Appendices and terminology

Appendices

Bearing standards

Characteristics		Standards
Terminology		ISO 5593
Dimensions	Ball and roller bearings (except tapered roller and thrust bearings)	ISO 15
	Tapered roller bearings	ISO 355
	Self-aligning unit bearings	ISO 2264
	Thrust bearings	ISO 104
	Snap ring grooves	ISO 464
	Snap rings	ISO 464
	Eccentric locking collars	ISO 3145
	Tapered sleeves	ISO 113/1
	Nuts and lock-washers	ISO 2982
	Split pillow blocks	ISO 113/2
	Self-aligning bearing units	ISO 3228
	Corner radii	ISO 582
Precision	Definitions	ISO 1132
	All types of bearings	ISO 492
	Thrust bearings	ISO 199
Clearances	Radial internal clearance	ISO 5753
Basic dynamic load and bearing life		ISO 281/1
Basic static load (or basic static capacity)		ISO 76
Thermal reference speed		ISO 15312

Gear tooth forces

T	Tangential force
C	Transmitted torque
Dp	Tooth pitch diameter

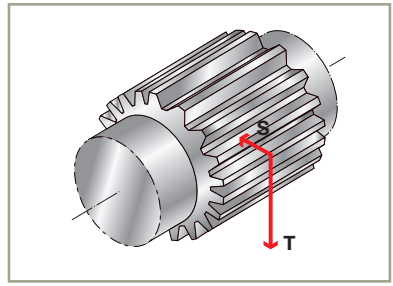
$T = 2C / Dp$

S	Separation forces
A	Axial forces

■ Straight-tooth cylindrical gear

α = pressure angle

$S = T \, tg\alpha$



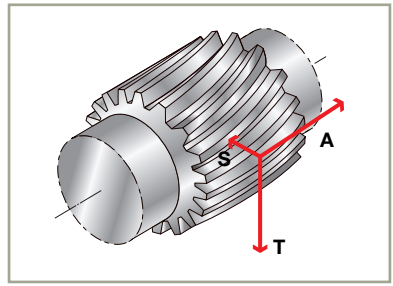
■ Helical-tooth cylindrical gear

α = pressure angle

$S = T \, tg\alpha / cos\gamma$

γ = helix angle

$A = T \, tg\gamma$



■ Straight-tooth bevel gear

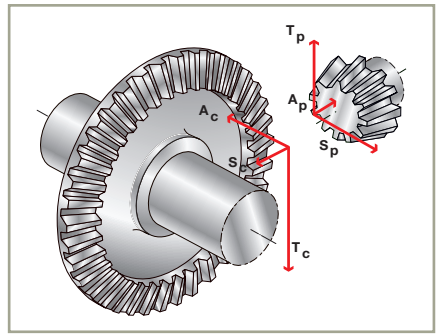
$T = Tp = Tc$

α = pressure angle

$Sp = - Ac = T \, tg\alpha \cos\theta$

θ = 1/2 angle at gear apex

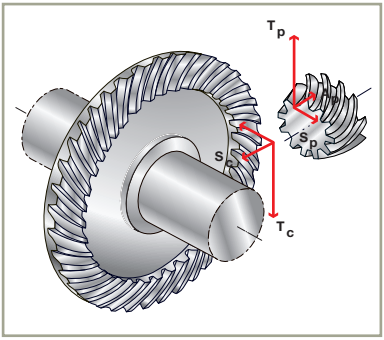
$Ap = - Sc = T \, tg\alpha \sin\theta$



Appendices *(continued)*

Helical-tooth bevel gear

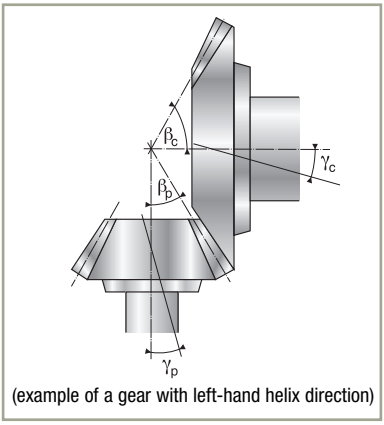
D_p = pitch diameter of the driving gear
D_c = pitch diameter of the driven gear
L = tooth length
D_p = mean diameter of the driving gear
D_c = mean diameter of the driven gear
T_p = tangential force of the driving gear
T_c = tangential force of the driven gear



