

AMERICAN GEAR MANUFACTURERS ASSOCIATION

*Calculation of Bevel Gear Top Land and
Guidance on Cutter Edge Radius*



AGMA INFORMATION SHEET

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American
Gear
Manufacturers
Association

Calculation of Bevel Gear Top Land and Guidance on Cutter Edge Radius
AGMA 929-A06

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ABSTRACT

This information sheet supplements ANSI/AGMA 2005-D03 with calculations for bevel gear top land and guidance for selection of cutter edge radius for determination of tooth geometry. It integrates various publications with modifications to include face hobbing. It adds top land calculations for non-generated manufacturing methods. It is intended to provide assistance in completing the calculations requiring determination of top lands and cutter edge radii for gear capacity in accordance with ANSI/AGMA 2003-B97.

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Foreword

[The foreword, footnotes and annexes, if any, in this document are provided for informational purposes only and are not to be construed as a part of AGMA Information Sheet 929-A06, *Calculation of Bevel Gear Top Land and Guidance on Cutter Edge Radius*.]

The Bevel Gearing Committee recognized the need for additional equations to aid in the design of bevel gears. The equations for geometry factors found in the annex of ANSI/AGMA 2003-B97 require detailed information on the proposed cutting tool before a proper calculation can be performed. In addition, the minimum top land thickness is required to aid in determining the maximum case depth allowed on carburized bevel gears. The equations required for these values were not published in AGMA documentation, but could be found, for some cases, in the publications listed in the bibliography of this information sheet. AGMA 929-A06 expands on those equations to include gears manufactured with the face hobbing cutting method.

In the case of non-generated gears, the equations in this document may yield different values for pinion top land thicknesses and gear tooth depth at the toe and heel than obtained on some well known commercial software. The pinion top land thickness is reduced by curvature added to the pinion, a natural consequence of the non-generated gear member having no profile curvature on the teeth. For the gear member, the non-generating process cuts a rootline tangent to the gear root cone, a rootline which does not wrap around the root cone as in the generated case. This leaves the toe and heel ends of the tooth slots shallow compared to the generated gear case, and the gear tooth space at the ends of the teeth narrower. The non-generated gear is the imaginary generating gear for the pinion. So the pinion teeth, which fit in the non-generated gear tooth slots, are thinner at the ends than their generated gear counterparts.

The cutter edge radii calculated in this document are based on the geometrical conditions present and include a manufacturing gauging flat. Individual blade manufacturers have standard blade edge radii and manufacturing tolerances for their products which should be considered when sourcing non-standard radii. It is recommended to work closely with the blade supplier to ensure design specifications and sourced product specifications are consistent.

The first draft of AGMA 929-A06 was made in February, 1999. It was approved by the AGMA Technical Division Executive Committee in August, 2006.

Suggestions for improvement of this document will be welcome. They should be sent to the American Gear Manufacturers Association, 500 Montgomery Street, Suite 350, Alexandria, Virginia 22314.

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American Gear Manufacturers Association –

Calculation of Bevel Gear Top Land and Guidance on Cutter Edge Radius

1 Scope

This information sheet provides a set of equations for the calculation of bevel gear top land and guidance on cutter edge radius. It integrates the equations in ANSI/AGMA 2005-D03, *Design Manual for Bevel Gears*, and Gleason publication SD3124B, *Formulas for Cutter Specifications and Tooth Thickness Measurements for Spiral Bevel and Hypoid Gears*, with modifications to include face hobbing, and additions for the top land calculations for

non-generated manufacturing methods, to achieve compatibility between publications.

It is intended to provide assistance in completing the calculations requiring determination of top lands and cutter edge radii in ANSI/AGMA 2003-B97, *Rating the Pitting Resistance and Bending Strength of Generated Straight Bevel, Zerol Bevel and Spiral Bevel Gear Teeth*.

Annexes are provided for additional related information and calculation examples.

2 Symbols, terminology and definitions

2.1 Symbols and terminology

The equations in this information sheet are written in terms generally used for hypoids. See table 1.

For other gears, the nomenclature from ANSI/AGMA 2005-D03, table 9 are used (see table 3).

NOTE: Some of the symbols and terminology contained in this document may differ from those used in other documents and AGMA standards. Users of this standard should assure themselves that they are using the symbols, terminology and definitions in the manner indicated herein.

