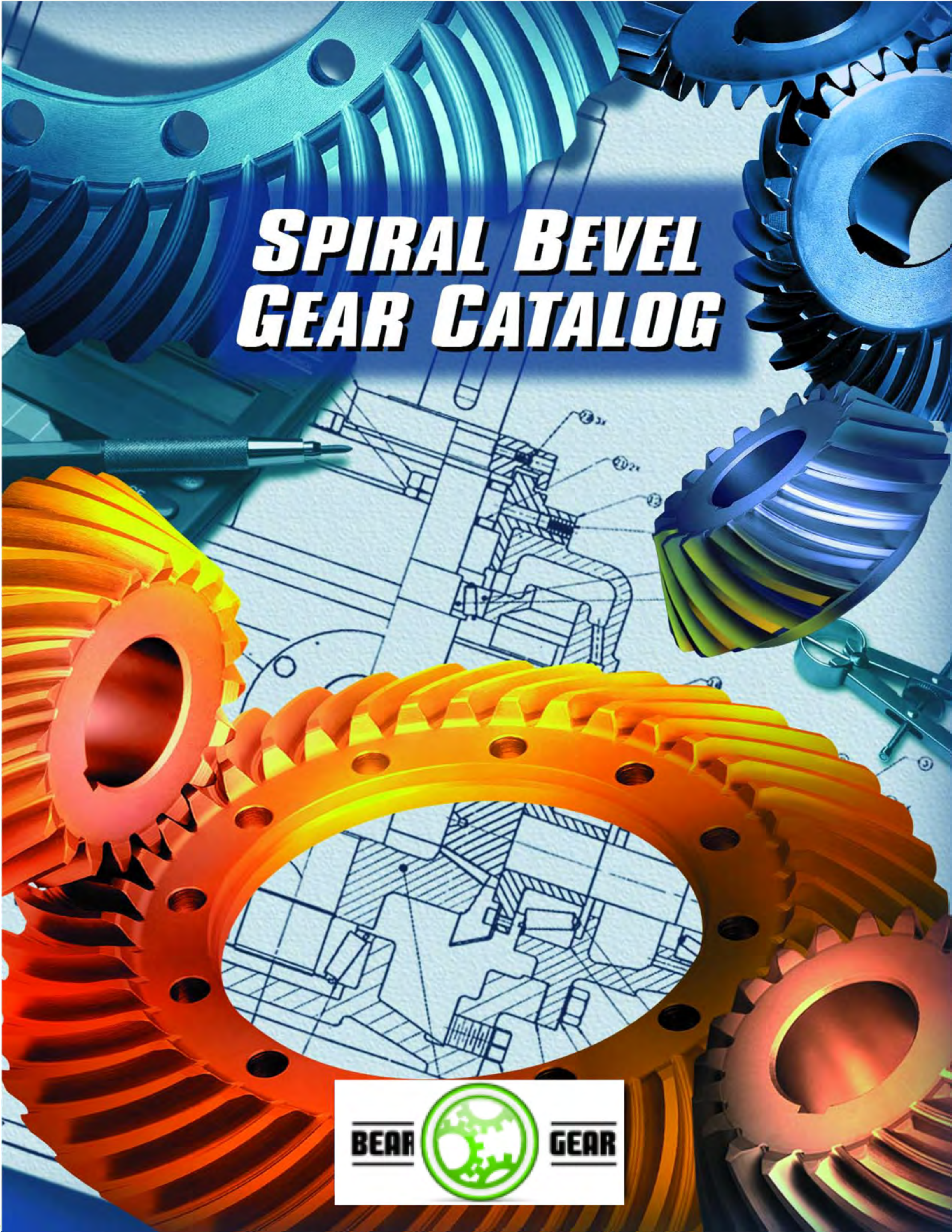
Spiral Bevel Gear Catalog



BEAR GEAR

SPECIALISTS IN HIGH PRECISION GEARS

Since its inception in 1947, China Gear Manufacturing Inc. has continued to build a solid reputation for quality, service and reliability. From the very beginning, China Gear has provided high precision spur, helical and bevel gears that meet the rapidly changing and demanding requirements of the gear industry.

Arrow's primary goal is to insure customer satisfaction by improving the manufacturing process, eliminating waste, and delivering a quality product on time at a competitive price.

