nu_1^2\right)}{E_1} + \dfrac{\left(1-\nu_2^2\right)}{E_2}\right]}}$	191,646 $(N/mm^2)^{1/2}$		E: 51	
Bevel gear factor	Z_{KP}	1,2		E: 11	
Lubricant factor	$C_{ZL} = 0{,}08 \cdot \dfrac{\sigma_{H,lim} - 850}{350} + 0{,}83$ using $\sigma_{Hlim} = 1\,200$ N/mm^2, which is the upper allowed limit in the above formula.	0,910		E: 55	
	$Z_L = C_{ZL} + \dfrac{4 \cdot (1{,}0 - C_{ZL})}{\left(1{,}2 + \dfrac{134}{\nu_{40}}\right)^2}$	0,992		E: 54	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Speed factor	$C_{ZV} = 0{,}08 \cdot \frac{\sigma_{H,lim} - 850}{350} + 0{,}85$ using σ_{Hlim} = 1 200 N/mm^2, which is the upper allowed limit in the above formula.	0,930		E: 57	
	$Z_v = C_{ZV} + \frac{2 \cdot (1{,}0 - C_{ZV})}{\sqrt{0{,}8 + \frac{32}{v_{mt2}}}}$	0,974		E: 56	
Roughness factor with the radius of relative curvature $\rho = \rho_{rel}$ = 12,459 mm for Method B1 (see ISO 10300–1:2023, Annex A)	$Rz_{10} = \frac{Rz_1 + Rz_2}{2} \cdot \sqrt[3]{\frac{10}{\rho}}$	7,435 µm		E: 58	
	$C_{ZR} = 0{,}12 + \frac{1\ 000 - \sigma_{H,lim}}{5\ 000}$ using σ_{Hlim} = 1 200 N/mm^2, which is the upper allowed limit in the above formula.	0,080		E: 60	
	$Z_R = \left(\frac{3}{Rz_{10}}\right)^{C_{ZR}}$	0,930		E: 59	
Product of the lubricant influence factors	$Z_L Z_v Z_R$	0,899			
Size factor	Z_X for Method B1 (see ISO 10300–2:2023, 6.5.2)	1,000			
Hypoid factor	Z_{Hyp} *Set* Z_{Hyp} *= 1,0 for non-offset.*	1,000		E: 12	
Life factor for pinion	$Z_{NT,1}$	1,000		T: 6	
Life factor for wheel	$Z_{NT,2}$	1,000		T: 6	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Work hardening factor	Set $Z_{W,1} = Z_{W,2} = 1{,}0$ because pinion and wheel with equal hardness.	1,000		E: 70	
Contact stress formula					
Nominal normal force of the virtual cylindrical gear at mean point P	$F_n = \frac{F_{mt1}}{\cos \alpha_{nD} \cdot \cos \beta_{m1}}$ NOTE ISO 10300-2:2023, Formula (3) contains a misprint. The correct formula has been applied to this sample calculation.	14 193,3 N		E: 3	
Nominal value of the contact stress	$\sigma_{H0-B1} = \sqrt{\frac{F_n}{l_{bm} \cdot \rho_{rel}}} Z_{M-B} \cdot Z_{LS} \cdot Z_E$	1 168,5 N/mm²		E: 2	
Contact stress	$\sigma_{H-B1} = \sigma_{H0-B1} \cdot \sqrt{K_A \cdot K_v \cdot K_{H\beta} \cdot K_{H\alpha}}$	1 712,8 N/mm²		E: 1	
Permissible contact stress	$\sigma_{HP-B1} = \sigma_{H,lim} \cdot Z_{NT} \cdot Z_X \cdot Z_L \cdot Z_v \cdot Z_R \cdot Z_W \cdot Z_{KP} \cdot Z_{Hyp}$	1 617,8 N/mm²		E: 4	
Calculated safety factor for contact stress (macropitting) on pinion and wheel	$S_{H1,2-B1} = \frac{\sigma_{HP1,2-B1}}{\sigma_{H1,2-B1}}$	0,944		E: 5	

Table A.8 — Calculation of tooth root strength for pinion

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Y-factors					
Load sharing factor	$Y_{LS} = Z_{LS}^2$	0,873			E: 36
Geometry values for pinion according to Tables A.2 and A.3.	$h_{a0} = h_{fp} = k_{hfp}\ m_{mn}$	4,017 mm			F: 2
Parameters for pinion	$E_{1,D} = \left(\frac{\pi}{4} - x_{sm1}\right) \cdot m_{mn} - h_{a0} \cdot \tan\alpha_{eD} - \frac{\rho_{a01,D} \cdot (1 - \sin\alpha_{eD}) - s_{pr1,D}}{\cos\alpha_{eD}}$	0,385 mm			E: 7
	$E_{1,C} = \left(\frac{\pi}{4} - x_{sm1}\right) \cdot m_{mn} - h_{a0} \cdot \tan\alpha_{eC} - \frac{\rho_{a01,C} \cdot (1 - \sin\alpha_{eC}) - s_{pr1,C}}{\cos\alpha_{eC}}$	0,385 mm			E: 7
	$G_{1,D} = \frac{\rho_{a01,D}}{m_{mn}} - \frac{h_{a0}}{m_{mn}} + x_{hm1}$	−0,496			E: 8
	$G_{1,C} = \frac{\rho_{a01,C}}{m_{mn}} - \frac{h_{a0}}{m_{mn}} + x_{hm1}$	−0,496			E: 8
	$H_{1,D} = \frac{2}{z_{vn1,D}} \cdot \left(\frac{\pi}{2} - \frac{E_{1,D}}{m_{mn}}\right) - \frac{\pi}{3}$	−0,934			E: 9
	$H_{1,C} = \frac{2}{z_{vn1,C}} \cdot \left(\frac{\pi}{2} - \frac{E_{1,C}}{m_{mn}}\right) - \frac{\pi}{3}$	−0,934			E: 9

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Iteration starting with $\vartheta = \pi/6$ until $(\vartheta_{new} - \vartheta) < 0{,}000\,001$	$\vartheta_{1,D,C} = \frac{2 \cdot G_{1,D,C}}{z_{vn1,D,C}} \cdot \tan \vartheta_{1,D,C} - H_{1,D,C}$	Initial: 52,221°			E: 10
		Final: 50,783°			E: 10
Tooth root chordal thickness on the drive side	$s_{Fn1,D} = m_{mn} \cdot z_{vn1,D} \cdot \sin\left(\frac{\pi}{3} - \vartheta_{1,D}\right) + m_{mn} \cdot \sqrt{3} \cdot \left(\frac{G_{1,D}}{\cos \vartheta_{1,D}} - \frac{\rho_{a01,D}}{m_{mn}}\right)$	7,423 mm			E: 11
Tooth root chordal thickness on coast side	$s_{Fn1,C} = m_{mn} \cdot z_{vn1,C} \cdot \sin\left(\frac{\pi}{3} - \vartheta_{1,C}\right) + m_{mn} \cdot \sqrt{3} \cdot \left(\frac{G_{1,C}}{\cos \vartheta_{1,C}} - \frac{\rho_{a01,C}}{m_{mn}}\right)$	7,423 mm			E: 11
Tooth root chord	$s_{Fn1} = 0{,}5 \cdot s_{Fn1,D} + 0{,}5 \cdot s_{Fn1,C}$	7,423 mm			E: 12
Fillet radius at contact point of 30° tangent on the drive side	$\rho_{F1,D} = \rho_{a01,D} + \frac{2 \cdot G_{1,D}^2 \cdot m_{mn}}{\cos \vartheta_{1,D} \cdot \left(z_{vn1,D} \cdot \left(\cos \vartheta_{1,D}\right)^2 - 2 \cdot G_{1,D}\right)}$	1,023 mm			E: 13
Normal pressure angle at tooth tip on the drive side	$\alpha_{an1,D} = \arccos\left(\frac{d_{vbn1,D}}{d_{van1,D}}\right)$	32,776°			E: 16
Auxiliary angle for tooth form and tooth correction factor on the drive side	$\gamma_{a1,D} = \frac{1}{z_{vn1,D}} \cdot \left[\frac{\pi}{2} + 2\left(x_{hm1} \cdot \tan \alpha_{eD} + x_{sm1}\right)\right] + \mathrm{inv}\alpha_{eD} - \mathrm{inv}\alpha_{an1,D}$	1,242°			E: 17

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Load application angle at tooth tip of virtual cylindrical gear on drive side	$\alpha_{\mathrm{Fan1,D}} = \alpha_{\mathrm{an1,D}} - \gamma_{\mathrm{a1,D}}$	31,534°			E: 15
Bending moment arm on the drive side	$h_{\mathrm{Fa1,D}} =$ $\frac{m_{\mathrm{mn}}}{2} \cdot \left[\left(\cos\gamma_{\mathrm{a1,D}} - \sin\gamma_{\mathrm{a1,D}} \cdot \tan\alpha_{\mathrm{Fan1,D}} \right) \cdot \frac{d_{\mathrm{van1,D}}}{m_{\mathrm{mn}}} - z_{\mathrm{vn1,D}} \cdot \cos\left(\frac{\pi}{3} - \vartheta_{\mathrm{1,D}} \right) - \frac{G_{\mathrm{1,D}}}{\cos\vartheta_{\mathrm{1,D}}} + \frac{\rho_{\mathrm{a01,D}}}{m_{\mathrm{mn}}} \right]$	6,405 mm			E: 14
Tooth form factor on the drive side	$Y_{\mathrm{Fa1,D}} = \frac{6 \cdot \frac{h_{\mathrm{Fa1,D}}}{m_{\mathrm{mn}}} \cdot \cos\alpha_{\mathrm{Fan1,D}}}{\left(\frac{s_{\mathrm{Fn1}}}{m_{\mathrm{mn}}} \right)^2 \cdot \cos\alpha_{\mathrm{n1,D}}}$	2,033			E: 6
Stress correction factor on the drive side	$L_{\mathrm{a1,D}} = \frac{s_{\mathrm{Fn1}}}{h_{\mathrm{Fa1,D}}}$	1,159			E: 25
	$q_{\mathrm{s1,D}} = \frac{s_{\mathrm{Fn1}}}{2\rho_{\mathrm{F1,D}}}$	3,630			E: 26
	$Y_{\mathrm{Sa1,D}} = \left(1{,}2 + 0{,}13 \cdot L_{\mathrm{a1,D}} \right) \cdot q_{\mathrm{s1,D}}^{\left(\frac{1}{1{,}21 + 2{,}3/L_{\mathrm{a1,D}}} \right)}$	2,022			E: 24
Relative surface condition factor	$Y_{\mathrm{R,relT}} = \frac{Y_{\mathrm{R}}}{Y_{\mathrm{RT}}} = 1{,}674 - 0{,}529 \cdot (Rz + 1)^{1/10}$	0,972			E: 40

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
for Rz = 16 µm and through hardened and case hardened steels					
Life factor for pinion	$Y_{NT,1}$	1,000			T: 4
Stress correction factor	Y_{ST}	2,000			E: 4
Size factor	$Y_X = 1{,}05 - 0{,}01 m_{mn}$ Set $Y_X = 1{,}0$ since range is $0{,}8 \leq Y_X \leq 1{,}0$.	1,000			E: 209
Bevel spiral angle factor using l_{bm} according to Table A.6 for l_{bb}	$Y_{BS} = \frac{a_{BS}}{c_{BS}}\left(\frac{l_{bb}}{b_a} - 1{,}05 \cdot b_{BS}\right)^2 + 1$	1,054			E: 30
with	$b_a = b_v / \cos\beta_v$	31,008 mm			E: 34
	$l_{bb} = l_{bm}\frac{\cos\beta_{vb}}{\cos\beta_v}$	23,077 mm			E: 35
Relative notch sensitivity factor	$Y_{\delta,relT1} = \frac{1+\sqrt{\rho' \cdot \chi_1^X}}{1+\sqrt{\rho' \cdot \chi_T^X}}$	1,010			E: 43
Contact ratio factor, Y_ε, for $\varepsilon_{v\beta} = 1{,}227 > 1$	Y_ε	0,625			E: 29
Tooth root stress formula for pinion					

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Nominal tooth root stress	$\sigma_{\text{F01-B1}} = \frac{F_{\text{vmt}}}{b_{\text{v}} \cdot m_{\text{mn}}} \cdot Y_{\text{Fa}} \cdot Y_{\text{Sa}} \cdot Y_{\varepsilon} \cdot Y_{\text{BS}} \cdot Y_{\text{LS}}$	316,5 N/mm^2			E: 2
Local tooth root stress	$\sigma_{\text{F1-B1}} = \sigma_{\text{F01-B1}} \cdot K_{\text{A}} \cdot K_{\text{v}} \cdot K_{\text{F}\beta} \cdot K_{\text{F}\alpha}$	680,1 N/mm^2			E: 1
Permissible tooth root stress	$\sigma_{\text{FP1-B1}} = \sigma_{\text{F,lim}} \cdot Y_{\text{ST}} \cdot Y_{\text{NT}} \cdot Y_{\delta,\text{relT-B1}} \cdot Y_{\text{R,relT-B1}} \cdot Y_{\text{X}}$	942,0 N/mm^2			E: 4
Calculated safety for tooth root strength on pinion	$S_{\text{F1-B1}} = \frac{\sigma_{\text{FP1-B1}}}{\sigma_{\text{F1-B1}}}$	1,385			E: 5

Table A.9 — Calculation of tooth root strength for wheel

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Y-factors different from pinion					
Geometry values for wheel according to Tables A.2 and A.3.	$h_{a0} = h_{fp} = k_{hfp}\, m_{mn}$	4,017 mm			F: 2
Parameters for wheel	$E_{2,D} = \left(\frac{\pi}{4} - x_{sm2}\right) \cdot m_{mn} - h_{a0} \cdot \tan\alpha_{eD} - \frac{\rho_{a02,D} \cdot (1 - \sin\alpha_{eD}) - s_{pr2,D}}{\cos\alpha_{eD}}$	0,398 mm			E: 7
	$E_{2,C} = \left(\frac{\pi}{4} - x_{sm2}\right) \cdot m_{mn} - h_{a0} \cdot \tan\alpha_{eC} - \frac{\rho_{a02,C} \cdot (1 - \sin\alpha_{eC}) - s_{pr2,C}}{\cos\alpha_{eC}}$	0,398 mm			E: 7
	$G_{2,D} = \frac{\rho_{a02,D}}{m_{mn}} - \frac{h_{a0}}{m_{mn}} + x_{hm2}$	−1,382			E: 8
	$G_{2,C} = \frac{\rho_{a02,C}}{m_{mn}} - \frac{h_{a0}}{m_{mn}} + x_{hm2}$	−1,382			E: 8
	$H_{2,D} = \frac{2}{z_{vn2,D}} \cdot \left(\frac{\pi}{2} - \frac{E_{2,D}}{m_{mn}}\right) - \frac{\pi}{3}$	−1,033			E: 9
	$H_{2,C} = \frac{2}{z_{vn2,C}} \cdot \left(\frac{\pi}{2} - \frac{E_{2,C}}{m_{mn}}\right) - \frac{\pi}{3}$	−1,033			E: 9

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Iteration starting with $\vartheta = \pi/6$ until ($\vartheta_{new} - \vartheta$) < 0,000 001	$\vartheta_{2,D,C} = \frac{2 \cdot G_{2,D,C}}{z_{vn2,D,C}} \cdot \tan \vartheta_{2,D,C} - H_{2,D,C}$	Initial: 58,705°			E: 10
		Final: 57,895°			E: 10
Tooth root chordal thickness on the drive side	$s_{Fn2,D} = m_{mn} \cdot z_{vn2,D} \cdot \sin\left(\frac{\pi}{3} - \vartheta_{2,D}\right) + m_{mn} \cdot \sqrt{3} \cdot \left(\frac{G_{2,D}}{\cos \vartheta_{2,D}} - \frac{\rho_{a02,D}}{m_{mn}}\right)$	6,898 mm			E: 11
Tooth root chordal thickness on coast side	$s_{Fn2,C} = m_{mn} \cdot z_{vn2,C} \cdot \sin\left(\frac{\pi}{3} - \vartheta_{2,C}\right) + m_{mn} \cdot \sqrt{3} \cdot \left(\frac{G_{2,C}}{\cos \vartheta_{2,C}} - \frac{\rho_{a02,C}}{m_{mn}}\right)$	6,898 mm			E: 11
Tooth root chord	$s_{Fn2} = 0{,}5 \cdot s_{Fn2,D} + 0{,}5 \cdot s_{Fn2,C}$	6,898 mm			E: 12
Fillet radius at contact point of 30° tangent	$\rho_{F2,D} = \rho_{a02,D} + \frac{2 \cdot G_{2,D}^2 \cdot m_{mn}}{\cos \vartheta_{2,D} \cdot \left(z_{vn2,D} \cdot (\cos \vartheta_{2,D})^2 - 2 \cdot G_{2,D}\right)}$	1,592 mm			E: 13
Normal pressure angle at tooth tip on the drive side	$\alpha_{an2,D} = \arccos\left(\frac{d_{vbn2,D}}{d_{van2,D}}\right)$	20,766°			E: 16
Auxiliary angle for tooth form and tooth correction factor on the drive side	$\gamma_{a2,D} = \frac{1}{z_{vn2,D}} \cdot \left[\frac{\pi}{2} + 2(x_{hm2} \cdot \tan \alpha_{eD} + x_{sm2})\right] + \mathrm{inv}\alpha_{eD} - \mathrm{inv}\alpha_{an2,D}$	0,209°			E: 17

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Load application angle at tooth tip of virtual cylindrical gear on the drive side	$\alpha_{\mathrm{Fan2,D}}=\alpha_{\mathrm{an2,D}}-\gamma_{\mathrm{a2,D}}$	20,557°			E: 15
Bending moment arm on the drive side	$h_{\mathrm{Fa2,D}}=$ $\frac{m_{\mathrm{mn}}}{2}\cdot\left[\left(\cos\gamma_{\mathrm{a2,D}}-\sin\gamma_{\mathrm{a2,D}}\cdot\tan\alpha_{\mathrm{Fan2,D}}\right)\cdot\frac{d_{\mathrm{van2,D}}}{m_{\mathrm{mn}}}-z_{\mathrm{vn2,D}}\cdot\cos\left(\frac{\pi}{3}-\vartheta_{\mathrm{2,D}}\right)-\frac{G_{\mathrm{2,D}}}{\cos\vartheta_{\mathrm{2,D}}}+\frac{\rho_{\mathrm{a02,D}}}{m_{\mathrm{mn}}}\right]$	6,141 mm			E: 14
Tooth form factor on the drive side	$Y_{\mathrm{Fa2,D}}=\frac{6\cdot\frac{h_{\mathrm{Fa2,D}}}{m_{\mathrm{mn}}}\cdot\cos\alpha_{\mathrm{Fan2,D}}}{\left(\frac{s_{\mathrm{Fn2}}}{m_{\mathrm{mn}}}\right)^{2}\cdot\cos\alpha_{\mathrm{n2,D}}}$	2,480			E: 6
Stress correction factor on the drive side	$L_{\mathrm{a2,D}}=\frac{s_{\mathrm{Fn2}}}{h_{\mathrm{Fa2,D}}}$	1,123			E: 25
	$q_{\mathrm{s2,D}}=\frac{s_{\mathrm{Fn2}}}{2\rho_{\mathrm{F2,D}}}$	2,166			E: 26
	$Y_{\mathrm{Sa2,D}}=\left(1{,}2+0{,}13\cdot L_{\mathrm{a2,D}}\right)\cdot q_{\mathrm{s2,D}}^{\left(\frac{1}{1{,}21+2{,}3/L_{\mathrm{a2,D}}}\right)}$	1,706			E: 24
Relative surface condition factor for Rz = 16 µm for through	$Y_{\mathrm{R,relT}}=\frac{Y_{\mathrm{R}}}{Y_{\mathrm{RT}}}=1{,}674-0{,}529\cdot\left(Rz+1\right)^{1/10}$	0,972			E: 40

Description	Formula	Result	References to E: Formula, T: Table, F: Figure		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
hardened and case hardened steels					
Bevel spiral angle factor using l_{bm} according to Table A.6 for l_{bb}	$Y_{BS} = \frac{a_{BS}}{c_{BS}} \cdot \left(\frac{l_{bb}}{b_a} - 1{,}05 \cdot b_{BS} \right)^2 + 1$	1,054			E: 30
where	$b_a = b_v / \cos \beta_v$	31,008 mm			E: 34
	$l_{bb} = l_{bm} \cdot \frac{\cos \beta_{vb}}{\cos \beta_v}$	23,077 mm			E: 35
Relative notch sensitivity factor	$Y_{\delta,relT2} = \frac{1 + \sqrt{\rho' \cdot \chi_2^X}}{1 + \sqrt{\rho' \cdot \chi_T^X}}$	0,997			E: 43
Tooth root stress formula for wheel					
Nominal tooth root stress	$\sigma_{F02\text{-}B1} = \frac{F_{vmt}}{b_v \cdot m_{mn}} \cdot Y_{Fa} \cdot Y_{Sa} \cdot Y_\varepsilon \cdot Y_{BS} \cdot Y_{LS}$	325,9 N/mm^2			E: 2
Local tooth root stress	$\sigma_{F2\text{-}B1} = \sigma_{F02\text{-}B1} \cdot K_A \cdot K_v \cdot K_{F\beta} \cdot K_{F\alpha}$	700,1 N/mm^2			E: 1
Permissible tooth root stress	$\sigma_{FP2\text{-}B1} = \sigma_{F,lim} \cdot Y_{ST} \cdot Y_{NT} \cdot Y_{\delta,relT\ 2\text{-}B1} \cdot Y_{R,relT\text{-}B1} \cdot Y_X$	929,8 N/mm^2			E: 4
Calculated safety for tooth root strength on wheel	$S_{F2\text{-}B1} = \frac{\sigma_{FP2\text{-}B1}}{\sigma_{F2\text{-}B1}}$	1,328			E: 5

A.3 Calculation of Sample 1 according to Method B2

Table A.10 — Calculation of surface durability (macropitting)

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Approximate values for application factors					
Relative facewidth	$b_{v,rel} = \frac{b_2}{m_{et2}}$	5,600	E: B.1		
Relative mean back cone distance on pinion	$R_{mpt1} = \frac{R_{m1} \cdot \tan\delta_1}{m_{et2}}$	6,432	E: B.2		
Relative mean back cone distance on wheel	$R_{mpt2} = \frac{R_{m2} \cdot \tan\delta_2}{m_{et2}}$	49,915	E: B.2		
Face contact ratio for bevel gears	$\varepsilon_{v\beta} = b_2 \cdot \sin\beta_{m2} / (\pi \cdot m_{mn})$	1,443	E: B.4		
Relative mean virtual pitch radius on pinion	$r_{vn1} = \frac{R_{mpt1}}{\cos^2\beta_{m1}}$	9,586	E: B.6		
Relative mean virtual pitch radius on wheel	$r_{vn2} = \frac{R_{mpt2}}{\cos^2\beta_{m2}}$	74,388	E: B.6		
Relative centre distance	$a_{vn} = r_{vn1} + r_{vn2}$	83,974	E: B.7		
Relative mean virtual dedendum on pinion	$h_{vfm1} = h_{fm1} / m_{et2}$	0,528	E: B.8		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Relative mean virtual dedendum on wheel	$h_{vfm2} = h_{fm2} / m_{et2}$	1,244	E: B.8		
Relative virtual tooth thickness on pinion	$s_{vmn1} = s_{mn1} / m_{et2}$	1,425	E: B.9		
Relative virtual tooth thickness on wheel	$s_{vmn2} = s_{mn2} / m_{et2}$	0,774	E: B.9		
Relative mean virtual tip radius on pinion	$r_{va1} = r_{vn1} + h_{am1} / m_{et2}$	10,652	E: B.10		
Relative mean virtual tip radius on wheel	$r_{va2} = r_{vn2} + h_{am2} / m_{et2}$	74,739	E: B.10		
Angular pitch of virtual cylindrical wheel (required in ISO 10300-3:2023, 7.4.5)	$\theta_{v2} = \frac{\pi \cdot m_{mn}}{m_{et2} \cdot r_{vn2}}$	1,714°	E: B.11		
Relative edge radius of tool on pinion	$\rho_{va01} = \rho_{a01} / m_{et2}$	0,176	E: B.12		
Relative edge radius of tool on wheel	$\rho_{va02} = \rho_{a02} / m_{et2}$	0,265	E: B.12		
Virtual spiral angle for bevel gears without hypoid offset	$\beta_v = \beta_{m2}$	35°	E: B.13		
Adjusted pressure angle	$\alpha_a = \alpha_{eD} - \frac{\pi}{2} \cdot \cos \delta_2 \cdot \cos \beta_{m2} / z_2$	19,361°	E: B.16		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Base virtual helix angle	$\sin\beta_{vb} = \sin\beta_v \cdot \cos\alpha_a$	sin(32,761°)	E: B.17		
Relative mean virtual base radius on pinion	$r_{vbn1} = r_{vn1} \cdot \cos\alpha_a$	9,044	E: B.18		
Relative mean virtual base radius on wheel	$r_{vbn2} = r_{vn2} \cdot \cos\alpha_a$	70,182	E: B.18		
Relative length of action from pinion tip to pitch circle in the normal section	$g_{v\alpha na} = \sqrt{r_{va1}^2 - r_{vbn1}^2} - r_{vn1} \cdot \sin\alpha_a$	2,451	E: B.19		
Relative length of action from wheel tip to pitch circle in the normal section	$g_{v\alpha nr} = \sqrt{r_{va2}^2 - r_{vbn2}^2} - r_{vn2} \cdot \sin\alpha_a$	1,038	E: B.20		
Relative length of action in normal section	$g_{v\alpha n} = g_{v\alpha na} + g_{v\alpha nr}$	3,489	E: B.21		
Relative mean normal pitch of virtual cylindrical gear	$p_{mn} = \frac{2{,}0 \cdot \pi \cdot m_{mn}}{m_{et2} \cdot \cos\alpha_a \cdot \left(\cos^2\beta_{m1} + \cos^2\beta_{m2} + 2{,}0 \cdot \tan^2\alpha_a\right)}$	2,969	E: B.22		
Profile contact ratio in mean normal section	$\varepsilon_{v\alpha n} = \frac{g_{v\alpha n}}{p_{mn}}$	1,175	E: B.23		
Profile contact ratio in mean transverse section	$\varepsilon_{v\alpha} = \varepsilon_{v\alpha n} \cdot \left(\cos\beta_{vb}\right)^2$	0,831	E: B.24		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Modified contact ratio for bevel gears without hypoid offset	$\varepsilon_{\mathrm{v}\gamma} = \sqrt{\varepsilon_{\mathrm{v}\alpha}^2 + \varepsilon_{\mathrm{v}\beta}^2}$	1,665	E: B.25		
Contact shift factor; see also ISO 10300–1:2023, Figure B.7.	$k' = \dfrac{z_2 - z_1}{3{,}2 \cdot z_2 + 4{,}0 \cdot z_1}$	0,138	E: B.26		
Macropitting resistance geometry factor					
Angle between contact direction and tooth tangent in pitch plane	$\cot(\beta_{\mathrm{m1}} - \lambda_1) = \dfrac{\cos \zeta_{\mathrm{mp}}}{\cos \beta_{\mathrm{m1}} \cdot \cos \beta_{\mathrm{m2}} \cdot \tan(\beta_{\mathrm{m1}} - \lambda_{\mathrm{r}})} - \tan \beta_{\mathrm{m2}}$	cot(35°)		E: 24	
Angle between projection of pinion axis and direction of contact in pitch plane	$\lambda_1 = \beta_{\mathrm{m1}} - (\beta_{\mathrm{m1}} - \lambda_1)$	0°		E: 25	
Angle of contact line relative to the root cone	$\tan w = \dfrac{\sin \alpha_{\mathrm{a}} \cdot \tan(\beta_{\mathrm{m1}} - \lambda_{\mathrm{r}})}{\cos \alpha_{\mathrm{lim}}}$	tan(13,069°)		E: 26	
Mean base spiral angle	$\cos \beta_{\mathrm{bm}} = \dfrac{1{,}0}{\sqrt{\tan^2(\beta_{\mathrm{m1}} - \lambda_{\mathrm{r}}) \cos^2 \alpha_{\mathrm{a}} + 1{,}0}}$	cos(33,449°)		E: 27	
Relative mean normal base pitch	$p_{\mathrm{nb}} = \dfrac{\pi \cdot m_{\mathrm{mn}} \cdot \cos \alpha_{\mathrm{a}} \cdot \cos \beta_{\mathrm{bm}}}{m_{\mathrm{et2}} \cdot \cos(\beta_{\mathrm{m1}} - \lambda_{\mathrm{r}})}$	2,139		E: 28	
Angle between projection of wheel	$\lambda_2 = (\beta_{\mathrm{m1}} - \lambda_{\mathrm{r}}) - \beta_{\mathrm{m2}}$	0°		E: 29	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
axis and direction of contact in pitch plane					
Relative base facewidth	$b_b = \frac{b_2}{m_{et2} \cdot \cos\lambda_2}$	5,600		E: 30	
Pressure angle at point of load application on pinion	$\cos\alpha_{L1} = \cos\alpha_a \cdot \left[1{,}0 - \frac{(r_{va1} - r_{vn1}) \cdot \cos^2\beta_{m1}}{r_{va1} - r_{vn1} + R_{mpt1}}\right]$	cos(31,415°)		E: 31	
Pressure angle at point of load application on wheel	$\cos\alpha_{L2} = \cos\alpha_a \cdot \left[1{,}0 - \frac{(r_{va2} - r_{vn2}) \cdot \cos^2\beta_{m2}}{r_{va2} - r_{vn2} + R_{mpt2}}\right]$	cos(20,110°)		E: 31	
Radius of curvature difference between point of load application and mean point on pinion	$\rho_{\Delta 1} = \frac{r_{va1} - r_{vn1} + R_{mpt1}}{(\cos\beta_{m1})^2} \cdot \cos\alpha_{L1} \cdot (\tan\alpha_{L1} - \tan\alpha_a)$	2,474		E: 32	
Radius of curvature difference between point of load application and mean point on wheel	$\rho_{\Delta 2} = \frac{r_{va2} - r_{vn2} + R_{mpt2}}{(\cos\beta_{m2})^2} \cdot \cos\alpha_{L2} \cdot (\tan\alpha_{L2} - \tan\alpha_a)$	1,038		E: 32	
Radius of curvature change	$\rho_{\Delta red} = \cos\beta_{bm} \cdot (\rho_{\Delta 1} + \rho_{\Delta 2})$	2,930		E: 33	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Relative length of action within the contact ellipse	$g_\eta = \sqrt{\rho_{\Delta\text{red}}^2 \cdot (\cos\beta_{\text{bm}})^2 + b_\text{b}^2 \cdot (\sin\beta_{\text{bm}})^2}$	3,937		E: 34	
Radius of relative profile curvature and load sharing ratio at critical point					
Length of action at critical point in contact ellipse (iteration starting with $y_\text{I} = 0$)	$g_{\eta\text{I}} = \sqrt{g_\eta^2 - 4{,}0\, y_\text{I}^2}$	Initial: 3,937		E: 36	
		Final: 3,920		E: 36	
Length of action considering adjacent teeth	$g_{\eta\text{I}\Sigma}^3 = g_{\eta\text{I}}^3 + \sum_{k=1}^{k=x} \sqrt{\left[g_{\eta\text{I}}^2 - 4 \cdot k \cdot p_\text{nb} \cdot (k \cdot p_\text{nb} + 2 \cdot y_\text{I})\right]^3} + \sum_{k=1}^{k=y} \sqrt{\left[g_{\eta\text{I}}^2 - 4 \cdot k \cdot p_\text{nb} \cdot (k \cdot p_\text{nb} - 2 \cdot y_\text{I})\right]^3}$	Initial: 61,046		E: 37	
		Final: 60,352		E: 37	
Load sharing ratio	$\varepsilon_\text{NI} = g_{\eta\text{I}}^3 / g_{\eta\text{I}\Sigma}^3$	Initial: 1,000		E: 38	
		Final: 0,998		E: 38	
Length of contact line	$g_\text{c} = g_{\eta\text{I}} \cdot \rho_{\Delta\text{red}} \cdot b_\text{b} / g_\eta^2$	Initial: 4,167		E: 39	
		Final: 4,148		E: 39	
Position change along path of contact	$g_{\eta\Delta} = \dfrac{\rho_{\Delta\text{red}}^2 \cdot y_\text{I}}{g_{\eta\text{I}}^2} + k' \cdot g_\text{c} \cdot \tan\beta_\text{bm} + \dfrac{0{,}5 \cdot \rho_{\Delta\text{red}}}{\cos\beta_\text{bm}} - \rho_{\Delta 2}$	Initial: 1,098		E: 40	
		Final: 0,993		E: 40	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Intermediate value	$X=\dfrac{\sin^2 w\cdot\cos\alpha_{\lim}\cdot\cos\left(\zeta_{\mathrm{mp}}-\lambda_1\right)\cdot\cos\lambda_1}{\sin^2\left(\beta_{\mathrm{m}1}-\lambda_1\right)\cdot\sin\alpha_{\mathrm{a}}\cdot\cos\zeta_{\mathrm{mp}}}$	Initial: 0,469		E: 41	
		Final: 0,469		E: 41	
Profile radius of curvature on pinion	$\rho_1=R_{\mathrm{mpt}1}\cdot X\pm g_{\eta\Delta}$	Initial: 4,114		E: 42	
		Final: 4,009		E: 42	
Profile radius of curvature on wheel	$\rho_2=R_{\mathrm{mpt}2}\cdot X\pm g_{\eta\Delta}$	Initial: 22,302		E: 42	
		Final: 22,407		E: 42	
Relative radius of profile curvature between pinion and wheel	$\rho_{\mathrm{t}}=\dfrac{\rho_1\cdot\rho_2}{\rho_1+\rho_2}$	Initial: 3,473		E: 43	
		Final: 3,400		E: 43	
Inertia factor with $\varepsilon_{\mathrm{v}\gamma}\leq 2{,}0$	$Z_{\mathrm{i}}=2{,}0/\varepsilon_{\mathrm{v}\gamma}$	Initial: 1,201		E: 44	
		Final: 1,201		E: 44	
Macropitting resistance geometry factor	$Z_{\mathrm{I}}=\dfrac{g_{\mathrm{c}}\cdot\rho_{\mathrm{t}}\cdot\cos\alpha_{\mathrm{a}}\cdot m_{\mathrm{mn}}}{b_{\mathrm{b}}\cdot z_1\cdot Z_{\mathrm{i}}\cdot\varepsilon_{\mathrm{NI}}\cdot m_{\mathrm{et}2}}$	Initial: 0,103		E: 46	
		Final: 0,100		E: 46	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Facewidth factor					
for 12,7 ≤ b_2 ≤ 79,8 mm	$Z_{FW} = 0{,}004\ 92 \cdot b_2 + 0{,}437\ 5$	0,562		E: 48	
Contact stress adjustment factor					
for carburized case hardened steel	Z_A	0,967		E: 50	
Elasticity factor					
for a steel-on-steel gear pair	Z_E	191,646 $(N/mm^2)^{1/2}$		E: 51	
Lubricant film influence factors					
Product of the lubricant influence factors	$Z_L Z_V Z_R$	0,904			
Life factor					
Life factor	Z_{NT}	1,000		T: 6	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
K-factors					
For virtual contact ratio, $1 < \varepsilon_{v\gamma} = 1{,}665 < 2$	$c_{v1,2} = c_{v1} + c_{v2}$	0,660	T: 3		
	c_{v3}	0,230	T: 3		
	c_{v4}	0,900	T: 3		
	$c_{v5,6}$	0,940	T: 3		
	c_{v7}	0,766	T: 3		
Dynamic factor with $1 < \varepsilon_{v\gamma} \leq 2{,}0$	$K_{\text{v-B}}$	1,026	E: 15		
Face load factor	$K_{\text{H}\beta\text{-C}}$	1,650	E: 28		
Transverse load factor	$K_{\text{H}\alpha}$	1,000	E: 40		
Contact stress formula for drive and coast side					
Nominal contact stress	$\sigma_{\text{H0-B2}} = \sqrt{\frac{F_{\text{mt1}} \cdot d_{\text{m1}} \cdot Z_{\text{FW}}}{b_2 \cdot Z_{\text{I}}} \cdot \left(\frac{z_2}{d_{\text{e2}} \cdot z_1}\right)^2} \cdot Z_{\text{E}}$	1 098,3 N/mm^2		E: 21	
Contact stress	$\sigma_{\text{H-B2}} = \sigma_{\text{H0-B2}} \cdot \sqrt{K_{\text{A}} \cdot K_{\text{v}} \cdot K_{\text{H}\beta}} \cdot Z_{\text{A}} \leq \sigma_{\text{HP-B2}}$	1 449,3 N/mm^2		E: 20	
Permissible contact stress	$\sigma_{\text{HP-B2}} = \sigma_{\text{H,lim}} \cdot Z_{\text{NT}} \cdot Z_{\text{L}} \cdot Z_{\text{v}} \cdot Z_{\text{R}} \cdot Z_{\text{W}}$	1 355,9 N/mm^2		E: 22	
Calculated safety factor for contact stress for pinion and wheel	$S_{\text{H-B2}} = \frac{\sigma_{\text{HP-B2}}}{\sigma_{\text{H-B2}}} > S_{\text{H,min}}$	0,936		E: 23	

Table A.11 — Calculation of tooth root strength on pinion

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Geometry factor for bevel gears					
Distance when $\varepsilon_{v\gamma} \le 2{,}0$	$y_J = \frac{\pi \cdot m_{mn} \cdot \cos\alpha_a}{m_{et2}} - \frac{g_\eta}{2}$	0,131			E: 60
Distance for spiral bevel pinions	$y_{31} = \frac{g_{v\alpha n}}{2} + \frac{g_{v\alpha n}^2 \cdot y_J \cdot \cos^2\beta_{vb} + b_{v,rel} \cdot g_{v\alpha n} \cdot g_J \cdot k' \cdot \sin\beta_{vb}}{g_\eta^2}$	2,187			E: 65
where	$g_J = \sqrt{g_\eta^2 - 4y_J^2}$	3,929			E: 67
Transverse radius to point of load application					
for spiral bevel pinion	$x_{oo1} = \frac{b_{v,rel} \cdot g_{v\alpha n} \cdot g_J \cdot k' \cdot (\cos\beta_{vb})^2 \cdot m_{et2} - b_{v,rel}^2 \cdot y_J \cdot \sin\beta_{vb} \cdot m_{et2}}{g_\eta^2}$	1,545 mm			E: 69
Normal pressure angle at point of load application for pinion	$\tan\alpha_{L1} = \frac{y_{31} + a_{vn} \cdot \sin\alpha_n - \sqrt{r_{va2}^2 - r_{vbn2}^2}}{r_{vbn1}}$	tan(29,940°)			E: 71
Rotation angle used in bending strength calculations for pinion	$\xi_{h1} = \left(\frac{s_{vmn1}}{2r_{vn1}} - \mathrm{inv}\alpha_{L1} + \mathrm{inv}\alpha_n\right)$ NOTE ISO 10300-3:2023, Formula (72) contains a misprint in the last term. The correct formula has been applied to this sample calculation.	2,053°			E: 72

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Relative distance from pitch circle to the pinion point of load application and the wheel tooth centre line	$\Delta r_{y01} = \frac{r_{vbn1}}{\cos\alpha_{h1}} - r_{vn1}$	0,646			E: 73
where	$\alpha_{h1} = \alpha_{L1} - \xi_{h1}$	27,888°			E: 74
Mean transverse radius to point of load application, in mm	$r_{my01} = r_{mpt1} \cdot \left(\frac{R_m + x_{oo1}}{R_m}\right) + \Delta r_{y01} \cdot m_{et2}$	30,912 mm			E: 75
Load sharing ratio					
	$g'^3_J = g^3_J + \sum_{k=1}^{k=x} \sqrt{\left[g^2_J - 4 \cdot k \cdot \frac{\pi \cdot m_{mn} \cdot \cos\alpha_a}{m_{et2}} \cdot \left(k \cdot \frac{\pi \cdot m_{mn} \cdot \cos\alpha_a}{m_{et2}} + 2 \cdot y_J\right)\right]^3} + \sum_{k=1}^{k=y} \sqrt{\left[g^2_J - 4 \cdot k \cdot \frac{\pi \cdot m_{mn} \cdot \cos\alpha_a}{m_{et2}} \cdot \left(k \cdot \frac{\pi \cdot m_{mn} \cdot \cos\alpha_a}{m_{et2}} - 2 \cdot y_J\right)\right]^3}$	60,640			E: 76
Load sharing ratio	$\varepsilon_N = \frac{g^3_J}{g'^3_J}$	1,000			E: 77
Tooth form factor					
	$g_{01} = 0{,}5 \cdot s_{vmn1} + h_{vfm1} \cdot \tan\alpha_n + \rho_{va01} \cdot \left(\frac{1 - \sin\alpha_n}{\cos\alpha_n}\right)$	1,028			E: 79

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$g_{yb1} = h_{vfm1} - \rho_{va01}$	0,351			E: 80
	$g_{f01(1)} = g_{01} + g_{yb1}$	1,379			E: 81
Iteration starting with $g_{f01(1)}$ as initial value until $\frac{s_{N1} \cot \tau_1}{h_{N1}} = 2{,}0 \pm 0{,}001$	$\xi_1 = \frac{g_{f01}}{r_{vn1}}$	Initial: 8,244°			E: 82
		Final: 9,776°			E: 82
	$g_{xb1} = g_{f01} - g_{01}$	Initial: 0,351			E: 83
		Final: 0,608			E: 83
	$g_{za1} = g_{yb1} \cdot \cos \xi_1 - g_{xb1} \cdot \sin \xi_1$	Initial: 0,297			E: 84
		Final: 0,243			E: 84
	$g_{zb1} = g_{yb1} \cdot \sin \xi_1 + g_{xb1} \cdot \cos \xi_1$	Initial: 0,398			E: 85
		Final: 0,658			E: 85
	$\tan \tau_1 = \frac{g_{za1}}{g_{zb1}}$	Initial: tan(36,756°)			E: 86
		Final: tan(20,259°)			E: 86
	$s_{N1} = r_{vn1} \cdot \sin \xi_1 - \rho_{va01} \cdot \cos \tau_1 - g_{zb1}$	Initial: 0,835			E: 87
		Final: 0,804			E: 87
	$h_{N1} = \Delta r_{y01} + r_{vn1} \cdot (1 - \cos \xi_1) + \rho_{va01} \cdot \sin \tau_1 + g_{za1}$	Initial: 1,148			E: 88
		Final: 1,089			E: 88

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Tooth strength factor	$x_{N1} = \frac{s_{N1}^2}{h_{N1}}$	0,593			E: 90
Tooth form factor	$Y_1 = \frac{2}{3} \cdot \left[\frac{1}{\left(\frac{1}{x_{N1}} - \frac{\tan \alpha_{h1}}{3 \cdot s_{N1}} \right)} \right]$	0,455			E: 91
Tooth fillet radius at root diameter					
Relative fillet radius at root of tooth	$r_{mf1} = \frac{(h_{vfm1} - \rho_{va01})^2}{r_{vn1} + h_{vfm1} - \rho_{va01}} + \rho_{va01}$	0,189			E: 185
Stress concentration and correction factor					
Stress concentration and stress correction factor	$Y_{f1} = L + \left(\frac{2 s_{N1}}{r_{mf1}} \right)^M \left(\frac{2 s_{N1}}{h_{N1}} \right)^O$	1,823			E: 186
where	$L = 0{,}325\,454\,5 - 0{,}007\,272\,7\ \alpha_n$	0,180			E: 187
	$M = 0{,}331\,818\,2 - 0{,}009\,090\,9\ \alpha_n$	0,150			E: 188
	$O = 0{,}268\,181\,8 + 0{,}009\,090\,9\ \alpha_n$	0,450			E: 189
Inertia factor					
Inertia factor when $\varepsilon_{v\gamma} < 2{,}0$	$Y_i = 2{,}0 / \varepsilon_{v\gamma}$	1,201			E: 190

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Calculated effective facewidth					
Projected length of the instantaneous contact line in the tooth lengthwise direction	$g_{\mathrm{K1}} = \frac{b_1 \cdot g_{\mathrm{v}\alpha\mathrm{n}} \cdot g_{\mathrm{J1}} \cdot (\cos\beta_{\mathrm{vb}})^2}{g_\eta^2}$	15,879			E: 192
For the toe increment	$\Delta b_{\mathrm{i1}}' = \frac{b_1 - g_{\mathrm{K1}}}{2 \cdot \cos\beta_{\mathrm{m1}}} - \frac{x_{\mathrm{oo1}}}{\cos\beta_{\mathrm{m1}}}$	3,926			E: 194
For the heel increment	$\Delta b_{\mathrm{e1}}' = \frac{b_1 - g_{\mathrm{K1}}}{2 \cdot \cos\beta_{\mathrm{m1}}} + \frac{x_{\mathrm{oo1}}}{\cos\beta_{\mathrm{m1}}}$	7,698			E: 195
Calculated effective facewidth	$b_{\mathrm{ce1}} = C_{\mathrm{mm}} \cdot h_{\mathrm{N1}} \cdot \cos\beta_{\mathrm{m1}} \cdot \left[\arctan\left(\frac{\Delta b_{\mathrm{i1}}}{C_{\mathrm{mm}} \cdot h_{\mathrm{N1}}}\right) + \arctan\left(\frac{\Delta b_{\mathrm{e1}}}{C_{\mathrm{mm}} \cdot h_{\mathrm{N1}}}\right)\right] + g_{K1}$ with C_{mm} = 25,4 mm	25,223			E: 202
Bevel geometry factor					
Bevel geometry factor	$Y_{\mathrm{J1}} = \frac{Y_1}{Y_{\mathrm{f1}} \cdot \varepsilon_{\mathrm{N}} \cdot Y_{\mathrm{i}}} \cdot \frac{r_{\mathrm{my01}}}{r_{\mathrm{mpt1}}} \cdot \frac{b_{\mathrm{ce1}}}{b_1} \cdot \frac{m_{\mathrm{mt1}}}{m_{\mathrm{et2}}}$	0,201			E: 59
Root stress adjustment factor for carburized case hardened steel	Y_{A}	1,075			E: 203