Table 1 – Symbols and terms

Symbol	Term	Units	Where first used
A_{iG}, A_{iP}	Inner cone distance, gear or pinion	inch	Eq 7, Eq 1
A_{mG}, A_{mP}	Mean cone distance, gear or pinion	inch	Eq 9, Eq 1
A_{oG}, A_{oP}	Outer cone distance, gear or pinion	inch	Eq 7, Eq 3
A_{xG}	Cone distance for involute lengthwise curvature point where normal circular pitch and slot width is a maximum	inch	Eq 31
a_G, a_P	Mean addendum, gear or pinion	inch	Eq 50, Eq 50
a_{iG}, a_{iP}	Inner addendum, gear or pinion	inch	Eq 78, Eq 77
a'_{iG}, a'_{iP}	Adjusted inner addendum, gear or pinion	inch	Eq 82, Eq 81
a_{oG}, a_{oP}	Outer addendum, gear or pinion	inch	Eq 163, Eq 162
B	Outer normal backlash allowance	inch	Eq 6
b_G, b_P	Mean dedendum, gear or pinion	inch	Eq 19, Eq 22
b_{iG}, b_{iP}	Inner dedendum, gear or pinion	inch	Eq 25, Eq 24
b_{oG}, b_{oP}	Outer dedendum, gear or pinion	inch	Eq 20, Eq 22
b_{xG}, b_{xP}	Dedendum at cone distance A_{xG} , gear or pinion	inch	Eq 44, Eq 45
b'_{oG}	Theoretical outer gear dedendum	inch	Eq 19
c	Clearance	inch	Eq 77

(continued)

Table 1 (continued)

Symbol	Term	Units	Where first used
D, d	Pitch diameter, gear or pinion	inch	Eq 140, Eq 139
F_G, F_P	Face width of gear or pinion	inch	Eq 25, Eq 2
F_{iP}	Hypoid pinion face width from calculation point to inside	inch	Eq 1
F_{oP}	Hypoid pinion face width from calculation point to outside	inch	Eq 3
F_{xG}	Distance from mean cone to cone distance at involute curvature	inch	Eq 38
k_E	Gear rotation factor	- -	Eq 52
N, n	Number of teeth, gear or pinion	- -	Eq 79, Eq 79
p_m	Mean circular pitch	inch	Eq 27
p_n	Mean normal circular pitch	inch	Eq 27
Q	Intermediate factor	inch	Eq 35
q	Generating angle at mean	degrees	Eq 9
q_i	Generating angle at inside	degrees	Eq 13
q_o	Generating angle at outside	degrees	Eq 11
q_x	Generating angle at involute curvature	degrees	Eq 39
R_{bNG1}, R_{bNP2}	Mean normal base radius, convex, gear or pinion	inch	Eq 143, Eq 142
R_{bNG2}, R_{bNP1}	Mean normal base radius, concave, gear or pinion	inch	Eq 144, Eq 141
R_{ibVG}, R_{ibVP}	Inner base radius – concave, gear or pinion	inch	Eq 90, Eq 87
R_{ibXG}, R_{ibXP}	Inner base radius – convex, gear or pinion	inch	Eq 89, Eq 88
R_{iG}, R_{iP}	Original inner pitch radius, gear or pinion	inch	Eq 76, Eq 75
R_{ioG}, R_{ioP}	Inner outside radius, gear or pinion	inch	Eq 86, Eq 85
R_{NG}, R_{NP}	Mean normal pitch radius, gear or pinion	inch	Eq 140, Eq 139
R_{oNG}, R_{oNP}	Mean normal outside radius, gear or pinion	inch	Eq 146, Eq 145
R'_{bNG1}, R'_{bNP2}	Outer normal base radius, convex, gear or pinion	inch	Eq 160, Eq 159
R'_{bNG2}, R'_{bNP1}	Outer normal base radius, concave, gear or pinion	inch	Eq 161, Eq 158
R'_{iG}, R'_{iP}	New inner pitch radius, gear or pinion	inch	Eq 84, Eq 83
R'_{NG}, R'_{NP}	Outer normal pitch radius, gear or pinion	inch	Eq 157, Eq 156
R'_{oNG}, R'_{oNP}	Outer normal outside radius, gear or pinion	inch	Eq 163, Eq 162
R''_{bNG1}, R''_{bNP2}	Inner normal base radius, convex, gear or pinion	inch	Eq 179, Eq 178
R''_{bNG2}, R''_{bNP1}	Inner normal base radius, concave, gear or pinion	inch	Eq 180, Eq 177
R''_{NG}, R''_{NP}	Inner mean normal pitch radius, gear or pinion	inch	Eq 176, Eq 175
R''_{oNG}, R''_{oNP}	Inner normal outside radius, gear or pinion	inch	Eq 182, Eq 181
r_c	Cutter radius	inch	Eq 9
r_{TG}, r_{TP}	Maximum blade edge radius, gear or pinion	inch	Eq 74, Eq 73
r_{1G}, r_{1P}	Maximum blade edge radius for no running interference, gear or pinion	inch	Eq 74, Eq 73
r_{1VG}, r_{1VP}	Maximum blade edge radius for no running interference concave, gear or pinion	inch	Eq 106, Eq 103
r_{1XG}, r_{1XP}	Maximum blade edge radius for no running interference convex, gear or pinion	inch	Eq 105, Eq 104
r_{2G}, r_{2P}	Maximum blade edge radius that can be manufactured, gear or pinion	inch	Eq 74, Eq 73
r_{2RG}, r_{2RP}	Roughing cutter edge radius, gear or pinion	inch	Eq 113, Eq 114