To achieve these objectives, China Gear has embraced the continuous improvement philosophy while implementing the most advanced technology available for the machining, heat treatment and inspection of our products. We are an approved supplier to major companies throughout the world and have consistently received vendor awards for both quality and on-time delivery. China Gear Manufacturing Inc. takes great pride in its history of steady growth and its record for
maintaining long-lasting customer relations.

BEAR GEAR

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STOCK SPIRAL BEVEL GEARS

We stock 51 different sets of lapped spiral bevel gears in ratios of 1 to 1, 2 to 1, 3 to 1, 3 to 2 and 4 to 3 and 8 different sets of ground tooth spiral bevel gears in ratios of 1 to 1 and 2 to 1. Should you be unable to satisfy your gear requirements from the selection of stock gears listed in our catalog, please contact us for assistance. We can modify most of our stock gears to your specifications.

Custom Gears

In addition to the stock gears listed in this catalog we manufacture spiral bevel, hypoid, Zerol® bevel, Coniflex® bevel, helical and spur gears, as well as Curvic® couplings to customers' prints and specifications. Please refer to the following chart for the complete range of sizes and capabilities.

TABLE OF CONTENTS

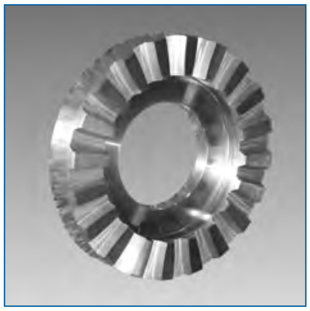

Spiral Bevel


Zerol® Bevel


Coniflex® Bevel


Spur


Helical


Curvic® Coupling

RANGE SIZE AND CAPABILITIES

Type of Gear	Maximum Pitch Diameter	Diametral Pitch	Face Width	Unground Tooth	Ground Tooth
Spiral Bevel	30"	1.5 - 48	5.0	AGMA 9*	AGMA 13
Zerol® Bevel	22"	1.5 - 48	4.0	AGMA 9*	AGMA 13
Coniflex® Bevel	28"	2.5 - 48	6.0	AGMA 9*	--
Helical	36"	3.0 - 48	13.0	AGMA 9	AGMA 13
Internal Spur	32"	3.6 - 48	8.0	AGMA 9	AGMA 13
Internal Spline	32"	3.6 - 48	8.0	AGMA 9	AGMA 13
Spur	36"	3.0 - 48	13.0	AGMA 9	AGMA 13
Spline	36"	4/8 - 80/160	13.0	AGMA 9	AGMA 13

*Some Configurations to AGMA Quality Number 10 (lapped).

Standard and ground tooth stock spiral bevel gears ...

RATING DATA AND SPECIFICATIONS

China Gear 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 China Gear Manufacturing Inc.

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

China Gear 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).
$$PLV = 0.262 \times \text{pinion pitch diameter} \times RPM_p$$
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

$T_{rp} = 2 \times 1330$ 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.

