

Rules and Formulas For Spur Gear Calculations

Diametral Pitch is the number of teeth to each inch of the pitch diameter.

To Find	Having	Rule	Formula
Diametral Pitch (DP)	Circular Pitch (CP)	Divide 3.1416 by Circular Pitch (CP)	$DP = \frac{3.1416}{CP}$
	Pitch Diameter (PD) and Number of Teeth (N)	Divide Number of Teeth (N) by Pitch Diameter (PD)	$DP = \frac{N}{PD}$
	Outside Diameter (OD) and Number of Teeth (N)	Divide Number of Teeth (N) plus 2 by Outside Diameter (OD)	$DP = \frac{N + 2}{OD}$
Pitch Diameter (PD)	Number of Teeth (N) and Diametral Pitch (DP)	Divide Number of Teeth (N) by Diametral Pitch (DP)	$PD = \frac{N}{DP}$
	Number of Teeth (N) and Outside Diameter (OD)	Divide product of Outside Diameter (OD) and Number of Teeth (N) by Number of Teeth (N) plus 2	$PD = \frac{OD \times N}{N + 2}$
	Outside Diameter (OD) and Diametral Pitch (DP)	Subtract from Outside Diameter (OD) quotient of 2 divided by Diametral Pitch (DP)	$PD = OD - (2 \div DP)$
	Addendum (a) and Number of Teeth (N)	Multiply Addendum (a) by Number of Teeth (N)	$PD = a \times N$
Outside Diameter (OD)	Number of Teeth (N) and Diametral Pitch (DP)	Divide Number of Teeth (N) plus 2 by Diametral Pitch (DP)	$OD = \frac{N + 2}{DP}$
	Pitch Diameter (PD) and Diametral Pitch (DP)	Add to Pitch Diameter (PD) quotient of 2 divided by Diametral Pitch (DP)	$OD = PD + \frac{2}{DP}$
	Pitch Diameter (PD) and Number of Teeth (N)	Divide Number of Teeth (N) plus 2 by quotient of Number of Teeth (N) divided by Pitch Diameter (PD)	$OD = \frac{N + 2}{N \div PD}$
	Number of Teeth (N) and Addendum (a)	Multiply Number of Teeth (N) plus 2 by Addendum (a)	$OD = (N + 2) \times a$
Number Of Teeth (N)	Pitch Diameter (PD) and Diametral Pitch (DP)	Multiply Pitch Diameter (PD) by Diametral Pitch (DP)	$N = PD \times DP$
	Outside Diameter (OD) and Diametral Pitch (DP)	Multiply Outside Diameter (OD) by Diametral Pitch (DP) and subtract 2	$N = (OD \times DP) - 2$
Thickness Of Tooth (t)	Diametral Pitch (DP)	Divide 1.5708 By Diametral Pitch (DP)	$t = \frac{1.5708}{DP}$
Addendum (a)	Diametral Pitch (DP)	Divide 1 by Diametral Pitch (DP)	$a = \frac{1}{DP}$
Dedendum (b)	Diametral Pitch (DP)	Divide 1.157 By Diametral Pitch (DP)	$b = \frac{1.157}{DP}$
Working Depth (hk)	Diametral Pitch (DP)	Divide 2 by Diametral Pitch (DP)	$hk = \frac{2}{DP}$
Whole Depth (ht)	Diametral Pitch (DP)	Divide 2.157 By Diametral Pitch (DP)	$ht = \frac{2.157}{DP}$
Clearance (c)	Diametral Pitch (DP)	Divide .157 By Diametral Pitch (DP)	$c = \frac{.157}{DP}$
	Thickness of Tooth (t)	Divide Thickness of Tooth (t) at Pitch Line by 10	$c = \frac{t}{10}$

Note: Rules and formulas relating to tooth depth and outside diameter apply to full-depth, equal addendum gears.