(continued)

Table 1 (continued)

Symbol	Term	Units	Where first used
r_{3G}, r_{3P}	Maximum blade edge radius to avoid mutilation, gear or pinion	inch	Eq 74, Eq 73
r_{3VG}, r_{3VP}	Maximum blade edge radius to avoid mutilation concave, gear or pinion	inch	Eq 136, Eq 133
r_{3XG}, r_{3XP}	Maximum blade edge radius to avoid mutilation convex, gear or pinion	inch	Eq 135, Eq 134
r'_{2RG}, r'_{2RP}	Maximum roughing blade edge radius which can be manufactured, gear or pinion	inch	Eq 111, Eq 112
r'_{2VG}, r'_{2VP}	Maximum finishing blade edge radius concave, defined by maximum roughing blade edge radius and minimum stock allowance, gear or pinion	inch	Eq 118, Eq 115
r'_{2XG}, r'_{2XP}	Maximum finishing blade edge radius convex, defined by maximum roughing blade edge radius and minimum stock allowance, gear or pinion	inch	Eq 117, Eq 116
r''_{2VG}, r''_{2VP}	Maximum finishing blade edge radius concave, gear or pinion	inch	Eq 122, Eq 119
r''_{2XG}, r''_{2XP}	Maximum finishing blade edge radius convex, gear or pinion	inch	Eq 121, Eq 120
S_{AG}, S_{AP}	Stock allowance, gear or pinion	inch	Eq 65, Eq 66
S_1	Crown gear to cutter center distance	inch	Eq 34
T_{mn}, t_{mn}	Mean normal circular thickness at pitch line, gear or pinion	inch	Eq 47, Eq 48
T_n	Gear mean normal circular thickness without backlash	inch	Eq 47
t_{iNG}, t_{iNP}	Inner normal circular thickness at pitch line, gear or pinion	inch	Eq 189, Eq 188
t_{LiNG}, t_{LiNP}	Inner normal top land, gear or pinion	inch	Eq 192, Eq 190
t_{LNG}, t_{LNP}	Mean normal top land, gear or pinion	inch	Eq 154, Eq 152
t_{LoNG}, t_{LoNP}	Outer normal top land, gear or pinion	inch	Eq 173, Eq 171
t_{mP}	Mean pinion transverse circular thickness	inch	Eq 49
t_{oNG}, t_{oNP}	Outer normal circular thickness at pitch line, gear or pinion	inch	Eq 170, Eq 169
W	Finishing point width gear (Unitool and single sided)	inch	Table 2
W_{BG}, W_{BP}	Finishing blade point, gear or pinion	inch	Eq 69, Eq 70
W_{BRG}, W_{BRP}	Roughing blade point, gear or pinion	inch	Eq 67, Eq 68
W'_e	Effective gear point width	inch	Eq 52
W_{iG}, W_{iP}	Inner slot width, gear or pinion	inch	Eq 59, Eq 60
W_{LG}, W_{LP}	Minimum slot width, gear or pinion	inch	Eq 61, Eq 62
W_{MG}, W_{MP}	Maximum slot width, gear or pinion	inch	Eq 63, Eq 64
W_{mG}, W_{mP}	Mean slot width, gear or pinion	inch	Eq 50, Eq 51
W_{oG}, W_{oP}	Outer slot width, gear or pinion	inch	Eq 55, Eq 56
W_{RG}, W_{RP}	Roughing point width, gear or pinion	inch	Eq 65, Eq 66
W_{xG}, W_{xP}	Slot width at A_{xG} (maximum gear or pinion slot)	inch	Eq 57, Eq 58
x_{iVG}, x_{iVP}	Limit tooth height for interference concave, gear or pinion	inch	Eq 102, Eq 97
x_{iXG}, x_{iXP}	Limit tooth height for interference convex, gear or pinion	inch	Eq 101, Eq 99
y	Amount of fillet mutilation permitted	inch	Eq 129
Γ, γ	Pitch angle, gear or pinion	degrees	Eq 76, Eq 75
Γ_R	Gear root angle	degrees	Eq 17
$\Delta a_G, \Delta a_P$	Change in inner addendum, gear or pinion	inch	Eq 80, Eq 79