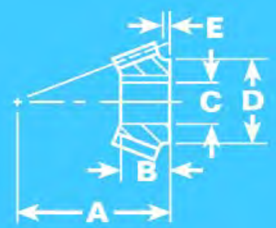


Figure 1

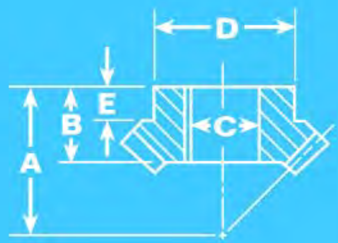


Figure 2

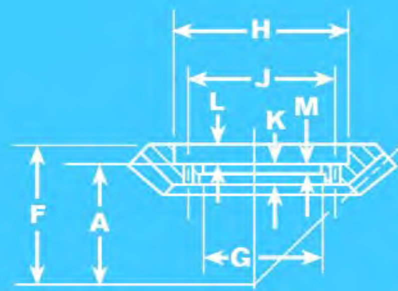


Figure 3

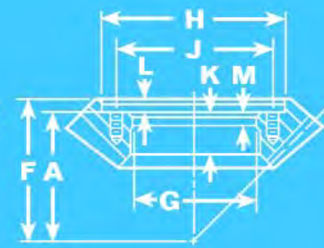
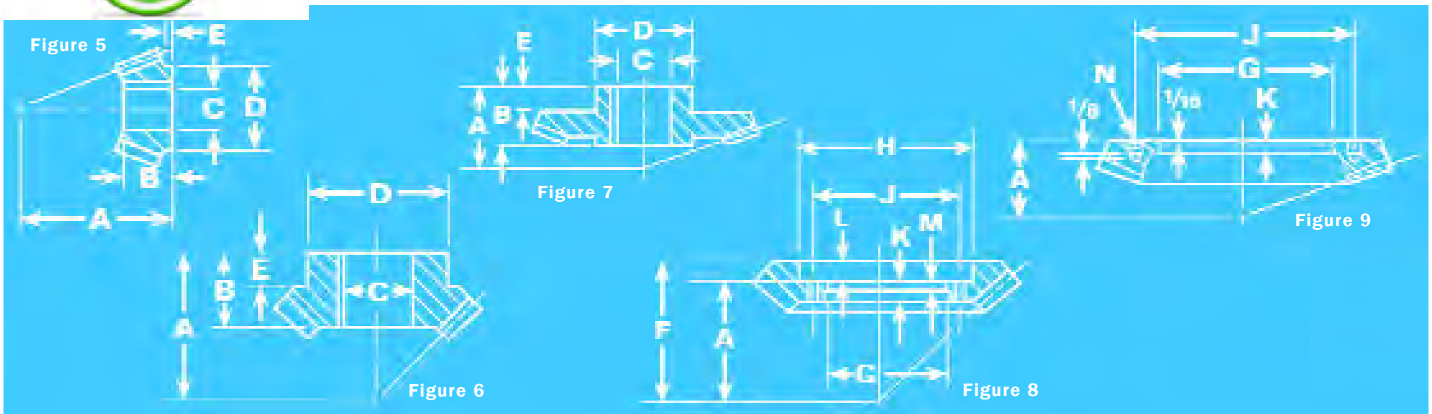


Figure 4

Part No.	18P18L18	18P18R18	12P18L18	12P18R18	10P20L20	10P20R20	8P20L20	8P20R20	7P21L21	7P21R21	6P21L21	6P21R21	6P24L24	6P24R24	5P25L25	5P25R25	45P27L27	45P27R27	4P28L28	4P28R28	4P32L32	4P32R32	35P35L35	35P35R35	3P36L36	3P36R36	257P36L36	257P36R36	225P36L36	225P36R36
Figure	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4
Gear																														
Outside Dia.	1.061		1.571		2.086		2.590		3.100		3.665		4.100		5.172		6.201		7.238		8.202		10.262		12.304		14.372		16.430	
Pitch Dia.	1.000		1.500		2.000		2.500		3.000		3.500		4.000		5.000		6.000		7.000		8.000		10.000		12.000		14.000		16.000	
Pinion																														
Outside Dia.	1.061		1.571		2.086		2.590		3.100		3.665		4.100		5.172		6.201		7.238		8.202		10.262		12.304		14.372		16.430	
Pitch Dia.	1.000		1.500		2.000		2.500		3.000		3.500		4.000		5.000		6.000		7.000		8.000		10.000		12.000		14.000		16.000	
Combination	18	18	18	18	20	20	20	20	21	21	21	21	24	24	25	25	27	27	28	28	32	32	35	35	36	36	36	36	36	36
Diametral Pitch	18		12		10		8		7		6		6		5		4½		4		4		3½		3		2.57		2.25	
Face Width	3/16		5/16		½		9/16		11/16		13/16		1		1 3/16		1 5/16		1½		1½		1⅞		2		2¾		3	
A Mount Dist.	⅞		1 5/16		1⅝		1 15/16		2¼		2 9/16		2 13/16		3 7/16		4⅛		4⅝		3¾		4 11/16		5 9/16		7½		8½	
B Bore Length	15/32		11/16		⅞		1		1⅛		1¼		1⅜		1⅝		1⅞		2											
C Bore Dia. +.0005 -.0000	⅜		⅝		¾		15/16		1 1/16		1 3/16		1 5/16		1 7/16		1 11/16		1 15/16											
D Hub Dia.	¾		1¼		1½		1⅞		2⅛		2½		2¾		3¼		3⅝		4											
E Hub Length	¼		7/16		⅜		7/16		½		9/16		9/16		9/16		¾		11/16											
F Apex to Back																					4⅜		5 7/16		6½		8		9¼	
G Bore Dia. +.001 -.000																					3¾		5		6½		8⅞		10½	
H C'bore Dia.																					5½		7⅛		8⅝		11¼		13	
J Bolt Circle																					4⅝		6		7½		10		11¾	
K Web Thick.																					⅝		¾		¾		2		2⅛	
L C'bore Depth																					⅝		¾		15/16		½		¾	
M Bore Length																					5/16		5/16		¾		1		½	
Holes Size																					13/32		17/32		17/32		½-20		½-20	
Holes No.																					12		12		12		10		12	
Keyway	⅛x1/16		3/16x1/16		3/16x1/16		¼x3/32		¼x3/32		¼x3/32		⅜x⅛		⅜x⅛		⅜x⅛		½x3/16											
****Max. Bore**	*		*		⅞		1 3/16		1 7/16		1 11/16		1⅞		2½		2¾		2⅞		*		*		*		*		*	
Wt. per pair, lbs.	.12		.40		.81		1.25		2.25		3.75		5.37		10.5		16.5		24.5		17.0		30.0		46.0		79.5		108.0	
Torque (lb. in.)	37		138		405		712		1251		1936		2991		5218		7765		11481		14209		24433		38404		69158		95307	

