ARROW GEAR COMPANY

Standard and ground tooth stock spiral bevel gears ...

RATING DATA AND SPECIFICATIONS

Arrow stock gears are lapped to AGMA Quality Number 9 or ground to AGMA Quality Number 11. Each pair of gears is made of alloy steel with carburized and hardened teeth. 20° pressure angle and 35° spiral angle are standard. All pinions are left hand spiral. Mounting distance, backlash, mating teeth and set number are etched on each pair. See page 16.

Hub type gears can be rebored to the maximum diameter specified in the tables. It is preferred that all remachining of bores be performed by Arrow Gear Company.

Calculations

$T_w = \frac{HP \times 63025}{RPM}$

HP = Horsepower
T_w = Working torque (in. lb.)
RPM = Revolutions/minute

$T_r = T_w \frac{SF}{K_V}$

T_a = Allowable torque (in. lb.)
T_r = Catalog torque (in. lb.) (SF = 1)

K_V = Velocity Factor

$= \sqrt{\frac{78}{78 + \sqrt{PLV}}}$ (Lapped AGMA Q9)

= 1 (Ground AGMA Q11)

PLV = Pitch line velocity
= 0.262 x RPM x Pitch Diameter
SF = Service Factor

Service factors have been determined by many industries for specific applications from field data and should be used when available. In the absence of a service factor, select an appropriate overload factor.

OVERLOAD FACTORS

POWER SOURCE	CHARACTER OF LOAD ON DRIVEN MACHINE		
	Uniform	Medium Shock	Heavy Shock
Uniform	1.00	1.25	1.75
Light Shock	1.25	1.50	2.00
Medium Shock	1.50	1.75	2.25

Arrow Stock Gear Selection

1) Calculate the pinion working torque (T_{wp}).

$$T_{wp} = \frac{63025 \times HP}{RPM_p}$$

2) Estimate the rated pinion torque (T_{rp}).

$$T_{rp} = 2 \times T_{wp}$$

3) Find the rated pinion torque in the catalog that is approximately equal to the estimated torque.
4) Calculate the pitch line velocity (PLV).

PLV = 0.262 x pinion pitch diameter x RPM_p

5) Calculate the dynamic factor K_V.

$$K_v = \sqrt{\frac{78}{78 + \sqrt{PLV}}}$$

6) Calculate the allowable pinion torque (T_{ap}).

$$T_{ap} = T_{rp} \times K_V$$

7) Calculate the service factor.

$$SF = \frac{T_{ap}}{T_{wp}}$$

Example

Customer requires a bevel 3:1 reduction
Pinion speed = 1800
HP = 38

Then: $T_{wp} = \frac{63025 \times 38}{1800} = 1330$ in. lb.

First estimate
T_{rp} = 2 x 1330 in. lb. = 2660 in. lb.
From the 3:1 ratios on page 7 (6P45L15/6P15R45):
T_{rp} = 2381 in. lb. (catalog value)
PLV = 0.262 x 2.5 x 1800 = 1179

$$K_v = \sqrt{\frac{78}{78 + \sqrt{1179}}} = 0.833$$

T_{ap} = 2381 in. lb. x 0.833 = 1983 in. lb.

$SF = \frac{1983}{1330} = 1.49$

A 1.49 SF indicates that the stock gear set has a capacity of 1.49 times that required.

Gear sizes in this manual must be selected from the calculated allowable torque.
For applications involving unusual conditions, our Engineering Service is available.