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Relative surface condition factor					
Relative surface condition factor for pinion	$Y_{\mathrm{R,RelT}}$	1,000			E: 204
Relative notch sensitivity factor					
Notch parameter	$q_{\mathrm{s-B2}} = \frac{s_{\mathrm{N1}}}{2 \cdot r_{\mathrm{mf1}}}$	2,129			E:205
Relative notch sensitivity factor	$Y_{\delta,\mathrm{RelT}}$	1,000			E: 206
Life factor					
Life factor	Y_{NT}	1,000			T: 4
Stress correction factor					
Stress correction factor	Y_{ST}	2,000			E: 4
K-factors					
Face load factor	$K_{\mathrm{F\beta}}$	1,650	E: 32		
Transverse load factor	$K_{\mathrm{F\alpha}}$	1,000	E: 40		
Tooth root stress formula					
Nominal tooth root stress	$\sigma_{\mathrm{F01\text{-}B2}} = \frac{F_{\mathrm{mt1}}}{b_1} \cdot \frac{m_{\mathrm{mt1}}}{m_{\mathrm{et2}}^2} \cdot \frac{Y_{\mathrm{A1}}}{Y_{\mathrm{J1}}}$	439,2 N/mm^2			E: 55
Tooth root stress	$\sigma_{\mathrm{F1\text{-}B2}} = \sigma_{\mathrm{F01\text{-}B2}} \cdot K_{\mathrm{A}} \cdot K_{\mathrm{v}} \cdot K_{\mathrm{F}\beta} \cdot K_{\mathrm{F}\alpha}$	817,8 N/mm^2			E: 52

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Permissible tooth root stress					
Permissible tooth root stress	$\sigma_{\text{FP1-B2}} = \sigma_{\text{F,lim}} \cdot Y_{\text{ST}} \cdot Y_{\text{NT}} \cdot Y_{\delta,\text{relT-B2}} \cdot Y_{\text{R,relT-B2}} \cdot Y_{\text{X}}$	960,0 N/mm^2			E: 57
Calculated safety factor					
Calculated safety factor	$S_{\text{F1-B2}} = \dfrac{\sigma_{\text{FP1-B2}}}{\sigma_{\text{F1-B2}}}$	1,174			E: 58

Table A.12 — Calculation of tooth root strength on wheel

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Geometry factor for bevel gears					
Distance when $\varepsilon_{v\gamma} \leq 2{,}0$	$y_J = \frac{\pi \cdot m_{mn} \cdot \cos\alpha_a}{m_{et2}} - \frac{g_\eta}{2}$	0,131			E: 60
Distance for spiral bevel wheels	$y_{32} = \frac{g_{v\alpha n}}{2} + \frac{g_{v\alpha n}^2 \cdot y_J \cdot (\cos\beta_{vb})^2 - b_{v,rel} \cdot g_{v\alpha n} \cdot g_J \cdot k' \cdot \sin\beta_{vb}}{g_\eta^2}$	1,447			E: 66
where	$g_J = \sqrt{g_\eta^2 - 4 \cdot y_J^2}$	3,929			E: 67
Transverse radius to point of load application					
for spiral bevel wheel	$x_{oo2} = \frac{b_{v,rel} \cdot g_{v\alpha n} \cdot g_J \cdot k' \cdot (\cos\beta_{vb})^2 \cdot m_{et2} + b_{v,rel}^2 \cdot y_J \cdot \sin\beta_{vb} \cdot m_{et2}}{g_\eta^2}$	2,846 mm			E: 70
Normal pressure angle at point of load application for wheel	$\tan\alpha_{L2} = \frac{y_{32} + a_{vn} \cdot \sin\alpha_n - \sqrt{r_{va1}^2 - r_{vbn1}^2}}{r_{vbn2}}$	tan(19,272°)			E: 71
Rotation angle used in bending strength calculations for wheel	$\xi_{h2} = \frac{s_{vmn2}}{2 \cdot r_{vn2}} - \mathrm{inv}\alpha_{L2} + \mathrm{inv}\alpha_n$ NOTE ISO 10300-3:2023, Formula (72) contains a misprint in the last term. The correct formula has been applied to this sample calculation.	0,391°			E: 72
Relative distance from pitch circle to the pinion point of	$\Delta r_{y02} = \frac{r_{vbn2}}{\cos\alpha_{h2}} - r_{vn2}$	−0,216			E: 73

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
load application and the wheel tooth centre line					
where	$\alpha_{h2} = \alpha_{L2} - \xi_{h2}$	18,881°			E: 74
Mean transverse radius to point of load application, in mm	$r_{my02} = r_{mpt2} \cdot \left(\frac{R_m + x_{oo2}}{R_m} \right) + \Delta r_{y02} \cdot m_{et2}$	78,194 mm			E: 75
Load sharing ratio					
Load sharing ratio	$g'^3_J = g^3_J + \sum_{k=1}^{k=x} \sqrt{\left[g_J^2 - 4 \cdot k \cdot \frac{\pi \cdot m_{mn} \cdot \cos\alpha_a}{m_{et2}} \cdot \left(k \cdot \frac{\pi \cdot m_{mn} \cdot \cos\alpha_a}{m_{et2}} + 2 \cdot y_J \right) \right]^3} + \sum_{k=1}^{k=y} \sqrt{\left[g_J^2 - 4 \cdot k \cdot \frac{\pi \cdot m_{mn} \cdot \cos\alpha_a}{m_{et2}} \cdot \left(k \cdot \frac{\pi \cdot m_{mn} \cdot \cos\alpha_a}{m_{et2}} - 2 \cdot y_J \right) \right]^3}$	60,640			E: 76
	$\varepsilon_N = \frac{g_J^3}{g'^3_J}$	1,000			E: 77
Tooth form factor					
	$g_{02} = 0{,}5 \cdot s_{vmn2} + h_{vfm2} \cdot \tan\alpha_n + \rho_{va02} \cdot \left(\frac{1 - \sin\alpha_n}{\cos\alpha_n} \right)$	1,025			E: 79
	$g_{yb2} = h_{vfm2} - \rho_{va02}$	0,979			E: 80
	$g_{f02(1)} = g_{02} + g_{yb2}$	2,004			E: 81

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Iteration starting with $g_{f0\,2\,(1)}$ as initial value until $\frac{s_{N2}\cot\tau_2}{h_{N2}} = 2{,}0 \pm 0{,}001$	$\xi_2 = \frac{g_{f02}}{r_{vn2}}$	Initial: 1,543°			E: 82
		Final: 2,335°			E: 82
	$g_{xb2} = g_{f02} - g_{02}$	Initial: 0,979			E: 83
		Final: 2,007			E: 83
	$g_{za2} = g_{yb2} \cdot \cos\xi_2 - g_{xb2} \cdot \sin\xi_2$	Initial: 0,952			E: 84
		Final: 0,896			E: 84
	$g_{zb2} = g_{yb2} \cdot \sin\xi_2 + g_{xb2} \cdot \cos\xi_2$	Initial: 1,005			E: 85
		Final: 2,045			E: 85
	$\tan\tau_2 = \frac{g_{za2}}{g_{zb2}}$	Initial: tan(43,457°)			E: 86
		Final: tan(23,669°)			E: 86
	$s_{N2} = r_{vn2} \cdot \sin\xi_2 - \rho_{va02} \cdot \cos\tau_2 - g_{zb2}$	Initial: 0,807			E: 87
		Final: 0,744			E: 87
	$h_{N2} = \Delta r_{y02} + r_{vn2} \cdot (1 - \cos\xi_2) + \rho_{va02} \cdot \sin\tau_2 + g_{za2}$	Initial: 0,945			E: 88
		Final: 0,849			E: 88
Tooth strength factor	$x_{N2} = \frac{s_{N2}^2}{h_{N2}}$	0,652			E: 90

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Tooth form factor	$Y_2 = \frac{2}{3} \cdot \left[\frac{1}{\left(\frac{1}{x_{N2}} - \frac{\tan \alpha_{h2}}{3 \cdot s_{N2}} \right)} \right]$	0,483			E: 91
Tooth fillet radius at root diameter					
Relative fillet radius at root of tooth	$r_{mf2} = \frac{(h_{vfm2} - \rho_{va02})^2}{r_{vn2} + h_{vfm2} - \rho_{va02}} + \rho_{va02}$	0,277			E: 185
Stress concentration and correction factor					
Stress concentration and stress correction factor	$Y_{f2} = L + \left(\frac{2s_{N2}}{r_{mf2}} \right)^M \left(\frac{2s_{N2}}{h_{N2}} \right)^O$	1,836			E: 186
where	$L = 0{,}325\ 454\ 5 - 0{,}007\ 272\ 7\ \alpha_n$	0,180			E: 187
	$M = 0{,}331\ 818\ 2 - 0{,}009\ 090\ 9\ \alpha_n$	0,150			E: 188
	$O = 0{,}268\ 181\ 8 + 0{,}009\ 090\ 9\ \alpha_n$	0,450			E: 189
Inertia factor					
Inertia factor when $\varepsilon_{v\gamma} < 2{,}0$	$Y_i = 2{,}0 / \varepsilon_{v\gamma}$	1,201			E: 190
Calculated effective facewidth					
Projected length of the instantaneous contact line in the	$g_{K2} = \frac{b_2 \cdot g_{v\alpha n} \cdot g_{J2} \cdot (\cos \beta_{vb})^2}{g_\eta^2}$	15,879			E: 192

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
tooth lengthwise direction					
For the toe increment	$\Delta b_{i2}^{'} = \frac{b_2 - g_{K2}}{2 \cdot \cos \beta_{m2}} - \frac{x_{oo2}}{\cos \beta_{m2}}$	2,337			E: 194
For the heel increment	$\Delta b_{e2}^{'} = \frac{b_2 - g_{K2}}{2 \cdot \cos \beta_{m2}} + \frac{x_{oo2}}{\cos \beta_{m2}}$	9,286			E: 195
Calculated effective facewidth	$b_{ce2} = C_{mm} \cdot h_{N2} \cdot \cos \beta_{m2} \cdot \left[\arctan \left(\frac{\Delta b_{i2}}{C_{mm} \cdot h_{N2}} \right) + \arctan \left(\frac{\Delta b_{e2}}{C_{mm} \cdot h_{N2}} \right) \right] + g_{K2}$ with C_{mm} = 25,4 mm	24,968			E: 202
Bevel geometry factor					
Bevel geometry factor	$Y_{J2} = \frac{Y_2}{Y_{f2} \cdot \varepsilon_N \cdot Y_i} \cdot \frac{r_{my02}}{r_{mpt2}} \cdot \frac{b_{ce2}}{b_2} \cdot \frac{m_{mt2}}{m_{et2}}$	0,190			E: 59
Root stress adjustment factor for carburized case hardened steel	Y_A	1,075			E: 203
Relative surface condition factor					
Relative surface condition factor for pinion	$Y_{R,RelT}$	1,000			E: 204

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Relative notch sensitivity factor					
Notch parameter	$q_{\text{s-B2}} = \dfrac{s_{\text{N2}}}{2 \cdot r_{\text{mf2}}}$	1,341			E: 205
Relative notch sensitivity factor	$Y_{\delta,\text{RelT}}$	0,95			E: 206
Life factor					
Life factor	Y_{NT}	1,000			T: 4
Stress correction factor					
Stress correction factor	Y_{ST}	2,000			E: 4
Tooth root stress formula					
Nominal tooth root stress	$\sigma_{\text{F02-B2}} = \dfrac{F_{\text{mt2}}}{b_2} \cdot \dfrac{m_{\text{mt2}}}{m_{\text{et2}}^2} \cdot \dfrac{Y_{\text{A2}}}{Y_{\text{J2}}}$	463,5 N/mm^2			E: 55
Tooth root stress	$\sigma_{\text{F2-B2}} = \sigma_{\text{F02-B2}} \cdot K_{\text{A}} \cdot K_{\text{v}} \cdot K_{\text{F}\beta} \cdot K_{\text{F}\alpha}$	863,2 N/mm^2			E: 52
Permissible tooth root stress					
Permissible tooth root stress	$\sigma_{\text{FP2-B2}} = \sigma_{\text{F,lim}} \cdot Y_{\text{ST}} \cdot Y_{\text{NT}} \cdot Y_{\delta,\text{relT-B2}} \cdot Y_{\text{R,relT-B2}} \cdot Y_{\text{X}}$	912,0 N/mm^2			E: 57
Calculated safety factor					
Calculated safety factor	$S_{\text{F2-B2}} = \dfrac{\sigma_{\text{FP2-B2}}}{\sigma_{\text{F2-B2}}}$	1,057			E: 58

A.4 Calculation of Sample 1 according to local calculation method for surface durability – Method B1 localised

Table A.13 — Virtual cylindrical gears

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Length of path of contact in transverse section	$g_{v\alpha} = g_{va1} + g_{va2} = \frac{1}{2} \cdot \left[\left(\sqrt{d_{va1}^2 - d_{vb1}^2} - d_{v1} \cdot \sin\alpha_{vet} \right) + \left(\sqrt{d_{va2}^2 - d_{vb2}^2} - d_{v2} \cdot \sin\alpha_{vet} \right) \right]$	13,120 mm	E: A.49		
Point A on the transverse path of contact	$g_Y(A) = -g_{va2}$	-3,848 mm	E: A.47		
Point E on the transverse path of contact	$g_Y(E) = g_{va1}$	9,271 mm	E: A.48		
Contact point Y on the transverse path of contact	$g_Y(Y) = g_Y(A) + k_s \cdot g_{v\alpha} + Y \cdot \frac{(1 - 2 \cdot k_s) \cdot g_{v\alpha}}{i}$ with $Y = 0 \ldots i$; $i = 10$ Note that in all following equations, g_Y is a function of Y ($g_Y = g_Y(Y)$)	-3,848 mm -2,536 mm -1,224 mm 0,088 mm 1,400 mm 2,712 mm 4,023 mm 5,335 mm 6,647 mm 7,959 mm 9,271 mm	E: A.50		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Distance of the middle contact line in the zone of action	$f_{\mathrm{m,Y}} = \left(g_{\mathrm{va2}} - g_{\mathrm{v}\alpha}/2 + g_{\mathrm{Y}}\right)\cdot\cos\beta_{\mathrm{vb}}$	-5,526 mm -4,420 mm -3,315 mm -2,210 mm -1,105 mm 0,000 mm 1,105 mm 2,210 mm 3,315 mm 4,420 mm 5,526 mm	E: A.51		
Coordinates of the ends of the contact line	$x_{1,\mathrm{Y}} = \dfrac{f_{\mathrm{Y}}\cdot\cos\beta_{\mathrm{vb}} + \tan\beta_{\mathrm{vb}}\cdot\left(f_{\mathrm{Y}}\cdot\sin\beta_{\mathrm{vb}} + \dfrac{b_{\mathrm{v,eff}}}{2}\right) + \dfrac{1}{2}\cdot\left(g_{\mathrm{v}\alpha} + b_{\mathrm{v,eff}}\cdot\tan\gamma\right)}{\tan\gamma + \tan\beta_{\mathrm{vb}}}$ $x_{1,\mathrm{Y}} = 0$ for $x_{1,\mathrm{Y}} < 0$ $x_{1,\mathrm{Y}} = b_{\mathrm{v,eff}}$ for $x_{1,\mathrm{Y}} > b_{\mathrm{v,eff}}$	10,795 mm 12,845 mm 14,896 mm 16,946 mm 18,996 mm 21,047 mm 21,590 mm 21,590 mm 21,590 mm 21,590 mm 21,590 mm	E: A.56		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$x_{2,Y}=\frac{f_Y\cdot\cos\beta_{vb}+\tan\beta_{vb}\cdot\left(f_Y\cdot\sin\beta_{vb}+\frac{b_{v,eff}}{2}\right)-\frac{1}{2}\cdot\left(g_{v\alpha}-b_{v,eff}\cdot\tan\gamma\right)}{\tan\gamma+\tan\beta_{vb}}$ $x_{2,Y}=0$ for $x_{2,Y}<0$ $x_{2,Y}=b_{v,eff}$ for $x_{2,Y}>b_{v,eff}$	0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,543 mm 2,594 mm 4,644 mm 6,694 mm 8,745 mm 10,795 mm	E: A.57		
Coordinates of the ends of the contact line	$y_{1,Y}=-x_{1,Y}\cdot\tan\beta_{vb}+f_Y\cdot\cos\beta_{vb}+\tan\beta_{vb}\cdot\left(f_Y\cdot\sin\beta_{vb}+\frac{b_{v,eff}}{2}\right)$	-6,560 mm -6,560 mm -6,560 mm -6,560 mm -6,560 mm -6,560 mm -5,596 mm -4,284 mm -2,972 mm -1,660 mm -0,348 mm	E: A.58		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$y_{2,Y} = -x_{2,Y} \cdot \tan\beta_{vb} + f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \frac{b_{v,eff}}{2} \right)$	0,348 mm 1,660 mm 2,972 mm 4,284 mm 5,596 mm 6,560 mm 6,560 mm 6,560 mm 6,560 mm 6,560 mm 6,560 mm	E: A.58		
correction factor for the length of contact lines	$C_{lb,Y} = \sqrt{\left(1-\left(\frac{f_Y}{f_{max}}\right)^2\right) \cdot \left(1-\sqrt{\frac{b_{v,eff}}{b_v}}\right)^2}$	0,068 0,072 0,075 0,077 0,078 0,078 0,078 0,077 0,075 0,072 0,068	E: A.61		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Theoretical length of contact line	$l_{\text{mb0,Y}} = \sqrt{\left(x_{1,\text{Y}} - x_{2,\text{Y}}\right)^2 + \left(y_{1,\text{Y}} - y_{2,\text{Y}}\right)^2}$	12,816 mm 15,250 mm 17,684 mm 20,118 mm 22,553 mm 24,342 mm 22,553 mm 20,118 mm 17,684 mm 15,250 mm 12,816 mm	E: A.60		
Length of contact line	$l_{\text{mb,Y}} = l_{\text{mb0,Y}} \cdot \left(1 - C_{\text{lb,Y}}\right)$	11,942 mm 14,154 mm 16,364 mm 18,578 mm 20,801 mm 22,442 mm 20,801 mm 18,578 mm 16,364 mm 14,154 mm 11,942 mm	E: A.59		

<table>
<tr><th rowspan="3">Description</th><th rowspan="3">Formula</th><th rowspan="3">Result</th><th colspan="3">References to</th></tr>
<tr><th>ISO 10300-1</th><th>ISO 10300-2</th><th>ISO 10300-3</th></tr>
<tr><th colspan="3">E: Formula, T: Table, F: Figure</th></tr>
<tr><td>Distance of the top contact line in the zone of action</td><td>$f_{t,Y} = f_{m,Y} + p_{vet} \cdot \cos \beta_{vb}$</td><td>3,961 mm
5,066 mm
6,171 mm
7,276 mm
8,381 mm
9,486 mm
10,591 mm
11,696 mm
12,801 mm
13,907 mm
15,012 mm</td><td>E: A.52</td><td></td><td></td></tr>
<tr><td>Coordinates of the ends of the contact line</td><td>$x_{1,Y} = \dfrac{f_Y \cdot \cos \beta_{vb} + \tan \beta_{vb} \cdot \left(f_Y \cdot \sin \beta_{vb} + \dfrac{b_{v,eff}}{2} \right) + \dfrac{1}{2} \cdot \left(g_{v\alpha} + b_{v,eff} \cdot \tan \gamma \right)}{\tan \gamma + \tan \beta_{vb}}$
$x_{1,Y} = 0$ for $x_{1,Y} < 0$
$x_{1,Y} = b_{v,eff}$ for $x_{1,Y} > b_{v,eff}$</td><td>21,590 mm
21,590 mm
21,590 mm
21,590 mm
21,590 mm
21,590 mm
21,590 mm
0,000 mm
0,000 mm
0,000 mm
0,000 mm</td><td>E: A.56</td><td></td><td></td></tr>
</table>

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$x_{2,\mathrm{Y}} = \dfrac{f_\mathrm{Y} \cdot \cos\beta_\mathrm{vb} + \tan\beta_\mathrm{vb} \cdot \left(f_\mathrm{Y} \cdot \sin\beta_\mathrm{vb} + \dfrac{b_\mathrm{v,eff}}{2}\right) - \dfrac{1}{2} \cdot \left(g_{\mathrm{v}\alpha} - b_\mathrm{v,eff} \cdot \tan\gamma\right)}{\tan\gamma + \tan\beta_\mathrm{vb}}$ $x_{2,\mathrm{Y}} = 0$ for $x_{2,\mathrm{Y}} < 0$ $x_{2,\mathrm{Y}} = b_\mathrm{v,eff}$ for $x_{2,\mathrm{Y}} > b_\mathrm{v,eff}$	7,892 mm 9,942 mm 11,992 mm 14,043 mm 16,093 mm 18,143 mm 20,194 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm	E: A.57		
Coordinates of the ends of the contact line	$y_{1,\mathrm{Y}} = -x_{1,\mathrm{Y}} \cdot \tan\beta_\mathrm{vb} + f_\mathrm{Y} \cdot \cos\beta_\mathrm{vb} + \tan\beta_\mathrm{vb} \cdot \left(f_\mathrm{Y} \cdot \sin\beta_\mathrm{vb} + \dfrac{b_\mathrm{v,eff}}{2}\right)$	-2,206 mm -0,894 mm 0,418 mm 1,730 mm 3,042 mm 4,354 mm 5,666 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm	E: A.58		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$y_{2,Y} = -x_{2,Y} \cdot \tan\beta_{vb} + f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \frac{b_{v,eff}}{2} \right)$	6,560 mm 6,560 mm 6,560 mm 6,560 mm 6,560 mm 6,560 mm 6,560 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm	E: A.58		
Correction factor for the length of contact lines	$C_{lb,Y} = \sqrt{\left(1-\left(\frac{f_Y}{f_{max}}\right)^2\right) \cdot \left(1-\sqrt{\frac{b_{v,eff}}{b_v}}\right)^2}$	0,073 0,070 0,065 0,060 0,053 0,043 0,028 0,000 0,000 0,000 0,000	E: A.61		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Theoretical length of contact line	$l_{tb0,Y} = \sqrt{\left(x_{1,Y} - x_{2,Y}\right)^2 + \left(y_{1,Y} - y_{2,Y}\right)^2}$	16,263 mm 13,829 mm 11,394 mm 8,960 mm 6,526 mm 4,092 mm 1,658 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm	E: A.60		
Length of contact line	$l_{tb,Y} = l_{tb0,Y} \cdot \left(1 - C_{lb,Y}\right)$	15,073 mm 12,863 mm 10,648 mm 8,424 mm 6,183 mm 3,917 mm 1,611 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm	E: A.59		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Distance of the root contact line in the zone of action	$f_{r,Y} = f_{m,Y} - p_{vet} \cdot \cos \beta_{vb}$	-15,012 mm -13,907 mm -12,801 mm -11,696 mm -10,591 mm -9,486 mm -8,381 mm -7,276 mm -6,171 mm -5,066 mm -3,961 mm	E: A.53		
Coordinates of the ends of the contact line	$x_{1,Y} = \dfrac{f_Y \cdot \cos \beta_{vb} + \tan \beta_{vb} \cdot \left(f_Y \cdot \sin \beta_{vb} + \dfrac{b_{v,eff}}{2} \right) + \dfrac{1}{2} \cdot \left(g_{v\alpha} + b_{v,eff} \cdot \tan \gamma \right)}{\tan \gamma + \tan \beta_{vb}}$ $x_{1,Y} = 0$ for $x_{1,Y} < 0$ $x_{1,Y} = b_{v,eff}$ for $x_{1,Y} > b_{v,eff}$	0,000 mm 0,000 mm 0,000 mm 0,000 mm 1,396 mm 3,447 mm 5,497 mm 7,547 mm 9,598 mm 11,648 mm 13,698 mm	E: A.56		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$x_{2,Y}=\dfrac{f_Y\cdot\cos\beta_{vb}+\tan\beta_{vb}\cdot\left(f_Y\cdot\sin\beta_{vb}+\dfrac{b_{v,eff}}{2}\right)-\dfrac{1}{2}\cdot\left(g_{v\alpha}-b_{v,eff}\cdot\tan\gamma\right)}{\tan\gamma+\tan\beta_{vb}}$ $x_{2,Y}=0$ for $x_{2,Y}<0$ $x_{2,Y}=b_{v,eff}$ for $x_{2,Y}>b_{v,eff}$	0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm	E: A.57		
Coordinates of the ends of the contact line	$y_{1,Y}=-x_{1,Y}\cdot\tan\beta_{vb}+f_Y\cdot\cos\beta_{vb}+\tan\beta_{vb}\cdot\left(f_Y\cdot\sin\beta_{vb}+\dfrac{b_{v,eff}}{2}\right)$	0,000 mm 0,000 mm 0,000 mm 0,000 mm -6,560 mm -6,560 mm -6,560 mm -6,560 mm -6,560 mm -6,560 mm -6,560 mm	E: A.58		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$y_{2,\mathrm{Y}} = -x_{2,\mathrm{Y}} \cdot \tan\beta_{\mathrm{vb}} + f_{\mathrm{Y}} \cdot \cos\beta_{\mathrm{vb}} + \tan\beta_{\mathrm{vb}} \cdot \left(f_{\mathrm{Y}} \cdot \sin\beta_{\mathrm{vb}} + \frac{b_{\mathrm{v,eff}}}{2} \right)$	0,000 mm 0,000 mm 0,000 mm 0,000 mm -5,666 mm -4,354 mm -3,042 mm -1,730 mm -0,418 mm 0,894 mm 2,206 mm	E: A.58		
Correction factor for the length of contact lines	$C_{\mathrm{lb,Y}} = \sqrt{\left(1 - \left(\frac{f_{\mathrm{Y}}}{f_{\max}}\right)^2\right) \cdot \left(1 - \sqrt{\frac{b_{\mathrm{v,eff}}}{b_{\mathrm{v}}}}\right)^2}$	0,000 0,000 0,000 0,000 0,028 0,043 0,053 0,060 0,065 0,070 0,073	E: A.61		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Theoretical length of contact line	$l_{rb0,Y} = \sqrt{\left(x_{1,Y} - x_{2,Y}\right)^2 + \left(y_{1,Y} - y_{2,Y}\right)^2}$	0,000 mm 0,000 mm 0,000 mm 0,000 mm 1,658 mm 4,092 mm 6,526 mm 8,960 mm 11,394 mm 13,829 mm 16,263 mm	E: A.60		
Length of contact line	$l_{rb,Y} = l_{rb0,Y} \cdot \left(1 - C_{lb,Y}\right)$	0,000 mm 0,000 mm 0,000 mm 0,000 mm 1,611 mm 3,917 mm 6,183 mm 8,424 mm 10,648 mm 12,863 mm 15,073 mm	E: A.59		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Related peak load for calculating the load sharing factor	$p^*_{\mathrm{t,Y}} = \dfrac{w_\mathrm{Y}}{w_\mathrm{max}} = 1 - \left(\dfrac{\lvert f_\mathrm{t,Y}\rvert}{\lvert f_\mathrm{max}\rvert}\right)^{e_\mathrm{LS}}$ with $e_\mathrm{LS} = 3$	0,957 0,911 0,839 0,736 0,597 0,415 0,186 0,000 0,000 0,000 0,000		E: A.7	
Related peak load for calculating the load sharing factor	$p^*_{\mathrm{m,Y}} = \dfrac{w_\mathrm{Y}}{w_\mathrm{max}} = 1 - \left(\dfrac{\lvert f_\mathrm{m,Y}\rvert}{\lvert f_\mathrm{max}\rvert}\right)^{e_\mathrm{LS}}$ with $e_\mathrm{LS} = 3$	0,884 0,941 0,975 0,993 0,999 1,000 0,999 0,993 0,975 0,941 0,884		E: A.7	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Related peak load for calculating the load sharing factor	$p^*_{\mathrm{r,Y}} = \frac{w_{\mathrm{Y}}}{w_{\max}} = 1 - \left(\frac{\lvert f_{\mathrm{r,Y}} \rvert}{\lvert f_{\max} \rvert} \right)^{e_{\mathrm{LS}}}$ with $e_{\mathrm{LS}} = 3$	0,000 0,000 0,000 0,000 0,186 0,415 0,597 0,736 0,839 0,911 0,957		E: A.7	
Related area for calculating the load sharing factor X_{LS}	$A^*_{\mathrm{t,Y}} = \frac{1}{4} \cdot \pi \cdot p^*_{\mathrm{t,Y}} \cdot l_{\mathrm{tb,Y}}$	11,335 mm 9,203 mm 7,017 mm 4,870 mm 2,898 mm 1,277 mm 0,236 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm		E: A.6	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Related area for calculating the load sharing factor X_{LS}	$A^*_{m,Y} = \frac{1}{4} \cdot \pi \cdot p^*_{m,Y} \cdot l_{mb,Y}$	8,296 mm 10,459 mm 12,532 mm 14,483 mm 16,322 mm 17,626 mm 16,322 mm 14,48 mm 12,532 mm 10,459 mm 8,296 mm		E: A.6	
Related area for calculating the load sharing factor X_{LS}	$A^*_{r,Y} = \frac{1}{4} \cdot \pi \cdot p^*_{r,Y} \cdot l_{rb,Y}$	0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,236 mm 1,277 mm 2,898 mm 4,870 mm 7,017 mm 9,203 mm 11,335 mm		E: A.6	

Description	Formula	Result	References to		
			ISO 10300-1	**ISO 10300-2**	**ISO 10300-3**
			E: Formula, T: Table, F: Figure		
Local load distribution factor	$Z_{LS,Y}=\sqrt{\dfrac{A_{m,Y}^{*}}{A_{t,Y}^{*}+A_{m,Y}^{*}+A_{r,Y}^{*}}}$	0,650 0,729 0,801 0,865 0,916 0,935 0,916 0,865 0,801 0,729 0,650		E: A.5	
Curvature factor	$X_{Y}=\dfrac{\tan\alpha_{vet}}{\sqrt{\dfrac{(d_{v1}/2\cdot\sin\alpha_{vet}+g_{Y})}{d_{vb1}/2}}\cdot\sqrt{\dfrac{(d_{v2}/2\cdot\sin\alpha_{vet}-g_{Y})}{d_{vb2}/2}}}$	1,192 1,113 1,049 0,997 0,953 0,916 0,884 0,856 0,831 0,809 0,790	E: A.63		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local equivalent radius of curvature vertical to the contact line in the contact point Y	$\rho_{\mathrm{rel,Y}} = \rho_{\mathrm{rel}} \cdot \frac{1}{X_{\mathrm{Y}}^{2}}$	8,763 mm 10,061 mm 11,320 mm 12,539 mm 13,718 mm 14,859 mm 15,960 mm 17,021 mm 18,043 mm 19,026 mm 19,969 mm	E: A.62		
Auxiliary variable	$a = \frac{1}{K_{\mathrm{H}\beta} - 1}$	1,538	E: 31		
Auxiliary variable	$b_{\mathrm{Y}} = \frac{2}{l_{\mathrm{bm,Y}}}$	0,167 mm^{-1} 0,141 mm^{-1} 0,122 mm^{-1} 0,108 mm^{-1} 0,096 mm^{-1} 0,089 mm^{-1} 0,096 mm^{-1} 0,108 mm^{-1} 0,122 mm^{-1} 0,141 mm^{-1} 0,167 mm^{-1}	E: 31		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Distance from M_Y to Y	$z_{\mathrm{Y}}=\sqrt{\left(\frac{b_{\mathrm{v,eff}}}{2}-\frac{x_{1,\mathrm{Y}}+x_{2,\mathrm{Y}}}{2}\right)^2+\left(g_{\mathrm{va}2}-\frac{g_{\mathrm{v}\alpha}}{2}+g_{\mathrm{Y}}-\frac{y_{1,\mathrm{Y}}+y_{2,\mathrm{Y}}}{2}\right)^2}$	5,971 mm 5,191 mm 3,974 mm 2,757 mm 1,540 mm 0,000 mm 1,540 mm 2,757 mm 3,974 mm 5,191 mm 5,971 mm	E: 30		
Local face load factor for contact stress	$K_{\mathrm{H}\beta,\mathrm{Y}}=K_{\mathrm{H}\beta}\cdot\left[1-\left(b_{\mathrm{Y}}\cdot z_{\mathrm{Y}}\right)^{a}\right]$	0,000 0,626 1,107 1,395 1,563 1,650 1,563 1,395 1,107 0,626 0,000	E: 29		

Table A.14 — Local velocities and slip

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Surface velocity in tooth width direction	$w_{t1s} = v_{mt1} \cdot \sin \beta_{m1}$	1,979 m/s		E: A.14	
	$w_{t2s} = v_{mt2} \cdot \sin \beta_{m2}$	1,979 m/s		E: A.14	
Pinion local surface velocity in tooth height direction	$w_{t1h,Y} = v_{mt1} \cdot \cos \beta_{m1} \cdot \left(\sin \alpha_{nD,C} + \frac{g_Y}{d_{v1}/2} \right)$	0,594 m/s 0,721 m/s 0,848 m/s 0,975 m/s 1,102 m/s 1,229 m/s 1,357 m/s 1,484 m/s 1,611 m/s 1,738 m/s 1,865 m/s		E: A.15	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Wheel local surface velocity in tooth height direction	$w_{\text{t2h,Y}} = v_{\text{mt2}} \cdot \cos\beta_{\text{m2}} \cdot \left(\sin\alpha_{\text{nD,C}} - \frac{g_{\text{Y}}}{d_{\text{v2}}/2} \right)$	1,015 m/s 0,998 m/s 0,982 m/s 0,966 m/s 0,949 m/s 0,933 m/s 0,917 m/s 0,900 m/s 0,884 m/s 0,867 m/s 0,851 m/s		E: A.16	
Pinion local surface velocity	$w_{\text{t1,Y}} = \sqrt{w_{\text{t1s}}^2 + w_{\text{t1h,Y}}^2}$	2,066 m/s 2,106 m/s 2,153 m/s 2,206 m/s 2,266 m/s 2,330 m/s 2,400 m/s 2,474 m/s 2,552 m/s 2,634 m/s 2,720 m/s		E: A.17	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Wheel local surface velocity	$w_{t2,Y} = \sqrt{w_{t2s}^2 + w_{t2h,Y}^2}$	2,224 m/s 2,217 m/s 2,210 m/s 2,202 m/s 2,195 m/s 2,188 m/s 2,181 m/s 2,174 m/s 2,168 m/s 2,161 m/s 2,154 m/s		E: A.17	
Angle between the sliding velocities in lengthwise and tooth profile direction	$\omega_{wt1,Y} = \arctan \frac{w_{t1h,Y}}{w_{t1s}}$	16,703° 20,016° 23,196° 26,231° 29,116° 31,848° 34,427° 36,857° 39,141° 41,286° 43,299°		E: A.19	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Angle between the sliding velocities in lengthwise and tooth profile direction	$\omega_{\text{wt2,Y}} = \arctan \dfrac{w_{\text{t2h,Y}}}{w_{\text{t2s}}}$	27,146° 26,769° 26,390° 26,008° 25,624° 25,237° 24,848° 24,456° 24,062° 23,665° 23,266°		E: A.19	
Pinion local surface velocity vertical to the contact line	$w_{\text{t1vert,Y}} = w_{\text{t1,Y}} \cdot \sin\left(\lvert\beta_{\text{B}}\rvert + \lvert\omega_{\text{wt1,Y}}\rvert\right)$	1,039 m/s 1,162 m/s 1,286 m/s 1,409 m/s 1,533 m/s 1,657 m/s 1,780 m/s 1,904 m/s 2,028 m/s 2,151 m/s 2,275 m/s		E: A.18	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Wheel local surface velocity vertical to the contact line	$w_{t2vert,Y} = w_{t2,Y} \cdot \sin\left(\lvert\beta_B\rvert + \lvert\omega_{wt2,Y}\rvert\right)$	1,448 m/s 1,432 m/s 1,416 m/s 1,400 m/s 1,384 m/s 1,368 m/s 1,352 m/s 1,336 m/s 1,320 m/s 1,305 m/s 1,289 m/s		E: A.18	
Local sum velocity vertical to the contact line	$v_{\Sigma vert,Y} = w_{t1vert,Y} + w_{t2vert,Y}$	2,486 m/s 2,594 m/s 2,702 m/s 2,810 m/s 2,917 m/s 3,025 m/s 3,133 m/s 3,240 m/s 3,348 m/s 3,456 m/s 3,563 m/s		E: A.23	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local slip vertical to the contact line	$\zeta_{\text{vert,Y1}} = 1{,}0 - \left\| \frac{w_{\text{t2vert,Y}}}{w_{\text{t1vert,Y}}} \right\|$	-0,394 -0,232 -0,101 0,007 0,097 0,174 0,240 0,298 0,349 0,394 0,434		E: A.24	
	$\zeta_{\text{vert,Y2}} = 1{,}0 - \left\| \frac{w_{\text{t1vert,Y}}}{w_{\text{t2vert,Y}}} \right\|$	0,283 0,188 0,092 -0,007 -0,108 -0,211 -0,316 -0,425 -0,535 -0,649 -0,765		E: A.25	

Table A.15 — Calculation of local surface durability (macropitting)

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local contact stress	$\sigma_{H,Y} = \sqrt{\dfrac{F_n \cdot K_A \cdot K_v \cdot K_{H\beta,Y} \cdot K_{H\alpha}}{l_{b,Y} \cdot \rho_{rel,Y}}} \cdot Z_E \cdot Z_{LS,Y}$	0,000 N/mm² 1 259,665 N/mm² 1 612,517 N/mm² 1 744,444 N/mm² 1 766,000 N/mm² 1 712,808 N/mm² 1 637,312 N/mm² 1 497,235 N/mm² 1 277,214 N/mm² 916,025 N/mm² 0,000 N/mm²		E: A.2	
Local modified contact stress	$\sigma_{H,Y,mod} = \sigma_{H,Y} + \left(\dfrac{1}{6} \cdot e_{LS} + 0,25\right) \cdot max\left(\sigma_{H,Y}\right) \cdot \left(\dfrac{\lvert g_Y \rvert}{g_{va,max}}\right)^4$ with $e_{LS} = 3$	39,318 N/mm² 1 267,083 N/mm² 1 612,921 N/mm² 1 744,444 N/mm² 1 766,687 N/mm² 1 722,499 N/mm² 1 684,288 N/mm² 1 642,500 N/mm² 1 627,232 N/mm² 1 635,468 N/mm² 1 324,500 N/mm²		E: A.1	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Calculation factor	$C_{ZV} = 0{,}08 \cdot \frac{\sigma_{H,lim} - 850}{350} + 0{,}85$	0,930		E: 57	
Local tangential speed	$v_{mt2,Y} = v_{mt2} - 2 \cdot \frac{v_{mt2} \cdot g_Y \cdot \sin \alpha_{vet}}{d_{v2}}$	3,475 m/s 3,466 m/s 3,458 m/s 3,450 m/s 3,442 m/s 3,434 m/s 3,426 m/s 3,418 m/s 3,410 m/s 3,401 m/s 3,393 m/s		E: A.9	
Local speed factor	$Z_{v,Y} = C_{ZV} + \frac{2 \cdot (1 - C_{ZV})}{\sqrt{0{,}8 + \frac{32}{v_{mt2,Y}}}}$	0,974 0,974 0,974 0,974 0,974 0,974 0,974 0,974 0,974 0,974 0,974		E: A.8	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local hypoid factor	$Z_{\mathrm{Hyp,Y}} = 1 - 0{,}3 \cdot \left(\frac{v_{\mathrm{g,par}}}{v_{\Sigma,\mathrm{vert,Y}}} - 0{,}15 \right)$	1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000		E: A.10	
Calculation factor for the local bevel slip factor	$Z_{\mathrm{S0,Y1}} = \frac{7}{24} \cdot \zeta_{\mathrm{vert,Y1}} + \frac{47}{40}$	1,060 1,107 1,145 1,177 1,203 1,226 1,245 1,250 1,250 1,250 1,250		E: A.13	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$Z_{S0,Y2} = \frac{7}{24} \cdot \zeta_{vert,Y2} + \frac{47}{40}$	1,250 1,230 1,202 1,173 1,144 1,114 1,083 1,051 1,019 1,000 1,000		E: A.13	
Local bevel slip factor (driving gear)	$Z_{S,Y1} = Z_{S0,Y1}$	1,060 1,107 1,145 1,177 1,203 1,226 1,245 1,250 1,250 1,250 1,250		E: A.11	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local bevel slip factor (driven gear)	$Z_{S,Y2} = Z_{S0,Y2} + (Z_{S0,Y2} - 0{,}95) \cdot 1{,}75$	1,775 1,720 1,643 1,563 1,482 1,400 1,315 1,228 1,139 1,088 1,088		E: A.12	
Local permissible contact stress	$\sigma_{HP,Y,1} = \sigma_{H,lim,1} \cdot Z_{NT} \cdot Z_X \cdot Z_L \cdot Z_R \cdot Z_W \cdot Z_{v,Y} \cdot Z_{Hyp,Y} \cdot Z_{S,Y,1}$	1 429,328 N/mm² 1 492,965 N/mm² 1 544,348 N/mm² 1 586,698 N/mm² 1 622,203 N/mm² 1 652,395 N/mm² 1 678,380 N/mm² 1 684,883 N/mm² 1 684,800 N/mm² 1 684,715 N/mm² 1 684,633 N/mm²		E: A.3	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$\sigma_{\mathrm{HP,Y,2}} = \sigma_{\mathrm{H,lim,2}} \cdot Z_{\mathrm{NT}} \cdot Z_{\mathrm{X}} \cdot Z_{\mathrm{L}} \cdot Z_{\mathrm{R}} \cdot Z_{\mathrm{W}} \cdot Z_{\mathrm{v,Y}} \cdot Z_{\mathrm{Hyp,Y}} \cdot Z_{\mathrm{S,Y,2}}$	2 393,355 N/mm^2 2 318,902 N/mm^2 2 214,509 N/mm^2 2 107,752 N/mm^2 1 998,552 N/mm^2 1 886,823 N/mm^2 1 772,473 N/mm^2 1 655,411 N/mm^2 1 535,538 N/mm^2 1 465,703 N/mm^2 1 465,630 N/mm^2		E: A.3	
Calculated local safety factor for contact stress (macropitting) on pinion and wheel	$S_{\mathrm{H,Y,1}} = \dfrac{\sigma_{\mathrm{HP,Y,1}}}{\sigma_{\mathrm{H,Y,mod}}}$	36,353 1,178 0,957 0,910 0,918 0,959 0,996 1,026 1,035 1,030 1,272		E: A.4	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$S_{H,Y,2} = \frac{\sigma_{HP,Y,2}}{\sigma_{H,Y,mod}}$	60,872 1,830 1,373 1,208 1,131 1,095 1,052 1,008 0,944 0,896 1,107		E: A.4	

Annex B
(informative)

Sample 2: Rating of a hypoid gear set according to Method B1 and Method B2

B.1 Initial data

Sample 2 is for a hypoid gear pair which uses Method 1 according to ISO 23509.

Table B.1 — Initial data for pitch cone parameters

Symbol	Description	Method 0	Method 1	Method 2	Method 3
Σ	Shaft angle	X	90°	X	X
a	Hypoid offset	0,0	15 mm	X	X
$z_{1,2}$	Number of teeth	X	13/42	X	X
d_{m2}	Mean pitch diameter of wheel	—	—	X	—
d_{e2}	Outer pitch diameter of wheel	X	170 mm	—	X
b_2	Wheel facewidth	X	30 mm	X	X
β_{m1}	Mean spiral angle of pinion	—	50°	—	—
β_{m2}	Mean spiral angle of wheel	X	—	X	X
r_{c0}	Cutter radius	X	63,5 mm	X	X
z_0	Number of blade groups (only face hobbing)	X	—	X	X

Table B.2 — Input data for tooth profile parameters

Data type I		Data type II	
Symbol	**Description**	**Symbol**	**Description**
α_{dD}	20°		
α_{dC}	20°		
$f_{\alpha lim}$	1		
x_{hm1}	—	c_{ham}	0,35
k_{hap}	—	k_d	2,000
k_{hfp}	—	k_c	0,125
x_{smn}	—	k_t W_{m2}	0,1 —
j_{et2}	0,2 mm		
θ_{a2}	1°		
θ_{f2}	4°		
ρ_{a01}	0,8 mm		
ρ_{a02}	1,2 mm		
$s_{pr1D,C}$	0 mm/0 mm		
$s_{pr2D,C}$	0 mm/0 mm		

Table B.3 and Table B.4 show geometric and operational data and text for explanation.