Note: All dimensions are in inches. *Cannot be reworked. **Keyway Unchanged

BEAR GEAR



Part No.	10P32L16	10P16R32	9P34L17	9P17R34	8P36L18	8P18R36	7P38L19	7P19R38	6P40L20	6P20R40	5P40L20	5P20R40	4P40L20	4P20R40	35P42L21	35P21R42	320P46L23	320P23R46
Figure	5	6	5	6	5	7	5	7	6	7	6	7	6	8	6	8	6	9
Gear Outside Dia.	3.200		3.783		4.518		5.457		6.699		8.053		9.985		12.069		14.413	
Gear Pitch Dia.	3.200		3.778		4.500		5.429		6.667		8.000		10.000		12.000		14.362	
Pinion Outside Dia.	1.764		2.087		2.457		2.965		3.620		4.404		5.436		6.517		7.760	
Pinion Pitch Dia.	1.600		1.889		2.250		2.714		3.333		4.000		5.000		6.000		7.181	
Combination	16	32	17	34	18	36	19	38	20	40	20	40	20	40	21	42	23	46
Diametral Pitch	10		9		8		7		6		5		4		3½		3 13/64	
Face Width	9/16		5/8		13/16		1		1 3/16		1 7/16		1¾		2		2⅜	
A Mount Dist.	1⅞	1 11/16	2¼	1 15/16	2 9/16	2 1/16	3	2 7/16	3 11/16	2 15/16	4 7/16	3½	5½	2 9/16	6 9/16	3⅛	7⅞	4 7/16
B Bore Length	¾	1	⅞	1⅛	1	1⅜	1⅛	1⅝	1⅜	1⅞	1⅝	2¼	2		2¼		2 15/16	
C Bore Dia. +.0005 -.0000	⅝	15/16	¾	1 1/16	⅞	1 5/16	1 1/16	1 7/16	1 5/16	1 11/16	1 9/16	2 1/16	1 13/16		2 1/16		2⅝	
D Hub Dia.	1¼	1⅞	1½	2⅛	1¾	2½	2⅛	2⅞	2¾	3⅛	2⅞	3⅞	3¾		3⅞		4½	
E Hub Length	3/16	9/16	¼	9/16	3/16	9/16	⅛	⅝	¼	13/16	¼	15/16	5/16		5/16		¼	
F Apex to Back														3 3/16		3⅞		
G Bore Dia. +.001 -.000														5		5¾		9¼
H C'bore Dia.														6⅝		8		
J Bolt Circle														5¾		6⅞		10½
K Web Thick														⅝		¾		¾
L C'bore Depth														⅝		¾		
M Bore Length														5/16		5/16		
Holes N Size														13/32		17/32		½-20 a
Holes N No.														12		12		12
Keyway	3/16x1/16	1/4x3/32	3/16x1/16	1/4x3/32	3/16x1/16	3/8x1/8	1/4x3/32	3/8x1/8	3/8x1/8	3/8x1/8	3/8x1/8	1/2x3/16	1/2x3/16		1/2x3/16		5/8x7/32	
**Max. Bore	*	1 3/16	⅞	1 7/16	1	1½	1 3/16	2	1⅝	2¼	1⅞	2¾	2½	*	2⅞	*	3	9¼
Wt. each, lbs.	.25	1.12	.50	1.75	.62	2.87	1.00	5.00	2.00	8.00	3.50	14.00	6.75	13.75	11.25	24.50	20	30
Torque (lb. in.) Gear	820		1288		2352		3962		6674		11116		19996		31474		58348	
Torque (lb. in.) Pinion	410		644		1176		1981		3337		5558		9998		15737		29174	

