

9.8 Calculation for Gleason system spiral bevel gear

- | | |
|--------------------------------------|---|
| 1. Number of teeth of pinion $z_1 =$ | 5. Working depth $h' = 1.700m =$ |
| 2. Number of teeth of gear $z_2 =$ | 6. Tooth depth $h = 1.888m =$ |
| 3. Module $m =$ | 7. Pressure angle $\alpha = (\text{standard is } 20^\circ)$ |
| 4. Facewidth $b =$ | 8. Shaft angle $\Sigma = 90^\circ$ |

Gear terms	Pinion 1	Gear 2
9. Reference diameter	$d_1 = z_1 m$	$d_2 = z_2 m$
10. Pitch angle	$\delta_1 = \tan^{-1} \frac{z_1}{z_2}$	$\delta_2 = 90^\circ - \delta_1$
11. Cone distance	$R_e = \frac{d_2}{2 \sin \delta_2}$	
12. Circular pitch	$p = \pi m = 3.14159m$	
13. Addendum	$h_{a1} = h' - h_{a2}$	$h_{a2} = 0.460m + \frac{0.390m}{\left(\frac{z_2}{z_1}\right)^2}$
14. Dedendum	$h_{f1} = h - h_{a1}$	$h_{f2} = h - h_{a2}$
15. Bottom clearance	$c = h - h' \text{ (Parallel bottom clearance)}$	
16. Dedendum angle ⁽¹⁾	$\theta_{f1} = \tan^{-1} \frac{h_{f1}}{R_e}$	$\theta_{f2} = \tan^{-1} \frac{h_{f2}}{R_e}$
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. Tooth thickness ⁽²⁾	$s_1 = p - s_2$	$s_2 = \frac{p}{2} - (h_{a1} - h_{a2}) \frac{\tan \alpha_n}{\cos \beta} - Km^{(3)}$
22. Backlash	$j_n =$ Refer to Gleason Works for backlash recommendation or Backlash for Bevel gear in JIS B 1705.	
23. Spiral angle	$\beta = (35^\circ \text{ is standard})$	
24. Shape of teeth		
25. Driving gear		
26. Revolving direction		
27. Axial facewidth	$X_{b1} = \frac{b \cos \delta_{a1}}{\cos \theta_{f2}}$	$X_{b2} = \frac{b \cos \delta_{a2}}{\cos \theta_{f1}}$
28. Tip (Inside) diameter (toe)	$d_{i1} = d_{a1} - \frac{2b \sin \delta_{a1}}{\cos \delta_{f2}}$	$d_{i2} = d_{a2} - \frac{2b \sin \delta_{a2}}{\cos \delta_{f1}}$
29. Material angle	$\theta_{x1} = 90^\circ - \theta_{f2}$	$\theta_{x2} = 90^\circ - \theta_{f1}$
30. Material angle	$\theta_{y1} = 90^\circ - \delta_1$	$\theta_{y2} = 90^\circ - \delta_2$

Note (1) Addendum angle θ_a is equivalent to Dedendum angle θ_f of Mating gear.

(2) Gear cutting by methods of Spread Blade and Single Side may use calculation formula from drawing. There are different calculations depending on gear cutting methods when using Gear tooth vernier calipers to calculate dimension of Sector span. Therefore designed Tooth thickness is necessary for reference.

(3) Obtain Factor K from Fig. 2 of page 112.

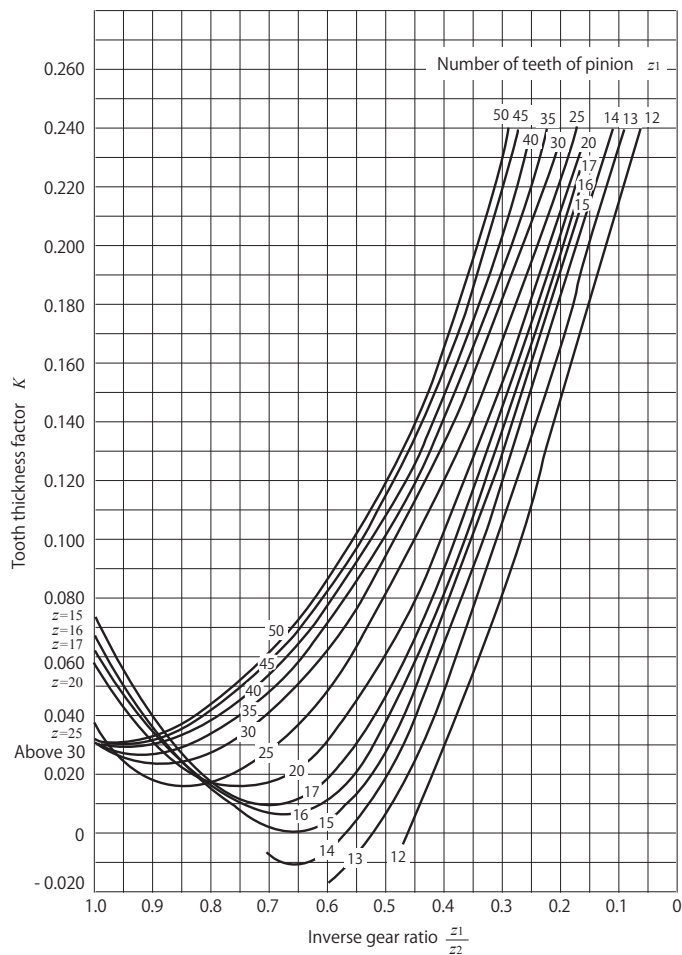


Fig. 4 Tooth thickness factor K

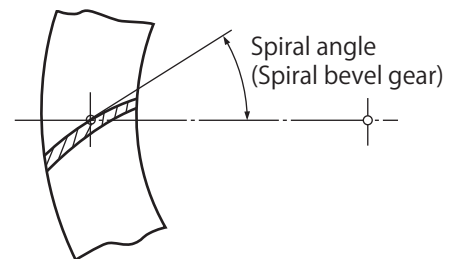


Fig. 5 Spiral angle for Spiral bevel gear
(Mean spiral angle)

Table 2. Minimum number of teeth to prevent Undercut

$\alpha=20^\circ$		$\alpha=16^\circ$		$\alpha=14.5^\circ$	
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	No. of teeth of pinion z_1	No. of teeth of gear z_2
z_1	z_2	z_1	z_2	z_1	z_2
12	26	16	59	19	70
13	22	17	45	20	60
14	20	18	36	21	42
15	19	19	31	22	40
16	18	20	29	23	36
17	17	21	27	24	33
		22	26	25	32
		23	25	26	30
		24	24	27	29
				28	28