Table B.3 — Geometric data from calculation according to ISO 23509

Symbol	Description	Values	Symbol	Description	Value
$d_{m1,2}$	Mean pitch diameter of pinion/wheel	53,384 mm/ 141,877 mm	ζ_{mp}	Offset angle in pitch plane	11,390°
$h_{am1,2}$	Mean addendum of pinion/wheel	3,432 mm/ 1,848 mm	ζ_R	Pinion offset angle in root plane	10,319°
$h_{fm1,2}$	Mean dedendum of pinion/wheel	2,508 mm/ 4,092 mm	$R_{e1,2}$	Outer cone distance on pinion/wheel	89,600 mm/ 91,470 mm
$\alpha_{eD,C}$	Effective pressure angle for drive side/coast side	20°/20°	$R_{m1,2}$	Mean cone distance on pinion/wheel	73,511 mm/ 76,338 mm
$\alpha_{nD,C}$	Generated pressure angle for drive side/coast side	17,748°/ 22,252°	$\delta_{1,2}$	Pitch angle on pinion/wheel	21,291°/ 68,321°
α_{lim}	Limit pressure angle	−2,252°	$\delta_{a1,2}$	Face angle on pinion/wheel	25,234°/ 69,321°
m_{mn}	Mean normal module	2,640 mm	$\delta_{f1,2}$	Root angle on pinion/wheel	20,305°/ 64,321°
k_{hfp}	Basic crown gear dedendum factor	1,25	$x_{sm1,2}$	Thickness modification coefficient on pinion/wheel	0,038/ −0,062
ζ_m	Pinion offset angle in axial plane	10,603°	m_{et2}	Outer transverse module	4,048 mm
$s_{mn1,2}$	Mean normal circular tooth thickness of pinion/wheel	4,922 mm/ 3,241 mm	—		

Table B.4 — Operation parameters and additional considerations

Symbol	Description	Value
Additional data		
	Wheel profile	Generated
	Roughing/finishing method	Face milling
$b_{2\text{eff}}$	Effective facewidth on wheel	$0{,}85 \cdot b_2$
	Profile crowning	Low
	Verification of contact pattern	Checked under light test load for each gear
	Mounting conditions of pinion and wheel	One member cantilever–mounted
Operation parameters		
T_1	Pinion torque	250 Nm
n_1	Pinion rotational speed	1 200 min^{-1}
K_A	Application factor	1,1
Active flank		Drive
Material data for pinion and wheel (case hardened steel)		
E	Modulus of elasticity	210 000 N/mm^2
ν	Poisson's ratio	0,3
$\sigma_{\text{H lim}}$	Allowable stress number (contact)	1 500 N/mm^2
$\sigma_{\text{F lim}}$	Nominal stress number (bending)	480 N/mm^2
Surface hardness		Same for pinion and wheel
Quality parameters		
R_z	Flank roughness on pinion/wheel	8 µm/8 µm
R_z	Tooth root roughness on pinion/wheel	16 µm/16 µm
f_pt	Single pitch deviation on pinion/wheel	11,6 µm/23,5 µm
Lubrication parameters		
Oil type		ISO-VG-150
Oil temperature		90 °C

B.2 Calculation of Sample 2 according to Method B1

Table B.5 — Virtual cylindrical gears

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Virtual cylindrical gears in transverse section					
Reference diameter on pinion	$d_{v1} = \dfrac{d_{m1}}{\cos\delta_1}$	57,294 mm	E: A.1		
Reference diameter on wheel	$d_{v2} = \dfrac{d_{m2}}{\cos\delta_2}$	384,065 mm	E: A.1		
Number of teeth on pinion	$z_{v1} = d_{v1}/m_{vt}$	15,533	E: A.12		
Number of teeth on wheel	$z_{v2} = d_{v2}/m_{vt}$	104,125	E: A.12		
Gear ratio	$u_v = z_{v2}/z_{v1}$	6,703	E: A.13		
Helix angle	$\beta_v = \dfrac{\beta_{m1}+\beta_{m2}}{2}$	44,303°	E: A.8		
Transverse module	$m_{vt} = m_{mn}/\cos\beta_v$	3,688 mm	E: A.11		

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Transverse pressure angle of virtual cylindrical gears	$\alpha_{vet} = \arctan\left(\tan\alpha_e / \cos\beta_v\right)$ since $\alpha_e = \alpha_{eD}$ for drive side	26,957°	E: A.10		
Auxiliary angle for virtual facewidth	$\vartheta_{mp} = \arctan\left(\sin\delta_2 \cdot \tan\zeta_m\right)$	9,868°	E: A.21		
Projected auxiliary angle for length of contact line	$\gamma' = \vartheta_{mp} - \zeta_{mp}/2$	4,173°	E: A.20		
Centre distance of virtual cylindrical gear pair	$a_v = \left(d_{v1} + d_{v2}\right) / 2$	220,680 mm	E: A.5		
Helix angle of virtual cylindrical gear at base circle	$\beta_{vb} = \arcsin\left(\sin\beta_v \cos\alpha_e\right)$ since $\alpha_e = \alpha_{eD}$ for drive side	41,021°	E: A.16		
Tip diameter on pinion	$d_{va1} = d_{v1} + 2\,h_{am1}$	64,158 mm	E: A.6		
Tip diameter on wheel	$d_{va2} = d_{v2} + 2\,h_{am2}$	387,761 mm	E: A.6		
Root diameter on pinion	$d_{vf1} = d_{v1} - 2\,h_{fm1}$	52,279 mm	E: A.7		
Root diameter on wheel	$d_{vf2} = d_{v2} - 2\,h_{fm2}$	375,881 mm	E: A.7		
Base diameter on pinion	$d_{vb1} = d_{v1} \cos\alpha_{vet}$	51,069 mm	E: A.9		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Base diameter on wheel	$d_{vb2} = d_{v2} \cdot \cos\alpha_{vet}$	342,334 mm	E: A.9		
Transverse base pitch	$p_{vet} = \pi \cdot m_{mn} \cdot \cos\alpha_{vet} / \cos\beta_{v}$	10,329 mm	E: A.17		
Length of path of contact of virtual cylindrical gear in transverse section	$g_{v\alpha} = \frac{1}{2} \cdot \left[\left(\sqrt{d_{va1}^2 - d_{vb1}^2} - d_{v1} \cdot \sin\alpha_{vet} \right) + \left(\sqrt{d_{va2}^2 - d_{vb2}^2} - d_{v2} \cdot \sin\alpha_{vet} \right) \right]$	10,435 mm	E: A.18		
Transverse contact ratio	$\varepsilon_{v\alpha} = g_{v\alpha} / p_{vet}$	1,010	E: A.23		
Effective facewidth with $b_{2\,eff} = 0{,}85 \cdot b_2$	$b_{v,eff} = \frac{\left(b_{2,eff} / \cos(\zeta_{mp}/2) - g_{v\alpha} \cdot \cos\alpha_{vet} \cdot \tan(\zeta_{mp}/2)\right)}{1 - \tan\gamma' \cdot \tan(\zeta_{mp}/2)}$	24,880 mm	E: A.19		
Facewidth	$b_{v} = b_2 \cdot \frac{b_{v,eff}}{b_{2,eff}}$	29,271 mm	E: A.22		
Virtual cylindrical gears in normal section					
Number of pinion teeth of virtual cylindrical gears	$z_{vn1} = \frac{z_{v1}}{\cos^2\beta_{vb} \cdot \cos\beta_{v}}$	38,131	E: A.41		
Number of wheel teeth of virtual cylindrical gears	$z_{vn2} = u_{v} \cdot z_{vn1}$	255,605	E: A.42		
Reference diameter on pinion	$d_{vn1} = z_{vn1} \cdot m_{mn}$	100,653 mm	E: A.43		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Reference diameter on wheel	$d_{vn2} = z_{vn2} \cdot m_{mn}$	674,716 mm	E: A.43		
Tip diameter on pinion	$d_{van1} = d_{vn1} + 2 \cdot h_{am1}$	107,517 mm	E: A.44		
Tip diameter on wheel	$d_{van2} = d_{vn2} + 2 \cdot h_{am2}$	678,412 mm	E: A.44		
Base diameter on pinion	$d_{vbn1} = d_{vn1} \cdot \cos\alpha_e$	94,583 mm	E: A.45		
Base diameter on wheel	$d_{vbn2} = d_{vn2} \cdot \cos\alpha_e$	634,026 mm	E: A.45		
Face contact ratio	$\varepsilon_{v\beta} = \dfrac{b_{v,eff} \cdot \sin\beta_v}{\pi \cdot m_{mn}}$	2,096	E: A.24		
Virtual contact ratio	$\varepsilon_{v\gamma} = \varepsilon_{v\alpha} + \varepsilon_{v\beta}$	3,106	E: A.25		
Inclination angle of contact line	$\beta_B = \arctan(\tan\beta_v \cdot \sin\alpha_e)$	18,459°	E: A.38		
Radius of relative curvature in normal section at the mean point	$\rho_t = \left[\dfrac{1}{\cos\alpha_{nD} \cdot (\tan\alpha_{nD} - \tan\alpha_{lim}) + \tan\zeta_{mp} \cdot \tan\beta_B} \cdot \dfrac{\cos\beta_{m1} \cdot \cos\beta_{m2}}{\cos\zeta_{mp}} \cdot \left(\dfrac{1}{R_{m2} \cdot \tan\delta_2} + \dfrac{1}{R_{m1} \cdot \tan\delta_1}\right)\right]^{-1}$	19,924 mm	E: A.39		
Radius of relative curvature vertical to the contact line	$\rho_{rel} = \lvert\rho_t\rvert \cdot (\cos\beta_B)^2$	17,926 mm	E: A.37		

Table B.6 — General influence factors

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Nominal tangential force of bevel gears	$F_{mt1} = \frac{2\,000 \cdot T_1}{d_{m1}}$	9 366,1 N	E: 1		
Nominal tangential force of virtual cylindrical gears	$F_{vmt} = F_{mt1} \cdot \frac{\cos \beta_v}{\cos \beta_{m1}}$	10 427,4 N	E: 2		
Nominal tangential speed at mean point of the pinion	$v_{mt1} = \frac{d_{m1} \cdot n_1}{19\,098}$	3,354 m/s	E: 5		
Nominal tangential speed at mean point of the wheel	$v_{mt2} = \frac{d_{m2} \cdot n_2}{19\,098}$	2,759 m/s	E: 5		
Correction factor for non-average conditions for $F_{vmt} K_A / b_{veff} \geq$ 100 N/mm	C_F	1,0	E: 12		
Mean value of mesh stiffness per unit facewidth	$c_\gamma = c_{\gamma 0} \cdot C_F$	20 N/(mm·µm)	E: 11		
Single stiffness	$c' = c'_0 \cdot C_F$	14 N/(mm·µm)	E: 18		
Single pitch deviation	f_{pt}	23,5 µm			

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Running-in allowance for case hardened and nitrided gears	$y_\alpha = 0{,}075 \cdot f_{\mathrm{pt}}$	1,763 µm	E: 51		
Effective pitch deviation with $y_{\mathrm{p}} = y_\alpha$	$f_{\mathrm{p,eff}} = f_{\mathrm{pt}} - y_{\mathrm{p}}$	21,737 µm	E: 17		
Relative pinion mass per unit facewidth reduced to the line of action	$m_1^* = \frac{1}{8} \cdot \rho \cdot \pi \cdot \frac{d_{\mathrm{m1}}^2}{\cos^2[(\alpha_{\mathrm{nD}} + \alpha_{\mathrm{nC}})/2]}$ where ρ is the density of the gear material (for steel ρ = 7,86·10^{-6} kg/mm^3)	0,010 kg/mm	E: 14		
Relative wheel mass per unit facewidth reduced to the line of action	$m_2^* = \frac{1}{8} \cdot \rho \cdot \pi \cdot \frac{d_{\mathrm{m2}}^2}{\cos^2[(\alpha_{\mathrm{nD}} + \alpha_{\mathrm{nC}})/2]}$ where ρ is the density of the gear material (for steel ρ = 7,86·10^{-6} kg/mm^3)	0,067 kg/mm	E: 14		
Mass reduced to the line of action of the dynamically equivalent cylindrical gear pair	$m_{\mathrm{red}} = \frac{m_1^* \cdot m_2^*}{m_1^* + m_2^*}$	0,008 kg/mm	E: 10		
Resonance speed of pinion	$n_{\mathrm{E1}} = \frac{30 \cdot 10^3}{\pi \cdot z_1} \cdot \sqrt{\frac{c_\gamma}{m_{\mathrm{red}}}}$	36 000,6 min^{-1}	E: 9		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Dimensionless reference speed	$N = \frac{n_1}{n_{E1}}$	0,033	E: 8		
For virtual contact ratio, $\varepsilon_{v\gamma} = 3{,}105 > 2$	$c_{v1,2} = c_{v1} + c_{v2}$	0,523	T: 3		
	c_{v3}	0,062	T: 3		
	c_{v4}	0,249	T: 3		
	$c_{v5,6}$	0,558	T: 3		
	c_{v7}	0,834	T: 3		
Constant factor for calculating the dynamic factor with K_A = 1,1 as given in Table B.4	$K = \frac{b_v \cdot f_{p,eff} \cdot c'}{F_{vmt} \cdot K_A} \cdot c_{v1,2} + c_{v3}$	0,468	E: 16		
Dynamic factor	$K_{v-B} = N \cdot K + 1$	1,016	E: 15		
Determination of the length of contact lines					
For virtual contact ratio, $\varepsilon_{v\beta} = 2{,}095$, $\varepsilon_{v\beta} \geq 1$	$f_t = +p_{vet} \cos\beta_{vb}$	7,793 mm	T: A.2		
	f_m	0,0 mm	T: A.2		
	$f_r = -p_{vet} \cos\beta_{vb}$	−7,793 mm	T: A.2		

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Maximum distances from middle contact line	$f_{\text{maxB}} = \frac{1}{2} \cdot \left[g_{\text{v}\alpha} + b_{\text{v,eff}} \cdot (\tan\gamma + \tan\beta_{\text{vb}}) \right] \cdot \cos\beta_{\text{vb}}$	12,869 mm	E: A.33		
	$f_{\text{max0}} = \frac{1}{2} \cdot \left[g_{\text{v}\alpha} - b_{\text{v,eff}} \cdot (\tan\gamma + \tan\beta_{\text{vb}}) \right] \cdot \cos\beta_{\text{vb}}$	−4,997 mm	E: A.34		
	fmax = fmaxB since fmaxB > fmax0	12,869 mm			
Theoretical length of contact line	$l_{\text{b0}} = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$	14,531 mm	E: A.32		
Theoretical length of middle contact line calculated with $f = f_{\text{m}}$ for contact stress as specified in ISO 10300−2:2023, 6.1	$x_1 = \dfrac{f \cdot \cos\beta_{\text{vb}} + \tan\beta_{\text{vb}} \cdot \left(f \cdot \sin\beta_{\text{vb}} + \frac{b_{\text{v,eff}}}{2} \right) + \frac{1}{2} \cdot (g_{\text{v}\alpha} + b_{\text{v,eff}} \cdot \tan\gamma)}{\tan\gamma + \tan\beta_{\text{vb}}}$	17,922 mm	E: A.29		
	$x_2 = \dfrac{f \cdot \cos\beta_{\text{vb}} + \tan\beta_{\text{vb}} \cdot \left(f \cdot \sin\beta_{\text{vb}} + \frac{b_{\text{v,eff}}}{2} \right) - \frac{1}{2} \cdot (g_{\text{v}\alpha} - b_{\text{v,eff}} \cdot \tan\gamma)}{\tan\gamma + \tan\beta_{\text{vb}}}$	6,959 mm	E: A.30		
	$y_1 = -x_1 \cdot \tan\beta_{\text{vb}} + f \cdot \cos\beta_{\text{vb}} + \tan\beta_{\text{vb}} \cdot \left(f \cdot \sin\beta_{\text{vb}} + \frac{b_{\text{v,eff}}}{2} \right)$	−4,769 mm	E: A.31		
	$y_2 = -x_2 \cdot \tan\beta_{\text{vb}} + f \cdot \cos\beta_{\text{vb}} + \tan\beta_{\text{vb}} \cdot \left(f \cdot \sin\beta_{\text{vb}} + \frac{b_{\text{v,eff}}}{2} \right)$	4,769 mm	E: A.31		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Correction factor	$C_{\text{lb}} = \sqrt{\left(1 - \left(\frac{f}{f_{\max}}\right)^2\right) \cdot \left(1 - \sqrt{\frac{b_{\text{v,eff}}}{b_{\text{v}}}}\right)^2}$	0,078	E: A.36		
Length of contact line	$l_{\text{bm}} = l_{\text{b0}} \cdot (1 - C_{\text{lb}})$	13,397 mm	E: A.26		
Load sharing factor					
Exponent for calculation of parabolic distribution of peak loads	e_{LS}	3		T: 5	
Related peak load	$p^* = 1 - \left(\frac{\lvert f \rvert}{\lvert f_{\max} \rvert}\right)^{e_{\text{LS}}}$	—		E: 7 F: 2	
Related peak load at tip contact line	$p_{\text{t}}^* = 1 - \left(\frac{\lvert f_{\text{t}} \rvert}{\lvert f_{\max} \rvert}\right)^{e_{\text{LS}}}$	0,778			
Related peak load at middle contact line	$p_{\text{m}}^* = 1 - \left(\frac{\lvert f_{\text{m}} \rvert}{\lvert f_{\max} \rvert}\right)^{e_{\text{LS}}}$	1,0			

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Related peak load at root contact line	$p_{\mathrm{r}}{}^{*} = 1 - \left(\frac{\lvert f_{\mathrm{r}} \rvert}{\lvert f_{\max} \rvert} \right)^{e_{\mathrm{LS}}}$	0,778			
Related area	$A^{*} = \frac{1}{4} \cdot p^{*} \cdot l_{\mathrm{b}} \cdot \pi$	—		E: 8 F: 2	
Related area at tip contact line	$A_{t}^{*} = \frac{1}{4} p_{t}^{*} \cdot l_{\mathrm{bt}} \cdot \pi$	5,370 mm			
Related area at middle contact line	$A_{m}^{*} = \frac{1}{4} p_{m}^{*} \cdot l_{\mathrm{bm}} \cdot \pi$	10,522 mm			
Related area at root contact line	$A_{r}^{*} = \frac{1}{4} p_{r}^{*} \cdot l_{\mathrm{br}} \cdot \pi$	5,370 mm			
Load sharing factor	$Z_{\mathrm{LS}} = \sqrt{\frac{A_{\mathrm{m}}^{*}}{A_{\mathrm{t}}^{*} + A_{\mathrm{m}}^{*} + A_{\mathrm{r}}^{*}}}$	0,703		E: 10	
Face load factors (Calculation according to Method C)					
Load distribution factor	$K_{\mathrm{H}\beta\mathrm{-C}} = 1{,}5 \cdot K_{\mathrm{H}\beta\mathrm{-be}}$	1,65	E: 28		
with	$K_{\mathrm{H}\beta\mathrm{-be}}$	1,100	T: 4		
Load distribution factor	$K_{\mathrm{F}\beta\mathrm{-C}} = K_{\mathrm{H}\beta\mathrm{-C}} / K_{\mathrm{F0}}$	1,556	E: 32		
with	K_{F0}	1,060	E: 33		

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Transverse load factors (Calculation according to Method B)					
Determinant tangential force at mid face width on the pitch cone	$F_{\mathrm{mtH}} = F_{\mathrm{vmt}} \cdot K_{\mathrm{A}} \cdot K_{\mathrm{v}} \cdot K_{\mathrm{H}\beta}$	18 925,8 N	E: 47		
Transverse load factors for bevel gear with virtual contact ratio $\varepsilon_{\mathrm{v}\gamma}$ = 3,106 > 2	$K^*_{\mathrm{H}\alpha-\mathrm{B}} = K^*_{\mathrm{F}\alpha-\mathrm{B}} = 0,9 + 0,4 \cdot \sqrt{\frac{2 \cdot \left(\varepsilon_{\mathrm{v}\gamma} - 1\right)}{\varepsilon_{\mathrm{v}\gamma}} \cdot \frac{c_\gamma \cdot \left(f_{\mathrm{pt}} - y_\alpha\right)}{F_{\mathrm{mtH}} / b_{\mathrm{v}}}}$	0,900	E: 48		
Relative hypoid offset	$a_{\mathrm{rel}} = \frac{2 \cdot \lvert a \rvert}{d_{\mathrm{m2}}}$	0,211	E: 41		
Transverse load factors	$K_{\mathrm{H}\alpha} = K_{\mathrm{F}\alpha} = K^*_{\mathrm{H}\alpha} - \frac{K^*_{\mathrm{H}\alpha} - 1}{0,1} \cdot a_{\mathrm{rel}}$ since $K_{\mathrm{H}\alpha} \geq 1,0$	1,000	E: 40		

Table B.7 — Calculation of surface durability (macropitting)

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Z-factors					
Factors for calculation of mid-zone factor for $\varepsilon_{v\beta}$ = 2,095 ≥ 1	$F_1 = \varepsilon_{v\alpha}$	1,010		T: 4	
	$F_2 = \varepsilon_{v\alpha}$	1,010		T: 4	
Mid-zone factor	$Z_{M-B} = \dfrac{\tan\alpha_{vet}}{\sqrt{\left[\sqrt{\left(\dfrac{d_{va1}}{d_{vb1}}\right)^2 - 1} - F_1 \cdot \dfrac{\pi}{z_{v1}}\right] \cdot \left[\sqrt{\left(\dfrac{d_{va2}}{d_{vb2}}\right)^2 - 1} - F_2 \cdot \dfrac{\pi}{z_{v2}}\right]}}$	0,963		E: 6	
Elasticity factor	$Z_E = \sqrt{\dfrac{1}{\pi \cdot \left[\dfrac{\left(1-\nu_1^2\right)}{E_1} + \dfrac{\left(1-\nu_2^2\right)}{E_2}\right]}}$	191,646 $(N/mm^2)^{1/2}$		E: 51	
Bevel gear factor	Z_{KP}	1,2		E: 11	
Lubricant factor	$C_{ZL} = 0{,}08 \cdot \dfrac{\sigma_{H,lim} - 850}{350} + 0{,}83$ using σ_{Hlim} = 1 200 N/mm², which is the upper allowed limit in the above formula.	0,910		E: 55	
Lubricant factor	$Z_L = C_{ZL} + \dfrac{4 \cdot (1{,}0 - C_{ZL})}{\left(1{,}2 + \dfrac{134}{\nu_{40}}\right)^2}$	0,992		E: 54	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Speed factor	$C_{ZV} = 0{,}08 \cdot \frac{\sigma_{H,lim} - 850}{350} + 0{,}85$ using $\sigma_{H,lim}$ = 1 200 N/mm², which is the upper allowed limit in the above formula.	0,930		E: 57	
	$Z_v = C_{ZV} + \frac{2 \cdot (1{,}0 - C_{ZV})}{\sqrt{0{,}8 + \frac{32}{v_{mt2}}}}$	0,970		E: 56	
Roughness factor with the radius of relative curvature $\rho = \rho_{rel}$ = 17,93 mm for Method B1 (see ISO 10300–1:2023, Annex A)	$Rz_{10} = \frac{Rz_1 + Rz_2}{2} \cdot \sqrt[3]{\frac{10}{\rho}}$	6,586 µm		E: 58	
	$C_{ZR} = 0{,}12 + \frac{1\ 000 - \sigma_{H,lim}}{5\ 000}$ using $\sigma_{H,lim}$ = 1 200 N/mm², which is the upper allowed limit in the above formula.	0,080		E: 60	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Roughness factor with the radius of relative curvature $\rho = \rho_{rel}$ = 17,93 mm for Method B1 (see ISO 10300–1:2023, Annex A)	$Z_R = \left(\frac{3}{Rz_{10}} \right)^{C_{ZR}}$	0,939		E: 59	
Product of the lubricant influence factors	$Z_L Z_V Z_R$	0,903			
Size factor	Z_X for Method B1 (see ISO 10300–2:2023, 6.5.2)	1,0			
Hypoid factor	$Z_{Hyp} = 1 - 0,3 \cdot \left(\frac{v_{g,par}}{v_{\Sigma,vert}} - 0,15 \right)$	0,952		E: 12	
Life factor for pinion	$Z_{NT,1}$	1,0		T: 6	
Life factor for wheel	$Z_{NT,2}$	1,0		T: 6	
Work hardening factor	Set $Z_{W,1} = Z_{W,2}$ = 1,0 because pinion and wheel with equal hardness.	1,0			
Contact stress formula					
Nominal normal force of the virtual cylindrical gear at mean point P	$F_n = \frac{F_{mt1}}{\cos \alpha_{nD} \cdot \cos \beta_{m1}}$ NOTE ISO 10300-2:2023, Formula (3) contains a misprint. The correct formula has been applied to this sample calculation.	15 298,7 N		E: 3	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Nominal value of the contact stress	$\sigma_{\mathrm{H0-B1}} = \sqrt{\frac{F_{\mathrm{n}}}{l_{\mathrm{bm}} \cdot \rho_{\mathrm{rel}}}} Z_{\mathrm{M-B}} \cdot Z_{\mathrm{LS}} \cdot Z_{\mathrm{E}}$	1 036,3 N/mm²		E: 2	
Contact stress	$\sigma_{\mathrm{H-B1}} = \sigma_{\mathrm{H0-B1}} \cdot \sqrt{K_{\mathrm{A}} \cdot K_{\mathrm{v}} \cdot K_{\mathrm{H}\beta} \cdot K_{\mathrm{H}\alpha}}$	1 396,1 N/mm²		E: 1	
Permissible contact stress	$\sigma_{\mathrm{HP-B1}} = \sigma_{\mathrm{H,lim}} \cdot Z_{\mathrm{NT}} \cdot Z_{\mathrm{X}} \cdot Z_{\mathrm{L}} \cdot Z_{\mathrm{v}} \cdot Z_{\mathrm{R}} \cdot Z_{\mathrm{W}} \cdot Z_{\mathrm{KP}} \cdot Z_{\mathrm{Hyp}}$	1 548,9 N/mm²		E: 4	
Calculated safety factor for contact stress (macropitting) on pinion and wheel	$S_{\mathrm{H1,2-B1}} = \frac{\sigma_{\mathrm{HP1,2-B1}}}{\sigma_{\mathrm{H1,2-B1}}}$	1,109		E: 5	

Table B.8 — Calculation of tooth root strength for pinion

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Y–factors					
Load sharing factor	$Y_{LS} = Z_{LS}^2$	0,495			E: 36
Geometry values for pinion according to Tables B.2 and B.3	$h_{a0} = h_{fp} = k_{hfp}\, m_{mn}$	3,300 mm			F: 2
Parameters for pinion	$E_{1,D} = \left(\frac{\pi}{4} - x_{sm1}\right) \cdot m_{mn} - h_{a0} \cdot \tan\alpha_{eD} - \frac{\rho_{a01,D} \cdot (1 - \sin\alpha_{eD}) - s_{pr1,D}}{\cos\alpha_{eD}}$	0,213			E: 7
	$E_{1,C} = \left(\frac{\pi}{4} - x_{sm1}\right) \cdot m_{mn} - h_{a0} \cdot \tan\alpha_{eC} - \frac{\rho_{a01,C} \cdot (1 - \sin\alpha_{eC}) - s_{pr1,C}}{\cos\alpha_{eC}}$	0,213			E: 7
	$G_{1,D} = \frac{\rho_{a01,D}}{m_{mn}} - \frac{h_{a0}}{m_{mn}} + x_{hm1}$	−0,647			E: 8
	$G_{1,C} = \frac{\rho_{a01,C}}{m_{mn}} - \frac{h_{a0}}{m_{mn}} + x_{hm1}$	−0,647			E: 8
	$H_{1,D} = \frac{2}{z_{vn1,D}} \cdot \left(\frac{\pi}{2} - \frac{E_{1,D}}{m_{mn}}\right) - \frac{\pi}{3}$	−0,969			E: 9

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$H_{1,C} = \frac{2}{z_{vn1,C}} \cdot \left(\frac{\pi}{2} - \frac{E_{1,C}}{m_{mn}}\right) - \frac{\pi}{3}$	−0,969			E: 9
Iteration starting with $\vartheta = \pi/6$ until $(\vartheta_{new} - \vartheta)$ < 0,000 001	$\vartheta_{1,D,C} = \frac{2 \cdot G_{1,D,C}}{z_{vn1,D,C}} \cdot \tan\vartheta_{1,D,C} - H_{1,D,C}$	Initial: 54,399°			E: 10
		Final: 52,945°			E: 10
Tooth root chordal thickness on drive side	$s_{Fn1,D} = m_{mn} \cdot z_{vn1,D} \cdot \sin\left(\frac{\pi}{3} - \vartheta_{1,D}\right) + m_{mn} \cdot \sqrt{3} \cdot \left(\frac{G_{1,D}}{\cos\vartheta_{1,D}} - \frac{\rho_{a01,D}}{m_{mn}}\right)$	6,065 mm			E: 11
Tooth root chordal thickness on coast side	$s_{Fn1,C} = m_{mn} \cdot z_{vn1,C} \cdot \sin\left(\frac{\pi}{3} - \vartheta_{1,C}\right) + m_{mn} \cdot \sqrt{3} \cdot \left(\frac{G_{1,C}}{\cos\vartheta_{1,C}} - \frac{\rho_{a01,C}}{m_{mn}}\right)$	6,065 mm			E: 11
Tooth root chord	$s_{Fn1} = 0{,}5 \cdot s_{Fn1,D} + 0{,}5 \cdot s_{Fn1,C}$	6,065 mm			E: 12
Fillet radius at contact point of 30° tangent on drive side	$\rho_{F1,D} = \rho_{a01,D} + \frac{2 \cdot G_{1,D}^2 \cdot m_{mn}}{\cos\vartheta_{1,D} \cdot \left(z_{vn1,D} \cdot (\cos\vartheta_{1,D})^2 - 2 \cdot G_{1,D}\right)}$	1,042 mm			E: 13
Normal pressure angle at tooth tip on drive side	$\alpha_{an1,D} = \arccos\left(\frac{d_{vbn1,D}}{d_{van1,D}}\right)$	28,393°			E: 16
Auxiliary angle for tooth form and	$\gamma_{a1,D} = \frac{1}{z_{vn1,D}} \cdot \left[\frac{\pi}{2} + 2(x_{hm1} \cdot \tan\alpha_{eD} + x_{sm1})\right] + \mathrm{inv}\alpha_{eD} - \mathrm{inv}\alpha_{an1,D}$	1,078°			E: 17

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
tooth correction factor on drive side					
Load application angle at tooth tip of virtual cylindrical gear on drive side	$\alpha_{\mathrm{Fan1,D}} = \alpha_{\mathrm{an1,D}} - \gamma_{\mathrm{a1,D}}$	27,315°			E: 15
Bending moment arm on drive side	$h_{\mathrm{Fa1,D}} =$ $\frac{m_{\mathrm{mn}}}{2} \cdot \left[\left(\cos \gamma_{\mathrm{a1,D}} - \sin \gamma_{\mathrm{a1,D}} \cdot \tan \alpha_{\mathrm{Fan1,D}} \right) \cdot \frac{d_{\mathrm{van1,D}}}{m_{\mathrm{mn}}} - z_{\mathrm{vn1,D}} \cdot \cos \left(\frac{\pi}{3} - \vartheta_{\mathrm{1,D}} \right) - \frac{G_{\mathrm{1,D}}}{\cos \vartheta_{\mathrm{1,D}}} + \frac{\rho_{\mathrm{a01,D}}}{m_{\mathrm{mn}}} \right]$	5,098 mm			E: 14
Tooth form factor on drive side	$Y_{\mathrm{Fa1,D}} = \frac{6 \cdot \frac{h_{\mathrm{Fa1,D}}}{m_{\mathrm{mn}}} \cdot \cos \alpha_{\mathrm{Fan1,D}}}{\left(\frac{s_{\mathrm{Fn1}}}{m_{\mathrm{mn}}} \right)^2 \cdot \cos \alpha_{\mathrm{n1,D}}}$	2,047			E: 6

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Stress correction factor on drive side	$L_{a1,D} = \frac{s_{Fn1}}{h_{Fa1,D}}$	1,190			E: 25
	$q_{s1,D} = \frac{s_{Fn1}}{2\rho_{F1,D}}$	2,910			E: 26
	$Y_{Sa1,D} = \left(1,2+0,13 \cdot L_{a1,D}\right) \cdot q_{s1,D}^{\left(\frac{1}{1,21+2,3/L_{a1,D}}\right)}$	1,903			E: 24
Relative surface condition factor for Rz = 16 µm and through hardened and case hardened steels	$Y_{R,relT} = \frac{Y_R}{Y_{RT}} = 1,674 - 0,529 \cdot (Rz+1)^{1/10}$	0,972			E: 40
Life factor for pinion	$Y_{NT,1}$	1,000			T: 4
Stress correction factor	Y_{ST}	2,000			E: 4
Size factor	$Y_X = 1,05 - 0,01 m_{mn}$ Set $Y_X = 1,0$ since range is $0,8 \le Y_X \le 1,0$.	1,000			E: 209
Bevel spiral angle factor using l_{bm} according to Table B.6 for l_{bb}	$Y_{BS} = \frac{a_{BS}}{c_{BS}}\left(\frac{l_{bb}}{b_a} - 1,05 \cdot b_{BS}\right)^2 + 1$	1,909			E: 30

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
where	$b_a = b_v / \cos \beta_v$	40,901 mm			E: 34
	$l_{bb} = l_{bm} \cdot \dfrac{\cos \beta_{vb}}{\cos \beta_v}$	14,123 mm			E: 35
Relative notch sensitivity factor	$Y_{\delta,relT1} = \dfrac{1+\sqrt{\rho' \cdot \chi_1^X}}{1+\sqrt{\rho' \cdot \chi_T^X}}$	1,004			E: 43
Contact ratio factor, Y_ε, for $\varepsilon_{v\beta} = 2{,}095 > 1$	Y_ε	0,625			E: 29
Tooth root stress formula for pinion					
Nominal tooth root stress	$\sigma_{F01\text{-}B1} = \dfrac{F_{vmt}}{b_v \cdot m_{mn}} \cdot Y_{Fa} \cdot Y_{Sa} \cdot Y_\varepsilon \cdot Y_{BS} \cdot Y_{LS}$	310,4 N/mm^2			E: 2
Local tooth root stress	$\sigma_{F1\text{-}B1} = \sigma_{F0\text{-}B1} \cdot K_A \cdot K_v \cdot K_{F\beta} \cdot K_{F\alpha}$	531,5 N/mm^2			E: 1
Permissible tooth root stress	$\sigma_{FP\text{-}B1} = \sigma_{F,lim} \cdot Y_{ST} \cdot Y_{NT} \cdot Y_{\delta,relT\text{-}B1} \cdot Y_{R,relT\text{-}B1} \cdot Y_X$	936,4 N/mm^2			E: 4
Calculated safety for tooth root strength on pinion	$S_{F1\text{-}B1} = \dfrac{\sigma_{FP1\text{-}B1}}{\sigma_{F1\text{-}B1}}$	1,762			E: 5

Table B.9 — Calculation of tooth root strength for wheel

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Y–factors different from pinion					
Geometry values for wheel according to Tables B.2 and B.3	$h_{a0} = h_{fp} = k_{hfp}\, m_{mn}$	3,300 mm			F: 2
Parameters for wheel	$E_{2,D} = \left(\frac{\pi}{4} - x_{sm2}\right) \cdot m_{mn} - h_{a0} \cdot \tan\alpha_{eD} - \frac{\rho_{a02,D} \cdot (1-\sin\alpha_{eD}) - s_{pr2,D}}{\cos\alpha_{eD}}$	0,197 mm			E: 7
	$E_{2,C} = \left(\frac{\pi}{4} - x_{sm2}\right) \cdot m_{mn} - h_{a0} \cdot \tan\alpha_{eC} - \frac{\rho_{a02,C} \cdot (1-\sin\alpha_{eC}) - s_{pr2,C}}{\cos\alpha_{eC}}$	0,197 mm			E: 7
	$G_{2,D} = \frac{\rho_{a02,D}}{m_{mn}} - \frac{h_{a0}}{m_{mn}} + x_{hm2}$	−1,095			E: 8
	$G_{2,C} = \frac{\rho_{a02,C}}{m_{mn}} - \frac{h_{a0}}{m_{mn}} + x_{hm2}$	−1,095			E: 8
	$H_{2,D} = \frac{2}{z_{vn2,D}} \cdot \left(\frac{\pi}{2} - \frac{E_{2,D}}{m_{mn}}\right) - \frac{\pi}{3}$	−1,035			E: 9
	$H_{2,C} = \frac{2}{z_{vn2,C}} \cdot \left(\frac{\pi}{2} - \frac{E_{2,C}}{m_{mn}}\right) - \frac{\pi}{3}$	−1,035			E: 9

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Iteration starting with $\vartheta = \pi/6$ until $(\vartheta_{new} - \vartheta) < 0{,}000\,001$	$\vartheta_{D,C} = \frac{2 \cdot G_{D,C}}{z_{vnD,C}} \cdot \tan \vartheta_{D,C} - H_{D,C}$	Initial: 59,046°			E: 10
		Final: 58,527°			E: 10
Tooth root chordal thickness on drive side	$s_{Fn2,D} = m_{mn} \cdot z_{vn2,D} \cdot \sin\left(\frac{\pi}{3} - \vartheta_{2,D}\right) + m_{mn} \cdot \sqrt{3} \cdot \left(\frac{G_{2,D}}{\cos \vartheta_{2,D}} - \frac{\rho_{a02,D}}{m_{mn}}\right)$	5,674 mm			E: 11
Tooth root chordal thickness on coast side	$s_{Fn2,C} = m_{mn} \cdot z_{vn2,C} \cdot \sin\left(\frac{\pi}{3} - \vartheta_{2,C}\right) + m_{mn} \cdot \sqrt{3} \cdot \left(\frac{G_{2,C}}{\cos \vartheta_{2,C}} - \frac{\rho_{a02,C}}{m_{mn}}\right)$	5,674 mm			E: 11
Tooth root chord	$s_{Fn2} = 0{,}5 \cdot s_{Fn2,D} + 0{,}5 \cdot s_{Fn2,C}$	5,674 mm			E: 12
Fillet radius at contact point of 30° tangent	$\rho_{F2,D} = \rho_{a02,D} + \frac{2 \cdot G_{2,D}^2 \cdot m_{mn}}{\cos \vartheta_{2,D} \cdot \left(z_{vn2,D} \cdot \left(\cos \vartheta_{2,D}\right)^2 - 2 \cdot G_{2,D}\right)}$	1,369 mm			E: 13
Normal pressure angle at tooth tip on drive side	$\alpha_{an2,D} = \arccos\left(\frac{d_{vbn2,D}}{d_{van2,D}}\right)$	20,841°			E: 16
Auxiliary angle for tooth form and tooth correction factor on drive side	$\gamma_{a2,D} = \frac{1}{z_{vn2,D}} \cdot \left[\frac{\pi}{2} + 2\left(x_{hm2} \cdot \tan \alpha_{eD} + x_{sm2}\right)\right] + \mathrm{inv}\alpha_{eD} - \mathrm{inv}\alpha_{an2,D}$	0,159°			E: 17
Load application angle at tooth tip of virtual cylindrical gear on drive side	$\alpha_{Fan2,D} = \alpha_{an2,D} - \gamma_{a2,D}$	20,682°			E: 15

Description	Formula	Result	References to E: Formula, T: Table, F: Figure		
			ISO 10300-1	**ISO 10300-2**	**ISO 10300-3**
Bending moment arm on drive side	$h_{\mathrm{Fa2,D}} = \dfrac{m_{\mathrm{mn}}}{2} \cdot \left[\left(\cos \gamma_{\mathrm{a2,D}} - \sin \gamma_{\mathrm{a2,D}} \cdot \tan \alpha_{\mathrm{Fan2,D}} \right) \cdot \dfrac{d_{\mathrm{van2,D}}}{m_{\mathrm{mn}}} - z_{\mathrm{vn2,D}} \cdot \cos \left(\dfrac{\pi}{3} - \vartheta_{\mathrm{2,D}} \right) - \dfrac{G_{\mathrm{2,D}}}{\cos \vartheta_{\mathrm{2,D}}} + \dfrac{\rho_{\mathrm{a02,D}}}{m_{\mathrm{mn}}} \right]$	4,972 mm			E: 14
Tooth form factor on drive side	$Y_{\mathrm{Fa2,D}} = \dfrac{6 \cdot \dfrac{h_{\mathrm{Fa2,D}}}{m_{\mathrm{mn}}} \cdot \cos \alpha_{\mathrm{Fan2,D}}}{\left(\dfrac{s_{\mathrm{Fn2}}}{m_{\mathrm{mn}}} \right)^2 \cdot \cos \alpha_{\mathrm{n2,D}}}$	2,403			E: 6
Stress correction factor on drive side	$L_{\mathrm{a2,D}} = \dfrac{s_{\mathrm{Fn2}}}{h_{\mathrm{Fa2,D}}}$	1,141			E: 25
	$q_{\mathrm{s2,D}} = \dfrac{s_{\mathrm{Fn2}}}{2 \cdot \rho_{\mathrm{F2,D}}}$	2,073			E: 26
	$Y_{\mathrm{Sa2,D}} = \left(1{,}2 + 0{,}13 \cdot L_{\mathrm{a2,D}} \right) \cdot q_{\mathrm{s2,D}}^{\left(\frac{1}{1{,}21 + 2{,}3 / L_{\mathrm{a2,D}}} \right)}$	1,690			E: 24
Relative surface condition factor for Rz = 16 µm for through hardened and case hardened steels	$Y_{\mathrm{R,relT}} = \dfrac{Y_{\mathrm{R}}}{Y_{\mathrm{RT}}} = 1{,}674 - 0{,}529 \cdot \left(Rz + 1 \right)^{1/10}$	0,972			E: 40

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Bevel spiral angle factor using l_{bm} according to Table B.6 for l_{bb}	$Y_{BS} = \frac{a_{BS}}{c_{BS}} \cdot \left(\frac{l_{bb}}{b_a} - 1{,}05 \cdot b_{BS} \right)^2 + 1$	1,909			E: 30
where	$b_a = b_v / \cos \beta_v$	40,901 mm			E: 34
	$l_{bb} = l_{bm} \cdot \frac{\cos \beta_{vb}}{\cos \beta_v}$	14,123 mm			E: 35
Relative notch sensitivity factor	$Y_{\delta,relT2} = \frac{1+\sqrt{\rho' \cdot \chi_2^X}}{1+\sqrt{\rho' \cdot \chi_T^X}}$	0,996			E: 43
Contact ratio factor, Y_ε, for $\varepsilon_{v\beta}$ = 2,095 > 1	Y_ε	0,625			E: 29
Tooth root stress formula for wheel					
Nominal tooth root stress	$\sigma_{F02\text{-}B1} = \frac{F_{vmt}}{b_v \cdot m_{mn}} \cdot Y_{Fa} \cdot Y_{Sa} \cdot Y_\varepsilon \cdot Y_{BS} \cdot Y_{LS}$	323,6 N/mm^2			E: 2
Local tooth root stress	$\sigma_{F2\text{-}B1} = \sigma_{F02\text{-}B1} \cdot K_A \cdot K_v \cdot K_{F\beta} \cdot K_{F\alpha}$	554,1 N/mm^2			E: 1
Permissible tooth root stress	$\sigma_{FP2\text{-}B1} = \sigma_{F,lim} \cdot Y_{ST} \cdot Y_{NT} \cdot Y_{\delta,relT\,2\text{-}B1} \cdot Y_{R,relT\text{-}B1} \cdot Y_X$	929,0 N/mm^2			E: 4
Calculated safety for tooth root strength on wheel	$S_{F2\text{-}B1} = \frac{\sigma_{FP2\text{-}B1}}{\sigma_{F2\text{-}B1}}$	1,677			E: 5

B.3 Calculation of Sample 2 according to Method B2

Table B.10 — Calculation of surface durability (macropitting)