Note: All dimensions are in inches. *Cannot be reworked. **Keyway Unchanged a - ¾ thread length

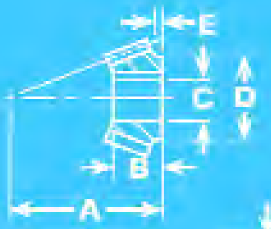


Figure 10

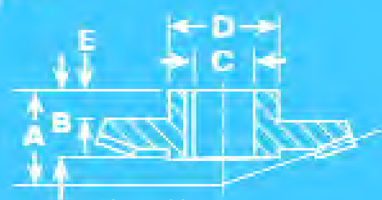


Figure 11

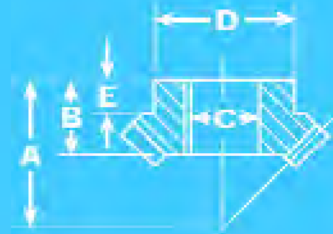


Figure 12

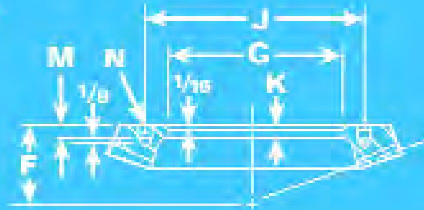
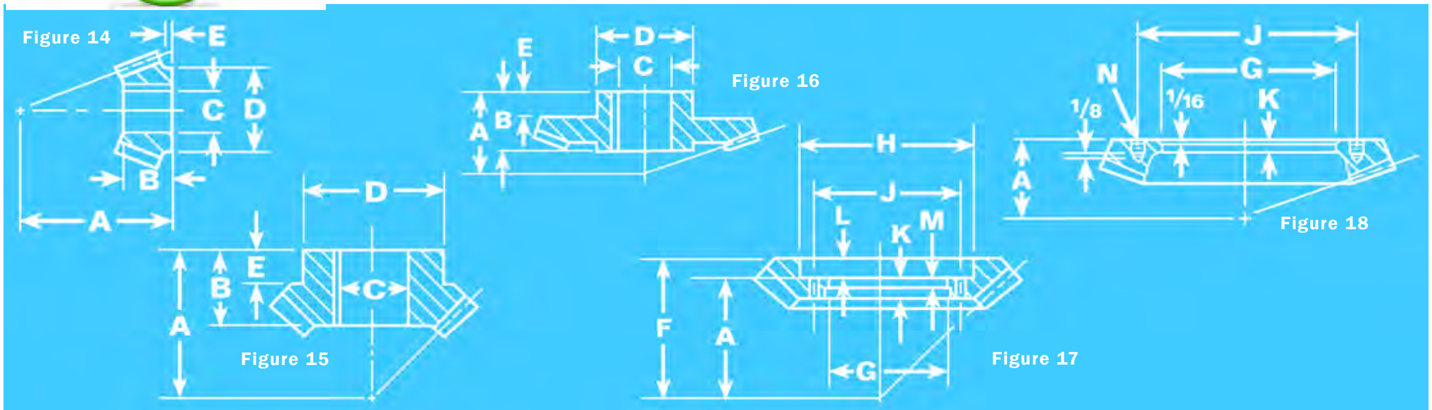