$$T_c = T_p = 2\,C / D_p$$

α = pressure angle
γ_p = helix angle of driving gear
γ_c = helix angle of the driven gear
($\gamma_p = \gamma_c$ for straight-tooth and helical-tooth bevel gear pairs)

β_p = 1/2 angle at apex of driving gear
β_c = 1/2 angle at apex of driven gear



(example of a gear with left-hand helix direction)

Direction of gear rotation:
(for an observer standing on the large base of the cone and looking at the apex)
\+ counter-clockwise
\- clockwise

Direction of the helix	Direction of gear rotation	Separation force	Axial force
right	-	Driving gear (moving away from driven gear) $S_p = \frac{T_p}{\cos\gamma_p} \cdot (\mathrm{tg}\alpha \cos\beta_p + \sin\gamma_p \sin\beta_p)$	Driving gear (moving away from driven gear) $A_p = \frac{T_p}{\cos\gamma_p} \cdot (\mathrm{tg}\alpha \sin\beta_p - \sin\gamma_p \cos\beta_p)$
or			
left	+	Driven gear (approaching driving gear) $S_c = \frac{T_c}{\cos\gamma_c} \cdot (\mathrm{tg}\alpha \cos\beta_c - \sin\gamma_c \sin\beta_c)$	Driven gear (approaching driving gear) $A_c = \frac{T_c}{\cos\gamma_c} \cdot (\mathrm{tg}\alpha \sin\beta_c + \sin\gamma_c \cos\beta_c)$
right	+	Driving gear (moving away from driven gear) $S_p = \frac{T_p}{\cos\gamma_p} \cdot (\mathrm{tg}\alpha \cos\beta_p - \sin\gamma_p \sin\beta_p)$	Driving gear (moving away from driven gear) $A_p = \frac{T_p}{\cos\gamma_p} \cdot (\mathrm{tg}\alpha \sin\beta_p + \sin\gamma_p \cos\beta_p)$
or			
left	-	Driven gear (approaching driving gear) $S_c = \frac{T_c}{\cos\gamma_c} \cdot (\mathrm{tg}\alpha \cos\beta_c + \sin\gamma_c \sin\beta_c)$	Driven gear (approaching driving gear) $A_c = \frac{T_c}{\cos\gamma_c} \cdot (\mathrm{tg}\alpha \sin\beta_c - \sin\gamma_c \cos\beta_c)$

Terminology

Vocabulary

Symbol	Description	Unit
α	nominal angle of contact	°
B	width of bearing inner ring	mm
C	width of bearing outer ring	mm
C	basic dynamic capacity of a bearing	N
C_0	basic static capacity of a bearing	N
C_e	equivalent basic dynamic capacity of an assembly	N
C_{0e}	equivalent basic static capacity of an assembly	N
D	outside diameter of the bearing	mm
D_w	mean diameter of the rolling element	mm
d	bearing bore diameter	mm
fc	factor for calculating the basic dynamic load	
f_s	safety factor	
F_a	total axial load on the bearing	N
F_r	total radial load on the bearing	N
J_a	theoretical axial clearance	mm
J_r	operating radial clearance	mm
i	number of rows of rolling elements	
l	effective length of the contact generating surface	mm
L_{10}	nominal service life	
N	speed of rotation	tr/mn
P	equivalent dynamic radial load of the bearing	N
P_0	equivalent static radial load of the bearing	N
T	nominal width of a tapered bearing	mm
X	radial factor of bearing	
X_0	static radial factor	
Y	axial factor of bearing	
Y_0	static axial factor	
Z	number of rolling elements	