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula,T: Table, F: Figure		
Approximate values for application factors					
Relative facewidth	$b_{\mathrm{v,rel}} = \dfrac{b_2}{m_{\mathrm{et2}}}$	7,412	E: B.1		
Relative mean back cone distance on pinion	$R_{\mathrm{mpt1}} = \dfrac{R_{\mathrm{m1}} \cdot \tan\delta_1}{m_{\mathrm{et2}}}$	7,078	E: B.2		
Relative mean back cone distance on wheel	$R_{\mathrm{mpt2}} = \dfrac{R_{\mathrm{m2}} \cdot \tan\delta_2}{m_{\mathrm{et2}}}$	47,443	E: B.2		
Angle between direction of contact and the pitch tangent	$\cot\left(\zeta_{\mathrm{mp}} - \lambda\right) = \cot\zeta_{\mathrm{mp}} \cdot \left(1{,}0 + \dfrac{z_1 \cdot \cos\delta_2}{z_2 \cdot \cos\delta_1 \cdot \cos\zeta_{\mathrm{mp}}}\right)$	cot(10,150°)	E: B.3		
Face contact ratio for hypoid gears	$\varepsilon_{\mathrm{v}\beta} = \left[\dfrac{\cos\beta_{\mathrm{m2}}}{\cot\left(\zeta_{\mathrm{mp}} - \lambda\right)} + \sin\beta_{\mathrm{m2}}\right] \cdot \dfrac{b_2}{\pi \cdot m_{\mathrm{mn}}}$	2,763	E: B.5		
Relative mean virtual pitch radius on pinion	$r_{\mathrm{vn1}} = \dfrac{R_{\mathrm{mpt1}}}{\cos^2\beta_{\mathrm{m1}}}$	17,128	E: B.6		
Relative mean virtual pitch radius on wheel	$r_{\mathrm{vn2}} = \dfrac{R_{\mathrm{mpt2}}}{\cos^2\beta_{\mathrm{m2}}}$	77,696	E: B.6		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula,T: Table, F: Figure		
Relative centre distance	$a_{vn} = r_{vn1} + r_{vn2}$	94,824	E: B.7		
Relative mean virtual dedendum on pinion	$h_{vfm1} = h_{fm1} / m_{et2}$	0,620	E: B.8		
Relative mean virtual dedendum on wheel	$h_{vfm2} = h_{fm2} / m_{et2}$	1,011	E: B.8		
Relative virtual tooth thickness on pinion	$s_{vmn1} = s_{mn1} / m_{et2}$	1,216	E: B.9		
Relative virtual tooth thickness on wheel	$s_{vmn2} = s_{mn2} / m_{et2}$	0,801	E: B.9		
Relative mean virtual tip radius on pinion	$r_{va1} = r_{vn1} + h_{am1} / m_{et2}$	17,976	E: B.10		
Relative mean virtual tip radius on wheel	$r_{va2} = r_{vn2} + h_{am2} / m_{et2}$	78,152	E: B.10		
Angular pitch of virtual cylindrical wheel (required in ISO 10300–3:2023, 7.4.5)	$\theta_{v2} = \frac{\pi \cdot m_{mn}}{m_{et2} \cdot r_{vn2}}$	1,511°	E: B.11		
Relative edge radius of tool on pinion	$\rho_{va01} = \rho_{a01} / m_{et2}$	0,198	E: B.12		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula,T: Table, F: Figure		
Relative edge radius of tool on wheel	$\rho_{\text{va02}} = \rho_{\text{a02}} / m_{\text{et2}}$	0,296	E: B.12		
Virtual spiral angle for hypoid gears	$\beta_{\text{v}} = \beta_{\text{m1}} - \lambda_{\text{r}}$	48,272°	E: B.13		
where	$\tan(\beta_{\text{m1}} - \lambda_{\text{r}}) = \dfrac{R_{\text{m2}} \cdot \tan\delta_{\text{f2}} \cdot \tan\beta_{\text{m1}} + R_{\text{m1}} \cdot \tan\delta_{\text{a1}} \cdot \tan\beta_{\text{m2}}}{R_{\text{m2}} \cdot \tan\delta_{\text{f2}} + R_{\text{m1}} \cdot \tan\delta_{\text{a1}}}$	tan(48,272°)	E: B.15		
Adjusted pressure angle	$\alpha_{\text{a}} = \alpha_{\text{eD}} - \dfrac{\pi}{2} \cdot \cos\delta_2 \cdot \cos\beta_{\text{m2}} / z_2$	19,381°	E: B.16		
Base virtual helix angle	$\sin\beta_{\text{vb}} = \sin\beta_{\text{v}} \cdot \cos\alpha_{\text{a}}$	sin(44,750°)	E: B.17		
Relative mean virtual base radius on pinion	$r_{\text{vbn1}} = r_{\text{vn1}} \cdot \cos\alpha_{\text{a}}$	16,158	E: B.18		
Relative mean virtual base radius on wheel	$r_{\text{vbn2}} = r_{\text{vn2}} \cdot \cos\alpha_{\text{a}}$	73,293	E: B.18		
Relative length of action from pinion tip to pitch circle in the normal section	$g_{\text{v}\alpha\text{na}} = \sqrt{r_{\text{va1}}^2 - r_{\text{vbn1}}^2} - r_{\text{vn1}} \cdot \sin\alpha_{\text{a}}$	2,194	E: B.19		
Relative length of action from wheel tip to pitch circle in the normal section	$g_{\text{v}\alpha\text{nr}} = \sqrt{r_{\text{va2}}^2 - r_{\text{vbn2}}^2} - r_{\text{vn2}} \cdot \sin\alpha_{\text{a}}$	1345	E: B.20		
Relative length of action in normal section	$g_{\text{v}\alpha\text{n}} = g_{\text{v}\alpha\text{na}} + g_{\text{v}\alpha\text{nr}}$	3,539	E: B.21		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula,T: Table, F: Figure		
Relative mean normal pitch of virtual cylindrical gear	$p_{\mathrm{mn}} = \dfrac{2{,}0\pi\, m_{\mathrm{mn}}}{m_{\mathrm{et2}} \cos\alpha_{\mathrm{a}} \left(\cos^2\beta_{\mathrm{m1}} + \cos^2\beta_{\mathrm{m2}} + 2{,}0 \tan^2\alpha_{\mathrm{a}}\right)}$	3,417	E: B.22		
Profile contact ratio in mean normal section	$\varepsilon_{\mathrm{v\alpha n}} = \dfrac{g_{\mathrm{v\alpha n}}}{p_{\mathrm{mn}}}$	1,036	E: B.23		
Profile contact ratio in mean transverse section	$\varepsilon_{\mathrm{v}\alpha} = \varepsilon_{\mathrm{v}\alpha n} \cos^2\beta_{\mathrm{vb}}$	0,522	E: B.24		
Modified contact ratio for bevel gears without hypoid offset	$\varepsilon_{\mathrm{v}\gamma} = \sqrt{\varepsilon_{\mathrm{v\alpha}}^2 + \varepsilon_{\mathrm{v}\beta}^2}$	2,812	E: B.25		
Contact shift factor, see also ISO 10300–2:2023, Figure B.7	$k' = \dfrac{z_2 - z_1}{3{,}2\, z_2 + 4{,}0\, z_1}$	0,156	E: B.26		
Macropitting resistance geometry factor					
Angle between contact direction and tooth tangent in pitch plane	$\cot\left(\beta_{\mathrm{m1}} - \lambda_1\right) = \dfrac{\cos\zeta_{\mathrm{mp}}}{\cos\beta_{\mathrm{m1}} \cdot \cos\beta_{\mathrm{m2}} \cdot \tan\left(\beta_{\mathrm{m1}} - \lambda_{\mathrm{r}}\right)} - \tan\beta_{\mathrm{m2}}$	cot(46,710°)		E: 24	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula,T: Table, F: Figure		
Angle between projection of pinion axis and direction of contact in pitch plane	$\lambda_1 = \beta_{m1} - (\beta_{m1} - \lambda_1)$	3,288°		E: 25	
Angle of contact line relative to the root cone	$\tan w = \dfrac{\sin\alpha_a \cdot \tan(\beta_{m1} - \lambda_r)}{\cos\alpha_{lim}}$	tan(20,424°)		E: 26	
Mean base spiral angle	$\cos\beta_{bm} = \dfrac{1{,}0}{\sqrt{\tan^2(\beta_{m1} - \lambda_r) \cdot \cos^2\alpha_a + 1{,}0}}$	cos(46,607°)		E: 27	
Relative mean normal base pitch	$p_{nb} = \dfrac{\pi \cdot m_{mn} \cdot \cos\alpha_a \cdot \cos\beta_{bm}}{m_{et2} \cdot \cos(\beta_{m1} - \lambda_r)}$	1,995		E: 28	
Angle between projection of wheel axis and direction of contact in pitch plane	$\lambda_2 = (\beta_{m1} - \lambda_r) - \beta_{m2}$	9,663°		E: 29	
Relative base facewidth	$b_b = \dfrac{b_2}{m_{et2} \cdot \cos\lambda_2}$	7,518		E: 30	
Pressure angle at point of load application on pinion	$\cos\alpha_{L1} = \cos\alpha_a \cdot \left[1{,}0 - \dfrac{(r_{va1} - r_{vn1}) \cdot \cos^2\beta_{m1}}{r_{va1} - r_{vn1} + R_{mpt1}}\right]$	cos(25,626°)		E: 31	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula,T: Table, F: Figure		
Pressure angle at point of load application on wheel	$\cos\alpha_{L2}=\cos\alpha_a\cdot\left[1{,}0-\frac{(r_{va2}-r_{vn2})\cdot\cos^2\beta_{m2}}{r_{va2}-r_{vn2}+R_{mpt2}}\right]$	cos(20,308°)		E: 31	
Radius of curvature difference between point of load application and mean point on pinion	$\rho_{\Delta 1}=\frac{r_{va1}-r_{vn1}+R_{mpt1}}{(\cos\beta_{m1})^2}\cdot\cos\alpha_{L1}\cdot(\tan\alpha_{L1}-\tan\alpha_a)$	2,212		E: 32	
Radius of curvature difference between point of load application and mean point on wheel	$\rho_{\Delta 2}=\frac{r_{va2}-r_{vn2}+R_{mpt2}}{(\cos\beta_{m2})^2}\cdot\cos\alpha_{L2}\cdot(\tan\alpha_{L2}-\tan\alpha_a)$	1,345		E: 32	
Radius of curvature change	$\rho_{\Delta red}=\cos\beta_{bm}\left(\rho_{\Delta 1}+\rho_{\Delta 2}\right)$	2,443		E: 33	
Relative length of action within the contact ellipse	$g_\eta=\sqrt{\rho_{\Delta red}^2\cdot(\cos\beta_{bm})^2+b_b^2\cdot(\sin\beta_{bm})^2}$	5,715		E: 34	
Radius of relative profile curvature and load sharing ratio at critical point					
Relative length of action at critical point in contact ellipse (iteration starting with y_I = 0)	$g_{\eta I}=\sqrt{g_\eta^2-4{,}0\cdot y_I^2}$	Initial: 5,715		E: 36	
		Final: 5,653		E: 36	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula,T: Table, F: Figure		
Relative length of action considering adjacent teeth	$g_{\eta\mathrm{I}\Sigma}^3 = g_{\eta\mathrm{I}}^3 + \sum_{k=1}^{k=x}\sqrt{\left[g_{\eta\mathrm{I}}^2 - 4\cdot k\cdot p_{\mathrm{nb}}\cdot\left(k\cdot p_{\mathrm{nb}} + 2\cdot y_{\mathrm{I}}\right)\right]^3} + \sum_{k=1}^{k=y}\sqrt{\left[g_{\eta\mathrm{I}}^2 - 4\cdot k\cdot p_{\mathrm{nb}}\cdot\left(k\cdot p_{\mathrm{nb}} - 2\cdot y_{\mathrm{I}}\right)\right]^3}$	Initial: 323,766		E: 37	
		Final: 317,689		E: 37	
Load sharing ratio	$\varepsilon_{\mathrm{NI}} = g_{\eta\mathrm{I}}^3 / g_{\eta\mathrm{I}\Sigma}^3$	Initial: 0,577		E: 38	
		Final: 0,569		E: 38	
Relative length of contact line	$g_{\mathrm{c}} = g_{\eta\mathrm{I}}\cdot\rho_{\Delta\mathrm{red}}\cdot b_{\mathrm{b}} / g_\eta^2$	Initial: 3,214		E: 39	
		Final: 3,179		E: 39	
Relative position change along the path of contact	$g_{\eta\Delta} = \frac{\rho_{\Delta\mathrm{red}}^2\cdot y_{\mathrm{I}}}{g_{\eta\mathrm{I}}^2} + k'\cdot g_{\mathrm{c}}\cdot\tan\beta_{\mathrm{bm}} + \frac{0{,}5\cdot\rho_{\Delta\mathrm{red}}}{\cos\beta_{\mathrm{bm}}} - \rho_{\Delta 2}$	Initial: 0,962		E: 40	
		Final: 0,878		E: 40	
Intermediate value	$X = \frac{\sin^2 w\cdot\cos\alpha_{\lim}\cdot\cos\left(\zeta_{\mathrm{mp}} - \lambda_1\right)\cdot\cos\lambda_1}{\sin^2\left(\beta_{\mathrm{m1}} - \lambda_1\right)\cdot\sin\alpha_{\mathrm{a}}\cdot\cos\zeta_{\mathrm{mp}}}$	Initial: 0,695		E: 41	
		Final: 0,695		E: 41	
Relative profile radius of curvature on pinion	$\rho_1 = R_{\mathrm{mpt1}}\, X \pm g_{\eta\Delta}$	Initial: 5,883		E: 42	
		Final: 5,799		E: 42	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula,T: Table, F: Figure		
Relative profile radius of curvature on wheel	$\rho_2 = R_{\text{mpt}2} X \pm g_{\eta\Delta}$	Initial: 32,024		E: 42	
		Final: 32,109		E: 42	
Relative radius of profile curvature between pinion and wheel	$\rho_{\text{t}} = \dfrac{\rho_1 \cdot \rho_2}{\rho_1 + \rho_2}$	Initial: 4,970		E: 43	
		Final: 4,912		E: 43	
Inertia factor with $\varepsilon_{\text{v}} > 2{,}0_{\gamma}$	$Z_{\text{i}} = 1{,}0$	Initial: 1,0		E: 45	
		Final: 1,0		E: 45	
Macropitting resistance geometry factor	$Z_{\text{I}} = \dfrac{g_{\text{c}} \cdot \rho_{\text{t}} \cdot \cos\alpha_{\text{a}} \cdot m_{\text{mn}}}{b_{\text{b}} \cdot z_1 \cdot Z_{\text{i}} \cdot \varepsilon_{\text{NI}} \cdot m_{\text{et}2}}$	Initial: 0,174		E: 46	
		Final: 0,173		E: 46	
Facewidth factor					
for $12{,}7 \le b_2 \le 79{,}8$ mm	$Z_{\text{FW}} = 0{,}004\ 92 \cdot b_2 + 0{,}437\ 5$	0,585		E: 48	
Contact stress adjustment factor					
for carburized case hardened steel	Z_{A}	0,967		E: 50	
Elasticity factor					
for a steel on steel gear pair	Z_{E}	191,646 $(\text{N/mm}^2)^{1/2}$		E: 51	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula,T: Table, F: Figure		
Lubricant film influence factors					
Product of the lubricant influence factors	$Z_L Z_V Z_R$	0,906			
Work hardening factor					
Work hardening factor	Set $Z_{w,1}$ = $Z_{W,2}$ = 1,0 because pinion and wheel with equal hardness.	1,000			
Life factor					
Life factor	Z_{NT}	1,000		T: 6	
K–factors					
For virtual contact ratio, $\varepsilon_{v\gamma}$ = 2,812 > 2	$c_{v1,2} = c_{v1} + c_{v2}$	0,547	T: 3		
	c_{v3}	0,077	T: 3		
	c_{v4}	0,313	T: 3		
	$c_{v5,6}$	0,582	T: 3		
	c_{v7}	0,944	T: 3		
Dynamic factor	$K_{v\text{-}B}$	1,000	E: 15		
Face load factor	$K_{H\beta\text{-}C}$	1,650	E: 28		
Contact stress formula for drive and coast side					
Nominal contact stress	$\sigma_{H0-B2} = \sqrt{\frac{F_{mt1} \cdot d_{m1} \cdot Z_{FW}}{b_2 \cdot Z_I} \cdot \left(\frac{z_2}{d_{e2} \cdot z_1}\right)^2} \cdot Z_E$	865,1 N/mm²		E: 21	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula,T: Table, F: Figure		
Contact stress	$\sigma_{\text{H-B2}} = \sigma_{\text{H0-B2}} \cdot \sqrt{K_{\text{A}} \cdot K_{\text{v}} \cdot K_{\text{H}\beta}} \cdot Z_{\text{A}} \le \sigma_{\text{HP-B2}}$	1 127,1 N/mm^2		E: 20	
Permissible contact stress	$\sigma_{\text{HP-B2}} = \sigma_{\text{H,lim}} \cdot Z_{\text{NT}} \cdot Z_{\text{L}} \cdot Z_{\text{v}} \cdot Z_{\text{R}} \cdot Z_{\text{W}}$	1 359,0 N/mm^2		E: 22	
Calculated safety factor for contact stress for pinion and wheel	$S_{\text{H-B2}} = \dfrac{\sigma_{\text{HP-B2}}}{\sigma_{\text{H-B2}}} > S_{\text{H,min}}$	1,206		E: 23	

Table B.11 — Calculation of tooth root strength on pinion and wheel

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Geometry factor for hypoid gears (pinion and wheel)					
Initial formulae					
Drive flank pressure angle in wheel root coordinates	$\alpha_{\mathrm{Dnf}} = \alpha_{\mathrm{nD}} - \theta_{\mathrm{f2}} \cdot \sin \beta_{\mathrm{m2}}$	15,252°			E: 92
Coast flank pressure angle in wheel root coordinates	$\alpha_{\mathrm{Cnf}} = \alpha_{\mathrm{nC}} + \theta_{\mathrm{f2}} \cdot \sin \beta_{\mathrm{m2}}$	24,748°			E: 93
Average pressure angle unbalance	$\Delta\alpha_1 = \dfrac{\left(\alpha_{\mathrm{Dnf}} - \alpha_{\mathrm{Cnf}}\right)}{2{,}0}$	−4,748°			E: 94
Limit pressure angle in wheel root coordinates	$\alpha_{\mathrm{f}} = \alpha_{\mathrm{lim}} - \theta_{\mathrm{f2}} \cdot \sin \beta_{\mathrm{m2}}$	−4,748°			E: 95
Relative distance from blade edge to centreline	$g_{\mathrm{rb}} = \dfrac{\left[h_{\mathrm{fm2}} \cdot \tan\left(\dfrac{\alpha_{\mathrm{nD}} + \alpha_{\mathrm{nC}}}{2{,}0}\right) + \dfrac{W_{\mathrm{m2}}}{2{,}0}\right] \cdot \cos\left(\dfrac{\alpha_{\mathrm{nD}} + \alpha_{\mathrm{nC}}}{2{,}0}\right)}{m_{\mathrm{et2}}}$	0,578			E: 96
Intermediate value	$\eta_{\mathrm{D}} = \tan \alpha_{\mathrm{Dnf}} \cdot \left(\dfrac{g_{\mathrm{rb}}}{\sin \alpha_{\mathrm{Dnf}}} - h_{\mathrm{vfm2}}\right)$	0,324			E: 97
Intermediate value	$\eta_{\mathrm{C}} = -\tan \alpha_{\mathrm{Cnf}} \cdot \left(\dfrac{g_{\mathrm{rb}}}{\sin \alpha_{\mathrm{Cnf}}} - h_{\mathrm{vfm2}}\right)$	−0,171			E: 98

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Intermediate angle	$\tan\beta_a = \dfrac{\dfrac{W_{m2}}{2{,}0\cdot m_{et2}} - \rho_{va02}\cdot\left[\sec\left(\dfrac{\alpha_{nD}+\alpha_{nC}}{2{,}0}\right) - \tan\left(\dfrac{\alpha_{nD}+\alpha_{nC}}{2{,}0}\right)\right]}{h_{vfm2}-\rho_{va02}}$	tan(3,204°)			E: 99
Intermediate angle	$\left(\beta_D - \Delta\alpha\right) = \beta_a - \Delta\alpha_1$	7,952°			E: 100
Intermediate angle	$\left(\beta_C - \Delta\alpha\right) = -\beta_a - \Delta\alpha_1$	1,543°			E: 101
Intermediate value	$g_1 = \dfrac{h_{vfm2}-\rho_{va02}}{\cos\beta_a}$	0,715			E: 102
Wheel angle between centreline and fillet point on drive side	$\tan\Delta\theta_D = \dfrac{g_1\cdot\sin\left(\beta_D-\Delta\alpha\right)}{r_{vn2}-g_1\cdot\cos\left(\beta_D-\Delta\alpha\right)}$	tan(0,074°)			E: 103
Wheel angle between centreline and fillet point on coast side	$\tan\Delta\theta_C = \dfrac{g_1\cdot\sin\left(\beta_C-\Delta\alpha\right)}{r_{vn2}-g_1\cdot\cos\left(\beta_C-\Delta\alpha\right)}$	tan(0,014°)			E: 104
Wheel angle between fillet points	$\Delta\theta_2 = \dfrac{\theta_{v2}+\Delta\theta_D+\Delta\theta_C}{2{,}0}$	0,799°			E: 105
Relative vertical distance from pitch circle to fillet point	$y_1 = r_{vn2} - \dfrac{\left[r_{vn2}-g_1\cdot\cos\left(\beta_D-\Delta\alpha\right)\right]\cdot\cos\left(\Delta\theta_2-\Delta\theta_D\right)}{\cos\Delta\theta_D}$	0,715			E: 106
Relative horizontal distance from centreline to fillet point	$x_1 = \dfrac{\left[r_{vn2}-g_1\cdot\cos\left(\beta_D-\Delta\alpha\right)\right]\cdot\sin\left(\Delta\theta_2-\Delta\theta_D\right)}{\cos\Delta\theta_D}$	0,975			E: 107

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Generated pressure angle of wheel at fillet point	$\alpha_{LN2} = \alpha_{Dnf} - \Delta\theta_2$	14,453°			E: 108
Relative distance from centreline to tool critical drive side fillet point	$\mu_{D1} = \eta_D + \tan\alpha_{Dnf} \cdot (h_{vfm1} + h_{vfm2}) + \rho_{va01} \cdot (\sec\alpha_{Dnf} - \tan\alpha_{Dnf})$	0,919			E: 109
Relative distance from centreline to tool critical coast side fillet point	$\mu_{C1} = \eta_C - \tan\alpha_{Cnf} \cdot (h_{vfm1} + h_{vfm2}) - \rho_{va01} \cdot (\sec\alpha_{Cnf} - \tan\alpha_{Cnf}) + \frac{j_{en}}{m_{et2}}$ NOTE ISO 10300-3:2023, Formula (110) contains a misprint in the last term. The correct formula has been applied to this sample calculation.	−1,018			E: 110
Wheel angle between centreline and critical pinion drive side fillet point	$\tan\theta_{DLS} = \frac{\mu_{D1}}{r_{vn2} + h_{vfm1}}$	tan(0,673°)			E: 111
Wheel angle between centreline and critical pinion coast side fillet point	$\tan\theta_{CLS} = \frac{\mu_{C1}}{r_{vn2} + h_{vfm1}}$	tan(−0,744°)			E: 112
Relative radius from tool centre to critical pinion drive side fillet point	$R_{DL2} = \frac{r_{vn2} + h_{vfm1}}{\cos\theta_{DLS}}$	78,321			E: 113
Relative radius from tool centre to critical pinion coast side fillet point	$R_{CL2} = \frac{r_{vn2} + h_{vfm1}}{\cos\theta_{CLS}}$	78,322			E: 114

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Wheel angle from centreline to pinion tip on drive side	θ_{D1}	Initial: 1,511°			
		Final: 1,204°			
	$\Delta r_1 = r_{\mathrm{vn2}} \cdot \left(e^{\theta_{\mathrm{D1}} \cdot \tan \alpha_{\mathrm{f}}} - 1{,}0\right)$	Initial: −0,170			E: 115
		Final: −0,135			E: 115
	$h_1 = \left(r_{\mathrm{vn2}} + \Delta r_1\right) \sin\left(\alpha_{\mathrm{Dnf}} + \theta_{\mathrm{D1}}\right) - \left(r_{\mathrm{vn2}} \sin \alpha_{\mathrm{Dnf}} - g_{\mathrm{rb}}\right)$	Initial: 2,499			E: 116
		Final: 2,111			E: 116
	$h_{1\mathrm{o}} = \sqrt{r_{\mathrm{va1}}^2 - \left(r_{\mathrm{vn1}} - \Delta r_1\right)^2 \cdot \cos^2\left(\alpha_{\mathrm{Dnf}} + \theta_{\mathrm{D1}}\right)} - \left(r_{\mathrm{vn1}} - \Delta r_1\right) \cdot \sin\left(\alpha_{\mathrm{Dnf}} + \theta_{\mathrm{D1}}\right)$	Initial: 1,997			E: 117
		Final: 2,111			E: 117
Wheel angle from centreline to tooth surface at critical fillet point on drive side	θ_{D2o}	Initial: 0,755°			
		Final: 0,679°			
	$\mu_{\mathrm{D1o}} = r_{\mathrm{vn2}} \cdot e^{\theta_{\mathrm{D20}} \cdot \tan \alpha_{\mathrm{f}}} \cdot \sin \theta_{\mathrm{D2o}}$	Initial: 1,023			E: 118
		Final: 0,919			E: 118
Wheel angle from centreline to tooth surface at critical fillet point on coast side	θ_{C2o}	Initial: −0,755°			
		Final: −0,750°			
	$\mu_{\mathrm{C1o}} = r_{\mathrm{vn2}} \cdot e^{\theta_{\mathrm{C20}} \cdot \tan \alpha_{\mathrm{f}}} \cdot \sin \theta_{\mathrm{C2o}}$	Initial: −1,025			E: 119
		Final: −1,018			E: 119
Pinion angle from centreline to tooth surface at critical drive side fillet point	$r_{\mathrm{vn2}}\left(e^{\theta_{\mathrm{D2o}} \tan \alpha_{\mathrm{f}}} - 1{,}0\right) = r_{\mathrm{vn1}}\left(1{,}0 - e^{\theta_{\mathrm{D1o}} \tan \alpha_{\mathrm{f}}}\right)$ Formula shall be solved for θ_{D1o}, (as stated in ISO 10300-3).	−3,070°			E: 120

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Pinion angle from centreline to tooth surface at critical coast side fillet point	$r_{vn2}\left(e^{\theta_{C2o}\tan\alpha_f}-1{,}0\right)=r_{vn1}\left(1{,}0-e^{\theta_{C1o}\tan\alpha_f}\right)$ Formula shall be solved for θ_{C1o}, (as required in ISO 10300-3).	3,411°			E: 121
Wheel difference angle between tool and surface at drive side fillet point	$\Delta\theta_{D2o}=\theta_{DLS}-\theta_{D2o}$	−0,006°			E: 122
Wheel difference angle between tool and surface at coast side fillet point	$\Delta\theta_{C2o}=\theta_{CLS}-\theta_{C2o}$	0,005°			E: 123
Pinion difference angle between tool and surface at drive side fillet point	$\tan\Delta\theta_{D1o}=-\dfrac{R_{DL2}\sin\Delta\theta_{D2o}}{r_{vn2}+r_{vn1}-R_{DL2}\cos\Delta\theta_{D2o}}$	tan(0,029°)			E: 124
Pinion difference angle between tool and surface at coast side fillet point	$\tan\Delta\theta_{C1o}=-\dfrac{R_{CL2}\sin\Delta\theta_{C2o}}{r_{vn2}+r_{vn1}-R_{CL2}\cos\Delta\theta_{C2o}}$	tan(−0,025°)			E: 125
Pinion angle unbalance between fillet points	$\Delta\theta_1=\dfrac{\theta_{D1o}+\theta_{C1o}+\Delta\theta_{D1o}+\Delta\theta_{C1o}}{2{,}0}$	0,172°			E: 126
Pinion angle from centreline to pinion tip	$\Delta r_1=r_{vn1}\left(1{,}0-e^{\theta_{Do}\tan\alpha_f}\right)$ Formula shall be solved for θ_{Do}, (as stated in ISO 10300-3).	−5,436°			E: 127

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Wheel angle from centreline to tooth surface at pitch point on drive side	θ_D	Initial: −0,504°			
		Final: −0,452°			
	$\Delta r = r_{vn2} \cdot \left(e^{\theta_D \cdot \tan\alpha_f} - 1{,}0\right)$	Initial: 0,057			E: 128
		Final: 0,051			E: 128
	$h = \left(r_{vn2} + \Delta r\right) \sin\left(\alpha_{Dnf} + \theta_D\right) - \left(r_{vn2} \sin\alpha_{Dnf} - g_{rb}\right)$	Initial: −0,067			E: 129
		Final: 0,000			E: 129
Wheel angle from centreline to fillet point on drive flank	θ_{D2}	Initial: −0,542°			
		Final: −1,394°			
	$\Delta r_2 = r_{vn2} \cdot \left(e^{\theta_{D2} \cdot \tan\alpha_f} - 1{,}0\right)$	Initial: 0,061			E: 133
		Final: 0,157			E: 133
	$h_2 = \left(r_{vn2} + \Delta r_2\right) \sin\left(\alpha_{Dnf} + \theta_{D2}\right) - \left(r_{vn2} \sin\alpha_{Dnf} - g_{rb}\right)$	Initial: −0,116			E: 134
		Final: −1,213			E: 134
	$h_{2o} = \pm\sqrt{r_{va1}^2 - \left(r_{vn1} + \Delta r_2\right)^2 \cdot \cos^2\left(\alpha_{Dnf} + \theta_{D2}\right)} + \left(r_{vn1} + \Delta r_2\right) \cdot \sin\left(\alpha_{Dnf} + \theta_{D2}\right)$	Initial: −1,504			E: 135
		Final: −1,213			E: 135
Load sharing ratio for hypoid gears (pinion and wheel)					
Load sharing ratio for hypoid gears	ε_N	1,0			E: 136

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Tooth strength factor for hypoid gears (pinion and wheel)					
Relative length of action from pinion tip to pitch circle in normal section	$g_{v\alpha n1} = \sqrt{h_1^2 + (\Delta r_1 - \Delta r)^2 - 2{,}0 \cdot h_1 \cdot (\Delta r_1 - \Delta r) \cdot \sin(\alpha_{Dnf} + \theta_{D1})}$	2,171			E: 137
Relative length of action from wheel tip to pitch circle in normal section	$g_{v\alpha n2} = \sqrt{h_2^2 + (\Delta r_2 - \Delta r)^2 - 2{,}0 \cdot h_2 \cdot (\Delta r_2 - \Delta r) \cdot \sin(\alpha_{Dnf} + \theta_{D2})}$	1,243			E: 138
Relative length of action in normal section	$g_{v\alpha n,hyp} = g_{v\alpha n1} + g_{v\alpha n2}$	3,414			E: 139
Profile contact ratio in mean normal section	$\varepsilon_{v\alpha n,hyp} = g_{v\alpha n,hyp} / p_{mn}$	0,999			E: 140
Modified contact ratio for hypoid gears	$\varepsilon_{v\gamma} = \sqrt{\varepsilon_{v\alpha n,hyp}^2 + \varepsilon_{v\beta}^2}$	2,939			E: 141
Profile load sharing factor	ε_f	0,0			E: 143
Lengthwise load sharing factor	ε_b	2,939			E: 145
Relative length of action from pinion tip to point of load application	$g_{v\alpha n3} = \left\lvert \frac{p_{mn} \cdot \varepsilon_{v\alpha n,hyp}^2}{\varepsilon_{v\gamma}^2} \cdot \left(\frac{0{,}5 \cdot \varepsilon_{v\gamma}^2}{\varepsilon_{v\alpha n,hyp}} - \frac{\varepsilon_{v\beta} \cdot \varepsilon_b \cdot k'}{\varepsilon_{v\alpha}} + \varepsilon_f \right) - g_{v\alpha n1} \right\rvert$	1,419			E: 146
Relative length of action from wheel tip to point of load application	$g_{v\alpha n4} = \left\lvert \frac{p_{mn} \cdot \varepsilon_{v\alpha n,hyp}^2}{\varepsilon_{v\gamma}^2} \cdot \left(\frac{0{,}5 \cdot \varepsilon_{v\gamma}^2}{\varepsilon_{v\alpha n,hyp}} - \frac{\varepsilon_{v\beta} \cdot \varepsilon_b \cdot k'}{\varepsilon_{v\alpha}} + \varepsilon_f \right) - g_{v\alpha n2} \right\rvert$	1,419			E: 147

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Relative length of action to point of load application	$g_{J1,2} = g_{v\alpha n,\mathrm{hyp}} - g_{v\alpha n3,4}$	1,994			E: 148
Wheel angle from pinion tip to point of load application	θ_{D3}	Initial: −0,755			
		Final: 0,629°			
	$\Delta r_3 = r_{vn2} \cdot \left(e^{\theta_{D3} \cdot \tan \alpha_f} - 1{,}0 \right)$	Initial: 0,085			E: 149
		Final: −0,071			E: 149
	$h_3 = \left(r_{vn2} + \Delta r_3 \right) \sin \left(\alpha_{vDnf} + \theta_{D3} \right) - \left(r_{vn2} \sin \alpha_{vDnf} - g_{rb} \right)$	Initial: −0,390			E: 150
		Final: 1,381			E: 150
	$h_{3o} = \sqrt{g_{v\alpha n3}^2 - (\Delta r_3 - \Delta r)^2 \cdot \cos^2 (\alpha_{Dnf} + \theta_{D3})} - \lvert \Delta r_3 - \Delta r \rvert \cdot \sin (\alpha_{Dnf} + \theta_{D3})$	Initial: 1,410			E: 151
		Final: 1,381			E: 151
Pinion angle from wheel tip to point of load application	θ_{D4}	Initial: 0,504			
		Final: 0,629			
	$\Delta r_4 = r_{vn2} \cdot \left(e^{\theta_{D4} \cdot \tan \alpha_f} - 1{,}0 \right)$	Initial: −0,057			E: 152
		Final: −0,071			E: 152
	$h_4 = \left(r_{vn2} + \Delta r_4 \right) \sin \left(\alpha_{vDnf} + \theta_{D4} \right) - \left(r_{vn2} \sin \alpha_{vDnf} - g_{rb} \right)$	Initial: 1,221			E: 153
		Final: 1,381			E: 153
	$h_{4o} = \sqrt{g_{v\alpha n4}^2 - (\Delta r_4 - \Delta r)^2 \cdot \cos^2 (\alpha_{Dnf} + \theta_{D4})} - \lvert \Delta r_4 - \Delta r \rvert \cdot \sin (\alpha_{Dnf} + \theta_{D4})$	Initial: 1,386			E: 154
		Final: 1,381			E: 154
Relative distance from pitch circle to point of load application	$\Delta r_{LN2} = \dfrac{(r_{vn2} + \Delta r_3) \cdot \cos (\alpha_{Dnf} + \theta_{D3})}{\cos \alpha_{LN2}} - r_{vn2}$	−0,594			E: 155

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Angle between centre line and line from point of load application and fillet point on wheel	α_{2oo}	Initial: 30,505°			
		Final: 48,615°			
Relative horizontal distance from centreline to critical fillet point	$s_{N2} = x_1 - \rho_{va02} \cdot \cos\alpha_{2oo}$	Initial: 0,720			E: 156
		Final: 0,779			E: 156
Relative vertical distance from pitch circle to critical fillet point	$y_2 = y_1 + \rho_{va02} \cdot \sin\alpha_{2oo}$	Initial: 0,865			E: 157
		Final: 0,937			E: 157
Relative wheel load height at weakest section	$h_{N2} = y_2 + \Delta r_{LN2}$	Initial: 0,271			E: 158
		Final: 0,343			E: 158
Auxiliary value	$h_{N2o} = \dfrac{s_{N2}}{2{,}0 \cdot \tan\alpha_{2oo}}$	Initial: 0,611			E: 159
		Final: 0,343			E: 159
Wheel tooth strength factor	$x_{N2} = \dfrac{s_{N2}^2}{h_{N2}}$	1,769			E: 160
Pinion angle from pitch point to point of load application	$\Delta r_4 = r_{vn1} \cdot \left(1{,}0 - e^{\theta_{D5} \cdot \tan\alpha_f}\right)$ Formula shall be solved for θ_{D5}, (as stated in ISO 10300-3).	−2,848°			E: 161
Pinion pressure angle at point of load application	$\alpha_{LN1} = \alpha_{vnf} + \theta_{D4} - \theta_{D5} + \Delta\theta_1$	18,902°			E: 162

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Pinion radial distance to point of load application	$r_{41\text{o}} = \dfrac{(r_{\text{vn}1} - \Delta r_4) \cdot \cos(\alpha_{\text{Dnf}} + \theta_{\text{D}4})}{\cos \alpha_{\text{LN}1}}$	17,486			E: 163
Start of iteration with $\alpha_{\text{Do}} = \alpha_{\text{nD}} + \alpha_{\text{nC}}$	α_{Do}	Initial: 40,0°			
		Final: 30,920°			
Wheel angle between centreline and pinion fillet (enclosed iteration)	θ_{D2oo}	Initial (first pass): 0,755°			
		Final (first pass): 1,182°			
		Initial (last pass): 0,755°			
		Final (last pass): 1,428°			
	$\Delta r_5 = r_{\text{vn}2} \cdot e^{\theta_{\text{D2oo}} \cdot \tan \alpha_{\text{f}}}$	Initial (first pass): 77,611			E: 164
		Final (first pass): 77,563			
		Initial (last pass): 77,611			
		Final (last pass): 77,535			

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Wheel angle between centreline and pinion fillet (enclosed iteration)	$\mu_{\mathrm{D2}} = \dfrac{r_{\mathrm{vn2}} + h_{\mathrm{vfm1}} - \rho_{\mathrm{va01}} - \Delta r_5 \cdot \cos\theta_{\mathrm{D2oo}}}{\tan\alpha_{\mathrm{Do}}}$	Initial (first pass): 0,612 Final (first pass): 0,681 Initial (last pass): 0,858 Final (last pass): 1,013			E: 165
	$\mu_{\mathrm{D}} = \Delta r_5 \cdot \sin\theta_{\mathrm{D2oo}}$	Initial (first pass): 1,023 Final (first pass): 1,600 Initial (last pass): 1,023 Final (last pass): 1,932			E: 166
Pinion angle between centreline and pinion fillet	$r_{\mathrm{vn2}} \cdot \left(e^{\theta_{\mathrm{D2oo}} \cdot \tan\alpha_{\mathrm{f}}} - 1,0\right) = r_{\mathrm{vn1}} \cdot \left(1,0 - e^{\theta_{\mathrm{D1oo}} \cdot \tan\alpha_{\mathrm{f}}}\right)$ Formula shall be solved for θ_{D1oo}, (as stated in ISO 10300-3).	Initial: −5,338° Final: −6,441°			E: 167
Wheel rotation through path of action	$\tan\theta_{\mathrm{L2o}} = \dfrac{\mu_{\mathrm{D1}} - \rho_{\mathrm{va01}} \cdot \cos\alpha_{\mathrm{Do}}}{r_{\mathrm{vn2}} + h_{\mathrm{vfm1}} - \rho_{\mathrm{va01}} + \rho_{\mathrm{va01}} \cdot \sin\alpha_{\mathrm{Do}}}$	Initial: tan(0,562°) Final: tan(0,549°)			E: 168

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Wheel angle difference between path of action and tooth surface at pinion fillet	$\Delta\theta_{D2oo} = \theta_{L2o} - \theta_{D2oo}$	Initial: −0,620°			E: 169
		Final: −0,879°			
Relative wheel radius to pinion fillet point	$r_{L2o} = \dfrac{r_{vn2} + h_{vfm1} - \rho_{va01} + \rho_{va01} \cdot \sin\alpha_{Do}}{\cos\theta_{L2o}}$	Initial: 78,249			E: 170
		Final: 78,223			
Pinion angle to fillet point	$\tan\Delta\theta_{D1oo} = -\dfrac{r_{L2o} \cdot \sin\Delta\theta_{D2oo}}{r_{vn2} + r_{vn1} - r_{L2o} \cdot \cos\Delta\theta_{D2oo}}$	Initial: tan(2,923°)			E: 171
		Final: tan(4,131°)			
Relative pinion radius to fillet point	$r_{L1o} = \dfrac{r_{vn2} + r_{vn1} - r_{L2o} \cdot \cos\Delta\theta_{D2oo}}{\cos\Delta\theta_{D1oo}}$	Initial: 16,602			E: 172
		Final: 16,654			
Pinion angle from centre line to fillet point	$\left(\Delta\theta_1 - \theta_{L1o}\right) = \Delta\theta_1 - \theta_{D1oo} - \Delta\theta_{D1oo}$	Initial: 2,587°			E: 173
		Final: 2,482°			
Angle between centre line and line from point of load application and fillet point on pinion	$\alpha_1 = \alpha_{Do} - \theta_{D2oo} + \theta_{D1oo}$	Initial: 33,480°			E: 174
		Final: 23,051°			
Relative horizontal distance to critical fillet point	$s_{N1} = r_{L1o} \cdot \sin(\Delta\theta_1 - \theta_{L1o})$	Initial: 0,749			E: 175
		Final: 0,721			
Relative pinion load height at weakest section	$h_{N1} = r_{41o} - r_{L1o} \cdot \cos(\Delta\theta_1 - \theta_{L1o})$	Initial: 0,901			E: 176
		Final: 0,847			

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Auxiliary value	$h_{\text{N1o}} = \dfrac{s_{\text{N1}}}{2{,}0 \cdot \tan\alpha_1}$	Initial: 0,567 Final: 0,847			E: 177
Pinion tooth strength factor	$x_{\text{N1}} = \dfrac{s_{\text{N1}}^2}{h_{\text{N1}}}$	0,614			E: 178
Tooth form factor for hypoid gears (pinion and wheel)					
Tooth form factor for pinion	$Y_1 = \dfrac{2}{3} \cdot \left[\dfrac{1}{\left(\dfrac{1}{x_{\text{N1}}} - \dfrac{\tan\alpha_{\text{LN1}}}{3 \cdot s_{\text{N1}}} \right)} \right]$	0,453			E: 179
Tooth form factor for wheel	$Y_2 = \dfrac{2}{3} \cdot \left[\dfrac{1}{\left(\dfrac{1}{x_{\text{N2}}} - \dfrac{\tan\alpha_{\text{LN2}}}{3 \cdot s_{\text{N2}}} \right)} \right]$	1,465			E: 179
Transverse radius to point of load application (pinion and wheel)					
Mean facewidth of pinion	$b_{\text{k1}} = \dfrac{b_1 \cdot \varepsilon_{\text{v}\alpha\text{n,hyp}} \cdot \varepsilon_{\text{v}\beta}}{\varepsilon_{\text{v}\gamma}^2}$	10,203 mm			E: 180
Mean facewidth of wheel	$b_{\text{k2}} = \dfrac{b_2 \cdot \varepsilon_{\text{v}\alpha\text{n,hyp}} \cdot \varepsilon_{\text{v}\beta}}{\varepsilon_{\text{v}\gamma}^2}$	9,592 mm			E: 180

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Contact shift due to load for pinion	$x_{oo1} = k' \cdot b_{k1} - \frac{b_1 \cdot \varepsilon_f \cdot \varepsilon_{v\beta}}{\varepsilon_{v\gamma}^2}$	1,587 mm			E: 181
Contact shift due to load for wheel	$x_{oo2} = k' \cdot b_{k2} + \frac{b_2 \cdot \varepsilon_f \cdot \varepsilon_{v\beta}}{\varepsilon_{v\gamma}^2}$	1,492 mm			E: 182
Transverse radius to point of load application for pinion	$r_{my01} = \frac{r_{mpt1} \cdot (x_{oo1} + R_{m2})}{R_{m2}} + (r_{41o} - r_{vn1}) \cdot m_{et2}$	28,693 mm			E: 183
Transverse radius to point of load application for wheel	$r_{my02} = \frac{r_{mpt2} \cdot (x_{oo2} + R_{m2})}{R_{m2}} + \Delta r_{LN2} \cdot m_{et2}$	69,922 mm			E: 184
Tooth fillet radius at root diameter (pinion and wheel)					
Relative fillet radius at root of tooth on pinion	$r_{mf1} = \frac{(h_{vfm1} - \rho_{va01})^2}{r_{vn1} + h_{vfm1} - \rho_{va01}} + \rho_{va01}$	0,208			E: 185
Relative fillet radius at root of tooth on wheel	$r_{mf2} = \frac{(h_{vfm2} - \rho_{va02})^2}{r_{vn2} + h_{vfm2} - \rho_{va02}} + \rho_{va02}$	0,303			E: 185

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Stress concentration and correction factor (pinion and wheel)					
Stress concentration and stress correction factor on pinion	$Y_{f1} = L + \left(\frac{2s_{N1}}{r_{mf1}}\right)^M \left(\frac{2s_{N1}}{h_{N1}}\right)^O$	1,945			E: 186
Stress concentration and stress correction factor on wheel	$Y_{f2} = L + \left(\frac{2s_{N2}}{r_{mf2}}\right)^M \left(\frac{2s_{N2}}{h_{N2}}\right)^O$	2,728			E: 186
where	$L = 0{,}325\ 454\ 5 - 0{,}007\ 272\ 7\ \alpha_n$	0,196			E: 187
	$M = 0{,}331\ 818\ 2 - 0{,}009\ 090\ 9\ \alpha_n$	0,170			E: 188
	$O = 0{,}268\ 181\ 8 + 0{,}009\ 090\ 9\ \alpha_n$	0,430			E: 189
Inertia factor					
Inertia factor when $\varepsilon_{v\gamma} \geq 2{,}0$	Y_i	1,0			E: 191
Calculated effective facewidth					
Projected length of the instantaneous contact line in the tooth lengthwise direction (pinion)	$g_{K1} = \frac{b_1 \cdot g_{v\alpha n} \cdot g_{J1} \cdot (\cos\beta_{vb})^2}{g_\eta^2}$	3,354 mm			E: 193
Projected length of the instantaneous contact line in the tooth lengthwise direction (wheel)	$g_{K2} = \frac{b_2 \cdot g_{v\alpha n} \cdot g_{J2} \cdot (\cos\beta_{vb})^2}{g_\eta^2}$	3,154 mm			E: 193

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Toe increment on pinion	$\Delta b'_{i1} = \frac{b_1 - g_{K1}}{2\cos\beta_{m1}} - \frac{x_{oo1}}{\cos\beta_{m1}}$	19,742 mm			E: 194
Toe increment on wheel	$\Delta b'_{i2} = \frac{b_2 - g_{K2}}{2\cos\beta_{m2}} - \frac{x_{oo2}}{\cos\beta_{m2}}$	15,268 mm			E: 194
Heel increment on pinion	$\Delta b'_{e1} = \frac{b_1 - g_{K1}}{2\cos\beta_{m1}} - \frac{x_{oo1}}{\cos\beta_{m1}}$	24,681 mm			E: 195
Heel increment on wheel	$\Delta b'_{e2} = \frac{b_2 - g_{K2}}{2\cos\beta_{m2}} - \frac{x_{oo2}}{\cos\beta_{m2}}$	19,088 mm			E: 195
Calculated effective facewidth on pinion	$b_{ce1} = C_{mm} \cdot h_{N1} \cdot \cos\beta_{m1} \cdot \left[\arctan\left(\frac{\Delta b_{i1}}{C_{mm} \cdot h_{N1}}\right) + \arctan\left(\frac{\Delta b_{e1}}{C_{mm} \cdot h_{N1}}\right)\right] + g_{K1}$	25,435			E: 202
Calculated effective facewidth on wheel	$b_{ce2} = C_{mm} \cdot h_{N2} \cdot \cos\beta_{m2} \cdot \left[\arctan\left(\frac{\Delta b_{i2}}{C_{mm} \cdot h_{N2}}\right) + \arctan\left(\frac{\Delta b_{e2}}{C_{mm} \cdot h_{N2}}\right)\right] + g_{K2}$	18,104			E: 202
Basic formula of geometry factor (pinion and wheel)					
Geometry factor for pinion	$Y_{J1} = \frac{Y_1}{Y_{f1} \cdot \varepsilon_N \cdot Y_i} \cdot \frac{r_{my01}}{r_{mpt1}} \cdot \frac{b_{ce1}}{b_1} \cdot \frac{m_{mt1}}{m_{et2}}$	0,203			E: 59
Geometry factor for wheel	$Y_{J2} = \frac{Y_2}{Y_{f2} \cdot \varepsilon_N \cdot Y_i} \cdot \frac{r_{my02}}{r_{mpt2}} \cdot \frac{b_{ce2}}{b_2} \cdot \frac{m_{mt2}}{m_{et2}}$	0,266			E: 59

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Root stress adjustment factor for carburized case hardened steel	Y_A	1,075			E: 203
Relative surface condition factor					
Relative surface condition factor	$Y_{R,RelT}$	1,0			E: 204

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Relative notch sensitivity factor					
Notch parameter	$q_{s1\text{-B2}} = \frac{s_{N1}}{2 \cdot r_{mf1}}$	1,736			E: 205
	$q_{s2\text{-B2}} = \frac{s_{N2}}{2 \cdot r_{mf2}}$	1,286			E: 205
Relative notch sensitivity factor for pinion	$Y_{\delta,\text{RelT},1}$	1,0			E: 206
Relative notch sensitivity factor for wheel	$Y_{\delta,\text{RelT},2}$	0,95			E: 206
K–factors					
Face load factor	$K_{F\beta}$	1,556	E: 32		
Transverse load factor	$K_{F\alpha}$	1,0	E: 40		
Tooth root stress formula (pinion and wheel)					
Nominal tooth root stress on pinion	$\sigma_{F01\text{-B2}} = \frac{F_{mt1}}{b_1} \cdot \frac{m_{mt1}}{m_{et2}^2} \cdot \frac{Y_{A1}}{Y_{J1}}$	390,4 N/mm^2			E: 55
Tooth root stress on pinion	$\sigma_{F1\text{-B2}} = \sigma_{F01\text{-B2}} \cdot K_A \cdot K_v \cdot K_{F\beta} \cdot K_{F\alpha}$	668,3 N/mm^2			E: 52