Figure 13

Part No.		10P45L15	10P15R45	8P45L15	8P15R45	7P45L15	7P15R45	6P45L15	6P15R45	55P48L16	55P16R48	5P48L16	5P16R48	45P51L17	45P17R51	4P54L18	4P18R54	338P54L18	338P18R54
Figure		10	11	10	11	10	13	10	13	10	13	10	13	10	13	10	13	12	13
Gear Outside Dia.		4.492		5.627		6.438		7.514		8.725		9.625		11.364		13.523		16.015	
Gear Pitch Dia.		4.500		5.625		6.429		7.500		8.727		9.600		11.333		13.500		16.000	
Pinion Outside Dia.		1.716		2.138		2.462		2.882		3.283		3.611		4.304		5.021		5.964	
Pinion Pitch Dia.		1.500		1.875		2.143		2.500		2.909		3.200		3.778		4.500		5.333	
Combination		15	45	15	45	15	45	15	45	16	48	16	48	17	51	18	54	18	54
Diametral Pitch		10		8		7		6		5½		5		4½		4		3⅜	
Face Width		11/16		13/16		1		1⅛		1¼		1½		1¾		2		2½	
A Mount Dist.		2⅜	1⅝	2 15/16	2	3½		3 15/16		4 9/16		5 1/16		5 15/16		7 1/16		8⅜	
B Bore Length		¾	1⅛	⅞	1⅜	1¼		1 3/16		1⅜		1⅝		1⅞		2⅛		2⅝	
C Bore Dia.	+.0005 -.0000	⅝	1 1/16	¾	1 5/16	15/16		1 3/16		1 5/16		1 7/16		1 11/16		1 15/16		2⅜	
D Hub Dia.		1¼	2⅛	1½	2⅜	1⅞		2⅛		2½		2⅞		3⅛		3½		3½	
E Hub Length		1/16	7/16	1/16	⅝	3/16		⅛		⅛		3/16		⅛		⅛		¼	
F Mount Dist.							1¾		1 15/16		2 3/16		2 5/16		2 13/16		3⅛		3¾
G Bore Dia.	+.001 -.000						3¾		4½		5¼		5¾		7		8½		10¾
J Bolt Circle							4⅞		5⅝		6⅝		7⅛		8⅜		10		12
K Web Thick.							½		½		½		½		½		½		¾
M Thread Length							7/16		7/16		½		½		¾		¾		⅞
Screw N	Size						5/16-24		5/16-24		⅜-24		⅜-24		½-20		½-20		½-20
	No. Req'd						6		6		8		8		10		10		12
Keyway		3/16x1/16	¼x3/32	3/16x1/16	⅜x⅛	¼x3/32		¼x3/32		⅜x⅛		⅜x⅛		⅜x⅛		½x3/16		⅝x7/32	
**Max. Bore		*	1 7/16	*	1½	*	*	*	*	*	*	*	*	1⅞	*	2¼	*	2⅜	10¾
Wt. each, lbs.		.25	2.50	.50	4.00	.75	3.88	1.00	5.12	1.5	7.5	2.25	9.62	3.50	16.50	5.75	22.50	10	37.5
Torque (lb. in.)	Gear	1621		2993		4812		7143		10405		14752		23039		35446		67622	
	Pinion	540		998		1604		2381		3468		4917		7680		11815		22541	

Note: All dimensions are in inches. *Cannot be reworked. **Keyway Unchanged



Part No.	8P24L16	8P16R24	7P24L16	7P16R24	6P24L16	6P16R24	6P30L20	6P20R30	5P30L20	5P20R30	5P36L24	5P24R36	45P39L26	45P26R39	4P42L28	4P28R42	35P45L30	35P30R45	290P45L30	290P30R45
Figure	14	15	14	15	14	15	15	16	15	16	15	16	15	17	17	17	17	17	15	18
Gear Outside Dia.	3.037		3.496		4.070		5.067		6.080		7.278		8.722		10.589		12.943		15.639	
Gear Pitch Dia.	3.000		3.429		4.000		5.000		6.000		7.200		8.667		10.500		12.857		15.500	
Pinion Outside Dia.	2.169		2.506		2.930		3.578		4.290		5.094		6.065		7.355		8.960		10.908	
Pinion Pitch Dia.	2.000		2.286		2.667		3.333		4.000		4.800		5.778		7.000		8.571		10.334	
Combination	16	24	16	24	16	24	20	30	20	30	24	36	26	39	28	42	30	45	30	45
Diametral Pitch	8		7		6		6		5		5		4 1/2		4		3 1/2		2.903	
Face Width	5/8		11/16		13/16		1		1 1/8		1 1/4		1 3/8		1 3/4		2		2 3/4	
A Mount Dist.	1 15/16	1 3/4	2 3/16	2	2 1/2	2 1/4	3	2 3/4	3 1/2	3 1/8	4 1/4	3 9/16	5 3/16	2 7/8	4 11/16	3 5/16	5 13/16	4 1/8	8 5/8	6 1/8
B Bore Length	7/8	1	1	1 1/8	1 1/8	1 1/4	1 1/4	1 5/8	1 3/8	1 7/8	1 5/8	2	1 7/8						3 1/4	
C Bore Dia. +.0005 -.0000	3/4	15/16	15/16	1 1/16	1 1/16	1 3/16	1 3/16	1 7/16	1 5/16	1 11/16	1 7/16	1 15/16	1 11/16						3 3/8	
D Hub Dia.	1 1/2	1 7/8	1 7/8	2 1/8	2 1/8	2 3/8	2 3/8	2 7/8	2 3/4	3 1/8	3 1/4	3 1/2	3 5/8						6	
E Hub Length	1/4	7/16	5/16	7/16	7/16	9/16	5/16	11/16	5/16	11/16	3/8	9/16	9/16						1/2	
F Apex to Back.														3 1/2	5 9/16	4	6 13/16	4 7/8		
G Bore Dia. +.001 -.000														4 1/4	3 1/4	5 1/2	4	6 1/2		10
H C'bore Dia.														6	4 7/8	7 1/4	6	8 7/8		
J Bolt Circle														5 1/8	4	6 3/8	4 7/8	7 3/4		11 1/2
K Web Thick.														5/8	7/8	5/8	7/8	3/4		5/8
L C'Bore Dia.														5/8	7/8	11/16	1	3/4		
M Bore Length														5/16	5/16	5/16	5/16	5/16		
Holes Size														13/32	13/32	13/32	17/32	17/32		1/2-20a
Holes No.														12	12	12	12	12		12
Keyway	3/16x1/16	1/4x3/32	1/4x3/32	1/4x3/32	1/4x3/32	1/4x3/32	1/4x3/32	3/8x1/8	3/8x1/8	3/8x1/8	3/8x1/8	1/2x3/16	3/8x1/8						7/8x5/16	
**Max. Bore	*	1 3/16	*	1 9/16	*	1 11/16	1 11/16	1 5/8	1 7/8	2 1/4	2 1/2	2 5/8	2 3/4	*	*	*	*	*	4 3/8	10
Wt. each, lbs.	.38	1.00	.75	1.62	1.00	2.25	1.63	4.37	3.38	6.25	5.25	11.50	8.62	9.50	8.25	14.00	13.50	25.50	44.5	45
Torque (lb. in.) Gear	902		1295		2084		3850		5960		8658		13122		23370		37958		81825	
Torque (lb. in.) Pinion	601		863		1389		2567		3973		5772		8748		15580		25305		54550	

