9.6 Calculation for Gleason system Straight bevel gear

1. Number of teeth for pinion	$z_1 =$	5. Working depth	$h' = 2.000\,m =$
2. Number of teeth for gear	$z_2 =$	6. Tooth depth	$h = 2.188m + 0.05 =$
3. Module	$m =$	7. Reference pressure angle	$\alpha = 20°$
4. Facewidth	$b =$	8. Shaft angle	$\sum = 90°$

Gear terms	Pinion 1	Gear 2
9. Reference diameter	$d_1 = z_1 m$	$d_2 = z_2 m$
10. Reference pitch angle	$\delta_1 = \tan^{-1}\frac{z_1}{z_2}$	$\delta_2 = 90° - \delta_1$
11. Cone distance (outer)	$R_e = \frac{d_2}{2\sin\delta_2}$	
12. Circular pitch	$p = \pi m = 3.1416m$	
13. Addendum	$h_{a1} = h' - h_{a2}$	$h_{a2} = 0.540m + \frac{0.460m}{\left(\frac{z_2}{z_1}\right)^2}$
14. Dedendum(1)	$h_{f1} = 2.188m - h_{a1}$	$h_{f2} = 2.188m - h_{a2}$
15. Bottom clearance	$c = h - h'$ (Parallel bottom clearance)	
16. Dedendum angle(2)	$\theta_{f1} = \tan^{-1}\frac{h_{f1}}{R_e}$	$\theta_{f2} = \tan^{-1}\frac{h_{f2}}{R_e}$
17. Tip angle	$\delta_{a1} = \delta_1 + \theta_{f2}$	$\delta_{a2} = \delta_2 + \theta_{f1}$
18. Root angle	$\delta_{f1} = \delta_1 - \theta_{f1}$	$\delta_{f2} = \delta_2 - \theta_{f2}$
19. Tip (Outside) diameter (heel)	$d_{a1} = d_1 + 2h_{a1}\cos\delta_1$	$d_{a2} = d_2 + 2h_{a2}\cos\delta_2$
20. Pitch apex to crown	$X_1 = \frac{d_2}{2} - h_{a1}\sin\delta_1$	$X_2 = \frac{d_1}{2} - h_{a2}\sin\delta_2$
21. Circular thickness	$s_1 = p - s_2$	$s_2 = \frac{p}{2} - (h_{a1} - h_{a2})\tan\alpha - K \bullet m$(3)
22. Backlash	$j_n =$ Refer to Backlash for Bevel gear in JIS B 1705.	
23. Chordal tooth thickness	$\bar{s} = s_1 - \frac{(s_1)^3}{6(d_1)^2}$	$\bar{s} = s_2\frac{(s_2)^3}{6(d_2)^2}$
24. Chordal height	$\bar{h}_1 = h_{a1} + \frac{(s_1)^2\cos\delta_1}{4d_1}$	$\bar{h}_2 = h_{a2} + \frac{(s_2)^2\cos\delta_2}{4d_2}$
25. Axial facewidth	$X_{b1} = \frac{b\cos\delta_{a1}}{\cos\theta_{f2}}$	$X_{b2} = \frac{b\cos\delta_{a2}}{\cos\theta_{f1}}$
26. Tip (Inside) diameter (toe)	$d_{i1} = d_{a1} - \frac{2b\sin\delta_{a1}}{\cos\theta_{f2}}$	$d_{i2} = d_{a2} - \frac{2b\sin\delta_{a2}}{\cos\theta_{f1}}$
27. Material angle	$\theta_{x1} = 90° - \theta_{f2}$	$\theta_{x2} = 90° - \theta_{f1}$
28. Material angle	$\theta_{y1} = 90° - \delta_1$	$\theta_{y2} = 90° - \delta_2$

Calculation for Gleason system Angular straight bevel gear

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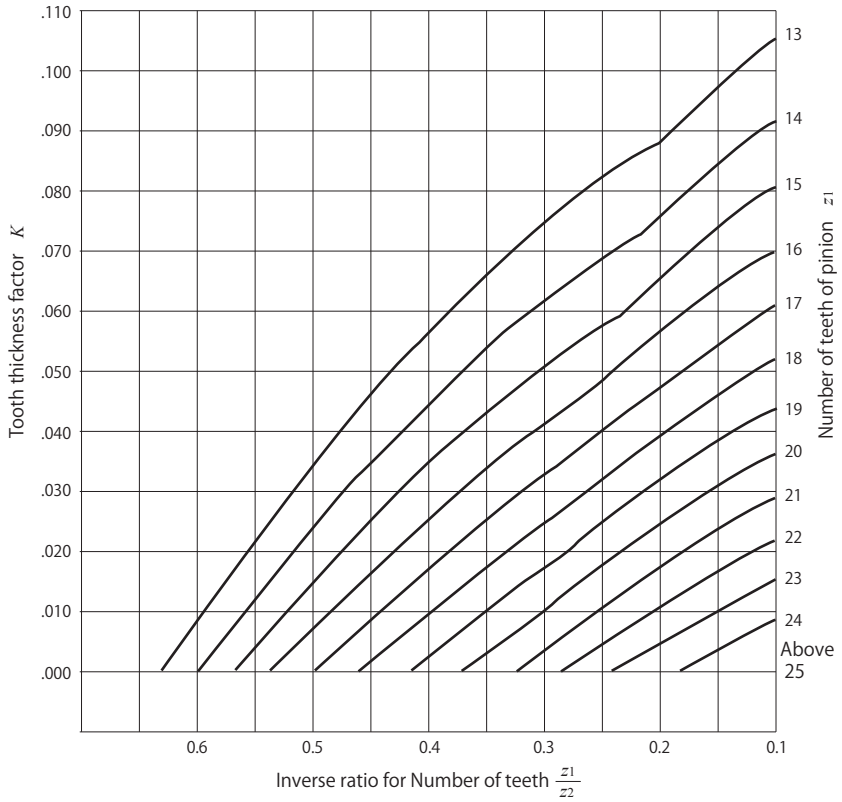
Gear terms	Pinion 1	Gear 2
10. Pitch angle	Refer to next page for Standard angular straight bevel gear	
13. Addendum	$h_{a1} = h' - h_{a1}$	$h_{a1} = 0.54m + \dfrac{0.46m}{\left(\dfrac{z_2\cos\delta_1}{z_1\cos\delta_2}\right)}$
20. Pitch apex to crown	$X_1 = R_e\cos\delta_1 - h_{a1}\sin\delta_1$	$X_2 = R_e\cos\delta_2 - h_{a2}\sin\delta_2$

Note (1) Actual dedendum is 0.05 mm longer than calculated value. (2) Dedendum angle θ_a is equivalent to Dedendum angle θ_f for Mating gear. (3) Obtain factor K from Fig. 2



Note) $u = \dfrac{z_1}{z_2}$ when $z_2 = 1.5$, $z_1 = 1.0$ or above 25, $K = 0$.

Fig. 2 Tooth thickness factor K

Table 1. Minimum number of teeth to prevent Undercut

α=20°		α=14.5°	
No. of teeth of pinion z_1	No. of teeth of gear z_2	No. of teeth of pinion z_1	No. of teeth of gear z_2
z_1	z_2	z_1	z_2
13	30	24	57
14	20	25	40
15	17	26	35
16	16	27	31
		28	29
		29	29