Description	Formula	Result	References to E: Formula, T: Table, F: Figure		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
Nominal tooth root stress on wheel	$\sigma_{\text{F02-B2}} = \frac{F_{\text{mt2}}}{b_2} \cdot \frac{m_{\text{mt2}}}{m_{\text{et2}}^2} \cdot \frac{Y_{\text{A2}}}{Y_{\text{J2}}}$	315,7 N/mm^2			E: 55
Tooth root stress on wheel	$\sigma_{\text{F2-B2}} = \sigma_{\text{F02-B2}} \cdot K_{\text{A}} \cdot K_{\text{v}} \cdot K_{\text{F}\beta} \cdot K_{\text{F}\alpha}$	540,4 N/mm^2			E: 52
Permissible tooth root stress (pinion and wheel)					
Permissible tooth root stress on pinion	$\sigma_{\text{FP1-B2}} = \sigma_{\text{F,lim}} \cdot Y_{\text{ST}} \cdot Y_{\text{NT}} \cdot Y_{\delta\text{,relT-B2}} \cdot Y_{\text{R,relT-B2}} \cdot Y_{\text{X}}$	960 N/mm^2			E: 57
Permissible tooth root stress on wheel	$\sigma_{\text{FP2-B2}} = \sigma_{\text{F,lim}} \cdot Y_{\text{ST}} \cdot Y_{\text{NT}} \cdot Y_{\delta\text{,relT-B2}} \cdot Y_{\text{R,relT-B2}} \cdot Y_{\text{X}}$	912 N/mm^2			E: 57
Calculated safety factors (pinion and wheel)					
Calculated safety factor for pinion	$S_{\text{F1-B2}} = \frac{\sigma_{\text{FP1-B2}}}{\sigma_{\text{F1-B2}}}$	1,436			E: 58
Calculated safety factor for wheel	$S_{\text{F2-B2}} = \frac{\sigma_{\text{FP2-B2}}}{\sigma_{\text{F2-B2}}}$	1,688			E: 58

B.4 Calculation of Sample 2 according to local calculation method for surface durability – Method B1 localised

Table B.12 — Virtual cylindrical gears

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Length of path of contact in transverse section	$g_{v\alpha} = g_{va1} + g_{va2} = \frac{1}{2} \cdot \left[\left(\sqrt{d_{va1}^2 - d_{vb1}^2} - d_{v1} \cdot \sin \alpha_{vet} \right) + \left(\sqrt{d_{va2}^2 - d_{vb2}^2} - d_{v2} \cdot \sin \alpha_{vet} \right) \right]$	10,435 mm	E: A.49		
Point A on the transverse path of contact	$g_Y(\mathrm{A}) = -g_{va2}$	- 4,004 mm	E: A.47		
Point E on the transverse path of contact	$g_Y(\mathrm{E}) = g_{va1}$	6,431 mm	E: A.48		
Contact point Y on the transverse path of contact	$g_Y(\mathrm{Y}) = g_Y(\mathrm{A}) + k_s \cdot g_{v\alpha} + Y \cdot \frac{(1 - 2 \cdot k_s) \cdot g_{v\alpha}}{i}$ with Y = 0 …*i*, *i* = 10 Note that in all following equations g_Y is a function of Y ($g_Y = g_Y(Y)$)	-4,004 mm -2,960 mm -1,917 mm -0,873 mm 0,170 mm 1,214 mm 2,257 mm 3,301 mm 4,344 mm 5,387 mm 6,431 mm	E: A.50		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Distance of the middle contact line in the zone of action	$f_{m,Y} = (g_{va2} - g_{v\alpha}/2 + g_Y) \cdot \cos\beta_{vb}$	-3,936 mm -3,149 mm -2,362 mm -1,575 mm -0,787 mm 0,000 mm 0,787 mm 1,575 mm 2,362 mm 3,149 mm 3,936 mm	E: A.51		
Coordinates of the ends of the contact line	$x_{1,Y} = \dfrac{f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right) + \dfrac{1}{2} \cdot (g_{v\alpha} + b_{v,eff} \cdot \tan\gamma)}{\tan\gamma + \tan\beta_{vb}}$ $x_{1,Y} = 0$ for $x_{1,Y} < 0$ $x_{1,Y} = b_{v,eff}$ for $x_{1,Y} > b_{v,eff}$	12,440 mm 13,536 mm 14,633 mm 15,729 mm 16,825 mm 17,922 mm 19,018 mm 20,114 mm 21,210 mm 22,307 mm 23,403 mm	E: A.56		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$x_{2,Y} = \dfrac{f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right) - \dfrac{1}{2} \cdot \left(g_{v\alpha} - b_{v,eff} \cdot \tan\gamma\right)}{\tan\gamma + \tan\beta_{vb}}$ $x_{2,Y} = 0$ for $x_{2,Y} < 0$ $x_{2,Y} = b_{v,eff}$ for $x_{2,Y} > b_{v,eff}$	1,477 mm 2,573 mm 3,670 mm 4,766 mm 5,862 mm 6,959 mm 8,055 mm 9,151 mm 10,247 mm 11,344 mm 12,440 mm	E: A.57		
Coordinates of the ends of the contact line	$y_{1,Y} = -x_{1,Y} \cdot \tan\beta_{vb} + f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right)$	-5,217 mm -5,128 mm -5,038 mm -4,948 mm -4,858 mm -4,769 mm -4,679 mm -4,589 mm -4,499 mm -4,410 mm -4,320 mm	E: A.58		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$y_{2,\mathrm{Y}} = -x_{2,\mathrm{Y}} \cdot \tan\beta_{\mathrm{vb}} + f_{\mathrm{Y}} \cdot \cos\beta_{\mathrm{vb}} + \tan\beta_{\mathrm{vb}} \cdot \left(f_{\mathrm{Y}} \cdot \sin\beta_{\mathrm{vb}} + \frac{b_{\mathrm{v,eff}}}{2} \right)$	4,320 mm 4,410 mm 4,499 mm 4,589 mm 4,679 mm 4,769 mm 4,858 mm 4,948 mm 5,038 mm 5,128 mm 5,217 mm	E: A.58		
correction factor for the length of contact lines	$C_{\mathrm{lb,Y}} = \sqrt{\left(1 - \left(\frac{f_{\mathrm{Y}}}{f_{\max}}\right)^2\right) \cdot \left(1 - \sqrt{\frac{b_{\mathrm{v,eff}}}{b_{\mathrm{v}}}}\right)^2}$	0,074 0,076 0,077 0,077 0,078 0,078 0,078 0,077 0,077 0,076 0,074	E: A.61		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Theoretical length of contact line	$l_{mb0,Y} = \sqrt{(x_{1,Y} - x_{2,Y})^2 + (y_{1,Y} - y_{2,Y})^2}$	14,531 mm 14,531 mm 14,531 mm 14,531 mm 14,531 mm 14,531 mm 14,531 mm 14,531 mm 14,531 mm 14,531 mm 14,531 mm	E: A.60		
Length of contact line	$l_{mb,Y} = l_{mb0,Y} \cdot (1 - C_{lb,Y})$	13,451 mm 13,431 mm 13,416 mm 13,405 mm 13,399 mm 13,397 mm 13,399 mm 13,405 mm 13,416 mm 13,431 mm 13,451 mm	E: A.59		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Distance of the top contact line in the zone of action	$f_{t,Y} = f_{m,Y} + p_{vet} \cdot \cos\beta_{vb}$	3,856 mm 4,644 mm 5,431 mm 6,218 mm 7,005 mm 7,793 mm 8,580 mm 9,367 mm 10,154 mm 10,942 mm 11,729 mm	E: A.52		
Coordinates of the ends of the contact line	$x_{1,Y} = \frac{f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \frac{b_{v,eff}}{2}\right) + \frac{1}{2} \cdot \left(g_{v\alpha} + b_{v,eff} \cdot \tan\gamma\right)}{\tan\gamma + \tan\beta_{vb}}$ $x_{1,Y} = 0$ for $x_{1,Y} < 0$ $x_{1,Y} = b_{v,eff}$ for $x_{1,Y} > b_{v,eff}$	23,292 mm 24,388 mm 24,880 mm 24,880 mm 24,880 mm 24,880 mm 24,880 mm 24,880 mm 24,880 mm 24,880 mm 24,880 mm	E: A.56		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$x_{2,Y} = \dfrac{f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2} \right) - \dfrac{1}{2} \cdot \left(g_{v\alpha} - b_{v,eff} \cdot \tan\gamma \right)}{\tan\gamma + \tan\beta_{vb}}$ $x_{2,Y} = 0$ for $x_{2,Y} < 0$ $x_{2,Y} = b_{v,eff}$ for $x_{2,Y} > b_{v,eff}$	12,329 mm 13,425 mm 14,521 mm 15,618 mm 16,714 mm 17,810 mm 18,907 mm 20,003 mm 21,099 mm 22,196 mm 23,292 mm	E: A.57		
Coordinates of the ends of the contact line	$y_{1,Y} = -x_{1,Y} \cdot \tan\beta_{vb} + f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2} \right)$	-4,329 mm -4,239 mm -3,624 mm -2,580 mm -1,537 mm -0,493 mm 0,550 mm 1,594 mm 2,637 mm 3,681 mm 4,724 mm	E: A.58		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$y_{2,Y} = -x_{2,Y} \cdot \tan\beta_{vb} + f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \frac{b_{v,eff}}{2} \right)$	5,208 mm 5,298 mm 5,388 mm 5,477 mm 5,567 mm 5,657 mm 5,747 mm 5,836 mm 5,926 mm 6,016 mm 6,106 mm	E: A.58		
Correction factor for the length of contact lines	$C_{lb,Y} = \sqrt{\left(1 - \left(\frac{f_Y}{f_{max}}\right)^2\right) \cdot \left(1 - \sqrt{\frac{b_{v,eff}}{b_v}}\right)^2}$	0,074 0,073 0,071 0,068 0,065 0,062 0,058 0,054 0,048 0,041 0,032	E: A.61		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Theoretical length of contact line	$l_{\text{tb0,Y}} = \sqrt{\left(x_{1,\text{Y}} - x_{2,\text{Y}}\right)^2 + \left(y_{1,\text{Y}} - y_{2,\text{Y}}\right)^2}$	14,531 mm 14,531 mm 13,730 mm 12,277 mm 10,823 mm 9,370 mm 7,917 mm 6,464 mm 5,011 mm 3,558 mm 2,105 mm	E: A.60		
Length of contact line	$l_{\text{tb,Y}} = l_{\text{tb0,Y}} \cdot \left(1 - C_{\text{lb,Y}}\right)$	13,449 mm 13,473 mm 12,758 mm 11,438 mm 10,115 mm 8,788 mm 7,457 mm 6,118 mm 4,771 mm 3,412 mm 2,037 mm	E: A.59		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Distance of the root contact line in the zone of action	$f_{r,Y} = f_{m,Y} - p_{vet} \cdot \cos \beta_{vb}$	-11,729 mm -10,942 mm -10,154 mm -9,367 mm -8,580 mm -7,793 mm -7,005 mm -6,218 mm -5,431 mm -4,644 mm -3,856 mm	E: A.53		
Coordinates of the ends of the contact line	$x_{1,Y} = \dfrac{f_Y \cdot \cos \beta_{vb} + \tan \beta_{vb} \cdot \left(f_Y \cdot \sin \beta_{vb} + \dfrac{b_{v,eff}}{2} \right) + \dfrac{1}{2} \cdot \left(g_{v\alpha} + b_{v,eff} \cdot \tan \gamma \right)}{\tan \gamma + \tan \beta_{vb}}$ $x_{1,Y} = 0$ for $x_{1,Y} < 0$ $x_{1,Y} = b_{v,eff}$ for $x_{1,Y} > b_{v,eff}$	1,588 mm 2,684 mm 3,781 mm 4,877 mm 5,973 mm 7,070 mm 8,166 mm 9,262 mm 10,359 mm 11,455 mm 12,551 mm	E: A.56		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$x_{2,Y} = \dfrac{f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right) - \dfrac{1}{2} \cdot \left(g_{v\alpha} - b_{v,eff} \cdot \tan\gamma\right)}{\tan\gamma + \tan\beta_{vb}}$ $x_{2,Y} = 0$ for $x_{2,Y} < 0$ $x_{2,Y} = b_{v,eff}$ for $x_{2,Y} > b_{v,eff}$	0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,492 mm 1,588 mm	E: A.57		
Coordinates of the ends of the contact line	$y_{1,Y} = -x_{1,Y} \cdot \tan\beta_{vb} + f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right)$	-6,106 mm -6,016 mm -5,926 mm -5,836 mm -5,747 mm -5,657 mm -5,567 mm -5,477 mm -5,388 mm -5,298 mm -5,208 mm	E: A.58		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$y_{2,\mathrm{Y}} = -x_{2,\mathrm{Y}} \cdot \tan\beta_{\mathrm{vb}} + f_{\mathrm{Y}} \cdot \cos\beta_{\mathrm{vb}} + \tan\beta_{\mathrm{vb}} \cdot \left(f_{\mathrm{Y}} \cdot \sin\beta_{\mathrm{vb}} + \frac{b_{\mathrm{v,eff}}}{2} \right)$	-4,724 mm -3,681 mm -2,637 mm -1,594 mm -0,550 mm 0,493 mm 1,537 mm 2,580 mm 3,624 mm 4,239 mm 4,329 mm	E: A.58		
Correction factor for the length of contact lines	$C_{\mathrm{lb,Y}} = \sqrt{\left(1 - \left(\frac{f_{\mathrm{Y}}}{f_{\mathrm{max}}}\right)^2\right) \cdot \left(1 - \sqrt{\frac{b_{\mathrm{v,eff}}}{b_{\mathrm{v}}}}\right)^2}$	0,032 0,041 0,048 0,054 0,058 0,062 0,065 0,068 0,071 0,073 0,074	E: A.61		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Theoretical length of contact line	$l_{rb0,Y} = \sqrt{(x_{1,Y} - x_{2,Y})^2 + (y_{1,Y} - y_{2,Y})^2}$	2,105 mm 3,558 mm 5,011 mm 6,464 mm 7,917 mm 9,370 mm 10,823 mm 12,277 mm 13,730 mm 14,531 mm 14,531 mm	E: A.60		
Length of contact line	$l_{rb,Y} = l_{rb0,Y} \cdot (1 - C_{lb,Y})$	2,037 mm 3,412 mm 4,771 mm 6,118 mm 7,457 mm 8,788 mm 10,115 mm 11,438 mm 12,758 mm 13,473 mm 13,449 mm	E: A.59		

<table>
<tr><th rowspan="3">Description</th><th rowspan="3">Formula</th><th rowspan="3">Result</th><th colspan="3">References to</th></tr>
<tr><th>ISO 10300-1</th><th>ISO 10300-2</th><th>ISO 10300-3</th></tr>
<tr><th colspan="3">E: Formula, T: Table, F: Figure</th></tr>
<tr><td>Related peak load for calculating the load sharing factor</td><td>$p_{t,Y}^{*} = \frac{w_Y}{w_{max}} = 1 - \left(\frac{\lvert f_{t,Y} \rvert}{\lvert f_{max} \rvert} \right)^{e_{LS}}$ with $e_{LS} = 3$</td><td>0,973
0,953
0,925
0,887
0,839
0,778
0,704
0,614
0,509
0,385
0,243</td><td></td><td>E: A.7</td><td></td></tr>
<tr><td>Related peak load for calculating the load sharing factor</td><td>$p_{m,Y}^{*} = \frac{w_Y}{w_{max}} = 1 - \left(\frac{\lvert f_{m,Y} \rvert}{\lvert f_{max} \rvert} \right)^{e_{LS}}$ with $e_{LS} = 3$</td><td>0,971
0,985
0,994
0,998
1,000
1,000
1,000
0,998
0,994
0,985
0,971</td><td></td><td>E: A.7</td><td></td></tr>
</table>

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Related peak load for calculating the load sharing factor	$p_{\mathrm{r,Y}}^{*} = \frac{w_{\mathrm{Y}}}{w_{\max}} = 1 - \left(\frac{\lvert f_{\mathrm{r,Y}} \rvert}{\lvert f_{\max} \rvert} \right)^{e_{\mathrm{LS}}}$ with $e_{\mathrm{LS}} = 3$	0,243 0,385 0,509 0,614 0,704 0,778 0,839 0,887 0,925 0,953 0,973		E: A.7	
Related area for calculating the load sharing factor X_{LS}	$A_{\mathrm{t,Y}}^{*} = \frac{1}{4} \cdot \pi \cdot p_{\mathrm{t,Y}}^{*} \cdot l_{\mathrm{tb,Y}}$	10,278 mm 10,085 mm 9,267 mm 7,970 mm 6,663 mm 5,370 mm 4,121 mm 2,952 mm 1,906 mm 1,033 mm 0,389 mm		E: A.6	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Related area for calculating the load sharing factor X_{LS}	$A_{m,Y}^{*}=\frac{1}{4}\cdot\pi\cdot p_{m,Y}^{*}\cdot l_{mb,Y}$	10,262 mm 10,394 mm 10,472 mm 10,509 mm 10,521 mm 10,522 mm 10,521 mm 10,509 mm 10,472 mm 10,394 mm 10,262 mm		E: A.6	
Related area for calculating the load sharing factor X_{LS}	$A_{r,Y}^{*}=\frac{1}{4}\cdot\pi\cdot p_{r,Y}^{*}\cdot l_{rb,Y}$	0,389 mm 1,033 mm 1,906 mm 2,952 mm 4,121 mm 5,370 mm 6,663 mm 7,970 mm 9,267 mm 10,085 mm 10,278 mm		E: A.6	

Description	Formula	Result	References to ISO 10300-1	 ISO 10300-2	 ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local load distribution factor	$Z_{LS,Y} = \sqrt{\frac{A^*_{m,Y}}{A^*_{t,Y} + A^*_{m,Y} + A^*_{r,Y}}}$	0,700 0,695 0,696 0,700 0,703 0,703 0,703 0,700 0,696 0,695 0,700		E: A.5	
Curvature factor	$X_Y = \frac{\tan\alpha_{vet}}{\sqrt{\frac{(d_{v1}/2 \cdot \sin\alpha_{vet} + g_Y)}{d_{vb1}/2}} \cdot \sqrt{\frac{(d_{v2}/2 \cdot \sin\alpha_{vet} - g_Y)}{d_{vb2}/2}}}$	1,176 1,119 1,071 1,030 0,994 0,963 0,935 0,910 0,888 0,868 0,850	E: A.63		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local equivalent radius of curvature vertical to the contact line in the contact point Y	$\rho_{\mathrm{rel,Y}} = \rho_{\mathrm{rel}} \cdot \frac{1}{X_{\mathrm{Y}}^{2}}$	12,970 mm 14,311 mm 15,617 mm 16,888 mm 18,126 mm 19,328 mm 20,496 mm 21,630 mm 22,729 mm 23,793 mm 24,823 mm	E: A.62		
Auxiliary variable	$a = \frac{1}{K_{\mathrm{H}\beta} - 1}$	1,538	E: 31		
Auxiliary variable	$b_{\mathrm{Y}} = \frac{2}{l_{\mathrm{bm,Y}}}$	0,149 mm^{-1} 0,149 mm^{-1} 0,149 mm^{-1} 0,149 mm^{-1} 0,149 mm^{-1} 0,149 mm^{-1} 0,149 mm^{-1} 0,149 mm^{-1} 0,149 mm^{-1} 0,149 mm^{-1} 0,149 mm^{-1}	E: 31		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Distance from M_Y to Y	$z_Y = \sqrt{\left(\frac{b_{v,eff}}{2} - \frac{x_{1,Y} + x_{2,Y}}{2}\right)^2 + \left(g_{va2} - \frac{g_{v\alpha}}{2} + g_Y - \frac{y_{1,Y} + y_{2,Y}}{2}\right)^2}$	6,726 mm 5,812 mm 4,359 mm 2,906 mm 1,453 mm 0,000 mm 1,453 mm 2,906 mm 4,359 mm 5,812 mm 6,726 mm	E: 30		
Local face load factor for contact stress	$K_{H\beta,Y} = K_{H\beta} \cdot \left[1-(b_Y \cdot z_Y)^a\right]$	0,000 0,329 0,800 1,194 1,493 1,650 1,493 1,194 0,800 0,329 0,000	E: 29		

Table B.13 — Local velocities and slip

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Surface velocity in tooth width direction	$w_{t1s} = v_{mt2} \cdot \sin \beta_{m2}$	2,569 m/s		E: A.14	
	$w_{t2s} = v_{mt2} \cdot \sin \beta_{m2}$	1,722 m/s		E: A.14	
Pinion local surface velocity in tooth height direction	$w_{t1h,Y} = v_{mt1} \cdot \cos \beta_{m1} \cdot \left(\sin \alpha_{nD,C} + \frac{g_Y}{d_{v1}/2} \right)$	0,356 m/s 0,434 m/s 0,513 m/s 0,592 m/s 0,670 m/s 0,749 m/s 0,827 m/s 0,906 m/s 0,984 m/s 1,063 m/s 1,141 m/s		E: A.15	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Wheel local surface velocity in tooth height direction	$w_{t2h,Y} = v_{mt2} \cdot \cos\beta_{m2} \cdot \left(\sin\alpha_{nD,C} - \frac{g_Y}{d_{v2}/2}\right)$	0,702 m/s 0,691 m/s 0,679 m/s 0,667 m/s 0,655 m/s 0,644 m/s 0,632 m/s 0,620 m/s 0,609 m/s 0,597 m/s 0,585 m/s		E: A.16	
Pinion local surface velocity	$w_{t1,Y} = \sqrt{w_{t1s}^2 + w_{t1h,Y}^2}$	2,594 m/s 2,606 m/s 2,620 m/s 2,637 m/s 2,655 m/s 2,676 m/s 2,699 m/s 2,724 m/s 2,752 m/s 2,781 m/s 2,812 m/s		E: A.17	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Wheel local surface velocity	$w_{\mathrm{t2,Y}} = \sqrt{w_{\mathrm{t2s}}^2 + w_{\mathrm{t2h,Y}}^2}$	1,859 m/s 1,855 m/s 1,851 m/s 1,847 m/s 1,842 m/s 1,838 m/s 1,834 m/s 1,830 m/s 1,826 m/s 1,822 m/s 1,818 m/s		E: A.17	
Angle between the sliding velocities in lengthwise and tooth profile direction	$\omega_{\mathrm{wt1,Y}} = \arctan \frac{w_{\mathrm{t1h,Y}}}{w_{\mathrm{t1s}}}$	7,887° 9,598° 11,291° 12,965° 14,617° 16,244° 17,845° 19,417° 20,960° 22,471° 23,950°		E: A.19	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Angle between the sliding velocities in lengthwise and tooth profile direction	$\omega_{wt2,Y} = \arctan \frac{w_{t2h,Y}}{w_{t2s}}$	22,188° 21,853° 21,517° 21,179° 20,839° 20,497° 20,155° 19,810° 19,464° 19,117° 18,768°		E: A.19	
Pinion local surface velocity vertical to the contact line	$w_{t1vert,Y} = w_{t1,Y} \cdot \sin\left(\lvert\beta_B\rvert + \lvert\omega_{wt1,Y}\rvert\right)$	1,151 m/s 1,226 m/s 1,300 m/s 1,375 m/s 1,449 m/s 1,524 m/s 1,598 m/s 1,673 m/s 1,747 m/s 1,822 m/s 1,896 m/s		E: A.18	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Wheel local surface velocity vertical to the contact line	$w_{\mathrm{t2vert,Y}} = w_{\mathrm{t2,Y}} \cdot \sin\left(\lvert\beta_{\mathrm{B}}\rvert + \lvert\omega_{\mathrm{wt2,Y}}\rvert\right)$	1,211 m/s 1,200 m/s 1,189 m/s 1,178 m/s 1,167 m/s 1,156 m/s 1,145 m/s 1,133 m/s 1,122 m/s 1,111 m/s 1,100 m/s		E: A.18	
Local sum velocity vertical to the contact line	$v_{\Sigma\mathrm{vert,Y}} = w_{\mathrm{t1vert,Y}} + w_{\mathrm{t2vert,Y}}$	2,362 m/s 2,426 m/s 2,489 m/s 2,553 m/s 2,616 m/s 2,679 m/s 2,743 m/s 2,806 m/s 2,870 m/s 2,933 m/s 2,996 m/s		E: A.23	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local slip vertical to the contact line	$\zeta_{\text{vert,Y1}} = 1{,}0 - \left\| \dfrac{w_{\text{t2vert,Y}}}{w_{\text{t1vert,Y}}} \right\|$	-0,052 0,021 0,085 0,143 0,195 0,242 0,284 0,322 0,358 0,390 0,420		E: A.24	
	$\zeta_{\text{vert,Y2}} = 1{,}0 - \left\| \dfrac{w_{\text{t1vert,Y}}}{w_{\text{t2vert,Y}}} \right\|$	0,050 -0,021 -0,093 -0,167 -0,242 -0,318 -0,396 -0,476 -0,557 -0,639 -0,724		E: A.25	

Table B.14 — Calculation of local surface durability (macropitting)

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local contact stress	$\sigma_{H,Y}=\sqrt{\frac{F_n \cdot K_A \cdot K_v \cdot K_{H\beta,Y} \cdot K_{H\alpha}}{l_{b,Y} \cdot \rho_{rel,Y}}} \cdot Z_E \cdot Z_{LS,Y}$	0,000 N/mm² 714,763 N/mm² 1 068,410 N/mm² 1 264,208 N/mm² 1 369,741 N/mm² 1 396,095 N/mm² 1 288,094 N/mm² 1 117,089 N/mm² 885,619 N/mm² 554,327 N/mm² 0,000 N/mm²		E: A.2	
Local modified contact stress	$\sigma_{H,Y,mod}=\sigma_{H,Y}+\left(\frac{1}{6} \cdot e_{LS}+0,25\right) \cdot max\left(\sigma_{H,Y}\right) \cdot \left(\frac{\lvert g_Y \rvert}{g_{va,max}}\right)^4$ with e_{LS} = 3	157,285 N/mm² 761,768 N/mm² 1 076,672 N/mm² 1 264,563 N/mm² 1 369,741 N/mm² 1 397,423 N/mm² 1 303,984 N/mm² 1 189,740 N/mm² 1 103,615 N/mm² 1 070,057 N/mm² 1 047,072 N/mm²		E: A.1	
Calculation factor	$C_{ZV}=0,08 \cdot \frac{\sigma_{H,lim}-850}{350}+0,85$	0,930		E: 57	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local tangential speed	$v_{mt2,Y} = v_{mt2} - 2 \cdot \frac{v_{mt2} \cdot g_Y \cdot \sin \alpha_{vet}}{d_{v2}}$	2,785 m/s 2,779 m/s 2,772 m/s 2,765 m/s 2,758 m/s 2,751 m/s 2,745 m/s 2,738 m/s 2,731 m/s 2,724 m/s 2,717 m/s		E: A.9	
Local speed factor	$Z_{v,Y} = C_{ZV} + \frac{2 \cdot (1 - C_{ZV})}{\sqrt{0,8 + \frac{32}{v_{mt2,Y}}}}$	0,970 0,970 0,970 0,970 0,970 0,970 0,970 0,970 0,970 0,970 0,969		E: A.8	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local hypoid factor	$Z_{\text{Hyp,Y}} = 1 - 0{,}3 \cdot \left(\frac{v_{\text{g,par}}}{v_{\Sigma,\text{vert,Y}}} - 0{,}15 \right)$	0,943 0,946 0,948 0,951 0,953 0,955 0,957 0,959 0,961 0,963 0,964		E: A.10	
Calculation factor for the local bevel slip factor	$Z_{\text{S0,Y1}} = \frac{7}{24} \cdot \zeta_{\text{vert,Y1}} + \frac{47}{40}$	1,160 1,181 1,200 1,217 1,232 1,245 1,250 1,250 1,250 1,250 1,250		E: A.13	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$Z_{S0,Y2} = \frac{7}{24} \cdot \zeta_{vert,Y2} + \frac{47}{40}$	1,189 1,169 1,148 1,126 1,104 1,082 1,059 1,036 1,013 1,000 1,000		E: A.13	
Local bevel slip factor (driving gear)	$Z_{S,Y1} = Z_{S0,Y1}$	1,160 1,181 1,200 1,217 1,232 1,245 1,250 1,250 1,250 1,250 1,250		E: A.11	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local bevel slip factor (driven gear)	$Z_{S,Y2} = Z_{S0,Y2} + (Z_{S0,Y2} - 0{,}95) \cdot 1{,}75$	1,609 1,552 1,494 1,435 1,375 1,313 1,251 1,187 1,122 1,088 1,088		E: A.12	
Local permissible contact stress	$\sigma_{HP,Y,1} = \sigma_{H,lim,1} \cdot Z_{NT} \cdot Z_X \cdot Z_L \cdot Z_R \cdot Z_W \cdot Z_{v,Y} \cdot Z_{Hyp,Y} \cdot Z_{S,Y,1}$	1 482,295 N/mm^2 1 513,713 N/mm^2 1 541,927 N/mm^2 1 567,425 N/mm^2 1 590,604 N/mm^2 1 611,781 N/mm^2 1 621,133 N/mm^2 1 624,421 N/mm^2 1 627,560 N/mm^2 1 630,558 N/mm^2 1 633,427 N/mm^2		E: A.3	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$\sigma_{HP,Y,2} = \sigma_{H,lim,2} \cdot Z_{NT} \cdot Z_X \cdot Z_L \cdot Z_R \cdot Z_W \cdot Z_{v,Y} \cdot Z_{Hyp,Y} \cdot Z_{S,Y,2}$	2 055,834 N/mm² 1 988,698 N/mm² 1 919,516 N/mm² 1 848,291 N/mm² 1 775,021 N/mm² 1 699,693 N/mm² 1 622,297 N/mm² 1 542,811 N/mm² 1 461,214 N/mm² 1 418,586 N/mm² 1 421,082 N/mm²		E: A.3	
Calculated local safety factor for contact stress (macropitting) on pinion and wheel	$S_{H,Y1} = \frac{\sigma_{HP,Y1}}{\sigma_{H,Y,mod}}$	9,424 1,987 1,432 1,239 1,161 1,153 1,243 1,365 1,475 1,524 1,560		E: A.4	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$S_{H,Y2} = \dfrac{\sigma_{HP,Y2}}{\sigma_{H,Y,mod}}$	13,071 2,611 1,783 1,462 1,296 1,216 1,244 1,297 1,324 1,326 1,357		E: A.4	

Annex C
(informative)

Sample 3: Rating of a hypoid gear set according to Method B1 and Method B2

C.1 Initial data

Sample 3 is for a hypoid gear pair which uses Method 2 according to ISO 23509.

Table C.1 — Initial data for pitch cone parameters

Symbol	Description	Method 0	Method 1	Method 2	Method 3
Σ	Shaft angle	X	X	90°	X
a	Hypoid offset	0,0	X	31,75 mm	X
$z_{1,2}$	Number of teeth	X	X	9/34	X
d_{m2}	Mean pitch diameter of wheel	—	—	146,7 mm	—
d_{e2}	Outer pitch diameter of wheel	X	X	—	X
b_2	Wheel facewidth	X	X	26,0 mm	X
β_{m1}	Mean spiral angle of pinion	—	X	—	—
β_{m2}	Mean spiral angle of wheel	X	—	21,009°	X
r_{c0}	Cutter radius	X	X	76,0 mm	X
z_0	Number of blade groups (only face hobbing)	X	—	13	X

Table C.2 — Input data for tooth profile parameters

Data type I		Data type II	
Symbol	**Description**	**Symbol**	**Description**
α_{dD}	20°		
α_{dC}	20°		
$f_{\alpha lim}$	1		
x_{hm1}	—	c_{ham}	0,275
k_{hap}	—	k_{d}	2,000
k_{hfp}	—	k_{c}	0,125
x_{smn}	—	k_{t} W_{m2}	0,1 —
j_{et2}	0,2 mm		
θ_{a2}	0°		
θ_{f2}	0°		
ρ_{a01}	0,8 mm		
ρ_{a02}	1,2 mm		
$s_{pr1D,C}$	0 mm/0 mm		
$s_{pr2D,C}$	0 mm/0 mm		

Table C.3 and Table C.4 show geometric and operational data and text for explanation.

Table C.3 — Geometric data from calculation according to ISO 23509

Symbol	Description	Values	Symbol	Description	Value
$d_{m1,2}$	Mean pitch diameter of pinion/wheel	51,258 mm/ 146,700 mm	ζ_{mp}	Offset angle on pitch plane	23,981°
$h_{am1,2}$	Mean addendum of pinion/wheel	5,840 mm/ 2,215 mm	ζ_R	Pinion offset angle on root plane	21,647°
$h_{fm1,2}$	Mean dedendum of pinion/wheel	3,222 mm/ 6,847 mm	$R_{e1,2}$	Outer cone distance on pinion/wheel	76,756 mm/ 95,168 mm
$\alpha_{eD,C}$	Effective pressure angle for drive side/coast side	20°/20°	$R_{m1,2}$	Mean cone distance on pinion/wheel	61,186 mm/ 82,168 mm
$\alpha_{nD,C}$	Generated pressure angle for drive side/coast side	15,868°/ 24,132°	$\delta_{1,2}$	Pitch angle on pinion/wheel	24,763°/ 63,212°
α_{lim}	Limit pressure angle	−4,132°	$\delta_{a1,2}$	Face angle on pinion/wheel	24,765°/ 63,212°
m_{mn}	Mean normal module	4,028 mm	$\delta_{f1,2}$	Root angle on pinion/wheel	24,765°/ 63,212°
k_{hfp}	Basic crown gear dedendum factor	1,25	$x_{sm1,2}$	Thickness modification coefficient on pinion/wheel	0,040 / −0,060
ζ_m	Pinion offset angle on axial plane	21,647°	m_{et2}	Outer transverse module	4,997 mm
$s_{mn1,2}$	Mean normal circular tooth thickness of pinion/wheel	7,969 mm/ 4,524 mm	—		

Table C.4 — Operation parameters and additional considerations

Symbol	Description	Value
	Additional data	
	Wheel profile	Generated
	Roughing/finishing method	Face hobbing/face milling
$b_{2\text{eff}}$	Effective facewidth on wheel	$0{,}85 \cdot b_2$
	Profile crowning	Low
	Verification of contact pattern	Checked under light test load for each gear
	Mounting conditions of pinion and wheel	One member cantilever-mounted
	Operation parameters	
T_1	Pinion torque	250 Nm
n_1	Pinion rotational speed	4 500 min^{-1}
K_A	Application factor	1,1
	Active flank	Drive
	Material data for pinion and wheel (case hardened steel)	
E	Modulus of elasticity	210 000 N/mm^2
ν	Poisson's ratio	0,3
$\sigma_{\text{H lim}}$	Allowable stress number (contact)	1510 N/mm^2
$\sigma_{\text{F lim}}$	Nominal stress number (bending)	500 N/mm^2
	Surface hardness	Same for pinion and wheel
	Quality parameters	
R_z	Flank roughness on pinion/wheel	3 µm/3 µm
R_z	Tooth root roughness on pinion/wheel	10 µm/10 µm
f_{pt}	Single pitch deviation on pinion/wheel	12 µm/25 µm
	Lubrication parameters	
	Oil type	ISO-VG-100
	Oil temperature	90 °C

C.2 Calculation of Sample 3 according to Method B1

Table C.5 — Virtual cylindrical gears

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Virtual cylindrical gears in transverse section					
Reference diameter on pinion	$d_{v1} = \dfrac{d_{m1}}{\cos\delta_1}$	56,448 mm	E: A.1		
Reference diameter on wheel	$d_{v2} = u^2 \cdot d_{v1}$	325,506 mm	E: A.4		
Helix angle	$\beta_v = \dfrac{\beta_{m1} + \beta_{m2}}{2}$	33°	E: A.8		
Transverse pressure angle of virtual cylindrical gears	$\alpha_{vet} = \arctan(\tan\alpha_e / \cos\beta_v)$ since $\alpha_e = \alpha_{eD}$ for drive side	23,460°	E: A.10		
Transverse module	$m_{vt} = m_{mn} / \cos\beta_v$	4,803 mm	E: A.11		
Number of teeth on pinion	$z_{v1} = d_{v1} / m_{vt}$	11,754	E: A.12		
Number of teeth on wheel	$z_{v2} = d_{v2} / m_{vt}$	67,776	E: A.12		
Gear ratio	$u_v = z_{v2} / z_{v1}$	5,766	E: A.13		
Auxiliary angle for virtual facewidth	$\vartheta_{mp} = \arctan(\sin\delta_2 \cdot \tan\zeta_m)$	19,508°	E: A.21		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Projected auxiliary angle for length of contact line	$\gamma' = \vartheta_{\mathrm{mp}} - \zeta_{\mathrm{mp}} / 2$	7,518°	E: A.20		
Centre distance of virtual cylindrical gear pair	$a_{\mathrm{v}} = (d_{\mathrm{v}1} + d_{\mathrm{v}2}) / 2$	190,977 mm	E: A.5		
Helix angle of virtual cylindrical gear at base circle	$\beta_{\mathrm{vb}} = \arcsin(\sin \beta_{\mathrm{v}} \cdot \cos \alpha_{\mathrm{e}})$ since $\alpha_{\mathrm{e}} = \alpha_{\mathrm{eD}}$ for drive side	30,783°	E: A.16		
Tip diameter on pinion	$d_{\mathrm{va1}} = d_{\mathrm{v1}} + 2\, h_{\mathrm{am1}}$	68,129 mm	E: A.6		
Tip diameter on wheel	$d_{\mathrm{va2}} = d_{\mathrm{v2}} + 2\, h_{\mathrm{am2}}$	329,936 mm	E: A.6		
Root diameter on pinion	$d_{\mathrm{vf1}} = d_{\mathrm{v1}} - 2\, h_{\mathrm{fm1}}$	50,004 mm	E: A.7		
Root diameter on wheel	$d_{\mathrm{vf2}} = d_{\mathrm{v2}} - 2\, h_{\mathrm{fm2}}$	311,811 mm	E: A.7		
Base diameter on pinion	$d_{\mathrm{vb1}} = d_{\mathrm{v1}} \cdot \cos \alpha_{\mathrm{vet}}$	51,782 mm	E: A.9		
Base diameter on wheel	$d_{\mathrm{vb2}} = d_{\mathrm{v2}} \cdot \cos \alpha_{\mathrm{vet}}$	298,599 mm	E: A.9		
Transverse base pitch	$p_{\mathrm{vet}} = \pi \cdot m_{\mathrm{mn}} \cdot \cos \alpha_{\mathrm{vet}} / \cos \beta_{\mathrm{v}}$	13,841 mm	E: A.17		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Length of path of contact of virtual cylindrical gear in transverse section	$g_{v\alpha}=\frac{1}{2}\cdot\left[\left(\sqrt{d_{va1}^2-d_{vb1}^2}-d_{v1}\cdot\sin\alpha_{vet}\right)+\left(\sqrt{d_{va2}^2-d_{vb2}^2}-d_{v2}\cdot\sin\alpha_{vet}\right)\right]$	16,280 mm	E: A.18		
Transverse contact ratio	$\varepsilon_{v\alpha}=g_{v\alpha}/p_{vet}$	1,176	E: A.23		
Effective facewidth with $b_{2,eff}=0{,}85\cdot b_2$	$b_{v,eff}=\frac{\left(b_{2,eff}/\cos\left(\zeta_{mp}/2\right)-g_{v\alpha}\cdot\cos\alpha_{vet}\cdot\tan\left(\zeta_{mp}/2\right)\right)}{1-\tan\gamma'\cdot\tan\left(\zeta_{mp}/2\right)}$	19,981 mm	E: A.19		
Facewidth	$b_v=b_2\cdot\frac{b_{v,eff}}{b_{2,eff}}$	23,507 mm	E: A.22		
Virtual cylindrical gears in normal section					
Number of pinion teeth of virtual cylindrical gears	$z_{vn1}=\frac{z_{v1}}{\cos^2\beta_{vb}\cdot\cos\beta_v}$	18,988	E: A.41		
Number of wheel teeth of virtual cylindrical gears	$z_{vn2}=u_v\cdot z_{vn1}$	109,492	E: A.42		
Reference diameter on pinion	$d_{vn1}=z_{vn1}\cdot m_{mn}$	76,481 mm	E: A.43		
Reference diameter on wheel	$d_{vn2}=z_{vn2}\cdot m_{mn}$	441,021 mm	E: A.43		
Tip diameter on pinion	$d_{van1}=d_{vn1}+2\cdot h_{am1}$	88,162 mm	E: A.44		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Tip diameter on wheel	$d_{van2} = d_{vn2} + 2 \cdot h_{am2}$	445,452 mm	E: A.44		
Base diameter on pinion	$d_{vbn1} = d_{vn1} \cdot \cos\alpha_e$	71,868 mm	E: A.45		
Base diameter on wheel	$d_{vbn2} = d_{vn2} \cdot \cos\alpha_e$	414,424 mm	E: A.45		
Face contact ratio	$\varepsilon_{v\beta} = \dfrac{b_{v,eff} \cdot \sin\beta_v}{\pi \cdot m_{mn}}$	0,860	E: A.24		
Virtual contact ratio	$\varepsilon_{v\gamma} = \varepsilon_{v\alpha} + \varepsilon_{v\beta}$	2,036	E: A.25		
Inclination angle of contact line	$\beta_B = \arctan(\tan\beta_v \cdot \sin\alpha_e)$	12,523°	E: A.38		
Radius of relative curvature in normal section at the mean point	$\rho_t = \left[\dfrac{1}{\cos\alpha_{nD} \cdot (\tan\alpha_{nD} - \tan\alpha_{lim}) + \tan\zeta_{mp} \cdot \tan\beta_B} \cdot \dfrac{\cos\beta_{m1} \cdot \cos\beta_{m2}}{\cos\zeta_{mp}} \cdot \left(\dfrac{1}{R_{m2} \cdot \tan\delta_2} + \dfrac{1}{R_{m1} \cdot \tan\delta_1}\right)\right]^{-1}$	14,703 mm	E: A.39		
Radius of relative curvature vertical to the contact line	$\rho_{rel} = \lvert\rho_t\rvert \cdot (\cos\beta_B)^2$	14,012 mm	E: A.37		

Table C.6 — General influence factors

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Nominal tangential force of bevel gears	$F_{\mathrm{mt}1,2} = \dfrac{2\,000 \cdot T_{1,2}}{d_{\mathrm{m}1,2}}$	9754,6 N	E: 1		
Nominal tangential force of virtual cylindrical gears	$F_{\mathrm{vmt}} = F_{\mathrm{mt}1} \cdot \dfrac{\cos \beta_{\mathrm{v}}}{\cos \beta_{\mathrm{m}1}}$	11 567,5 N	E: 2		
Nominal tangential speed at mean point of the pinion	$v_{\mathrm{mt}1} = \dfrac{d_{\mathrm{m}1} \cdot n_1}{19\,098}$	12,078 m/s	E: 5		
Nominal tangential speed at mean point of the wheel	$v_{\mathrm{mt}2} = \dfrac{d_{\mathrm{m}2} \cdot n_2}{19\,098}$	9,150 m/s	E: 5		
Correction factor for non-average conditions for $F_{\mathrm{vmt}}\,K_{\mathrm{A}} / b_{\mathrm{veff}} \geq$ 100 N/mm	C_{F}	1,0	E: 12		
Mean value of mesh stiffness per unit facewidth	$c_{\gamma} = c_{\gamma 0} \cdot C_{\mathrm{F}}$	14,000 N/(mm·µm)	E: 11		
Single stiffness	$c' = c'_0 \cdot C_{\mathrm{F}}$	20,000 N/(mm·µm)	E: 18		
Max. single pitch deviation as given in Table C.4	f_{pt}	25 µm			

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Running–in allowance for case hardened and nitrided gears	$y_\alpha = 0{,}075 \cdot f_{pt}$	1,875 µm	E: 51		
Effective pitch deviation with $y_p = y_\alpha$	$f_{p,eff} = f_{pt} - y_p$	23,125 µm	E: 17		
Relative pinion mass per unit facewidth reduced to the line of action	$m_1^* = \frac{1}{8} \cdot \rho \cdot \pi \cdot \frac{d_{m1}^2}{\cos^2[(\alpha_{nD} + \alpha_{nC})/2]}$ where ρ is the density of the gear material (for steel $\rho = 7{,}86 \cdot 10^{-6}$ kg/mm^3)	0,009 kg/mm	E: 14		
Relative wheel mass per unit facewidth reduced to the line of action	$m_2^* = \frac{1}{8} \cdot \rho \cdot \pi \cdot \frac{d_{m2}^2}{\cos^2[(\alpha_{nD} + \alpha_{nC})/2]}$ where ρ is the density of the gear material (for steel $\rho = 7{,}86 \cdot 10^{-6}$ kg/mm^3)	0,072 kg/mm	E: 14		
Mass reduced to the line of action of the dynamically equivalent cylindrical gear pair	$m_{red} = \frac{m_1^* \cdot m_2^*}{m_1^* + m_2^*}$	0,008 kg/mm	E: 10		
Resonance speed of pinion	$n_{E1} = \frac{30 \cdot 10^3}{\pi \cdot z_1} \cdot \sqrt{\frac{c_\gamma}{m_{red}}}$	53 693 min^{-1}	E: 9		

<table>
<tr><th rowspan="3">Description</th><th rowspan="3">Formula</th><th rowspan="3">Result</th><th colspan="3">References to</th></tr>
<tr><th>ISO 10300-1</th><th>ISO 10300-2</th><th>ISO 10300-3</th></tr>
<tr><th colspan="3">E: Formula, T: Table, F: Figure</th></tr>
<tr><td>Dimensionless reference speed</td><td>$N = \frac{n_1}{n_{E1}}$</td><td>0,084</td><td>E: 8</td><td></td><td></td></tr>
<tr><td rowspan="5">For virtual contact ratio, $\varepsilon_{v\gamma} = 2{,}036 > 2$</td><td>$c_{v1,2} = c_{v1} + c_{v2}$</td><td>0,648</td><td>T: 3</td><td></td><td></td></tr>
<tr><td>c_{v3}</td><td>0,202</td><td>T: 3</td><td></td><td></td></tr>
<tr><td>c_{v4}</td><td>0,785</td><td>T: 3</td><td></td><td></td></tr>
<tr><td>$c_{v5,6}$</td><td>0,875</td><td>T: 3</td><td></td><td></td></tr>
<tr><td>c_{v7}</td><td>0,889</td><td>T: 3</td><td></td><td></td></tr>
<tr><td>Constant for the dynamic factor with $K_A = 1{,}1$ as given in Table C.4</td><td>$K = \frac{b_v \cdot f_{p,eff} \cdot c'}{F_{vmt} \cdot K_A} \cdot c_{v1,2} + c_{v3}$</td><td>0,589</td><td>E: 16</td><td></td><td></td></tr>
<tr><td>Dynamic factor</td><td>$K_{v-B} = N \cdot K + 1$</td><td>1,000</td><td>E: 15</td><td></td><td></td></tr>
<tr><td colspan="6">Determination of the length of contact lines</td></tr>
<tr><td rowspan="3">For virtual contact ratio, $\varepsilon_{v\beta} = 0{,}860$, $0 < \varepsilon_{v\beta} < 1$</td><td>$f_t = -(p_{vet} - 0{,}5\ p_{vet}\ \varepsilon_{v\alpha}) \cos\beta_{vb}\ (1 - \varepsilon_{v\beta}) + p_{vet} \cos\beta_{vb}$</td><td>11,205 mm</td><td>T: A.2</td><td></td><td></td></tr>
<tr><td>$f_m = -(p_{vet} - 0{,}5\ p_{vet}\ \varepsilon_{v\alpha}) \cos\beta_{vb}\ (1 - \varepsilon_{v\beta})$</td><td>−0,686 mm</td><td>T: A.2</td><td></td><td></td></tr>
<tr><td>$f_r = -(p_{vet} - 0{,}5\ p_{vet}\ \varepsilon_{v\alpha}) \cos\beta_{vb}\ (1 - \varepsilon_{v\beta}) - p_{vet} \cos\beta_{vb}$</td><td>−12,577 mm</td><td>T: A.2</td><td></td><td></td></tr>
</table>