(continued)

Table 1 (continued)

Symbol	Term	Units	Where first used
Δb_{iG}	Depth reduction on non-generated gear at inside	inch	Eq 18
Δb_{oG}	Depth reduction on non-generated gear at outside	inch	Eq 17
Δb_{xG}	Depth reduction on non-generated gear at involute curvature	inch	Eq 42
$\Delta c_G, \Delta c_P$	Change in clearance, gear or pinion	inch	Eq 7, Eq 6
Δf	Width of blade flat	inch	Eq 111
Δq_i	Increment in generating angle at inside	degrees	Eq 16
Δq_o	Increment in generating angle at outside	degrees	Eq 15
Δq_x	Increment in generating angle at involute curvature	degrees	Eq 41
$\Delta W'_G, \Delta W'_P$	Difference between minimum slot width and blade point, gear or pinion	inch	Eq 128, Eq 127
$\Delta \phi_2$	Normal tilt of finishing cutter non-generated	degrees	Eq 8
δ_G, δ_P	Dedendum angle of gear or pinion	degrees	Eq 19, Eq 22
η_i	Generating angle at inside	degrees	Eq 14
η_o	Generating angle at outside	degrees	Eq 12
η_x	Generating angle at involute curvature, for face hobbing	degrees	Eq 34
η_1	Second auxiliary angle	degrees	Eq 10
ρ_{iVG}, ρ_{iVP}	Inner profile radius of curvature concave, gear or pinion	inch	Eq 96, Eq 93
ρ_{iXG}, ρ_{iXP}	Inner profile radius of curvature convex, gear or pinion	inch	Eq 95, Eq 94
ξ	Angle between gear root plane and plane in which taper is specified	degrees	Eq 53
Σb	Sum of pinion and gear mean dedendums	inch	Eq 28
Σb_i	Sum of pinion and gear inner dedendums	inch	Eq 30
Σb_o	Sum of pinion and gear outer dedendums	inch	Eq 29
Σb_x	Sum of pinion and gear dedendums at cone distance A_{xG}	inch	Eq 46
$\Sigma \phi$	Included pressure angle	degrees	Eq 5
ϕ_{BXG}	Inside blade angle gear cutter (non-generating)	degrees	Eq 8
ϕ_{iV}	Inner pinion pressure angle – concave	degrees	Eq 91
ϕ_{iX}	Inner pinion pressure angle – convex	degrees	Eq 92
ϕ_1	Normal pressure angle, concave, pinion	degrees	Eq 5
ϕ_2	Normal pressure angle, convex, pinion	degrees	Eq 5
ϕ_{1TG}, ϕ_{2TP}	Pressure angle at tip of tooth, convex gear or pinion	degrees	Eq 150, Eq 149
ϕ_{2TG}, ϕ_{1TP}	Pressure angle at tip of tooth, concave gear or pinion	degrees	Eq 151, Eq 148
ϕ'_{1TG}, ϕ'_{2TP}	Pressure angle at tip of tooth, outer convex gear or pinion	degrees	Eq 167, Eq 166
ϕ'_{2TG}, ϕ'_{1TP}	Pressure angle at tip of tooth, outer concave gear or pinion	degrees	Eq 168, Eq 165
$\phi''_{1TG}, \phi''_{2TP}$	Pressure angle at tip of tooth, inner convex gear or pinion	degrees	Eq 186, Eq 185
$\phi''_{2TG}, \phi''_{1TP}$	Pressure angle at tip of tooth, inner concave gear or pinion	degrees	Eq 187, Eq 184
ψ_G, ψ_P	Mean spiral angle, gear or pinion	degrees	Eq 9, Eq 139
ψ_{iG}, ψ_{iP}	Inner spiral angle, gear or pinion	degrees	Eq 7, Eq 6
ψ_{oG}, ψ_{oP}	Outer spiral angle, gear or pinion	degrees	Eq 7, Eq 6
ψ_{xG}	Spiral angle at cone distance A_{xG}	degrees	Eq 32
Ω_{VG}, Ω_{VP}	Intermediate blade mutilation value concave, gear or pinion	inch ²	Eq 132, Eq 129
Ω_{xG}, Ω_{xP}	Intermediate blade mutilation value convex, gear or pinion	inch ²	Eq 131, Eq 130