Note: All dimensions are in inches. *Cannot be reworked. **Keyway Unchanged a - 7/8 thread length

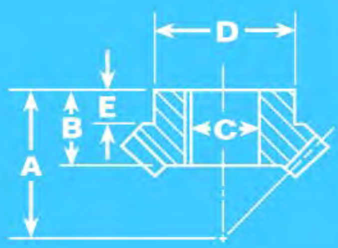


Figure 19

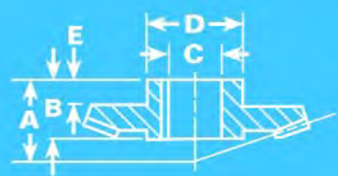


Figure 20

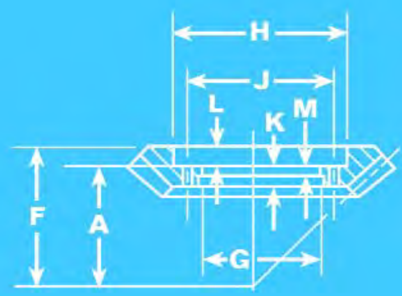
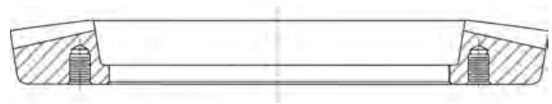