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Maximum distances from middle contact line	$f_{\text{maxB}} = \frac{1}{2} \cdot \left[g_{\text{v}\alpha} + b_{\text{v,eff}} \cdot (\tan\gamma + \tan\beta_{\text{vb}}) \right] \cdot \cos\beta_{\text{vb}}$	13,341 mm	E: A.33		
	$f_{\text{max0}} = \frac{1}{2} \cdot \left[g_{\text{v}\alpha} - b_{\text{v,eff}} \cdot (\tan\gamma + \tan\beta_{\text{vb}}) \right] \cdot \cos\beta_{\text{vb}}$	0,645 mm	E: A.34		
	$f_{\text{max}} = f_{\text{maxB}}$ since $f_{\text{maxB}} > f_{\text{max0}}$	13,341 mm			
Theoretical length of contact line	$l_{\text{b0}} = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$	23,184 mm	E: A.32		
Theoretical length of middle contact line calculated with $f = f_{\text{m}}$ for contact stress as specified in ISO 10300−2:2023, 6.1	$x_1 = \frac{f \cdot \cos\beta_{\text{vb}} + \tan\beta_{\text{vb}} \cdot \left(f \cdot \sin\beta_{\text{vb}} + \frac{b_{\text{v,eff}}}{2} \right) + \frac{1}{2} \cdot (g_{\text{v}\alpha} + b_{\text{v,eff}} \cdot \tan\gamma)}{\tan\gamma + \tan\beta_{\text{vb}}}$	19,918 mm	E: A.29		
Theoretical length of middle contact line calculated with $f = f_{\text{m}}$ for contact stress as specified in ISO 10300−2:2023, 6.1	$x_2 = \frac{f \cdot \cos\beta_{\text{vb}} + \tan\beta_{\text{vb}} \cdot \left(f \cdot \sin\beta_{\text{vb}} + \frac{b_{\text{v,eff}}}{2} \right) - \frac{1}{2} \cdot (g_{\text{v}\alpha} - b_{\text{v,eff}} \cdot \tan\gamma)}{\tan\gamma + \tan\beta_{\text{vb}}}$	0,000 mm	E: A.30		
	$y_1 = -x_1 \cdot \tan\beta_{\text{vb}} + f \cdot \cos\beta_{\text{vb}} + \tan\beta_{\text{vb}} \cdot \left(f \cdot \sin\beta_{\text{vb}} + \frac{b_{\text{v,eff}}}{2} \right)$	−6,712 mm	E: A.31		
	$y_2 = -x_2 \cdot \tan\beta_{\text{vb}} + f \cdot \cos\beta_{\text{vb}} + \tan\beta_{\text{vb}} \cdot \left(f \cdot \sin\beta_{\text{vb}} + \frac{b_{\text{v,eff}}}{2} \right)$	5,153 mm	E: A.31		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Correction factor	$C_{\mathrm{lb}} = \sqrt{\left(1-\left(\frac{f}{f_{\max}}\right)^2\right) \cdot \left(1-\sqrt{\frac{b_{\mathrm{v,eff}}}{b_{\mathrm{v}}}}\right)^2}$	0,078	E: A.36		
Length of contact line	$l_{\mathrm{bm}} = l_{\mathrm{b0}} \cdot (1 - C_{\mathrm{lb}})$	21,377 mm	E: A.26		
Load sharing factor (macropitting)					
Exponent for calculation of parabolic distribution of peak loads	e_{LS}	3		T: 5	
Related peak load	$p^* = 1 - \left(\frac{\lvert f \rvert}{\lvert f_{\max} \rvert}\right)^{e_{\mathrm{LS}}}$	—		E: 7 F: 2	
Related peak load at tip contact line	$p_{\mathrm{t}}{}^* = 1 - \left(\frac{\lvert f_{\mathrm{t}} \rvert}{\lvert f_{\max} \rvert}\right)^{e_{\mathrm{LS}}}$	0,407			
Related peak load at middle contact line	$p_{\mathrm{m}}{}^* = 1 - \left(\frac{\lvert f_{\mathrm{m}} \rvert}{\lvert f_{\max} \rvert}\right)^{e_{\mathrm{LS}}}$	1,000			
Related peak load at root contact line	$p_{\mathrm{r}}{}^* = 1 - \left(\frac{\lvert f_{\mathrm{r}} \rvert}{\lvert f_{\max} \rvert}\right)^{e_{\mathrm{LS}}}$	0,162			

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Related area	$A^* = \frac{1}{4} \cdot p^* \cdot l_b \cdot \pi$	—		E: 8 F: 2	
Related area at tip contact line	$A_t^* = \frac{1}{4} p_t^* \cdot l_{bt} \cdot \pi$	1,199 mm			
Related area at middle contact line	$A_m^* = \frac{1}{4} p_m^* \cdot l_{bm} \cdot \pi$	16,787 mm			
Related area at root contact line	$A_r^* = \frac{1}{4} p_r^* \cdot l_{br} \cdot \pi$	0,174 mm			
Load sharing factor	$Z_{LS} = \sqrt{\frac{A_m^*}{A_t^* + A_m^* + A_r^*}}$	0,961		E: 10	
Face load factors (Calculation according to Method C)					
Load distribution factor	$K_{H\beta-C} = 1{,}5 \cdot K_{H\beta-be}$	1,650	E: 28		
with	$K_{H\beta-be}$	1,100	T:4		
Load distribution factor	$K_{F\beta-C} = K_{H\beta-C} / K_{F0}$	1,633	E: 32		
with	K_{F0} since finishing method is face milling.	1,011	E: 33		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Transverse load factors (Calculation according to Method B)					
Determinant tangential force at mid facewidth on the pitch cone	$F_{\mathrm{mtH}} = F_{\mathrm{vmt}} \cdot K_{\mathrm{A}} \cdot K_{\mathrm{v}} \cdot K_{\mathrm{H}\beta}$	20 995,2 N	E: 47		
Transverse load factors for bevel gear with virtual contact ratio $\varepsilon_{\mathrm{v}\gamma} = 2{,}036 > 2$	$K^{*}_{\mathrm{H}\alpha-\mathrm{B}} = K^{*}_{\mathrm{F}\alpha-\mathrm{B}} = 0{,}9 + 0{,}4 \cdot \sqrt{\frac{2 \cdot (\varepsilon_{\mathrm{v}\gamma} - 1)}{\varepsilon_{\mathrm{v}\gamma}}} \cdot \frac{c_{\gamma} \cdot (f_{\mathrm{pt}} - y_{\alpha})}{F_{\mathrm{mtH}} / b_{\mathrm{v}}}$	1,109	E: 48		
Relative hypoid offset	$a_{\mathrm{rel}} = \frac{2 \cdot \lvert a \rvert}{d_{\mathrm{m2}}}$	0,433	E: 41		
Transverse load factors	$K_{\mathrm{H}\alpha} = K_{\mathrm{F}\alpha} = K^{*}_{\mathrm{H}\alpha} - \frac{K^{*}_{\mathrm{H}\alpha} - 1}{0{,}1} \cdot a_{\mathrm{rel}}$ since $K_{\mathrm{H}\alpha} \geq 1{,}0$	1,000	E: 40		

Table C.7 — Calculation of surface durability (macropitting)

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Z–factors					
Factors for calculation of mid–zone factor for $\varepsilon_{v\beta}$ = 0,860 < 1	$F_1 = \varepsilon_{v\alpha}$	1,292		T: 4	
	$F_2 = \varepsilon_{v\alpha}$	1,061		T: 4	
Mid–zone factor	$Z_{M-B} = \dfrac{\tan \alpha_{vet}}{\sqrt{\left[\sqrt{\left(\dfrac{d_{va1}}{d_{vb1}}\right)^2 - 1} - F_1 \cdot \dfrac{\pi}{z_{v1}}\right] \cdot \left[\sqrt{\left(\dfrac{d_{va2}}{d_{vb2}}\right)^2 - 1} - F_2 \cdot \dfrac{\pi}{z_{v2}}\right]}}$	0,937		E: 6	
Elasticity factor	$Z_E = \sqrt{\dfrac{1}{\pi \cdot \left[\dfrac{\left(1-\nu_1^2\right)}{E_1} + \dfrac{\left(1-\nu_2^2\right)}{E_2}\right]}}$	191,646 $(N/mm^2)^{1/2}$		E: 51	
Bevel gear factor	Z_{KP}	1,200		E: 11	
Lubricant factor	$C_{ZL} = 0{,}08 \cdot \dfrac{\sigma_{H,lim} - 850}{350} + 0{,}83$ using $\sigma_{H,lim}$ = 1 200 N/mm², which is the upper allowed limit in the above formula.	0,910		E: 55	
	$Z_L = C_{ZL} + \dfrac{4 \cdot (1{,}0 - C_{ZL})}{\left(1{,}2 + \dfrac{134}{\nu_{40}}\right)^2}$	0,966		E: 54	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Speed factor	$C_{ZV} = 0{,}08 \cdot \frac{\sigma_{H,lim} - 850}{350} + 0{,}85$ using $\sigma_{H,lim}$ = 1 200 N/mm^2, which is the upper allowed limit in the above formula.	0,930		E: 57	
	$Z_v = C_{ZV} + \frac{2 \cdot (1{,}0 - C_{ZV})}{\sqrt{0{,}8 + \frac{32}{v_{mt2}}}}$	0,998		E: 56	
Roughness factor with the radius of relative curvature $\rho = \rho_{rel}$ = 14,013 mm for Method B1 (see ISO 10300–1:2023, Annex A)	$Rz_{10} = \frac{Rz_1 + Rz_2}{2} \cdot \sqrt[3]{\frac{10}{\rho}}$	2,681 µm		E: 58	
	$C_{ZR} = 0{,}12 + \frac{1\ 000 - \sigma_{H,lim}}{5\ 000}$ using $\sigma_{H,lim}$ = 1 200 N/mm^2, which is the upper allowed limit in the above formula.	0,080		E: 60	
	$Z_R = \left(\frac{3}{Rz_{10}}\right)^{C_{ZR}}$	1,009		E: 59	
Product of the lubricant influence factors	$Z_L Z_v Z_R$	0,972			
Size factor	Z_X for Method B1 (see ISO 10300–2:2023, 6.5.2)	1,000			
Hypoid factor	Z_{Hyp}	0,829		E: 12	
Life factor for pinion	$Z_{NT,1}$	1,000		T: 6	
Life factor for wheel	$Z_{NT,2}$	1,000		T: 6	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Work hardening factor	Set $Z_{w,1} = Z_{W,2} = 1{,}0$ because pinion and wheel with equal hardness.	1,000			
Contact stress formula					
Nominal normal force of the virtual cylindrical gear at mean point P	$F_n = \dfrac{F_{mt1}}{\cos\alpha_{nD} \cdot \cos\beta_{m1}}$ NOTE ISO 10300-2:2023, Formula (3) contains a misprint. The correct formula has been applied to this sample calculation.	14 339 N		E: 3	
Nominal value of the contact stress	$\sigma_{H0-B1} = \sqrt{\dfrac{F_n}{l_{bm} \cdot \rho_{rel}}} Z_{M-B} \cdot Z_{LS} \cdot Z_E$	1 194,5 N/mm²		E: 2	
Contact stress	$\sigma_{H-B1} = \sigma_{H0-B1} \cdot \sqrt{K_A \cdot K_v \cdot K_{H\beta} \cdot K_{H\alpha}}$	1 609,2 N/mm²		E: 1	
Permissible contact stress	Z_{KP} $\sigma_{HP-B1} = \sigma_{H,lim} \cdot Z_{NT} \cdot Z_X \cdot Z_L \cdot Z_v \cdot Z_R \cdot Z_W \cdot Z_{KP} \cdot Z_{Hyp}$	1 459,9 N/mm²		E: 4	
Calculated safety factor for contact stress (macropitting) on pinion and wheel	$S_{H1,2-B1} = \dfrac{\sigma_{HP1,2-B1}}{\sigma_{H1,2-B1}}$	0,907		E: 5	

Table C.8 — Calculation of tooth root strength for pinion

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Y–factors					
Load sharing factor	$Y_{LS} = Z_{LS}^2$	0,924			E: 36
Geometry values for pinion according to Tables C.2 and C.3	$h_{a0} = h_{fp} = k_{hfp}\, m_{mn}$	5,035 mm			F: 2
Parameters for pinion	$E_{1,D} = \left(\frac{\pi}{4} - x_{sm1}\right) \cdot m_{mn} - h_{a0} \cdot \tan\alpha_{eD} - \frac{\rho_{a01,D} \cdot (1 - \sin\alpha_{eD}) - s_{pr1,D}}{\cos\alpha_{eD}}$	0,610 mm			E: 7
	$E_{1,C} = \left(\frac{\pi}{4} - x_{sm1}\right) \cdot m_{mn} - h_{a0} \cdot \tan\alpha_{eC} - \frac{\rho_{a01,C} \cdot (1 - \sin\alpha_{eC}) - s_{pr1,C}}{\cos\alpha_{eC}}$	0,610 mm			E: 7
	$G_{1,D} = \frac{\rho_{a01,D}}{m_{mn}} - \frac{h_{a0}}{m_{mn}} + x_{hm1}$	−0,601			E: 8
	$G_{1,C} = \frac{\rho_{a01,C}}{m_{mn}} - \frac{h_{a0}}{m_{mn}} + x_{hm1}$	−0,601			E: 8
	$H_{1,D} = \frac{2}{z_{vn1,D}} \cdot \left(\frac{\pi}{2} - \frac{E_{1,D}}{m_{mn}}\right) - \frac{\pi}{3}$	−0,898			E: 9

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$H_{1,C} = \frac{2}{z_{vn1,C}} \cdot \left(\frac{\pi}{2} - \frac{E_{1,C}}{m_{mn}} \right) - \frac{\pi}{3}$	−0,898			E: 9
Iteration starting with $\vartheta = \pi/6$ until $(\vartheta_{new} - \vartheta)$ < 0,000 001	$\vartheta_{1,D,C} = \frac{2 \cdot G_{1,D,C}}{z_{vn1,D,C}} \cdot \tan \vartheta_{1,D,C} - H_{1,D,C}$	Initial: 30,000°			E: 10
		Final: 47,476°			E: 10
Tooth root chordal thickness on drive side	$s_{Fn1,D} = m_{mn} \cdot z_{vn1,D} \cdot \sin\left(\frac{\pi}{3} - \vartheta_{1,D} \right) + m_{mn} \cdot \sqrt{3} \cdot \left(\frac{G_{1,D}}{\cos \vartheta_{1,D}} - \frac{\rho_{a01,D}}{m_{mn}} \right)$	8,991 mm			E: 11
Tooth root chordal thickness on coast side	$s_{Fn1,C} = m_{mn} \cdot z_{vn1,C} \cdot \sin\left(\frac{\pi}{3} - \vartheta_{1,C} \right) + m_{mn} \cdot \sqrt{3} \cdot \left(\frac{G_{1,C}}{\cos \vartheta_{1,C}} - \frac{\rho_{a01,C}}{m_{mn}} \right)$	8,991 mm			E: 11
Tooth root chord	$s_{Fn1} = 0{,}5 \cdot s_{Fn1,D} + 0{,}5 \cdot s_{Fn1,C}$	8,991 mm			E: 12
Fillet radius at contact point of 30° tangent on drive side	$\rho_{F1,D} = \rho_{a01,D} + \frac{2 \cdot G_{1,D}^2 \cdot m_{mn}}{\cos \vartheta_{1,D} \cdot \left(z_{vn1,D} \cdot (\cos \vartheta_{1,D})^2 - 2 \cdot G_{1,D} \right)}$	1,236 mm			E: 13
Normal pressure angle at tooth tip on drive side	$\alpha_{an1,D} = \arccos\left(\frac{d_{vbn1,D}}{d_{van1,D}} \right)$	35,394°			E: 16
Auxiliary angle for tooth form and tooth correction factor on drive side	$\gamma_{a1,D} = \frac{1}{z_{vn1,D}} \cdot \left[\frac{\pi}{2} + 2(x_{hm1} \cdot \tan \alpha_{eD} + x_{sm1}) \right] + \mathrm{inv}\alpha_{eD} - \mathrm{inv}\alpha_{an1,D}$	1,509°			E: 17

Description	Formula	Result	References to ISO 10300-1 (E: Formula, T: Table, F: Figure)	ISO 10300-2	ISO 10300-3
Load application angle at tooth tip of virtual cylindrical gear on drive side	$\alpha_{\mathrm{Fan1,D}} = \alpha_{\mathrm{an1,D}} - \gamma_{\mathrm{a1,D}}$	33,885°			E: 15
Bending moment arm on drive side	$h_{\mathrm{Fa1,D}} = \frac{m_{\mathrm{mn}}}{2} \cdot \left[\left(\cos\gamma_{\mathrm{a1,D}} - \sin\gamma_{\mathrm{a1,D}} \cdot \tan\alpha_{\mathrm{Fan1,D}} \right) \cdot \frac{d_{\mathrm{van1,D}}}{m_{\mathrm{mn}}} - z_{\mathrm{vn1,D}} \cdot \cos\left(\frac{\pi}{3} - \vartheta_{\mathrm{1,D}} \right) - \frac{G_{\mathrm{1,D}}}{\cos\vartheta_{\mathrm{1,D}}} + \frac{\rho_{\mathrm{a01,D}}}{m_{\mathrm{mn}}} \right]$	8,147 mm			E: 14
Tooth form factor on drive side	$Y_{\mathrm{Fa1,D}} = \frac{6 \cdot \frac{h_{\mathrm{Fa1,D}}}{m_{\mathrm{mn}}} \cdot \cos\alpha_{\mathrm{Fan1,D}}}{\left(\frac{s_{\mathrm{Fn1}}}{m_{\mathrm{mn}}} \right)^2 \cdot \cos\alpha_{\mathrm{n1,D}}}$	2,102			E: 6
Stress correction factor on drive side	$L_{\mathrm{a1,D}} = \frac{s_{\mathrm{Fn1}}}{h_{\mathrm{Fa1,D}}}$	1,104			E: 25
	$q_{\mathrm{s1,D}} = \frac{s_{\mathrm{Fn1}}}{2\rho_{\mathrm{F1,D}}}$	3,636			E: 26
	$Y_{\mathrm{Sa1,D}} = \left(1{,}2 + 0{,}13 \cdot L_{\mathrm{a1,D}} \right) \cdot q_{\mathrm{s1,D}}^{\left(\frac{1}{1{,}21 + 2{,}3/L_{\mathrm{a1,D}}} \right)}$	1,988			E: 24
Relative surface condition factor for Rz = 10 µm and	$Y_{\mathrm{R,relT}} = \frac{Y_{\mathrm{R}}}{Y_{\mathrm{RT}}} = 1{,}674 - 0{,}529 \cdot (Rz + 1)^{1/10}$	1,002			E: 40

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
through hardened and case hardened steels					
Life factor for pinion	$Y_{NT,1}$	1,000			T: 4
Stress correction factor	Y_{ST}	2,000			E: 4
Size factor	$Y_X = 1{,}05 - 0{,}01 \cdot m_{mn}$ Set $Y_X = 1{,}0$ since range is $0{,}8 \leq Y_X \leq 1{,}0$.	1,000			E: 209
Bevel spiral angle factor using l_{bm} according to Table C.6 for l_{bb}	$Y_{BS} = \frac{a_{BS}}{c_{BS}} \cdot \left(\frac{l_{bb}}{b_a} - 1{,}05 \cdot b_{BS} \right)^2 + 1$	1,014			E: 30
where	$b_a = b_v / \cos \beta_v$	28,029 mm			E: 34
	$l_{bb} = l_{bm} \cdot \frac{\cos \beta_{vb}}{\cos \beta_v}$	21,898 mm			E: 35
Relative notch sensitivity factor	$Y_{\delta,relT1} = \frac{1 + \sqrt{\rho' \cdot \chi_1^X}}{1 + \sqrt{\rho' \cdot \chi_T^X}}$	1,010			E: 43
Contact ratio factor, Y_ε, for $\varepsilon_{v\beta} = 0{,}860 \leq 1$	Y_ε	0,662			E: 29
Tooth root stress formula for pinion					

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Nominal tooth root stress	$\sigma_{\text{F01-B1}} = \frac{F_{\text{vmt}}}{b_{\text{v}} \cdot m_{\text{mn}}} \cdot Y_{\text{Fa}} \cdot Y_{\text{Sa}} \cdot Y_{\varepsilon} \cdot Y_{\text{BS}} \cdot Y_{\text{LS}}$	316,7 N/mm^2			E: 2
Local tooth root stress	$\sigma_{\text{F1-B1}} = \sigma_{\text{F01-B1}} \cdot K_{\text{A}} \cdot K_{\text{v}} \cdot K_{\text{F}\beta} \cdot K_{\text{F}\alpha}$	568,9 N/mm^2			E: 1
Permissible tooth root stress	$\sigma_{\text{FP1-B1}} = \sigma_{\text{F,lim}} \cdot Y_{\text{ST}} \cdot Y_{\text{NT}} \cdot Y_{\delta,\text{relT-B1}} \cdot Y_{\text{R,relT-B1}} \cdot Y_{\text{X}}$	1 011,5 N/mm^2			E: 4
Calculated safety for tooth root strength on pinion	$S_{\text{F1-B1}} = \frac{\sigma_{\text{FP1-B1}}}{\sigma_{\text{F1-B1}}}$	1,778			E: 5

Table C.9 — Calculation of tooth root strength for wheel

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Y–factors different from pinion					
Geometry values for wheel according to Tables C.2 and C.3	$h_{a0}= h_{fp} = k_{hfp}\, m_{mn}$	5,035 mm			F: 2
Parameters for wheel	$E_{2,D}=\left(\frac{\pi}{4}-x_{sm2}\right)\cdot m_{mn}-h_{a0}\cdot\tan\alpha_{eD}-\frac{\rho_{a02,D}\cdot(1-\sin\alpha_{eD})-s_{pr2,D}}{\cos\alpha_{eD}}$	0,732 mm			E: 7
	$E_{2,C}=\left(\frac{\pi}{4}-x_{sm2}\right)\cdot m_{mn}-h_{a0}\cdot\tan\alpha_{eC}-\frac{\rho_{a02,C}\cdot(1-\sin\alpha_{eC})-s_{pr2,C}}{\cos\alpha_{eC}}$	0,732 mm			E: 7
	$G_{2,D}=\frac{\rho_{a02,D}}{m_{mn}}-\frac{h_{a0}}{m_{mn}}+x_{hm2}$	−1,402			E: 8
Parameters for wheel	$G_{2,C}=\frac{\rho_{a02,C}}{m_{mn}}-\frac{h_{a0}}{m_{mn}}+x_{hm2}$	−1,402			E: 8
	$H_{2,D}=\frac{2}{z_{vn2,D}}\cdot\left(\frac{\pi}{2}-\frac{E_{2,D}}{m_{mn}}\right)-\frac{\pi}{3}$	−1,022			E: 9
	$H_{2,C}=\frac{2}{z_{vn2,C}}\cdot\left(\frac{\pi}{2}-\frac{E_{2,C}}{m_{mn}}\right)-\frac{\pi}{3}$	−1,022			E: 9

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Iteration starting with $\vartheta = \pi/6$ until $(\vartheta_{new} - \vartheta) < 0{,}000\,001$	$\vartheta_{2,D,C} = \dfrac{2 \cdot G_{2,D,C}}{z_{vn2,D,C}} \cdot \tan\vartheta_{2,D,C} - H_{2,D,C}$	Initial: 30,000°			E: 10
		Final: 56,343°			E: 10
Tooth root chordal thickness on drive side	$s_{Fn2,D} = m_{mn} \cdot z_{vn2,D} \cdot \sin\left(\dfrac{\pi}{3} - \vartheta_{2,D}\right) + m_{mn} \cdot \sqrt{3} \cdot \left(\dfrac{G_{2,D}}{\cos\vartheta_{2,D}} - \dfrac{\rho_{a02,D}}{m_{mn}}\right)$	8,406 mm			E: 11
Tooth root chordal thickness on coast side	$s_{Fn2,C} = m_{mn} \cdot z_{vn2,C} \cdot \sin\left(\dfrac{\pi}{3} - \vartheta_{2,C}\right) + m_{mn} \cdot \sqrt{3} \cdot \left(\dfrac{G_{2,C}}{\cos\vartheta_{2,C}} - \dfrac{\rho_{a02,C}}{m_{mn}}\right)$	8,406 mm			E: 11
Tooth root chord	$s_{Fn2} = 0{,}5 \cdot s_{Fn2,D} + 0{,}5 \cdot s_{Fn2,C}$	8,406 mm			E: 12
Fillet radius at contact point of 30° tangent	$\rho_{F2,D} = \rho_{a02,D} + \dfrac{2 \cdot G_{2,D}^2 \cdot m_{mn}}{\cos\vartheta_{2,D} \cdot \left(z_{vn2,D} \cdot (\cos\vartheta_{2,D})^2 - 2 \cdot G_{2,D}\right)}$	1,984 mm			E: 13
Normal pressure angle at tooth tip on drive side	$\alpha_{an2,D} = \arccos\left(\dfrac{d_{vbn2,D}}{d_{van2,D}}\right)$	21,511°			E: 16
Auxiliary angle for tooth form and tooth correction factor on drive side	$\gamma_{a2,D} = \dfrac{1}{z_{vn2,D}} \cdot \left[\dfrac{\pi}{2} + 2(x_{hm2} \cdot \tan\alpha_{eD} + x_{sm2})\right] + \mathrm{inv}\alpha_{eD} - \mathrm{inv}\alpha_{an2,D}$	0,371°			E: 17

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Load application angle at tooth tip of virtual cylindrical gear on drive side	$\alpha_{\text{Fan2,D}} = \alpha_{\text{an2,D}} - \gamma_{\text{a2,D}}$	21,141°			E: 15
Bending moment arm on drive side	$h_{\text{Fa2,D}} = \frac{m_{\text{mn}}}{2} \cdot \left[\left(\cos\gamma_{\text{a2,D}} - \sin\gamma_{\text{a2,D}} \cdot \tan\alpha_{\text{Fan2,D}} \right) \cdot \frac{d_{\text{van2,D}}}{m_{\text{mn}}} - z_{\text{vn2,D}} \cdot \cos\left(\frac{\pi}{3} - \vartheta_{\text{2,D}} \right) - \frac{G_{\text{2,D}}}{\cos\vartheta_{\text{2,D}}} + \frac{\rho_{\text{a02,D}}}{m_{\text{mn}}} \right]$	7,798 mm			E: 14
Tooth form factor on drive side	$Y_{\text{Fa2,D}} = \frac{6 \cdot \frac{h_{\text{Fa2,D}}}{m_{\text{mn}}} \cdot \cos\alpha_{\text{Fan2,D}}}{\left(\frac{s_{\text{Fn2}}}{m_{\text{mn}}} \right)^2 \cdot \cos\alpha_{\text{n2,D}}}$	2,586			E: 6
Stress correction factor on drive side	$L_{\text{a2,D}} = \frac{s_{\text{Fn2}}}{h_{\text{Fa2,D}}}$	1,078			E: 25
	$q_{\text{s2,D}} = \frac{s_{\text{Fn2}}}{2 \cdot \rho_{\text{F2,D}}}$	2,118			E: 26
	$Y_{\text{Sa2,D}} = \left(1,2 + 0,13 \cdot L_{\text{a2,D}}\right) \cdot q_{\text{s2,D}}^{\left(\frac{1}{1,21 + 2,3/L_{\text{a2,D}}} \right)}$	1,677			E: 24

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Relative surface condition factor for Rz = 10 µm for through hardened and case hardened steels	$Y_{\mathrm{R,relT}} = \dfrac{Y_{\mathrm{R}}}{Y_{\mathrm{RT}}} = 1{,}674 - 0{,}529 \cdot (Rz + 1)^{1/10}$	1,002			E: 40
Bevel spiral angle factor using l_{bm} according to Table C.6 for l_{bb}	$Y_{\mathrm{BS}} = \dfrac{a_{\mathrm{BS}}}{c_{\mathrm{BS}}} \cdot \left(\dfrac{l_{\mathrm{bb}}}{b_{\mathrm{a}}} - 1{,}05 \cdot b_{\mathrm{BS}} \right)^2 + 1$	1,014			E: 30
where	$b_{\mathrm{a}} = b_{\mathrm{v}} / \cos \beta_{\mathrm{v}}$	28,029 mm			E: 34
	$l_{\mathrm{bb}} = l_{\mathrm{bm}} \cdot \dfrac{\cos \beta_{\mathrm{vb}}}{\cos \beta_{\mathrm{v}}}$	21,898 mm			E: 35
Relative notch sensitivity factor	$Y_{\delta,\mathrm{relT2}} = \dfrac{1 + \sqrt{\rho' \cdot \chi_2^{\mathrm{X}}}}{1 + \sqrt{\rho' \cdot \chi_{\mathrm{T}}^{\mathrm{X}}}}$	0,996			E: 43
Tooth root stress formula for wheel					
Nominal tooth root stress	$\sigma_{\mathrm{F02\text{-}B1}} = \dfrac{F_{\mathrm{vmt}}}{b_{\mathrm{v}} \cdot m_{\mathrm{mn}}} \cdot Y_{\mathrm{Fa}} \cdot Y_{\mathrm{Sa}} \cdot Y_{\varepsilon} \cdot Y_{\mathrm{BS}} \cdot Y_{\mathrm{LS}}$	328,8 N/mm^2			E: 2
Local tooth root stress	$\sigma_{\mathrm{F2\text{-}B1}} = \sigma_{\mathrm{F02\text{-}B1}} \cdot K_{\mathrm{A}} \cdot K_{\mathrm{v}} \cdot K_{\mathrm{F}\beta} \cdot K_{\mathrm{F}\alpha}$	590,5 N/mm^2			E: 1
Permissible tooth root stress	$\sigma_{\mathrm{FP2\text{-}B1}} = \sigma_{\mathrm{F,lim}} \cdot Y_{\mathrm{ST}} \cdot Y_{\mathrm{NT}} \cdot Y_{\delta,\mathrm{relT\ 2\text{-}B1}} \cdot Y_{\mathrm{R,relT\text{-}B1}} \cdot Y_{\mathrm{X}}$	997,9 N/mm^2			E: 4

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Calculated safety for tooth root strength on wheel	$S_{\text{F2-B1}} = \dfrac{\sigma_{\text{FP2-B1}}}{\sigma_{\text{F2-B1}}}$	1,690			E: 5

C.3 Calculation of Sample 3 according to Method B2

Table C.10 — Calculation of surface durability (macropitting)

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Approximate values for application factors					
Relative facewidth	$b_{v,rel} = \dfrac{b_2}{m_{et2}}$	5,203	E: B.1		
Relative mean back cone distance on pinion	$R_{mpt1} = \dfrac{R_{m1} \cdot \tan\delta_1}{m_{et2}}$	5,648	E: B.2		
Relative mean back cone distance on wheel	$R_{mpt2} = \dfrac{R_{m2} \cdot \tan\delta_2}{m_{et2}}$	32,568	E: B.2		
Angle between direction of contact and the pitch tangent	$\cot\left(\zeta_{mp} - \lambda\right) = \cot\zeta_{mp} \cdot \left(1{,}0 + \dfrac{z_1 \cdot \cos\delta_2}{z_2 \cdot \cos\delta_1 \cdot \cos\zeta_{mp}}\right)$	cot(21,252°)	E: B.3		
Face contact ratio for hypoid gears	$\varepsilon_{v\beta} = \left[\dfrac{\cos\beta_{m2}}{\cot\left(\zeta_{mp} - \lambda\right)} + \sin\beta_{m2}\right] \cdot \dfrac{b_2}{\pi \cdot m_{mn}}$	1,483	E: B.5		
Relative mean virtual pitch radius on pinion	$r_{vn1} = \dfrac{R_{mpt1}}{\cos^2\beta_{m1}}$	11,292	E: B.6		
Relative mean virtual pitch radius on wheel	$r_{vn2} = \dfrac{R_{mpt2}}{\cos^2\beta_{m2}}$	37,371	E: B.6		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Relative centre distance	$a_{vn} = r_{vn1} + r_{vn2}$	48,663	E: B.7		
Relative mean virtual dedendum on pinion	$h_{vfm1} = h_{fm1} / m_{et2}$	0,645	E: B.8		
Relative mean virtual dedendum on wheel	$h_{vfm2} = h_{fm2} / m_{et2}$	1,370	E: B.8		
Relative virtual tooth thickness on pinion	$s_{vmn1} = s_{mn1} / m_{et2}$	1,595	E: B.9		
Relative virtual tooth thickness on wheel	$s_{vmn2} = s_{mn2} / m_{et2}$	0,905	E: B.9		
Relative mean virtual tip radius on pinion	$r_{va1} = r_{vn1} + h_{am1} / m_{et2}$	12,461	E: B.10		
Relative mean virtual tip radius on wheel	$r_{va2} = r_{vn2} + h_{am2} / m_{et2}$	37,815	E: B.10		
Angular pitch of virtual cylindrical wheel (required in ISO 10300−3:2023, 7.4.5)	$\theta_{v2} = \frac{\pi \cdot m_{mn}}{m_{et2} \cdot r_{vn2}}$	3,882°	E: B.11		
Relative edge radius of tool on pinion	$\rho_{va01} = \rho_{a01} / m_{et2}$	0,160	E: B.12		
Relative edge radius of tool on wheel	$\rho_{va02} = \rho_{a02} / m_{et2}$	0,240	E: B.12		
Virtual spiral angle for hypoid gears	$\beta_v = \beta_{m1} - \lambda_r$	42,261°	E: B.14		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
where	$\tan(\beta_{m1}-\lambda_r)=\frac{R_{m2}\cdot\tan\delta_{f2}\cdot\tan\beta_{m1}+R_{m1}\cdot\tan\delta_{a1}\cdot\tan\beta_{m2}}{R_{m2}\cdot\tan\delta_{f2}+R_{m1}\cdot\tan\delta_{a1}}$	tan(42,261°)	E: B.15		
Adjusted pressure angle	$\alpha_a=\alpha_{eD}-\frac{\pi}{2}\cdot\cos\delta_2\cdot\cos\beta_{m2}/z_2$	18,886°	E: B.16		
Base virtual helix angle	$\sin\beta_{vb}=\sin\beta_v\cdot\cos\alpha_a$	sin(39,516°)	E: B.17		
Relative mean virtual base radius on pinion	$r_{vbn1}=r_{vn1}\cdot\cos\alpha_a$	10,684	E: B.18		
Relative mean virtual base radius on wheel	$r_{vbn2}=r_{vn2}\cdot\cos\alpha_a$	35,359	E: B.18		
Relative length of action from pinion tip to pitch circle in the normal section	$g_{v\alpha na}=\sqrt{r_{va1}^2-r_{vbn1}^2}-r_{vn1}\cdot\sin\alpha_a$	2,757	E: B.19		
Relative length of action from wheel tip to pitch circle in the normal section	$g_{v\alpha nr}=\sqrt{r_{va2}^2-r_{vbn2}^2}-r_{vn2}\cdot\sin\alpha_a$	1,307	E: B.20		
Relative length of action in normal section	$g_{v\alpha n}=g_{v\alpha na}+g_{v\alpha nr}$	4,064	E: B.21		
Relative mean normal pitch of virtual cylindrical gear	$p_{mn}=\frac{2{,}0\cdot\pi\cdot m_{mn}}{m_{et2}\cdot\cos\alpha_a\cdot\left(\cos^2\beta_{m1}+\cos^2\beta_{m2}+2{,}0\cdot\tan^2\alpha_a\right)}$	3,333	E: B.22		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Profile contact ratio in mean normal section	$\varepsilon_{\mathrm{v}\alpha\mathrm{n}}=\dfrac{g_{\mathrm{v}\alpha\mathrm{n}}}{p_{\mathrm{mn}}}$	1,219	E: B.23		
Profile contact ratio in mean transverse section	$\varepsilon_{\mathrm{v}\alpha}=\varepsilon_{\mathrm{v}\alpha\mathrm{n}}\cdot(\cos\beta_{\mathrm{vb}})^2$	0,726	E: B.24		
Modified contact ratio for bevel gears without hypoid offset	$\varepsilon_{\mathrm{v}\gamma}=\sqrt{\varepsilon_{\mathrm{v}\alpha}^2+\varepsilon_{\mathrm{v}\beta}^2}$	1,651	E: B.25		
Contact shift factor; see also ISO 10300−2:2023, Figure B.7	$k'=\dfrac{z_2-z_1}{3{,}2\cdot z_2+4{,}0\cdot z_1}$	0,173	E: B.26		
Macropitting resistance geometry factor					
Angle between contact direction and tooth tangent in pitch plane	$\cot(\beta_{\mathrm{m1}}-\lambda_1)=\dfrac{\cos\zeta_{\mathrm{mp}}}{\cos\beta_{\mathrm{m1}}\cdot\cos\beta_{\mathrm{m2}}\cdot\tan(\beta_{\mathrm{m1}}-\lambda_{\mathrm{r}})}-\tan\beta_{\mathrm{m2}}$	cot(41,283°)		E: 24	
Angle between projection of pinion axis and direction of contact in pitch plane	$\lambda_1=\beta_{\mathrm{m1}}-(\beta_{\mathrm{m1}}-\lambda_1)$	3,707°		E: 25	
Angle of contact line relative to the root cone	$\tan w=\dfrac{\sin\alpha_{\mathrm{a}}\cdot\tan(\beta_{\mathrm{m1}}-\lambda_{\mathrm{r}})}{\cos\alpha_{\mathrm{lim}}}$	tan(16,431°)		E: 26	
Mean base spiral angle	$\cos\beta_{\mathrm{bm}}=\dfrac{1{,}0}{\sqrt{\tan^2(\beta_{\mathrm{m1}}-\lambda_{\mathrm{r}})\cdot\cos^2\alpha_{\mathrm{a}}+1{,}0}}$	cos(40,687°)		E: 27	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Relative mean normal base pitch	$p_{nb} = \frac{\pi \cdot m_{mn} \cdot \cos\alpha_a \cdot \cos\beta_{bm}}{m_{et2} \cdot \cos(\beta_{m1} - \lambda_r)}$	2,455		E: 28	
Angle between projection of wheel axis and direction of contact in pitch plane	$\lambda_2 = (\beta_{m1} - \lambda_r) - \beta_{m2}$	21,252°		E: 29	
Relative base facewidth	$b_b = \frac{b_2}{m_{et2} \cdot \cos\lambda_2}$	5,582		E: 30	
Pressure angle at point of load application on pinion	$\cos\alpha_{L1} = \cos\alpha_a \cdot \left[1{,}0 - \frac{(r_{va1} - r_{vn1}) \cdot \cos^2\beta_{m1}}{r_{va1} - r_{vn1} + R_{mpt1}}\right]$	cos(30,114°)		E: 31	
Pressure angle at point of load application on wheel	$\cos\alpha_{L2} = \cos\alpha_a \cdot \left[1{,}0 - \frac{(r_{va2} - r_{vn2}) \cdot \cos^2\beta_{m2}}{r_{va2} - r_{vn2} + R_{mpt2}}\right]$	cos(20,757°)		E: 31	
Radius of curvature difference between point of load application and mean point on pinion	$\rho_{\Delta 1} = \frac{r_{va1} - r_{vn1} + R_{mpt1}}{(\cos\beta_{m1})^2} \cdot \cos\alpha_{L1} \cdot (\tan\alpha_{L1} - \tan\alpha_a)$	2,805		E: 32	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Radius of curvature difference between point of load application and mean point on wheel	$\rho_{\Delta 2} = \frac{r_{\text{va}2} - r_{\text{vn}2} + R_{\text{mpt}2}}{(\cos \beta_{\text{m}2})^2} \cdot \cos \alpha_{\text{L}2} \cdot (\tan \alpha_{\text{L}2} - \tan \alpha_{\text{a}})$	1,307		E: 32	
Radius of curvature change	$\rho_{\Delta\text{red}} = \cos\beta_{\text{bm}} \left(\rho_{\Delta 1} + \rho_{\Delta 2}\right)$	3,118		E: 33	
Relative length of action within the contact ellipse	$g_\eta = \sqrt{\rho_{\Delta\text{red}}^2 \cdot (\cos \beta_{\text{bm}})^2 + b_{\text{b}}^2 \cdot (\sin \beta_{\text{bm}})^2}$	4,340		E: 34	
Radius of relative profile curvature and load sharing ratio at critical point					
Relative length of action at critical point in contact ellipse (iteration starting with y_I = 0)	$g_{\eta\text{I}} = \sqrt{g_\eta^2 - 4{,}0 \cdot y_\text{I}^2}$	Initial: 4,340		E: 36	
		Final: 4,298		E: 36	
Relative length of action considering adjacent teeth	$g_{\eta\text{I}\Sigma}^3 = g_{\eta\text{I}}^3 + \sum_{k=1}^{k=x} \sqrt{\left[g_{\eta\text{I}}^2 - 4 \cdot k \cdot p_{\text{nb}} \cdot (k \cdot p_{\text{nb}} + 2 \cdot y_\text{I})\right]^3} + \sum_{k=1}^{k=y} \sqrt{\left[g_{\eta\text{I}}^2 - 4 \cdot k \cdot p_{\text{nb}} \cdot (k \cdot p_{\text{nb}} - 2 \cdot y_\text{I})\right]^3}$	Initial: 81,735		E: 37	
		Final: 79,541		E: 37	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Load sharing ratio	$\varepsilon_{\mathrm{NI}} = g_{\eta \mathrm{I}}^3 / g_{\eta \mathrm{I}\Sigma}^3$	Initial: 1,000		E: 38	
		Final: 0,998		E: 38	
Relative length of contact line	$g_{\mathrm{c}} = g_{\eta \mathrm{I}} \cdot \rho_{\Delta \mathrm{red}} \cdot b_{\mathrm{b}} / g_{\eta}^2$	Initial: 4,011		E: 39	
		Final: 3,972		E: 39	
Relative position change along path of contact	$g_{\eta\Delta} = \frac{\rho_{\Delta \mathrm{red}}^2 \cdot y_{\mathrm{I}}}{g_{\eta \mathrm{I}}^2} + k' \cdot g_{\mathrm{c}} \cdot \tan\beta_{\mathrm{bm}} + \frac{0{,}5 \cdot \rho_{\Delta \mathrm{red}}}{\cos\beta_{\mathrm{bm}}} - \rho_{\Delta 2}$	Initial: 1,349		E: 40	
		Final: 1,181		E: 40	
Intermediate value	$X = \frac{\sin^2 w \cdot \cos\alpha_{\mathrm{lim}} \cdot \cos\left(\zeta_{\mathrm{mp}} - \lambda_1\right) \cdot \cos\lambda_1}{\sin^2\left(\beta_{\mathrm{m1}} - \lambda_1\right) \cdot \sin\alpha_{\mathrm{a}} \cdot \cos\zeta_{\mathrm{mp}}}$	Initial: 0,570		E: 41	
		Final: 0,570		E: 41	
Relative profile radius of curvature on pinion	$\rho_1 = R_{\mathrm{mpt1}} \cdot X \pm g_{\eta\Delta}$	Initial: 4,571		E: 42	
		Final: 4,402		E: 42	
Relative profile radius of curvature on wheel	$\rho_2 = R_{\mathrm{mpt2}} \cdot X \pm g_{\eta\Delta}$	Initial: 17,226		E: 42	
		Final: 17,395		E: 42	
Relative radius of profile curvature between pinion and wheel	$\rho_{\mathrm{t}} = \frac{\rho_1 \cdot \rho_2}{\rho_1 + \rho_2}$	Initial: 3,612		E: 43	
		Final: 3,513		E: 43	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Inertia factor with $\varepsilon_v > 2{,}0_\gamma$	$Z_i = 1{,}0$	Initial: 1,212		E: 45	
		Final: 1,212		E: 45	
Macropitting resistance geometry factor	$Z_I = \frac{g_c \cdot \rho_t \cdot \cos\alpha_a \cdot m_{mn}}{b_b \cdot z_1 \cdot Z_i \cdot \varepsilon_{NI} \cdot m_{et2}}$	Initial: 0,181		E: 46	
		Final: 0,175		E: 46	
Facewidth factor					
for 12,7 ≤ b_2 ≤ 79,8 mm	$Z_{FW} = 0{,}004\ 92 \cdot b_2 + 0{,}437\ 5$	0,565		E: 48	
Contact stress adjustment factor					
for carburized case hardened steel	Z_A	0,967		E: 50	
Elasticity factor					
for a steel on steel gear pair	Z_E	191,646 (N/mm^2)$^{1/2}$		E: 51	
Lubricant film influence factors					
Product of the lubricant influence factors	$Z_L Z_v Z_R$	0,978			
Work hardening factor					
Work hardening factor	Set $Z_{W,1}$ = $Z_{W,2}$ = 1,0 because pinion and wheel with equal hardness.	1,000			
Life factor					
Life factor	Z_{NT}	1,000		T: 6	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
K–factors					
For virtual contact ratio, $1 < \varepsilon_{v\gamma} = 1{,}651 < 2$	$c_{v1,2} = c_{v1} + c_{v2}$	0,660	T: 3		
	c_{v3}	0,230	T: 3		
	c_{v4}	0,900	T: 3		
	$c_{v5,6}$	0,940	T: 3		
	c_{v7}	0,764	T: 3		
Dynamic factor	$K_{v\text{-}B}$	1,000	E: 15		
Face load factor	$K_{H\beta\text{-}C}$	1,650	E: 28		
Contact stress formula for drive and coast side					
Nominal contact stress	$\sigma_{H0-B2} = \sqrt{\frac{F_{mt1} \cdot d_{m1} \cdot Z_{FW}}{b_2 \cdot Z_I} \cdot \left(\frac{z_2}{d_{e2} \cdot z_1}\right)^2} \cdot Z_E$	1 061,8 N/mm^2		E: 21	
Contact stress	$\sigma_{H-B2} = \sigma_{H0-B2} \cdot \sqrt{K_A \cdot K_v \cdot K_{H\beta}} \cdot Z_A \leq \sigma_{HP-B2}$	1 383,3 N/mm^2		E: 20	
Permissible contact stress	$\sigma_{HP-B2} = \sigma_{H,lim} \cdot Z_{NT} \cdot Z_L \cdot Z_v \cdot Z_R \cdot Z_W$	1 467,8 N/mm^2		E: 22	
Calculated safety factor for contact stress for pinion and wheel	$S_{H\text{-}B2} = \frac{\sigma_{HP\text{-}B2}}{\sigma_{H\text{-}B2}} > S_{H\,min}$	1,068		E: 23	