2.2 Definitions

This clause provides supplemental definitions for bevel gear cutter and cutting method terminologies referred to in this information sheet. The list of definitions given here is not intended to be all inclusive. For more detailed information regarding a particular cutter design or cutting method, the user is encouraged to consult the cutter manufacturer's data or machine tool manufacturer.

2.2.1 Bevel gear cutter terminology

alternate blade. Any multiple blade face cutter having successive blades that cut on opposite sides of a tooth space.

blade flat. A flat land on the end of blades required for blade manufacturing control.

blade point. The length across the end surface of a blade or tool (measured along a radius of a circular cutter), bounded by the extension of the cutting edge and non-cutting edge of the blade.

blade, inside. A blade of a circular face cutter with a cutting edge that produces the convex side of a tooth surface.

blade, outside. A blade of a circular face cutter with a cutting edge that produces the concave tooth surface.

coast side. The side of a tooth flank that is in contact with the opposite flank of the mate when the gear set is driven in the reverse direction.

drive side. The side of a tooth flank that is in contact with the opposite flank of the mate when the gear set is driven in the forward direction.

effective gear point width. Effective point width is one half of the difference of the outside minus the inside point diameters of a cutter. The effective point width is not equal to the slot width produced on the part when indexing motion occurs between drive and coast side generation. For spread blade cutters, the effective point width equals the actual cutter point width. When indexing accounts for part of the slot width, the effective point width can be negative.

fillet mutilation. Fouling of tooth fillet by the non-cutting side of the blade tip. This is caused by a tool edge radius or a blade point which is too large.

point width. One half of the difference between the inside and outside point diameters of an alternate blade cutter.

2.2.2 Bevel gear cutting method terminology

completing. A machining process where the tooth space is completed in one machining setup. Unlike single side, single setting, or fixed setting methods where the tooth space roughing and finishing are carried out in separate machining setups.

cutter tilt. A change in the relative position between workpiece and cutter, measured as an angle in the normal, or axial, or both planes of the workpiece.

Formate. A term describing non-generated gear members whose teeth have surfaces of revolution, and straight profiles in their normal sections. Pinions generated to run with such gears are called Formate pinions.

non-generated method. A gear cutting process where the tooth space is machined without generating motion (see Formate). The tooth surfaces are formed by the sweep of a straight-sided cutting tool and thus have straight profiles in any normal section.

single setting. A finishing method which is a variation of the spread blade method. It is used on wide face width gears to avoid having two cutter blades cutting in the same slot at the same time.

single side. A cutting method which uses an alternate blade cutter to separately cut the profiles on each side of a tooth space, with independent machine settings.

spread blade. A cutting method which uses a circular face cutter with alternate inside and outside blades to cut both sides of a tooth space at the same time.

Unitool. A method for producing pairs of spiral bevel, zerol bevel or hypoid gears using the same single face mill cutter for both members. The cutters used with this method are designated as Unitool cutters.

Versacut. A process which requires very few cutters to accommodate a wide variety of spiral bevel gears. The cutters used with this method are designated as Versacut cutters.

3 Input data

The equations in this information sheet are intended to be as general as possible. Many of the calculations require knowledge of the specific cutting method used in manufacture. Supplemental

definitions to be used with the terms described in ANSI/AGMA 2005-D03 for proper input data selection based on the manufacturing method used can be found in 2.2.

The tables in this clause describe the data necessary to complete the calculations of this information sheet. In most cases the values can be obtained from the calculations detailed in ANSI/AGMA 2005-D03. Many of those calculations are duplicated in annex A. Additional tables are provided here to supplement those calculations.

3.1 Input variables

Table 2 contains all the input variables necessary for the calculations used in this information sheet.