Table C.11 — Calculation of tooth root strength on pinion and wheel

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Geometry factor for hypoid gears (pinion and wheel)					
Initial formulae					
Drive flank pressure angle in wheel root coordinates	$\alpha_{\mathrm{Dnf}} = \alpha_{\mathrm{nD}} - \theta_{\mathrm{f2}} \cdot \sin \beta_{\mathrm{m2}}$	15,868°			E: 92
Coast flank pressure angle in wheel root coordinates	$\alpha_{\mathrm{Cnf}} = \alpha_{\mathrm{nC}} + \theta_{\mathrm{f2}} \cdot \sin \beta_{\mathrm{m2}}$	24,132°			E: 93
Average pressure angle unbalance	$\Delta\alpha_1 = \dfrac{\left(\alpha_{\mathrm{Dnf}} - \alpha_{\mathrm{Cnf}}\right)}{2{,}0}$	−4,132°			E: 94
Limit pressure angle in wheel root coordinates	$\alpha_{\mathrm{f}} = \alpha_{\mathrm{lim}} - \theta_{\mathrm{f2}} \cdot \sin \beta_{\mathrm{m2}}$	−4,132°			E: 95
Relative distance from blade edge to centreline	$g_{\mathrm{rb}} = \dfrac{\left[h_{\mathrm{fm2}} \cdot \tan\left(\dfrac{\alpha_{\mathrm{nD}} + \alpha_{\mathrm{nC}}}{2{,}0}\right) + \dfrac{W_{\mathrm{m2}}}{2{,}0}\right] \cdot \cos\left(\dfrac{\alpha_{\mathrm{nD}} + \alpha_{\mathrm{nC}}}{2{,}0}\right)}{m_{\mathrm{et2}}}$	0,755			E: 96
Intermediate value	$\eta_{\mathrm{D}} = \tan \alpha_{\mathrm{Dnf}} \cdot \left(\dfrac{g_{\mathrm{rb}}}{\sin \alpha_{\mathrm{Dnf}}} - h_{\mathrm{vfm2}}\right)$	0,395			E: 97
Intermediate value	$\eta_{\mathrm{C}} = -\tan \alpha_{\mathrm{Cnf}} \cdot \left(\dfrac{g_{\mathrm{rb}}}{\sin \alpha_{\mathrm{Cnf}}} - h_{\mathrm{vfm2}}\right)$	−0,213			E: 98

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Intermediate angle	$\tan\beta_{\text{a}} = \dfrac{\dfrac{W_{\text{m2}}}{2{,}0 \cdot m_{\text{et2}}} - \rho_{\text{va02}} \cdot \left[\sec\left(\dfrac{\alpha_{\text{nD}} + \alpha_{\text{nC}}}{2{,}0}\right) - \tan\left(\dfrac{\alpha_{\text{nD}} + \alpha_{\text{nC}}}{2{,}0}\right)\right]}{h_{\text{vfm2}} - \rho_{\text{va02}}}$	tan(6,879°)			E: 99
Intermediate angle	$\left(\beta_{\text{D}} - \Delta\alpha\right) = \beta_{\text{a}} - \Delta\alpha_1$	11,011°			E: 100
Intermediate angle	$\left(\beta_{\text{C}} - \Delta\alpha\right) = -\beta_{\text{a}} - \Delta\alpha_1$	−2,746°			E: 101
Intermediate value	$g_1 = \dfrac{h_{\text{vfm2}} - \rho_{\text{va02}}}{\cos\beta_{\text{a}}}$	1,138			E: 102
Wheel angle between centreline and fillet point on drive side	$\tan\Delta\theta_{\text{D}} = \dfrac{g_1 \cdot \sin\left(\beta_{\text{D}} - \Delta\alpha\right)}{r_{\text{vn2}} - g_1 \cdot \cos\left(\beta_{\text{D}} - \Delta\alpha\right)}$	tan(0,344°)			E: 103
Wheel angle between centreline and fillet point on coast side	$\tan\Delta\theta_{\text{C}} = \dfrac{g_1 \cdot \sin\left(\beta_{\text{C}} - \Delta\alpha\right)}{r_{\text{vn2}} - g_1 \cdot \cos\left(\beta_{\text{C}} - \Delta\alpha\right)}$	tan(−0,086°)			E: 104
Wheel angle between fillet points	$\Delta\theta_2 = \dfrac{\theta_{\text{v2}} + \Delta\theta_{\text{D}} + \Delta\theta_{\text{C}}}{2{,}0}$	2,070°			E: 105
Relative vertical distance from pitch circle to fillet point	$y_1 = r_{\text{vn2}} - \dfrac{\left[r_{\text{vn2}} - g_1 \cdot \cos\left(\beta_{\text{D}} - \Delta\alpha\right)\right] \cdot \cos\left(\Delta\theta_2 - \Delta\theta_{\text{D}}\right)}{\cos\Delta\theta_{\text{D}}}$	1,133			E: 106

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Relative horizontal distance from centreline to fillet point	$x_1 = \frac{[r_{vn2} - g_1 \cdot \cos(\beta_D - \Delta\alpha)] \cdot \sin(\Delta\theta_2 - \Delta\theta_D)}{\cos\Delta\theta_D}$	1,092			E: 107
Generated pressure angle of wheel at fillet point	$\alpha_{LN2} = \alpha_{Dnf} - \Delta\theta_2$	13,798°			E: 108
Relative distance from centreline to tool critical drive side fillet point	$\mu_{D1} = \eta_D + \tan\alpha_{Dnf} \cdot (h_{vfm1} + h_{vfm2}) + \rho_{va01} \cdot (\sec\alpha_{Dnf} - \tan\alpha_{Dnf})$	1,089			E: 109
Relative distance from centreline to tool critical coast side fillet point	$\mu_{C1} = \eta_C - \tan\alpha_{Cnf} \cdot (h_{vfm1} + h_{vfm2}) - \rho_{va01} \cdot (\sec\alpha_{Cnf} - \tan\alpha_{Cnf}) + \frac{j_{en}}{m_{et2}}$ NOTE ISO 10300-3:2023, Formula (110) contains a misprint in the last term. The correct formula has been applied to this sample calculation.	−1,187			E: 110
Wheel angle between centreline and critical pinion drive side fillet point	$\tan\theta_{DLS} = \frac{\mu_{D1}}{r_{vn2} + h_{vfm1}}$	tan(1,641°)			E: 111
Wheel angle between centreline and critical pinion coast side fillet point	$\tan\theta_{CLS} = \frac{\mu_{C1}}{r_{vn2} + h_{vfm1}}$	tan(−1,789°)			E: 112

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Relative radius from tool centre to critical pinion drive side fillet point	$R_{DL2} = \frac{r_{vn2} + h_{vfm1}}{\cos\theta_{DLS}}$	38,032			E: 113
Relative radius from tool centre to critical pinion coast side fillet point	$R_{CL2} = \frac{r_{vn2} + h_{vfm1}}{\cos\theta_{CLS}}$	38,035			E: 114
Wheel angle from centreline to pinion tip on drive side	θ_{D1}	Initial: 3,882°			
		Final: 2,881°			
	$\Delta r_1 = r_{vn2} \cdot \left(e^{\theta_{D1} \cdot \tan\alpha_f} - 1{,}0\right)$	Initial: −0,182			E: 115
		Final: −0,136			E: 115
	$h_1 = (r_{vn2} + \Delta r_1) \cdot \sin(\alpha_{Dnf} + \theta_{D1}) - (r_{vn2} \cdot \sin\alpha_{Dnf} - g_{rb})$	Initial: 3,103			E: 116
		Final: 2,505			E: 116
	$h_{1o} = \sqrt{r_{va1}^2 - (r_{vn1} - \Delta r_1)^2 \cdot \cos^2(\alpha_{Dnf} + \theta_{D1})} - (r_{vn1} - \Delta r_1) \cdot \sin(\alpha_{Dnf} + \theta_{D1})$	Initial: 2,339			E: 117
		Final: 2,505			E: 117
Wheel angle from centreline to tooth surface at critical fillet point on drive side	θ_{D2o}	Initial: 1,941°			
		Final: 1,673°			
	$\mu_{D1o} = r_{vn2} \cdot e^{\theta_{D2o} \cdot \tan\alpha_f} \cdot \sin\theta_{D2o}$	Initial: 1,263			E: 118
		Final: 1,089			E: 118

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Wheel angle from centreline to tooth surface at critical fillet point on coast side	θ_{C2o}	Initial: −1,941°			
		Final: −1,817°			
	$\mu_{\text{C1o}} = r_{\text{vn2}} \cdot e^{\theta_{\text{C2o}} \cdot \tan\alpha_{\text{f}}} \cdot \sin\theta_{\text{C2o}}$	Initial: −1,269			E: 119
		Final: −1,187			E: 119
Pinion angle from centreline to tooth surface at critical drive side fillet point	$r_{\text{vn2}}\left(e^{\theta_{\text{D2o}}\tan\alpha_{\text{f}}} - 1{,}0\right) = r_{\text{vn1}}\left(1{,}0 - e^{\theta_{\text{D1o}}\tan\alpha_{\text{f}}}\right)$ Formula shall be solved for θ_{D1o}, (as stated in ISO 10300-3).	−5,512°			E: 120
Pinion angle from centreline to tooth surface at critical coast side fillet point	$r_{\text{vn2}} \cdot \left(e^{\theta_{\text{C2o}} \cdot \tan\alpha_{\text{f}}} - 1{,}0\right) = r_{\text{vn1}} \cdot \left(1{,}0 - e^{\theta_{\text{C1o}} \cdot \tan\alpha_{\text{f}}}\right)$ Formula shall be solved for θ_{C1o}, (as stated in ISO 10300-3).	6,042°			E: 121
Wheel difference angle between tool and surface at drive side fillet point	$\Delta\theta_{\text{D2o}} = \theta_{\text{DLS}} - \theta_{\text{D2o}}$	−0,033°			E: 122
Wheel difference angle between tool and surface at coast side fillet point	$\Delta\theta_{\text{C2o}} = \theta_{\text{CLS}} - \theta_{\text{C2o}}$	0,028°			E: 123
Pinion difference angle between tool and surface at drive side fillet point	$\tan\Delta\theta_{\text{D1o}} = -\dfrac{R_{\text{DL2}} \cdot \sin\Delta\theta_{\text{D2o}}}{r_{\text{vn2}} + r_{\text{vn1}} - R_{\text{DL2}} \cdot \cos\Delta\theta_{\text{D2o}}}$	tan(0,116°)			E: 124

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Pinion difference angle between tool and surface at coast side fillet point	$\tan\Delta\theta_{C1o} = -\frac{R_{CL2}\cdot\sin\Delta\theta_{C2o}}{r_{vn2}+r_{vn1}-R_{CL2}\cdot\cos\Delta\theta_{C2o}}$	tan(−0,099°)			E: 125
Pinion angle unbalance between fillet points	$\Delta\theta_1 = \frac{\theta_{D1o}+\theta_{C1o}+\Delta\theta_{D1o}+\Delta\theta_{C1o}}{2}$	0,274 °			E: 126
Pinion angle from centreline to pinion tip	$\Delta r_1 = r_{vn1}\cdot\left(1{,}0-e^{\theta_{Do}\cdot\tan\alpha_f}\right)$ Formula shall be solved for θ_{Do}, (as stated in ISO 10300-3).	−9,462°			E: 127
Wheel angle from centreline to tooth surface at pitch point on drive side	θ_D	Initial: −1,294°			
		Final: −1,223°			
	$\Delta r = r_{vn2}\cdot\left(e^{\theta_D\cdot\tan\alpha_f}-1{,}0\right)$	Initial: 0,061			E: 128
		Final: 0,058			E: 128
	$h=(r_{vn2}+\Delta r)\cdot\sin(\alpha_{Dnf}+\theta_D)-(r_{vn2}\cdot\sin\alpha_{Dnf}-g_{rb})$	Initial: −0,044			E: 129
		Final: 0,000			E: 129

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Wheel angle from centreline to fillet point on drive flank	θ_{D2}	Initial: −1,467°			
		Final: −3,212°			
	$\Delta r_2 = r_{vn2} \cdot \left(e^{\theta_{D2} \cdot \tan \alpha_f} - 1,0 \right)$	Initial: 0,069			E: 133
		Final: 0,152			E: 133
	$h_2 = (r_{vn2} + \Delta r_2) \cdot \sin(\alpha_{Dnf} + \theta_{D2}) - (r_{vn2} \cdot \sin \alpha_{Dnf} - g_{rb})$	Initial: −0,152			E: 134
		Final: −1,242			E: 134
	$h_{2o} = \pm\sqrt{r_{va1}^2 - (r_{vn1} + \Delta r_2)^2 \cdot \cos^2(\alpha_{Dnf} + \theta_{D2})} + (r_{vn1} + \Delta r_2) \cdot \sin(\alpha_{Dnf} + \theta_{D2})$	Initial: −1,406			E: 135
		Final: −1,242			E: 135
Load sharing ratio for hypoid gears (pinion and wheel)					
Load sharing ratio for hypoid gears	ε_N	1,000			E: 136
Tooth strength factor for hypoid gears (pinion and wheel)					
Relative length of action from pinion tip to pitch circle in normal section	$g_{v\alpha n1} = \sqrt{h_1^2 + (\Delta r_1 - \Delta r)^2 - 2,0 \cdot h_1 \cdot (\Delta r_1 - \Delta r) \cdot \sin(\alpha_{Dnf} + \theta_{D1})}$	2,574			E: 137
Relative length of action from wheel tip to pitch circle in normal section	$g_{v\alpha n2} = \sqrt{h_2^2 + (\Delta r_2 - \Delta r)^2 - 2,0 \cdot h_2 \cdot (\Delta r_2 - \Delta r) \cdot \sin(\alpha_{Dnf} + \theta_{D2})}$	1,266			E: 138
Relative length of action in normal section	$g_{v\alpha n,hyp} = g_{v\alpha n1} + g_{v\alpha n2}$	3,840			E: 139

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Profile contact ratio in mean normal section	$\varepsilon_{\text{v}\alpha\text{n,hyp}} = g_{\text{v}\alpha\text{n,hyp}} / p_{\text{mn}}$	1,152			E: 140
Modified contact ratio for hypoid gears	$\varepsilon_{\text{v}\gamma} = \sqrt{\varepsilon_{\text{v}\alpha\text{n,hyp}}^2 + \varepsilon_{\text{v}\beta}^2}$	1,878			E: 141
Profile load sharing factor	ε_{f}	0,061			E: 143
Lengthwise load sharing factor	ε_{b}	1,874			E: 145
Relative length of action from pinion tip to point of load application	$g_{\text{v}\alpha\text{n}3} = \left\lvert \frac{p_{\text{mn}} \cdot \varepsilon_{\text{v}\alpha\text{n,hyp}}^2}{\varepsilon_{\text{v}\gamma}^2} \cdot \left(\frac{0{,}5 \cdot \varepsilon_{\text{v}\gamma}^2}{\varepsilon_{\text{v}\alpha\text{n,hyp}}} - \frac{\varepsilon_{\text{v}\beta} \cdot \varepsilon_{\text{b}} \cdot k'}{\varepsilon_{\text{v}\alpha}} + \varepsilon_{\text{f}} \right) - g_{\text{v}\alpha\text{n}1} \right\rvert$	1,406			E: 146
Relative length of action from wheel tip to point of load application	$g_{\text{v}\alpha\text{n}4} = \left\lvert \frac{p_{\text{mn}} \cdot \varepsilon_{\text{v}\alpha\text{n,hyp}}^2}{\varepsilon_{\text{v}\gamma}^2} \cdot \left(\frac{0{,}5 \cdot \varepsilon_{\text{v}\gamma}^2}{\varepsilon_{\text{v}\alpha\text{n,hyp}}} - \frac{\varepsilon_{\text{v}\beta} \cdot \varepsilon_{\text{b}} \cdot k'}{\varepsilon_{\text{v}\alpha}} + \varepsilon_{\text{f}} \right) - g_{\text{v}\alpha\text{n}2} \right\rvert$	1,560			E: 147
Relative length of action to point of load application	$g_{\text{J}\,1,2} = g_{\text{v}\alpha\text{n,hyp}} - g_{\text{v}\alpha\text{n}3,4}$	2,434/ 2,280			E: 148

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Wheel angle from pinion tip to point of load application	θ_{D3}	Initial: −1,941°			
		Final: 1,009°			
	$\Delta r_3 = r_{vn2} \cdot \left(e^{\theta_{D3} \cdot \tan\alpha_f} - 1{,}0\right)$	Initial: 0,092			E: 149
		Final: −0,048			E: 149
	$h_3 = (r_{vn2} + \Delta r_3) \cdot \sin(\alpha_{Dnf} + \theta_{D3}) - (r_{vn2} \cdot \sin\alpha_{Dnf} - g_{rb})$	Initial: −0,447			E: 150
		Final: 1,372			E: 150
	$h_{3o} = \sqrt{g_{v\alpha n3}^2 - (\Delta r_3 - \Delta r)^2 \cdot \cos^2(\alpha_{Dnf} + \theta_{D3})} - \lvert\Delta r_3 - \Delta r\rvert \cdot \sin(\alpha_{Dnf} + \theta_{D3})$	Initial: 1,398			E: 151
		Final: 1,372			E: 151
Pinion angle from wheel tip to point of load application	θ_{D4}	Initial: 1,294°			
		Final: 1,254°			
	$\Delta r_4 = r_{vn2} \cdot \left(e^{\theta_{D4} \cdot \tan\alpha_f} - 1{,}0\right)$	Initial: −0,061			E: 152
		Final: −0,059			E: 152
	$h_4 = (r_{vn2} + \Delta r_4) \cdot \sin(\alpha_{Dnf} + \theta_{D4}) - (r_{vn2} \cdot \sin\alpha_{Dnf} - g_{rb})$	Initial: 1,546			E: 153
		Final: 1,522			E: 153
	$h_{4o} = \sqrt{g_{v\alpha n4}^2 - (\Delta r_4 - \Delta r)^2 \cdot \cos^2(\alpha_{Dnf} + \theta_{D4})} - \lvert\Delta r_4 - \Delta r\rvert \cdot \sin(\alpha_{Dnf} + \theta_{D4})$	Initial: 1,521			E: 154
		Final: 1,522			E: 154

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Relative distance from pitch circle to point of load application	$\Delta r_{LN2} = \frac{(r_{vn2} + \Delta r_3) \cdot \cos(\alpha_{Dnf} + \theta_{D3})}{\cos \alpha_{LN2}} - r_{vn2}$	−0,594			E: 155
Angle between centre line and line from point of load application and fillet point on wheel	α_{2oo}	Initial: 31,735°			
		Final: 33,563°			
Relative horizontal distance from centreline to critical fillet point	$s_{N2} = x_1 - \rho_{va02} \cdot \cos \alpha_{2oo}$	Initial: 0,888			E: 156
		Final: 0,892			E: 156
Relative vertical distance from pitch circle to critical fillet point	$y_2 = y_1 + \rho_{va02} \cdot \sin \alpha_{2oo}$	Initial: 1,259			E: 157
		Final: 1,266			E: 157
Relative wheel load height at weakest section	$h_{N2} = y_2 + \Delta r_{LN2}$	Initial: 0,666			E: 158
		Final: 0,672			E: 158
Auxiliary value	$h_{N2o} = \frac{s_{N2}}{2{,}0 \cdot \tan \alpha_{2oo}}$	Initial: 0,718			E: 159
		Final: 0,672			E: 159
Wheel tooth strength factor	$x_{N2} = \frac{s_{N2}^2}{h_{N2}}$	1,184			E: 160

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Pinion angle from pitch point to point of load application	$\Delta r_4 = r_{vn1} \cdot \left(1{,}0 - e^{\theta_{D5} \cdot \tan \alpha_f}\right)$ Formula shall be solved for θ_{D5}, (as stated in ISO 10300-3).	−4,137°			E: 161
Pinion pressure angle at point of load application	$\alpha_{LN1} = \alpha_{vnf} + \theta_{D4} - \theta_{D5} + \Delta\theta_1$	21,531°			E: 162
Pinion radial distance to point of load application	$r_{41o} = \dfrac{(r_{vn1} - \Delta r_4) \cdot \cos(\alpha_{Dnf} + \theta_{D4})}{\cos \alpha_{LN1}}$	11,662			E: 163
Start of iteration with $\alpha_{Do} = \alpha_{nD} + \alpha_{nC}$	α_{Do}	Initial: 40,000°			
		Final: 37,905°			
Wheel angle between centreline and pinion fillet (enclosed iteration)	θ_{D2oo}	Initial (first pass): 1,941°			
		Final (first pass): 2,904°			
		Initial (last pass): 1,941°			
		Final (last pass): 3,018°			

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$\Delta r_5 = r_{vn2} \cdot e^{\theta_{D2oo} \cdot \tan \alpha_f}$	Initial (first pass): 37,280			E: 164
		Final (first pass): 37,235			
		Initial (last pass): 37,280			
		Final (last pass): 37,229			
Wheel angle between centreline and pinion fillet (enclosed iteration)	$\mu_{D2} = \dfrac{r_{vn2} + h_{vfm1} - \rho_{va01} - \Delta r_5 \cos \theta_{D2oo}}{\tan \alpha_{Do}}$	Initial (first pass): 0,712			E: 165
		Final (first pass): 0,797			
		Initial (last pass): 0,767			
		Final (last pass): 0,871			
	$\mu_D = \Delta r_5 \cdot \sin \theta_{D2oo}$	Initial (first pass): 1,263			E: 166
		Final (first pass): 1,886			
		Initial (last pass): 1,263			
		Final (last pass): 1,960			

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Pinion angle between centreline and pinion fillet	$r_{\mathrm{vn2}}\cdot\left(e^{\theta_{\mathrm{D2oo}}\cdot\tan\alpha_{\mathrm{f}}}-1{,}0\right)=r_{\mathrm{vn1}}\cdot\left(1{,}0-e^{\theta_{\mathrm{D1oo}}\cdot\tan\alpha_{\mathrm{f}}}\right)$ Formula shall be solved for θ_{D1oo}, (as stated in ISO 10300-3).	Initial: −9,535° Final: −9,907°			E: 167
Wheel rotation through path of action	$\tan\theta_{\mathrm{L2o}}=\dfrac{\mu_{\mathrm{D1}}-\rho_{\mathrm{va01}}\cdot\cos\alpha_{\mathrm{Do}}}{r_{\mathrm{vn2}}+h_{\mathrm{vfm1}}-\rho_{\mathrm{va01}}+\rho_{\mathrm{va01}}\cdot\sin\alpha_{\mathrm{Do}}}$	Initial: tan(1,458°) Final: tan(1,453°)			E: 168
Wheel angle difference between path of action and tooth surface at pinion fillet	$\Delta\theta_{\mathrm{D2oo}}=\theta_{\mathrm{L2o}}-\theta_{\mathrm{D2oo}}$	Initial: −1,446° Final: −1,565°			E: 169
Relative wheel radius to pinion fillet point	$r_{\mathrm{L2o}}=\dfrac{r_{\mathrm{vn2}}+h_{\mathrm{vfm1}}-\rho_{\mathrm{va01}}+\rho_{\mathrm{va01}}\sin\alpha_{\mathrm{Do}}}{\cos\theta_{\mathrm{L2o}}}$	Initial: 37,971 Final: 37,967			E: 170
Pinion angle to fillet point	$\tan\Delta\theta_{\mathrm{D1oo}}=-\dfrac{r_{\mathrm{L2o}}\cdot\sin\Delta\theta_{\mathrm{D2oo}}}{r_{\mathrm{vn2}}+r_{\mathrm{vn1}}-r_{\mathrm{L2o}}\cdot\cos\Delta\theta_{\mathrm{D2oo}}}$	Initial: tan(5,114°) Final: tan(5,530°)			E: 171
Relative pinion radius to fillet point	$r_{\mathrm{L1o}}=\dfrac{r_{\mathrm{vn2}}+r_{\mathrm{vn1}}-r_{\mathrm{L2o}}\cdot\cos\Delta\theta_{\mathrm{D2oo}}}{\cos\Delta\theta_{\mathrm{D1oo}}}$	Initial: 10,747 Final: 10,761			E: 172

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Pinion angle from centre line to fillet point	$(\Delta\theta_1 - \theta_{L1o}) = \Delta\theta_1 - \theta_{D1oo} - \Delta\theta_{D1oo}$	Initial: 4,694°			E: 173
		Final: 4,650°			
Angle between centre line and line from point of load application and fillet point on pinion	$\alpha_1 = \alpha_{Do} - \theta_{D2oo} + \theta_{D1oo}$	Initial: 27,561°			E: 174
		Final: 24,981°			
Relative horizontal distance to critical fillet point	$s_{N1} = r_{L1o} \cdot \sin(\Delta\theta_1 - \theta_{L1o})$	Initial: 0,880			E: 175
		Final: 0,872			
Relative pinion load height at weakest section	$h_{N1} = r_{41o} - r_{L1o} \cdot \cos(\Delta\theta_1 - \theta_{L1o})$	Initial: 0,951			E: 176
		Final: 0,936			
Auxiliary value	$h_{N1o} = \dfrac{s_{N1}}{2{,}0 \cdot \tan\alpha_1}$	Initial: 0,843			E: 177
		Final: 0,936			
Pinion tooth strength factor	$x_{N1} = \dfrac{s_{N1}^2}{h_{N1}}$	0,813			E: 178
Tooth form factor for hypoid gears (pinion and wheel)					
Tooth form factor for pinion	$Y_1 = \dfrac{2}{3}\left[\dfrac{1}{\left(\dfrac{1}{x_{N1}} - \dfrac{\tan\alpha_{LN1}}{3\, s_{N1}}\right)}\right]$	0,618			E: 179

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Tooth form factor for wheel	$Y_2 = \frac{2}{3}\left[\frac{1}{\left(\frac{1}{x_{N2}} - \frac{\tan\alpha_{LN2}}{3\, s_{N2}}\right)}\right]$	0,885			E: 179
Transverse radius to point of load application (pinion and wheel)					
Mean facewidth of pinion	$b_{k1} = \frac{b_1 \cdot \varepsilon_{v\alpha n,hyp} \cdot \varepsilon_{v\beta}}{\varepsilon_{v\gamma}^2}$	15,087			E: 180
Mean facewidth of wheel	$b_{k2} = \frac{b_2 \cdot \varepsilon_{v\alpha n,hyp} \cdot \varepsilon_{v\beta}}{\varepsilon_{v\gamma}^2}$	12,597			E: 180
Contact shift due to load for pinion	$x_{oo1} = k' \cdot b_{k1} - \frac{b_1 \cdot \varepsilon_f \cdot \varepsilon_{v\beta}}{\varepsilon_{v\gamma}^2}$	1,803			E: 181
Contact shift due to load for wheel	$x_{oo2} = k' \cdot b_{k2} + \frac{b_2 \cdot \varepsilon_f \cdot \varepsilon_{v\beta}}{\varepsilon_{v\gamma}^2}$	2,844			E: 182
Transverse radius to point of load application for pinion	$r_{my01} = \frac{r_{mpt1} \cdot (x_{oo1} + R_{m2})}{R_{m2}} + (r_{41o} - r_{vn1}) \cdot m_{et2}$	28,040 mm			E: 183
Transverse radius to point of load application for wheel	$r_{my02} = \frac{r_{mpt2} \cdot (x_{oo2} + R_{m2})}{R_{m2}} + \Delta r_{LN2} \cdot m_{et2}$	72,922 mm			E: 184

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Tooth fillet radius at root diameter (pinion and wheel)					
Relative fillet radius at root of tooth on pinion	$r_{\text{mf}1} = \frac{(h_{\text{vfm}1} - \rho_{\text{va}01})^2}{r_{\text{vn}1} + h_{\text{vfm}1} - \rho_{\text{va}01}} + \rho_{\text{va}01}$	0,180			E: 185
Relative fillet radius at root of tooth on wheel	$r_{\text{mf}2} = \frac{(h_{\text{vfm}2} - \rho_{\text{va}02})^2}{r_{\text{vn}2} + h_{\text{vfm}2} - \rho_{\text{va}02}} + \rho_{\text{va}02}$	0,273			E: 185
Stress concentration and correction factor (pinion and wheel)					
Stress concentration and stress correction factor on pinion	$Y_{\text{f}1} = L + \left(\frac{2s_{\text{N}1}}{r_{\text{mf}1}}\right)^M \left(\frac{2s_{\text{N}1}}{h_{\text{N}1}}\right)^O$	2,189			E: 186
Stress concentration and stress correction factor on wheel	$Y_{\text{f}2} = L + \left(\frac{2s_{\text{N}2}}{r_{\text{mf}2}}\right)^M \left(\frac{2s_{\text{N}2}}{h_{\text{N}2}}\right)^O$	2,336			E: 186
where	$L = 0{,}325\,454\,5 - 0{,}007\,272\,7\,\alpha_n$	0,210			E: 187
	$M = 0{,}331\,818\,2 - 0{,}009\,090\,9\,\alpha_n$	0,188			E: 188
	$O = 0{,}268\,181\,8 + 0{,}009\,090\,9\,\alpha_n$	0,412			E: 189
Inertia factor					
Inertia factor when $\varepsilon_{v\gamma} \geq 2{,}0$	Y_i	1,065			E: 191

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Calculated effective facewidth					
Projected length of the instantaneous contact line in the tooth lengthwise direction (pinion)	$g_{K1}=\frac{b_1 \cdot g_{v\alpha n,hyp} \cdot g_{J1} \cdot (\cos\beta_{vb})^2}{g_\eta^2}$	9,196			E: 193
Projected length of the instantaneous contact line in the tooth lengthwise direction (wheel)	$g_{K2}=\frac{b_2 \cdot g_{v\alpha n,hyp} \cdot g_{J2} \cdot (\cos\beta_{vb})^2}{g_\eta^2}$	7,194			E: 193
Toe increment on pinion	$\Delta b_{i1}^{'}=\frac{b_1-g_{K1}}{2 \cdot \cos\beta_{m1}}-\frac{x_{oo1}}{\cos\beta_{m1}}$	12,964			E: 194
Toe increment on wheel	$\Delta b_{i2}^{'}=\frac{b_2-g_{K2}}{2 \cdot \cos\beta_{m2}}-\frac{x_{oo2}}{\cos\beta_{m2}}$	7,026			E: 194
Heel increment on pinion	$\Delta b_{e1}^{'}=\frac{b_1-g_{K1}}{2 \cdot \cos\beta_{m1}}+\frac{x_{oo1}}{\cos\beta_{m1}}$	18,063			E: 195
Heel increment on wheel	$\Delta b_{e2}^{'}=\frac{b_2-g_{K2}}{2 \cdot \cos\beta_{m2}}+\frac{x_{oo2}}{\cos\beta_{m2}}$	13,119			E: 195
Calculated effective facewidth on pinion	$b_{ce1}=C_{mm} \cdot h_{N1} \cdot \cos\beta_{m1} \cdot \left[\arctan\left(\frac{\Delta b_{i1}}{C_{mm} \cdot h_{N1}}\right)+\arctan\left(\frac{\Delta b_{e1}}{C_{mm} \cdot h_{N1}}\right)\right]+g_{K1}$	28,515			E: 202

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
	with C_{mm} = 25,4 mm				
Calculated effective facewidth on wheel	$b_{ce2}=C_{mm}\cdot h_{N2}\cdot\cos\beta_{m2}\cdot\left[\arctan\left(\frac{\Delta b_{i2}}{C_{mm}\cdot h_{N2}}\right)+\arctan\left(\frac{\Delta b_{e2}}{C_{mm}\cdot h_{N2}}\right)\right]+g_{K2}$ with C_{mm} = 25,4 mm	23,859			E: 202
Basic formula of geometry factor (pinion and wheel)					
Geometry factor for pinion	$Y_{J1}=\frac{Y_1}{Y_{f1}\cdot\varepsilon_N\cdot Y_i}\cdot\frac{r_{my01}}{r_{mpt1}}\cdot\frac{b_{ce1}}{b_1}\cdot\frac{m_{mt1}}{m_{et2}}$	0,302			E: 59
Geometry factor for wheel	$Y_{J2}=\frac{Y_2}{Y_{f2}\cdot\varepsilon_N\cdot Y_i}\cdot\frac{r_{my02}}{r_{mpt2}}\cdot\frac{b_{ce2}}{b_2}\cdot\frac{m_{mt2}}{m_{et2}}$	0,280			E: 59
Root stress adjustment factor for carburized case hardened steel	Y_A	1,075			E: 203
Relative surface condition factor					
Relative surface condition factor	$Y_{R\,rel\,T}$	1,000			E: 204
Relative notch sensitivity factor					
Notch parameter	$q_{s1-B2}=\frac{s_{N1}}{2\cdot r_{mf1}}$	2,423			E: 205

Description	**Formula**	**Result**	**References to**		
			ISO 10300-1	**ISO 10300-2**	**ISO 10300-3**
			E: Formula, T: Table, F: Figure		
	$q_{s2\text{–}B2} = \dfrac{s_{N2}}{2 \cdot r_{mf2}}$	1,632			E: 205
Relative notch sensitivity factor	$Y_{\delta\ \mathrm{rel\ T1,2}}$	1,000			E: 206
K–factors					
Face load factor	$K_{F\beta}$	1,550	E: 32		
Transverse load factor	$K_{F\alpha}$	1,000	E: 40		
Tooth root stress formula (pinion and wheel)					
Nominal tooth root stress on pinion	$\sigma_{\mathrm{F01\text{-}B2}} = \dfrac{F_{\mathrm{mt1}}}{b_1} \cdot \dfrac{m_{\mathrm{mt1}}}{m_{\mathrm{et2}}^2} \cdot \dfrac{Y_{\mathrm{A1}}}{Y_{\mathrm{J1}}}$	254,0 N/mm^2			E: 55
Tooth root stress on pinion	$\sigma_{\mathrm{F1\text{-}B2}} = \sigma_{\mathrm{F01\text{-}B2}} \cdot K_{\mathrm{A}} \cdot K_{\mathrm{v}} \cdot K_{\mathrm{F}\beta} \cdot K_{\mathrm{F}\alpha}$	433,0 N/mm^2			E: 52
Nominal tooth root stress on wheel	$\sigma_{\mathrm{F02\text{-}B2}} = \dfrac{F_{\mathrm{mt2}}}{b_2} \cdot \dfrac{m_{\mathrm{mt2}}}{m_{\mathrm{et2}}^2} \cdot \dfrac{Y_{\mathrm{A2}}}{Y_{\mathrm{J2}}}$	328,3 N/mm^2			E: 55
Tooth root stress on wheel	$\sigma_{\mathrm{F2\text{-}B2}} = \sigma_{\mathrm{F02\text{-}B2}} \cdot K_{\mathrm{A}} \cdot K_{\mathrm{v}} \cdot K_{\mathrm{F}\beta} \cdot K_{\mathrm{F}\alpha}$	559,7 N/mm^2			E: 52
Permissible tooth root stress (pinion and wheel)					
Permissible tooth root stress on pinion	$\sigma_{\mathrm{FP1\text{-}B2}} = \sigma_{\mathrm{F,lim}} \cdot Y_{\mathrm{ST}} \cdot Y_{\mathrm{NT}} \cdot Y_{\delta,\mathrm{relT\text{-}B2}} \cdot Y_{\mathrm{R,relT\text{-}B2}} \cdot Y_{\mathrm{X}}$	1 000,0 N/mm^2			E: 57

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Permissible tooth root stress on wheel	$\sigma_{\text{FP2-B2}} = \sigma_{\text{F,lim}} \cdot Y_{\text{ST}} \cdot Y_{\text{NT}} \cdot Y_{\delta,\text{relT-B2}} \cdot Y_{\text{R,relT-B2}} \cdot Y_{\text{X}}$	1 000,0 N/mm^2			E: 57

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Calculated safety factors (pinion and wheel)					
Calculated safety factor for pinion	$S_{F1\text{-}B2} = \dfrac{\sigma_{FP1\text{-}B2}}{\sigma_{F1\text{-}B2}}$	2,309			E: 58
Calculated safety factor for wheel	$S_{F2\text{-}B2} = \dfrac{\sigma_{FP2\text{-}B2}}{\sigma_{F2\text{-}B2}}$	1,787			E: 58

C.4 Calculation of Sample 3 according to local calculation method for surface durability – Method B1 localised

Table C.12 — Virtual cylindrical gears

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Length of path of contact in transverse section	$g_{v\alpha}=g_{va1}+g_{va2}=\frac{1}{2}\cdot\left[\left(\sqrt{d_{va1}^2-d_{vb1}^2}-d_{v1}\cdot\sin\alpha_{vet}\right)+\left(\sqrt{d_{va2}^2-d_{vb2}^2}-d_{v2}\cdot\sin\alpha_{vet}\right)\right]$	16,280 mm	E: A.49		
Point A on the transverse path of contact	$g_Y(A)=-g_{va2}$	-5,379 mm	E: A.47		
Point E on the transverse path of contact	$g_Y(E)=g_{va1}$	10,901 mm	E: A.48		
Contact point Y on the transverse path of contact	$g_Y(Y)=g_Y(A)+k_s\cdot g_{v\alpha}+Y\cdot\frac{(1-2\cdot k_s)\cdot g_{v\alpha}}{i}$ with $Y=0\ldots i$; $i=10$ Note that in all following equations g_Y is a function of Y ($g_Y=g_Y(Y)$)	-5,379 mm -3,751 mm -2,123 mm -0,495 mm 1,133 mm 2,761 mm 4,389 mm 6,017 mm 7,645 mm 9,273 mm 10,901 mm	E: A.50		

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Distance of the middle contact line in the zone of action	$f_{\mathrm{m,Y}} = (g_{\mathrm{va2}} - g_{\mathrm{v}\alpha}/2 + g_{\mathrm{Y}}) \cdot \cos\beta_{\mathrm{vb}}$	-6,993 mm -5,595 mm -4,196 mm -2,797 mm -1,399 mm 0,000 mm 1,399 mm 2,797 mm 4,196 mm 5,595 mm 6,993 mm	E: A.51		
Coordinates of the ends of the contact line	$x_{1,\mathrm{Y}} = \dfrac{f_{\mathrm{Y}} \cdot \cos\beta_{\mathrm{vb}} + \tan\beta_{\mathrm{vb}} \cdot \left(f_{\mathrm{Y}} \cdot \sin\beta_{\mathrm{vb}} + \dfrac{b_{\mathrm{v,eff}}}{2} \right) + \dfrac{1}{2} \cdot \left(g_{\mathrm{v}\alpha} + b_{\mathrm{v,eff}} \cdot \tan\gamma \right)}{\tan\gamma + \tan\beta_{\mathrm{vb}}}$ $x_{1,\mathrm{Y}} = 0$ for $x_{1,\mathrm{Y}} < 0$ $x_{1,\mathrm{Y}} = b_{\mathrm{v,eff}}$ for $x_{1,\mathrm{Y}} > b_{\mathrm{v,eff}}$	9,991 mm 12,192 mm 14,393 mm 16,594 mm 18,796 mm 19,981 mm 19,981 mm 19,981 mm 19,981 mm 19,981 mm 19,981 mm	E: A.56		
Coordinates of the ends of the contact line	$x_{2,\mathrm{Y}} = \dfrac{f_{\mathrm{Y}} \cdot \cos\beta_{\mathrm{vb}} + \tan\beta_{\mathrm{vb}} \cdot \left(f_{\mathrm{Y}} \cdot \sin\beta_{\mathrm{vb}} + \dfrac{b_{\mathrm{v,eff}}}{2} \right) - \dfrac{1}{2} \cdot \left(g_{\mathrm{v}\alpha} - b_{\mathrm{v,eff}} \cdot \tan\gamma \right)}{\tan\gamma + \tan\beta_{\mathrm{vb}}}$	0,000 mm 0,000 mm 0,000 mm 0,000 mm	E: A.57		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$x_{2,Y} = 0$ for $x_{2,Y} < 0$ $x_{2,Y} = b_{v,eff}$ for $x_{2,Y} > b_{v,eff}$	0,000 mm 0,000 mm 1,186 mm 3,387 mm 5,588 mm 7,789 mm 9,991 mm			
Coordinates of the ends of the contact line	$y_{1,Y} = -x_{1,Y} \cdot \tan\beta_{vb} + f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \frac{b_{v,eff}}{2}\right)$	-8,140 mm -7,823 mm -7,507 mm -7,190 mm -6,873 mm -5,952 mm -4,324 mm -2,696 mm -1,068 mm 0,560 mm 2,188 mm	E: A.58		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$y_{2,Y} = -x_{2,Y} \cdot \tan\beta_{vb} + f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \frac{b_{v,eff}}{2} \right)$	-2,188 mm -0,560 mm 1,068 mm 2,696 mm 4,324 mm 5,952 mm 6,873 mm 7,190 mm 7,507 mm 7,823 mm 8,140 mm	E: A.58		
Correction factor for the length of contact lines	$C_{lb,Y} = \sqrt{\left(1 - \left(\frac{f_Y}{f_{max}}\right)^2\right) \cdot \left(1 - \sqrt{\frac{b_{v,eff}}{b_v}}\right)^2}$	0,066 0,071 0,074 0,076 0,078 0,078 0,078 0,076 0,074 0,071 0,066	E: A.61		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Theoretical length of contact line	$l_{\mathrm{mb0,Y}} = \sqrt{\left(x_{1,\mathrm{Y}} - x_{2,\mathrm{Y}}\right)^2 + \left(y_{1,\mathrm{Y}} - y_{2,\mathrm{Y}}\right)^2}$	11,629 mm 14,191 mm 16,753 mm 19,316 mm 21,878 mm 23,258 mm 21,878 mm 19,316 mm 16,753 mm 14,191 mm 11,629 mm	E: A.60		
Length of contact line	$l_{\mathrm{mb,Y}} = l_{\mathrm{mb0,Y}} \cdot \left(1 - C_{\mathrm{lb,Y}}\right)$	10,856 mm 13,186 mm 15,512 mm 17,842 mm 20,180 mm 21,443 mm 20,180 mm 17,842 mm 15,512 mm 13,186 mm 10,856 mm	E: A.59		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Distance of the top contact line in the zone of action	$f_{t,Y} = f_{m,Y} + p_{vet} \cdot \cos\beta_{vb}$	4,898 mm 6,296 mm 7,695 mm 9,094 mm 10,492 mm 11,891 mm 13,289 mm 14,688 mm 16,087 mm 17,485 mm 18,884 mm	E: A.52		
Coordinates of the ends of the contact line	$x_{1,Y} = \dfrac{f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2} \right) + \dfrac{1}{2} \cdot \left(g_{v\alpha} + b_{v,eff} \cdot \tan\gamma \right)}{\tan\gamma + \tan\beta_{vb}}$ $x_{1,Y} = 0$ for $x_{1,Y} < 0$ $x_{1,Y} = b_{v,eff}$ for $x_{1,Y} > b_{v,eff}$	19,981 mm 19,981 mm 19,981 mm 19,981 mm 19,981 mm 19,981 mm 19,981 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm	E: A.56		
Coordinates of the ends of the contact line	$x_{2,Y} = \dfrac{f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2} \right) - \dfrac{1}{2} \cdot \left(g_{v\alpha} - b_{v,eff} \cdot \tan\gamma \right)}{\tan\gamma + \tan\beta_{vb}}$	6,693 mm 8,894 mm 11,095 mm 13,296 mm	E: A.57		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$x_{2,Y} = 0$ for $x_{2,Y} < 0$ $x_{2,Y} = b_{v,eff}$ for $x_{2,Y} > b_{v,eff}$	15,498 mm 17,699 mm 19,900 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm			
Coordinates of the ends of the contact line	$y_{1,Y} = -x_{1,Y} \cdot \tan\beta_{vb} + f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \frac{b_{v,eff}}{2} \right)$	-0,251 mm 1,377 mm 3,005 mm 4,633 mm 6,261 mm 7,889 mm 9,517 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm	E: A.58		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$y_{2,Y} = -x_{2,Y} \cdot \tan\beta_{vb} + f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \frac{b_{v,eff}}{2} \right)$	7,666 mm 7,982 mm 8,299 mm 8,616 mm 8,932 mm 9,249 mm 9,566 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm	E: A.58		
Correction factor for the length of contact lines	$C_{lb,Y} = \sqrt{\left(1 - \left(\frac{f_Y}{f_{max}}\right)^2\right) \cdot \left(1 - \sqrt{\frac{b_{v,eff}}{b_v}}\right)^2}$	0,073 0,069 0,064 0,057 0,048 0,035 0,007 0,000 0,000 0,000 0,000	E: A.61		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Theoretical length of contact line	$l_{\text{tb0,Y}} = \sqrt{\left(x_{1,\text{Y}} - x_{2,\text{Y}}\right)^2 + \left(y_{1,\text{Y}} - y_{2,\text{Y}}\right)^2}$	15,468 mm 12,906 mm 10,343 mm 7,781 mm 5,219 mm 2,657 mm 0,094 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm	E: A.60		
Length of contact line	$l_{\text{tb,Y}} = l_{\text{tb0,Y}} \cdot \left(1 - C_{\text{lb,Y}}\right)$	14,345 mm 12,018 mm 9,684 mm 7,337 mm 4,967 mm 2,563 mm 0,094 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm	E: A.59		