Table 2 - Input variables

Symbol	Term
A_{iG}	Inner gear cone distance
A_{mG}	Gear mean cone distance
A_{mP}	Pinion mean cone distance
A_{oG}	Gear outer cone distance
a_G	Gear mean addendum
a_P	Pinion mean addendum
a_{oG}	Outer gear addendum
a_{oP}	Outer pinion addendum
B	Outer normal backlash allowance
b_G	Gear mean dedendum
b_P	Pinion mean dedendum
c	Clearance
D	Gear pitch diameter
d	Pinion pitch diameter
F_G	Gear face width
F_P	Pinion face width
N	Gear number of teeth
n	Pinion number of teeth
p_m	Mean circular pitch
r_c	Cutter radius
S_{AG}	Stock allowance, gear
S_{AP}	Stock allowance, pinion
T_n	Gear mean normal circular thickness without backlash
W	Gear finishing point width (Unitool and single setting)
y	Amount of fillet mutilation permitted
Symbol	Term

Γ	Gear pitch angle
Γ_R	Gear root angle
γ	Pinion pitch angle
Δf	Width of blade flat
δ_G	Dedendum angle of gear
δ_P	Dedendum angle of pinion
ϕ_{BXG}	Inside blade angle, gear cutter (non-generating)
ϕ_1	Concave pinion normal pressure angle
ϕ_2	Convex pinion normal pressure angle (always negative)
ψ_G	Gear mean spiral angle
ψ_P	Pinion mean spiral angle
ψ_{iG}	Inner gear spiral angle
ψ_{iP}	Inner pinion spiral angle
ψ_{oG}	Outer gear spiral angle
ψ_{oP}	Outer pinion spiral angle
Additional input variables for face hobbing	
Q	Intermediate factor
S_1	Crown gear to cutter center distance
η_i	Generating angle at inside
η_o	Generating angle at outside
η_1	Second auxiliary angle
Additional input variables for hypoids	
F_{iP}	Hypoid pinion face width from calculation point to inside
F_{oP}	Hypoid pinion face width from calculation point to outside

3.2 Variable substitutions

The calculations in this information sheet are written in terms of hypoid gears. Many of the variables for non-hypoid bevels are subscripted the same for pinion and gear. Table 3 provides a means for proper substitution of these variables into the calculations for hypoids.

3.3 Gear rotation factor

Table 4 provides for the proper selection of the input variable k_E based on the cutting method to be used in manufacture.

3.4 Additional input data

Table 5 contains some suggested default values for variables not described in ANSI/AGMA 2005-D03. Other values may be used if experience dictates.

Table 3 - Symbols and terms from ANSI/AGMA 2005-D03, table 9

Symbol	Equivalent symbol from ANSI/AGMA 2005-D03	Term
A_{mG}	A_m	Gear mean cone distance
A_{mP}	A_m	Pinion mean cone distance
A_{oG}	A_o	Gear outer cone distance
A_{oP}	A_o	Pinion outer cone distance
F_G	F	Gear face width
F_P	F	Pinion face width
ϕ_1	ϕ	Pressure angle - drive side
ϕ_2	ϕ	Pressure angle - coast side, set ϕ_2 to $-\phi_1$
ψ_G	ψ	Gear mean spiral angle
ψ_{oG}	ψ_o	Outer gear spiral angle
ψ_P	ψ	Pinion mean spiral angle

Table 4 - Gear rotation factor, k_E

Generating method	Face hobbing	Face milling	k_E
Spread blade		X	0.0
Gleason and Klingelnberg	X		1.0
Oerlikon not using a roughing blade	X		1.0
Oerlikon using a roughing blade	X		1.3
Straight bevels and planing generator			$\frac{2 W_{mG}}{P_n}$
Unitool and single setting		X	$\frac{2(W_{mG} - W)}{P_n}$
Versacut and standard single side		X	$\frac{2[W_{mG} + b_G(\tan \phi_1 - \tan \phi_2)]}{P_n}$

Table 5 - Suggested defaults for input data

Symbol	Term	Units	Suggested default
ϕ_{BXG}	Inside blade angle of gear cutter (non-generated gear only)	degrees	Average pressure angle
S_{AP}	Stock allowance, pinion	inch	For completing, use 0.000 For rough and finish, use actual or see annex B
S_{AG}	Stock allowance, gear	inch	For completing, use 0.000 For rough and finish, use actual or see annex B
y	Amount of fillet mutilation permitted	inch	0.002
Δf	Width of blade flat	inch	0.008
r_c	Cutter radius (straight bevels)	inch	10000
	Cutter radius (all other bevels)		See ANSI/AGMA 2005-D03