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Distance of the root contact line in the zone of action	$f_{r,Y} = f_{m,Y} - p_{vet} \cdot \cos\beta_{vb}$	-18,884 mm -17,485 mm -16,087 mm -14,688 mm -13,289 mm -11,891 mm -10,492 mm -9,094 mm -7,695 mm -6,296 mm -4,898 mm	E: A.53		
Coordinates of the ends of the contact line	$x_{1,Y} = \dfrac{f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right) + \dfrac{1}{2} \cdot \left(g_{v\alpha} + b_{v,eff} \cdot \tan\gamma\right)}{\tan\gamma + \tan\beta_{vb}}$ $x_{1,Y} = 0$ for $x_{1,Y} < 0$ $x_{1,Y} = b_{v,eff}$ for $x_{1,Y} > b_{v,eff}$	0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,081 mm 2,282 mm 4,484 mm 6,685 mm 8,886 mm 11,087 mm 13,289 mm	E: A.56		
Coordinates of the ends of the contact line	$x_{2,Y} = \dfrac{f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right) - \dfrac{1}{2} \cdot \left(g_{v\alpha} - b_{v,eff} \cdot \tan\gamma\right)}{\tan\gamma + \tan\beta_{vb}}$	0,000 mm 0,000 mm 0,000 mm 0,000 mm	E: A.57		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$x_{2,Y} = 0 \quad \text{for } x_{2,Y} < 0$ $x_{2,Y} = b_{v,eff} \quad \text{for } x_{2,Y} > b_{v,eff}$	0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm			
Coordinates of the ends of the contact line	$y_{1,Y} = -x_{2,Y} \cdot \tan\beta_{vb} + f_Y \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f_Y \cdot \sin\beta_{vb} + \frac{b_{v,eff}}{2} \right)$	0,000 mm 0,000 mm 0,000 mm 0,000 mm -9,566 mm -9,249 mm -8,932 mm -8,616 mm -8,299 mm -7,982 mm -7,666 mm	E: A.58		

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Coordinates of the ends of the contact line	$y_{2,\mathrm{Y}} = -x_{2,\mathrm{Y}} \cdot \tan\beta_{\mathrm{vb}} + f_{\mathrm{Y}} \cdot \cos\beta_{\mathrm{vb}} + \tan\beta_{\mathrm{vb}} \cdot \left(f_{\mathrm{Y}} \cdot \sin\beta_{\mathrm{vb}} + \frac{b_{\mathrm{v,eff}}}{2} \right)$	0,000 mm 0,000 mm 0,000 mm 0,000 mm -9,517 mm -7,889 mm -6,261 mm -4,633 mm -3,005 mm -1,377 mm 0,251 mm	E: A.58		
Correction factor for the length of contact lines	$C_{\mathrm{lb,Y}} = \sqrt{\left(1 - \left(\frac{f_{\mathrm{Y}}}{f_{\mathrm{max}}}\right)^2\right) \cdot \left(1 - \sqrt{\frac{b_{\mathrm{v,eff}}}{b_{\mathrm{v}}}}\right)^2}$	0,000 0,000 0,000 0,000 0,007 0,035 0,048 0,057 0,064 0,069 0,073	E: A.61		

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Theoretical length of contact line	$l_{rb0,Y} = \sqrt{\left(x_{1,Y} - x_{2,Y}\right)^2 + \left(y_{1,Y} - y_{2,Y}\right)^2}$	0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,094 mm 2,657 mm 5,219 mm 7,781 mm 10,343 mm 12,906 mm 15,468 mm	E: A.60		
Length of contact line	$l_{rb,Y} = l_{rb0,Y} \cdot \left(1 - C_{lb,Y}\right)$	0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,094 mm 2,563 mm 4,967 mm 7,337 mm 9,684 mm 12,018 mm 14,345 mm	E: A.59		

Description	Formula	Result	References to ISO 10300-1 (E: Formula, T: Table, F: Figure)	References to ISO 10300-2 (E: Formula, T: Table, F: Figure)	References to ISO 10300-3 (E: Formula, T: Table, F: Figure)
Related peak load for calculating the load sharing factor	$p_{t,Y}^{*} = \frac{w_Y}{w_{max}} = 1 - \left(\frac{\lvert f_{t,Y} \rvert}{\lvert f_{max} \rvert} \right)^{e_{LS}}$ with $e_{LS} = 3$	0,951 0,895 0,808 0,683 0,514 0,292 0,012 0,000 0,000 0,000 0,000		E: A.7	
Related peak load for calculating the load sharing factor	$p_{m,Y}^{*} = \frac{w_Y}{w_{max}} = 1 - \left(\frac{\lvert f_{m,Y} \rvert}{\lvert f_{max} \rvert} \right)^{e_{LS}}$ with $e_{LS} = 3$	0,856 0,926 0,969 0,991 0,999 1,000 0,999 0,991 0,969 0,926 0,856		E: A.7	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Related peak load for calculating the load sharing factor	$p_{\mathrm{r,Y}}^{*} = \frac{w_{\mathrm{Y}}}{w_{\max}} = 1 - \left(\frac{\lvert f_{\mathrm{r,Y}} \rvert}{\lvert f_{\max} \rvert} \right)^{e_{\mathrm{LS}}}$ with $e_{\mathrm{LS}} = 3$	0,000 0,000 0,000 0,000 0,012 0,292 0,514 0,683 0,808 0,895 0,951		E: A.7	
Related area for calculating the load sharing factor X_{LS}	$A_{\mathrm{t,Y}}^{*} = \frac{1}{4} \cdot \pi \cdot p_{\mathrm{t,Y}}^{*} \cdot l_{\mathrm{tb,Y}}$	10,709 mm 8,446 mm 6,146 mm 3,937 mm 2,003 mm 0,588 mm 0,001 mm 0,000 mm 0,000 mm 0,000 mm 0,000 mm		E: A.6	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Related area for calculating the load sharing factor X_{LS}	$A_{m,Y}^{*}=\frac{1}{4}\cdot\pi\cdot p_{m,Y}^{*}\cdot l_{mb,Y}$	7,298 mm 9,592 mm 11,804 mm 13,884 mm 15,831 mm 16,841 mm 15,831 mm 13,884 mm 11,804 mm 9,592 mm 7,298 mm		E: A.6	
Related area for calculating the load sharing factor X_{LS}	$A_{r,Y}^{*}=\frac{1}{4}\cdot\pi\cdot p_{r,Y}^{*}\cdot l_{rb,Y}$	0,000 mm 0,000 mm 0,000 mm 0,000 mm 0,001 mm 0,588 mm 2,003 mm 3,937 mm 6,146 mm 8,446 mm 10,709 mm		E: A.6	

Description	Formula	Result	References to ISO 10300-1 (E: Formula, T: Table, F: Figure)	References to ISO 10300-2 (E: Formula, T: Table, F: Figure)	References to ISO 10300-3 (E: Formula, T: Table, F: Figure)
Local load distribution factor	$Z_{LS,Y}=\sqrt{\dfrac{A^*_{m,Y}}{A^*_{t,Y}+A^*_{m,Y}+A^*_{r,Y}}}$	0,637 0,729 0,811 0,883 0,942 0,967 0,942 0,883 0,811 0,729 0,637		E: A.5	
Curvature factor	$X_Y=\dfrac{\tan\alpha_{vet}}{\sqrt{\dfrac{(d_{v1}/2\cdot\sin\alpha_{vet}+g_Y)}{d_{vb1}/2}}\cdot\sqrt{\dfrac{(d_{v2}/2\cdot\sin\alpha_{vet}-g_Y)}{d_{vb2}/2}}}$	1,331 1,191 1,093 1,019 0,962 0,916 0,878 0,847 0,821 0,800 0,781	E: A.63		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local equivalent radius of curvature vertical to the contact line in the contact point Y	$\rho_{\text{rel,Y}} = \rho_{\text{rel}} \cdot \frac{1}{X_{\text{Y}}^2}$	7,910 mm 9,875 mm 11,737 mm 13,497 mm 15,155 mm 16,711 mm 18,165 mm 19,517 mm 20,767 mm 21,915 mm 22,961 mm	E: A.62		
Auxiliary variable	$a = \frac{1}{K_{\text{H}\beta} - 1}$	1,538	E: 31		
Auxiliary variable	$b_{\text{Y}} = \frac{2}{l_{\text{bm,Y}}}$	0,184 mm^{-1} 0,152 mm^{-1} 0,129 mm^{-1} 0,112 mm^{-1} 0,099 mm^{-1} 0,093 mm^{-1} 0,099 mm^{-1} 0,112 mm^{-1} 0,129 mm^{-1} 0,152 mm^{-1} 0,184 mm^{-1}	E: 31		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Distance from M_Y to Y	$z_Y = \sqrt{\left(\frac{b_{v,eff}}{2} - \frac{x_{1,Y} + x_{2,Y}}{2}\right)^2 + \left(g_{va2} - \frac{g_{v\alpha}}{2} + g_Y - \frac{y_{1,Y} + y_{2,Y}}{2}\right)^2}$	5,428 mm 4,533 mm 3,252 mm 1,971 mm 0,690 mm 0,000 mm 0,690 mm 1,971 mm 3,252 mm 4,533 mm 5,428 mm	E: 30		
Local face load factor for contact stress	$K_{H\beta,Y} = K_{H\beta} \cdot \left[1 - (b_Y \cdot z_Y)^a\right]$	0,000 0,723 1,217 1,488 1,623 1,650 1,623 1,488 1,217 0,723 0,000	E: 29		

Table C.13 — Local velocities and slip

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Surface velocity in tooth width direction	$w_{\mathrm{t1s}} = v_{\mathrm{mt1}} \cdot \sin \beta_{\mathrm{m1}}$	8,539 m/s		E: A.14	
	$w_{\mathrm{t2s}} = v_{\mathrm{mt2}} \cdot \sin \beta_{\mathrm{m2}}$	3,280 m/s		E: A.14	
Pinion local surface velocity in tooth height direction	$w_{\mathrm{t1h,Y}} = v_{\mathrm{mt1}} \cdot \cos \beta_{\mathrm{m1}} \cdot \left(\sin \alpha_{\mathrm{nD,C}} + \dfrac{g_{\mathrm{Y}}}{d_{\mathrm{v1}}/2} \right)$	0,707 m/s 1,200 m/s 1,693 m/s 2,186 m/s 2,678 m/s 3,171 m/s 3,664 m/s 4,156 m/s 4,649 m/s 5,142 m/s 5,634 m/s		E: A.15	
Wheel local surface velocity in tooth height direction	$w_{\mathrm{t2h,Y}} = v_{\mathrm{mt2}} \cdot \cos \beta_{\mathrm{m2}} \cdot \left(\sin \alpha_{\mathrm{nD,C}} - \dfrac{g_{\mathrm{Y}}}{d_{\mathrm{v2}}/2} \right)$	2,618 m/s 2,532 m/s 2,447 m/s 2,361 m/s 2,276 m/s 2,191 m/s 2,105 m/s 2,020 m/s 1,934 m/s 1,849 m/s 1,763 m/s		E: A.16	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Pinion local surface velocity	$w_{\mathrm{t1,Y}} = \sqrt{w_{\mathrm{t1s}}^2 + w_{\mathrm{t1h,Y}}^2}$	8,568 m/s 8,623 m/s 8,705 m/s 8,814 m/s 8,949 m/s 9,109 m/s 9,292 m/s 9,497 m/s 9,722 m/s 9,967 m/s 10,230 m/s		E: A.17	
Wheel local surface velocity	$w_{\mathrm{t2,Y}} = \sqrt{w_{\mathrm{t2s}}^2 + w_{\mathrm{t2h,Y}}^2}$	4,197 m/s 4,144 m/s 4,092 m/s 4,042 m/s 3,993 m/s 3,945 m/s 3,898 m/s 3,852 m/s 3,808 m/s 3,765 m/s 3,724 m/s		E: A.17	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Angle between the sliding velocities in lengthwise and tooth profile direction	$\omega_{\mathrm{wt1,Y}} = \arctan \dfrac{w_{\mathrm{t1h,Y}}}{w_{\mathrm{t1s}}}$	4,736° 8,001° 11,214° 14,357° 17,414° 20,373° 23,222° 25,955° 28,566° 31,055° 33,419°		E: A.19	
Angle between the sliding velocities in lengthwise and tooth profile direction	$\omega_{\mathrm{wt2,Y}} = \arctan \dfrac{w_{\mathrm{t2h,Y}}}{w_{\mathrm{t2s}}}$	38,590° 37,666° 36,719° 35,749° 34,753° 33,734° 32,689° 31,620° 30,525° 29,405° 28,260°		E: A.19	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Pinion local surface velocity vertical to the contact line	$w_{\mathrm{t1vert,Y}} = w_{\mathrm{t1,Y}} \cdot \sin\left(\lvert\beta_{\mathrm{B}}\rvert + \lvert\omega_{\mathrm{wt1,Y}}\rvert\right)$	2,542 m/s 3,023 m/s 3,504 m/s 3,985 m/s 4,466 m/s 4,947 m/s 5,428 m/s 5,909 m/s 6,390 m/s 6,871 m/s 7,352 m/s		E: A.18	
Wheel local surface velocity vertical to the contact line	$w_{\mathrm{t2vert,Y}} = w_{\mathrm{t2,Y}} \cdot \sin\left(\lvert\beta_{\mathrm{B}}\rvert + \lvert\omega_{\mathrm{wt2,Y}}\rvert\right)$	3,267 m/s 3,183 m/s 3,100 m/s 3,017 m/s 2,933 m/s 2,850 m/s 2,766 m/s 2,683 m/s 2,599 m/s 2,516 m/s 2,433 m/s		E: A.18	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local sum velocity vertical to the contact line	$v_{\Sigma \text{vert,Y}} = w_{\text{t1vert,Y}} + w_{\text{t2vert,Y}}$	5,809 m/s 6,206 m/s 6,604 m/s 7,001 m/s 7,399 m/s 7,797 m/s 8,194 m/s 8,592 m/s 8,989 m/s 9,387 m/s 9,784 m/s		E: A.23	
Local slip vertical to the contact line	$\zeta_{\text{vert,Y1}} = 1{,}0 - \left\lvert \dfrac{w_{\text{t2vert,Y}}}{w_{\text{t1vert,Y}}} \right\rvert$	-0,285 -0,053 0,115 0,243 0,343 0,424 0,490 0,546 0,593 0,634 0,669		E: A.24	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$\zeta_{\text{vert,Y2}} = 1{,}0 - \left\lvert \frac{w_{\text{t1vert,Y}}}{w_{\text{t2vert,Y}}} \right\rvert$	0,222 0,050 -0,130 -0,321 -0,523 -0,736 -0,962 -1,202 -1,458 -1,731 -2,022		E: A.25	

Table C.14 — Calculation of local surface durability (macropitting)

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local contact stress	$\sigma_{\mathrm{H,Y}} = \sqrt{\dfrac{F_{\mathrm{n}} \cdot K_{\mathrm{A}} \cdot K_{\mathrm{v}} \cdot K_{\mathrm{H}\beta,\mathrm{Y}} \cdot K_{\mathrm{H}\alpha}}{l_{\mathrm{b,Y}} \cdot \rho_{\mathrm{rel,Y}}}} \cdot Z_{\mathrm{E}} \cdot Z_{\mathrm{LS,Y}}$	0,000 N/mm² 1 307,569 N/mm² 1 595,583 N/mm² 1 670,130 N/mm² 1 652,123 N/mm² 1 579,093 N/mm² 1 509,038 N/mm² 1 388,858 N/mm² 1 199,509 N/mm² 877,708 N/mm² 0,000 N/mm²		E: A.2	
Local modified contact stress	$\sigma_{\mathrm{H,Y,mod}} = \sigma_{\mathrm{H,Y}} + \left(\dfrac{1}{6} \cdot e_{\mathrm{LS}} + 0{,}25\right) \cdot max\left(\sigma_{\mathrm{H,Y}}\right) \cdot \left(\dfrac{\lvert g_{\mathrm{Y}} \rvert}{g_{\mathrm{va,max}}}\right)^4$ with $e_{\mathrm{LS}} = 3$	74,278 N/mm² 1 325,135 N/mm² 1 597,386 N/mm² 1 670,135 N/mm² 1 652,269 N/mm² 1 584,246 N/mm² 1 541,951 N/mm² 1 505,120 N/mm² 1 502,508 N/mm² 1 533,583 N/mm² 1 252,599 N/mm²		E: A.1	
Calculation factor	$C_{\mathrm{ZV}} = 0{,}08 \cdot \dfrac{\sigma_{\mathrm{H,lim}} - 850}{350} + 0{,}85$	0,930		E: 57	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local tangential speed	$v_{mt2,Y} = v_{mt2} - 2 \cdot \frac{v_{mt2} \cdot g_Y \cdot \sin\alpha_{vet}}{d_{v2}}$	9,270 m/s 9,234 m/s 9,197 m/s 9,161 m/s 9,125 m/s 9,088 m/s 9,052 m/s 9,015 m/s 8,979 m/s 8,942 m/s 8,906 m/s		E: A.9	
Local speed factor	$Z_{v,Y} = C_{ZV} + \frac{2 \cdot (1 - C_{ZV})}{\sqrt{0{,}8 + \frac{32}{v_{mt2,Y}}}}$	0,998 0,998 0,998 0,998 0,997 0,997 0,997 0,997 0,997 0,997 0,997		E: A.8	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local hypoid factor	$Z_{\text{Hyp,Y}} = 1 - 0{,}3 \cdot \left(\dfrac{v_{\text{g,par}}}{v_{\Sigma,\text{vert,Y}}} - 0{,}15 \right)$	0,780 0,797 0,812 0,825 0,837 0,847 0,857 0,866 0,874 0,881 0,888		E: A.10	
Calculation factor for the local bevel slip factor	$Z_{\text{S0,Y1}} = \dfrac{7}{24} \cdot \zeta_{\text{vert,Y1}} + \dfrac{47}{40}$	1,092 1,160 1,209 1,246 1,250 1,250 1,250 1,250 1,250 1,250 1,250		E: A.13	

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$Z_{S0,Y2} = \frac{7}{24} \cdot \zeta_{vert,Y2} + \frac{47}{40}$	1,240 1,190 1,137 1,081 1,023 1,000 1,000 1,000 1,000 1,000 1,000		E: A.13	
Local bevel slip factor (driving gear)	$Z_{S,Y1} = Z_{S0,Y1}$	1,092 1,160 1,209 1,246 1,250 1,250 1,250 1,250 1,250 1,250 1,250		E: A.11	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Local bevel slip factor (driven gear)	$Z_{S,Y2} = Z_{S0,Y2} + (Z_{S0,Y2} - 0{,}95) \cdot 1{,}75$	1,747 1,609 1,464 1,311 1,150 1,088 1,088 1,088 1,088 1,088 1,088		E: A.12	
Local permissible contact stress	$\sigma_{HP,Y,1} = \sigma_{H,lim,1} \cdot Z_{NT} \cdot Z_X \cdot Z_L \cdot Z_R \cdot Z_W \cdot Z_{v,Y} \cdot Z_{Hyp,Y} \cdot Z_{S,Y,1}$	1 250,406 N/mm² 1 356,685 N/mm² 1 440,485 N/mm² 1 508,933 N/mm² 1 535,437 N/mm² 1 554,738 N/mm² 1 572,145 N/mm² 1 587,921 N/mm² 1 602,282 N/mm² 1 615,409 N/mm² 1 627,451 N/mm²		E: A.3	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$\sigma_{HP,Y,2} = \sigma_{H,lim,2} \cdot Z_{NT} \cdot Z_X \cdot Z_L \cdot Z_R \cdot Z_W \cdot Z_{v,Y} \cdot Z_{Hyp,Y} \cdot Z_{S,Y,2}$	2 000,323 N/mm^2 1 882,733 N/mm^2 1 745,069 N/mm^2 1 588,086 N/mm^2 1 412,084 N/mm^2 1 352,621 N/mm^2 1 367,766 N/mm^2 1 381,491 N/mm^2 1 393,985 N/mm^2 1 405,406 N/mm^2 1 415,881 N/mm^2		E: A.3	
Calculated local safety factor for contact stress (macropitting) on pinion and wheel	$S_{H,Y1} = \frac{\sigma_{HP,Y1}}{\sigma_{H,Y,mod}}$	16,834 1,024 0,902 0,903 0,929 0,981 1,020 1,055 1,066 1,053 1,299		E: A.4	

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
	$S_{\mathrm{H,Y2}} = \dfrac{\sigma_{\mathrm{HP,Y2}}}{\sigma_{\mathrm{H,Y,mod}}}$	26,930 1,421 1,092 0,951 0,855 0,854 0,887 0,918 0,928 0,916 1,130		E: A.4	

Annex D
(informative)

Sample 4: Rating of a hypoid gear set according to Method B1 and Method B2

D.1 Initial data

Sample 4 is for a hypoid gear pair which uses Method 3 according to ISO 23509.

Table D.1 — Initial data for pitch cone parameters

Symbol	Description	Method 0	Method 1	Method 2	Method 3
Σ	Shaft angle	X	X	X	90°
a	Hypoid offset	0,0	X	X	40 mm
$z_{1,2}$	Number of teeth	X	X	X	12/49
d_{m2}	Mean pitch diameter of wheel	—	—	X	—
d_{e2}	Outer pitch diameter of wheel	X	X	—	400 mm
b_2	Wheel facewidth	X	X	X	60 mm
β_{m1}	Mean spiral angle of pinion	—	X	—	—
β_{m2}	Mean spiral angle of wheel	X	—	X	30°
r_{c0}	Cutter radius	X	X	X	135 mm
z_0	Number of blade groups (only face hobbing)	X	—	X	5

Table D.2 — Input data for tooth profile parameters

Data type I		Data type II	
Symbol	**Description**	**Symbol**	**Description**
α_{dD}	19°		
α_{dC}	21°		
$f_{\alpha lim}$	0		
x_{hm1}	0,2	c_{ham}	—
k_{hap}	1	k_{d}	—
k_{hfp}	1,25	k_{c}	—
x_{smn}	0,031	k_{t} W_{m2}	— —
j_{et2}	0 mm		
θ_{a2}	0°		
θ_{f2}	0°		
ρ_{a01}	0,8 mm		
ρ_{a02}	1,2 mm		
$s_{pr1D,C}$	0 mm/0 mm		
$s_{pr2D,C}$	0 mm/0 mm		

Table D.3 and Table D.4 show geometric and operational data and text for explanation.

Table D.3 — Geometric data from calculation according to ISO 23509

Symbol	Description	Values	Symbol	Description	Values
$d_{m1,2}$	Mean pitch diameter of pinion/wheel	99,377 mm/ 343,151 mm	ζ_{mp}	Offset angle on pitch plane	12,922°
$h_{am1,2}$	Mean addendum of pinion/wheel	7,278 mm/ 4,852 mm	ζ_R	Pinion offset angle on root plane	12,265°
$h_{fm1,2}$	Mean dedendum of pinion/wheel	6,368 mm/ 8,794 mm	$R_{e1,2}$	Outer cone distance on pinion/wheel	191,949 mm/ 211,074 mm
$\alpha_{eD,C}$	Effective pressure angle for drive side/coast side	20,731°/ 19,269°	$R_{m1,2}$	Mean cone distance on pinion/wheel	159,088 mm/ 181,074 mm
$\alpha_{nD,C}$	Generated pressure angle for drive side/coast side	19°/21°	$\delta_{1,2}$	Pitch angle on pinion/wheel	18,200°/ 71,360°
α_{lim}	Limit pressure angle	−1,731°	$\delta_{a1,2}$	Face angle on pinion/wheel	18,200°/ 71,360°
m_{mn}	Mean normal module	6,065 mm	$\delta_{f1,2}$	Root angle on pinion/wheel	18,200°/ 71,360°
k_{hfp}	Basic crown gear dedendum factor	1,25	$x_{sm1,2}$	Thickness modification coefficient on pinion/wheel	0,031/ −0,031
ζ_m	Pinion offset angle on axial plane	12,265°	m_{et2}	Outer transverse module	8,163 mm
$s_{mn1,2}$	Mean normal circular tooth thickness of pinion/wheel	10,786 mm/ 8,268 mm	—		

Table D.4 — Operating parameters and additional considerations

Symbol	Description	Value
	Additional data	
	Wheel profile	Non-generated
	Roughing/finishing method	Face hobbing
$b_{2\text{eff}}$	Effective facewidth on wheel	$0{,}85 \cdot b_2$
	Profile crowning	Low
	Verification of contact pattern	Checked under light test load for each gear
	Mounting conditions of pinion and wheel	One member cantilever-mounted
	Operation parameters	
T_1	Pinion torque	3 000 Nm
n_1	Pinion rotational speed	800 min^{-1}
K_A	Application factor	1,1
	Active flank	Drive
	Material data for pinion and wheel (case hardened steel)	
E	Modulus of elasticity	210 000 N/mm^2
ν	Poisson's ratio	0,3
$\sigma_{H\,\text{lim}}$	Allowable stress number (contact)	1 500 N/mm^2
$\sigma_{F\,\text{lim}}$	Nominal stress number (bending)	480 N/mm^2
	Surface hardness	Same for pinion and wheel
	Quality parameters	
R_z	Flank roughness on pinion/wheel	8 µm/8 µm
R_z	Tooth root roughness on pinion/wheel	16 µm/16 µm
f_{pt}	Single pitch deviation on pinion/wheel	14 µm/27 µm
	Lubrication parameters	
	Oil type	ISO-VG-150
	Oil temperature	90 °C

D.2 Calculation of Sample 4 according to Method B1

Table D.5 — Virtual cylindrical gears

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Virtual cylindrical gears in transverse section					
Reference diameter on pinion	$d_{v1} = \dfrac{d_{m1}}{\cos\delta_1}$	104,610 mm	E: A.1		
Reference diameter on wheel	$d_{v2} = \dfrac{d_{m2}}{\cos\delta_2}$	1 073,596 mm	E: A.1		
Number of teeth on pinion	$z_{v1} = d_{v1} / m_{vt}$	13,872	E: A.12		
Number of teeth on wheel	$z_{v2} = d_{v2} / m_{vt}$	142,370	E: A.12		
Gear ratio	$u_v = z_{v2} / z_{v1}$	10,263	E: A.13		
Helix angle	$\beta_v = \dfrac{\beta_{m1} + \beta_{m2}}{2}$	36,461°	E: A.8		
Transverse pressure angle of virtual cylindrical gears	$\alpha_{vet} = \arctan(\tan\alpha_e / \cos\beta_v)$ since $\alpha_e = \alpha_{eD}$ for drive side.	25,202°	E: A.10		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Transverse module	$m_{vt} = m_{mn} / \cos\beta_v$	7,541 mm	E: A.11		
Auxiliary angle for virtual facewidth	$\vartheta_{mp} = \arctan(\sin\delta_2 \cdot \tan\zeta_m)$	11,640°	E: A.21		
Projected auxiliary angle for length of contact line	$\gamma' = \vartheta_{mp} - \zeta_{mp} / 2$	5,179°	E: A.20		
Centre distance of virtual cylindrical gear pair	$a_v = (d_{v1} + d_{v2}) / 2$	589,103 mm	E: A.5		
Helix angle of virtual cylindrical gear at base circle	$\beta_{vb} = \arcsin(\sin\beta_v \cdot \cos\alpha_e)$ since $\alpha_e = \alpha_{eD}$ for drive side.	33,766°	E: A.16		
Tip diameter on pinion	$d_{va1} = d_{v1} + 2 \cdot h_{am1}$	119,166 mm	E: A.6		
Tip diameter on wheel	$d_{va2} = d_{v2} + 2 \cdot h_{am2}$	1 083,300 mm	E: A.6		
Root diameter on pinion	$d_{vf1} = d_{v1} - 2 \cdot h_{fm1}$	91,874 mm	E: A.7		
Root diameter on wheel	$d_{vf2} = d_{v2} - 2 \cdot h_{fm2}$	1 056,008 mm	E: A.7		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Base diameter on pinion	$d_{vb1} = d_{v1} \cdot \cos\alpha_{vet}$	94,653 mm	E: A.9		
Base diameter on wheel	$d_{vb2} = d_{v2} \cdot \cos\alpha_{vet}$	971,406 mm	E: A.9		
Transverse base pitch	$p_{vet} = \pi \cdot m_{mn} \cdot \cos\alpha_{vet} / \cos\beta_v$	21,435 mm	E: A.17		
Length of path of contact of virtual cylindrical gear in transverse section	$g_{v\alpha} = \frac{1}{2} \cdot \left[\left(\sqrt{d_{va1}^2 - d_{vb1}^2} - d_{v1} \cdot \sin\alpha_{vet}\right) + \left(\sqrt{d_{va2}^2 - d_{vb2}^2} - d_{v2} \cdot \sin\alpha_{vet}\right)\right]$	25,100 mm	E: A.18		
Transverse contact ratio	$\varepsilon_{v\alpha} = g_{v\alpha} / p_{vet}$	1,171	E: A.23		
Effective facewidth with $b_{2,eff} = 0{,}85 \cdot b_2$	$b_{v,eff} = \frac{\left(b_{2,eff} / \cos\left(\zeta_{mp}/2\right) - g_{v\alpha} \cdot \cos\alpha_{vet} \cdot \tan\left(\zeta_{mp}/2\right)\right)}{1 - \tan\gamma' \cdot \tan\left(\zeta_{mp}/2\right)}$	49,260 mm	E: A.19		
Facewidth	$b_v = b_2 \cdot \frac{b_{v,eff}}{b_{2,eff}}$	57,953 mm	E: A.22		
Virtual cylindrical gears in normal section					
Number of pinion teeth of virtual cylindrical gears	$z_{vn1} = \frac{z_{v1}}{\cos^2\beta_{vb} \cdot \cos\beta_v}$	24,958	E: A.41		

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Number of wheel teeth of virtual cylindrical gears	$z_{vn2} = u_v \cdot z_{vn1}$	256,145	E: A.42		
Reference diameter on pinion	$d_{vn1} = z_{vn1} \cdot m_{mn}$	151,370 mm	E: A.43		
Reference diameter on wheel	$d_{vn2} = z_{vn2} \cdot m_{mn}$	1 553,483 mm	E: A.43		
Tip diameter on pinion	$d_{van1} = d_{vn1} + 2 \cdot h_{am1}$	165,925 mm	E: A.44		
Tip diameter on wheel	$d_{van2} = d_{vn2} + 2 \cdot h_{am2}$	1 563,187 mm	E: A.44		
Root diameter on pinion	$d_{vfn1} = d_{vn1} - 2 \cdot h_{fm1}$	138,633 mm	E: A.7		
Root diameter on wheel	$d_{vfn2} = d_{vn2} - 2 \cdot h_{fm2}$	1 535,895 mm	E: A.7		
Base diameter on pinion	$d_{vbn1} = d_{vn1} \cdot \cos \alpha_e$	141,569 mm	E: A.45		
Base diameter on wheel	$d_{vbn2} = d_{vn2} \cdot \cos \alpha_e$	1 452,900 mm	E: A.45		

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Face contact ratio	$\varepsilon_{\mathrm{v}\beta}=\dfrac{b_{\mathrm{v,eff}}\cdot\sin\beta_{\mathrm{v}}}{\pi\cdot m_{\mathrm{mn}}}$	1,536	E: A.24		
Virtual contact ratio	$\varepsilon_{\mathrm{v}\gamma}=\varepsilon_{\mathrm{v}\alpha}+\varepsilon_{\mathrm{v}\beta}$	2,707	E: A.25		
Inclination angle of contact line	$\beta_{\mathrm{B}}=\arctan(\tan\beta_{\mathrm{v}}\cdot\sin\alpha_{\mathrm{e}})$	14,658°	E: A.38		
Radius of relative curvature in normal section at the mean point	$\rho_{\mathrm{t}}=\left[\dfrac{1}{\cos\alpha_{\mathrm{nD}}\cdot(\tan\alpha_{\mathrm{nD}}-\tan\alpha_{\mathrm{lim}})+\tan\zeta_{\mathrm{mp}}\cdot\tan\beta_{\mathrm{B}}}\cdot\dfrac{\cos\beta_{\mathrm{m}1}\cdot\cos\beta_{\mathrm{m}2}}{\cos\zeta_{\mathrm{mp}}}\left(\dfrac{1}{R_{\mathrm{m}2}\cdot\tan\delta_2}+\dfrac{1}{R_{\mathrm{m}1}\cdot\tan\delta_1}\right)\right]^{-1}$	30,337 mm	E: A.39		

Table D.6 — General influence factors

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Radius of relative curvature vertical to the contact line	$\rho_{rel} = \lvert\rho_t\rvert \cdot (\cos\beta_B)^2$	28,394 mm	E: A.37		
Nominal tangential force of bevel gears	$F_{mt1} = \frac{2\,000 \cdot T_1}{d_{m1}}$	60 376,4 N	E: 1		
Nominal tangential force of virtual cylindrical gears	$F_{vmt} = F_{mt1} \cdot \frac{\cos\beta_v}{\cos\beta_{m1}}$	66 311,0 N	E: 2		
Nominal tangential speed at mean point of the pinion	$v_{mt1} = \frac{d_{m1} \cdot n_1}{19\,098}$	4,163 m/s	E: 5		
Nominal tangential speed at mean point of the wheel	$v_{mt2} = \frac{d_{m2} \cdot n_2}{19\,098}$	3,520 m/s	E: 5		
Correction factor for non-average conditions for $F_{vmt} K_A / b_{veff} \geq 100$ N/mm	C_F	1,000	E: 12		
Mean value of mesh stiffness per unit facewidth	$c_\gamma = c_{\gamma 0} \cdot C_F$	20,00 N/(mm·µm)	E: 11		
Single stiffness	$c' = c'_0 \cdot C_F$	14,00 N/(mm·µm)	E: 18		
Single pitch deviation	f_{pt}	27,000 µm			

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Running–in allowance for case hardened and nitrided gears	$y_\alpha = 0{,}075 \cdot f_{\text{pt}}$	2,025 µm	E: 51		
Effective pitch deviation with $y_{\text{p}} = y_\alpha$	$f_{\text{p,eff}} = f_{\text{pt}} - y_{\text{p}}$	24,975 µm	E: 17		
Relative pinion mass per unit facewidth reduced to the line of action	$m_1^* = \frac{1}{8} \cdot \rho \cdot \pi \cdot \frac{d_{\text{m1}}^2}{\cos^2[(\alpha_{\text{nD}} + \alpha_{\text{nC}})/2]}$ where ρ is the density of the gear material (for steel $\rho = 7{,}86 \cdot 10^{-6}$ kg/mm^3)	0,033 kg/mm	E: 14		
Relative wheel mass per unit facewidth reduced to the line of action	$m_2^* = \frac{1}{8} \cdot \rho \cdot \pi \cdot \frac{d_{\text{m2}}^2}{\cos^2[(\alpha_{\text{nD}} + \alpha_{\text{nC}})/2]}$ where ρ is the density of the gear material (for steel $\rho = 7{,}86 \cdot 10^{-6}$ kg/mm^3)	0,393 kg/mm	E: 14		
Mass reduced to the line of action of the dynamically equivalent cylindrical gear pair	$m_{\text{red}} = \frac{m_1^* \cdot m_2^*}{m_1^* + m_2^*}$	0,030 kg/mm	E: 10		
Resonance speed of pinion	$n_{\text{E1}} = \frac{30 \cdot 10^3}{\pi \cdot z_1} \cdot \sqrt{\frac{c_\gamma}{m_{\text{red}}}}$	20 414,3 min^{-1}	E: 9		
Dimensionless reference speed	$N = \frac{n_1}{n_{\text{E1}}}$	0,039	E: 8		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
For virtual contact ratio, $\varepsilon_{v\gamma}$ = 2,707 > 2	$c_{v1,2} = c_{v1} + c_{v2}$	0,557	T: 3		
	c_{v3}	0,084	T: 3		
	c_{v4}	0,343	T: 3		
	$c_{v5,6}$	0,594	T: 3		
	c_{v7}	0,974	T: 3		
Constant factor for calculating the dynamic factor with K_A = 1,1 as given in Table D.4	$K = \frac{b_v \cdot f_{p,eff} \cdot c'}{F_{vmt} \cdot K_A} \cdot c_{v1,2} + c_{v3}$	0,238	E: 16		
Dynamic factor	$K_{v-B} = N \cdot K + 1$	1,000	E: 15		
Determination of the length of contact lines					
For virtual contact ratio, $\varepsilon_{v\beta}$ = 1,536, $\varepsilon_{v\beta} \geq 1$	$f_t = +p_{vet} \cos\beta_{vb}$	17,820 mm	T: A.2		
	f_m	0,000 mm	T: A.2		
	$f_r = -p_{vet} \cos\beta_{vb}$	−17,820 mm	T: A.2		
Maximum distances from middle contact line	$f_{maxB} = \frac{1}{2} \cdot \left[g_{v\alpha} + b_{v,eff} \cdot (\tan\gamma + \tan\beta_{vb}) \right] \cdot \cos\beta_{vb}$	26,173 mm	E: A.33		
Maximum distances from middle contact line	$f_{max0} = \frac{1}{2} \cdot \left[g_{v\alpha} - b_{v,eff} \cdot (\tan\gamma + \tan\beta_{vb}) \right] \cdot \cos\beta_{vb}$	−5,307 mm	E: A.34		
	$f_{max} = f_{maxB}$ since $f_{maxB} > f_{max0}$	26,173 mm			

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Theoretical length of contact line	$l_{b0} = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$	39,276 mm	E: A.32		
Theoretical length of middle contact line calculated with $f = f_m$ for contact stress as specified in ISO 10300−2:2023, 6.1	$x_1 = \dfrac{f \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right) + \dfrac{1}{2} \cdot (g_{v\alpha} + b_{v,eff} \cdot \tan\gamma)}{\tan\gamma + \tan\beta_{vb}}$	40,955 mm	E: A.29		
	$x_2 = \dfrac{f \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right) - \dfrac{1}{2} \cdot (g_{v\alpha} - b_{v,eff} \cdot \tan\gamma)}{\tan\gamma + \tan\beta_{vb}}$	8,305 mm	E: A.30		
	$y_1 = -x_1 \cdot \tan\beta_{vb} + f \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right)$	−10,915 mm	E: A.31		
	$y_2 = -x_2 \cdot \tan\beta_{vb} + f \cdot \cos\beta_{vb} + \tan\beta_{vb} \cdot \left(f \cdot \sin\beta_{vb} + \dfrac{b_{v,eff}}{2}\right)$	10,915 mm	E: A.31		
Correction factor	$C_{lb} = \sqrt{\left(1 - \left(\dfrac{f}{f_{max}}\right)^2\right) \cdot \left(1 - \sqrt{\dfrac{b_{v,eff}}{b_v}}\right)^2}$	0,078	E: A.36		
Length of contact line	$l_{bm} = l_{b0} \cdot (1 - C_{lb})$	36,210 mm	E: A.26		

Description	Formula	Result	References to ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Load sharing factor					
Exponent for calculation of parabolic distribution of peak loads	e_{LS}	3		T: 5	
Related peak load	$p^* = 1 - \left(\frac{\lvert f \rvert}{\lvert f_{max} \rvert} \right)^{e_{LS}}$			E: 7 F: 2	
Related peak load at tip contact line	$p_t{}^* = 1 - \left(\frac{\lvert f_t \rvert}{\lvert f_{max} \rvert} \right)^{e_{LS}}$	0,684			
Related peak load at middle contact line	$p_m{}^* = 1 - \left(\frac{\lvert f_m \rvert}{\lvert f_{max} \rvert} \right)^{e_{LS}}$	1,000			
Related peak load at root contact line	$p_r{}^* = 1 - \left(\frac{\lvert f_r \rvert}{\lvert f_{max} \rvert} \right)^{e_{LS}}$	0,684			
Related area	$A^* = \frac{1}{4} p^* l_b \cdot \pi$			E: 8 F: 2	
Related area at tip contact line	$A_t^* = \frac{1}{4} p_t^* \cdot l_{bt} \cdot \pi$	7,969 mm			

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Related area at middle contact line	$A_m^* = \frac{1}{4} p_m^* \cdot l_{\mathrm{bm}} \cdot \pi$	28,440 mm			
Related area at root contact line	$A_r^* = \frac{1}{4} p_r^* \cdot l_{\mathrm{br}} \cdot \pi$	7,969 mm			
Load sharing factor	$Z_{\mathrm{LS}} = \sqrt{\frac{A_m^*}{A_t^* + A_m^* + A_r^*}}$	0,801		E: 10	
Face load factors (Calculation according to Method C)					
Load distribution factor	$K_{\mathrm{H}\beta-\mathrm{C}} = 1{,}5 \cdot K_{\mathrm{H}\beta-\mathrm{be}}$	1,650	E: 28		
with	$K_{\mathrm{H}\beta\text{-be}}$	1,100	T: 4		
Load distribution factor	$K_{\mathrm{F}\beta-\mathrm{C}} = K_{\mathrm{H}\beta-\mathrm{C}} / K_{\mathrm{F}0}$	1,524	E: 32		
with	$K_{\mathrm{F}0}$	1,082	E: 34		
Transverse load factors (Calculation according to Method B)					
Determinant tangential force at mid facewidth on the pitch cone	$F_{\mathrm{mtH}} = F_{\mathrm{vmt}} \cdot K_{\mathrm{A}} \cdot K_{\mathrm{v}} \cdot K_{\mathrm{H}\beta}$	120 354,5 N	E: 47		
Transverse load factors for bevel gear with virtual contact ratio $\varepsilon_{\mathrm{v}\gamma} = 2{,}707 > 2$	$K_{\mathrm{H}\alpha-\mathrm{B}}^* = K_{\mathrm{F}\alpha-\mathrm{B}}^* = 0{,}9 + 0{,}4 \cdot \sqrt{\frac{2 \cdot \left(\varepsilon_{\mathrm{v}\gamma} - 1\right)}{\varepsilon_{\mathrm{v}\gamma}}} \cdot \frac{c_\gamma \cdot \left(f_{\mathrm{pt}} - y_\alpha\right)}{F_{\mathrm{mtH}} / b_{\mathrm{v}}}$	1,008	E: 48		
Relative hypoid offset	$a_{\mathrm{rel}} = \frac{2 \cdot \lvert a \rvert}{d_{\mathrm{m}2}}$	0,233	E: 41		

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Transverse load factors	$K_{\mathrm{H}\alpha} = K_{\mathrm{F}\alpha} = K^{*}_{\mathrm{H}\alpha} - \frac{K^{*}_{\mathrm{H}\alpha} - 1}{0,1} \cdot a_{\mathrm{rel}}$ since $K_{\mathrm{H}\alpha} \geq 1,0$	1,000	E: 40		

Table D.7 — Calculation of surface durability (macropitting)

Description	Formula	Result	References to		
			ISO 10300-1	ISO 10300-2	ISO 10300-3
			E: Formula, T: Table, F: Figure		
Z–factors					
Factors for calculation of mid–zone factor for $\varepsilon_{\mathrm{v}\beta} = 1{,}536 \geq 1$	$F_1 = \varepsilon_{\mathrm{v}\,\alpha}$	1,171		T: 4	
	$F_2 = \varepsilon_{\mathrm{v}\,\alpha}$	1,171		T: 4	
Mid–zone factor	$Z_{\mathrm{M-B}} = \dfrac{\tan \alpha_{\mathrm{vet}}}{\sqrt{\left[\sqrt{\left(\dfrac{d_{\mathrm{va1}}}{d_{\mathrm{vb1}}}\right)^2 - 1} - F_1 \cdot \dfrac{\pi}{z_{\mathrm{v1}}}\right] \cdot \left[\sqrt{\left(\dfrac{d_{\mathrm{va2}}}{d_{\mathrm{vb2}}}\right)^2 - 1} - F_2 \cdot \dfrac{\pi}{z_{\mathrm{v2}}}\right]}}$	0,973		E: 6	
Elasticity factor	$Z_{\mathrm{E}} = \sqrt{\dfrac{1}{\pi \cdot \left[\dfrac{\left(1-\nu_1^2\right)}{E_1} + \dfrac{\left(1-\nu_2^2\right)}{E_2}\right]}}$	191,646 $(\mathrm{N/mm^2})^{1/2}$		E: 51	
Bevel gear factor	Z_{KP}	1,200		E: 11	
Lubricant factor	$C_{\mathrm{ZL}} = 0{,}08 \cdot \dfrac{\sigma_{\mathrm{H,lim}} - 850}{350} + 0{,}83$ using $\sigma_{\mathrm{H,lim}} = 1\,200\ \mathrm{N/mm^2}$, which is the upper allowed limit in the above formula.	0,910		E: 55	
Lubricant factor	$Z_{\mathrm{L}} = C_{\mathrm{ZL}} + \dfrac{4 \cdot \left(1{,}0 - C_{\mathrm{ZL}}\right)}{\left(1{,}2 + \dfrac{134}{\nu_{40}}\right)^2}$	0,992		E: 54	

Description	Formula	Result	References to ISO 10300-1	References to ISO 10300-2	References to ISO 10300-3
			E: Formula, T: Table, F: Figure		
Speed factor	$C_{ZV} = 0{,}08 \cdot \frac{\sigma_{H,lim} - 850}{350} + 0{,}85$ using $\sigma_{H,lim}$ = 1 200 N/mm², which is the upper allowed limit in the above formula.	0,930		E: 57	
	$Z_v = C_{ZV} + \frac{2 \cdot (1{,}0 - C_{ZV})}{\sqrt{0{,}8 + \frac{32}{v_{mt2}}}}$	0,975		E: 56	
Roughness factor with the radius of relative curvature $\rho = \rho_{rel} =$ 28,399 mm for Method B1 (see ISO 10300–1:2023, Annex A)	$Rz_{10} = \frac{Rz_1 + Rz_2}{2} \cdot \sqrt[3]{\frac{10}{\rho}}$	5,650 µm		E: 58	
Roughness factor with the radius of relative curvature $\rho = \rho_{rel} =$ 28,399 mm for Method B1 (see ISO 10300–1:2023, Annex A)	$C_{ZR} = 0{,}12 + \frac{1\ 000 - \sigma_{H,lim}}{5\ 000}$ using $\sigma_{H,lim}$ = 1 200 N/mm², which is the upper allowed limit in the above formula.	0,080		E: 60	
	$Z_R = \left(\frac{3}{Rz_{10}} \right)^{C_{ZR}}$	0,951		E: 59	
Product of the lubricant influence factors	$Z_L Z_v Z_R$	0,919			