Figure 21

Part No.	8P28L21	8P21R28	7P28L21	7P21R28	6P32L24	6P24R32	5P32L24	5P24R32	4P32L24	4P24R32	35P36L27	35P27R36	3P36L27	3P27R36
Figure	19	19	19	19	19	20	19	20	19	21	21	21	21	21
Gear														
Outside Dia.	3.548		4.068		5.379		6.503		8.084		10.434		12.152	
Pitch Dia.	3.500		4.000		5.333		6.400		8.000		10.286		12.000	
Pinion														
Outside Dia.	2.789		3.186		4.219		5.053		6.288		8.117		9.424	
Pitch Dia.	2.625		3.000		4.000		4.800		6.000		7.714		9.000	
Combination	21	28	21	28	24	32	24	32	24	32	27	36	27	36
Diametral Pitch	8		7		6		5		4		3 1/2		3	
Face Width	11/16		3/4		1		1 1/4		1 1/2		1 3/4		2	
A Mount Dist.	2 1/4	2 1/8	2 5/8	2 7/16	3 3/8	3	3 15/16	3 7/16	4 15/16	2 7/8	4 3/4	3 3/4	5 7/16	4 7/16
B Bore Length	1	1 1/8	1 1/8	1 1/4	1 3/8	1 5/8	1 5/8	1 7/8	2					
C Bore Dia. +.0005 -.0000	15/16	1 1/16	1 1/16	1 3/16	1 5/16	1 7/16	1 7/16	1 11/16	1 13/16					
D Hub Dia.	1 7/8	2 1/8	2 1/8	2 3/8	2 3/4	2 7/8	3 1/4	3 1/8	3 3/4					
E Hub Length	3/8	1/2	7/16	9/16	7/16	9/16	7/16	9/16	5/8					
F Apex to Back.										3 1/2	5 1/2	4 1/2	6 1/2	5 3/16
G Bore Dia. +.001 -.000										3 3/4	3 1/2	5	4	6
H C'bore Dia.										5 3/8	5 1/8	7 1/4	6	8 1/8
J Bolt Circle										4 1/2	4 1/4	6 1/8	4 7/8	7
K Web Thick.										5/8	3/4	3/4	3/4	3/4
L C'bore Depth										5/8	3/4	3/4	1 1/16	3/4
M Bore Length										5/16	5/16	5/16	5/16	5/16
Holes Size										13/32	13/32	17/32	17/32	17/32
Holes No.										12	12	12	12	12
Keyway	1/4x3/32	1/4x3/32	1/4x3/32	1/4x3/32	3/8x1/8	3/8x1/8	3/8x1/8	3/8x1/8	1/2x3/16					
****Max. Bore**	1 3/16	1 7/16	1 9/16	1 11/16	2	2	2 3/8	2 1/8	2 3/4	*	*	*	*	*
Wt. each, lbs.	1.00	1.50	1.25	2.38	3.00	5.25	5.12	8.28	9.38	8.12	10.25	15.75	16.00	24.00
Torque (lb. in.) Gear	1469		2025		4324		7435		13185		23356		34959	
Torque (lb. in.) Pinion	1102		1519		3243		5576		9889		17517		26219	

Note: All dimensions are in inches. *Cannot be reworked. **Keyway Unchanged

China Gear-STAN® Standard (Non-Stock) Ratios



China Gear-Stan gear style used on ring gears.

The combinations listed in the following pages represent a line of Spiral Bevel Gears in sizes larger than our general selection of stock gears. We are tooled to produce these gear combinations without undue delays other than the normal time needed for the machining processes.

They are listed in groups according to the Pitch Diameter of the ***gear***, with a suitable selection of ratios to cover a wide range of applications. (Please contact our Design Engineering Department for other sizes and ratios.)

All ring gears are carburized and ***die quenched*** on the most modern type of equipment available, and kept to the closest possible limits of flatness and roundness.

As in our stock gear line, capacities are rated in terms of torque. The allowable torque, as shown on page 4, must be calculated before selecting gear size.

Ring gears should be ordered as shown in the following tables to take advantage of extensive tooling available. Pinion members can be designed to suit your machine or housing. Pinions of ratios higher than 3:1 are usually designed integral with the shaft because of fastening problems.

14 INCH PITCH DIAMETER OF GEAR

SIZES				SPECIFICATION						DESIGN				CAPACITY	
O.D.		Pitch Dia.		Ratio	Combi-nation	Diam. Pitch	Face Width	Mounting Distance		Bore	Bolt Circle Dia.	No. of Bolts	Bolt Size	Torque Pinion Lb. Inches	Torque Gear Lb. Inches
Gear	Pinion	Gear	Pinion					Gear	Pinion (Min.)						
14.027	5.973	14	5.50	2.55	22-56	4.00	2¼	3½	7¾	9.250	10.500	12	½-20	16950	43145
14.030	5.220	14	4.75	2.95	20-59	4.21	2¼	3¼	7¾	9.250	10.500	12	½-20	14183	41840
14.019	3.993	14	3.55	3.94	17-67	4.79	2¼	2¾	7½	9.250	10.500	12	½-20	9839	38777
13.990	3.517	14	3.09	4.53	15-68	4.86	2¼	2⅝	7½	9.250	10.500	12	½-20	8367	37930

16 INCH PITCH DIAMETER OF GEAR

16.040	6.837	16	6.28	2.55	22-56	3.50	2½	4	8½	10.750	12.000	12	½-20	23790	60556
15.950	4.599	16	4.06	3.94	17-67	4.19	2½	3	8½	10.750	12.000	12	½-20	13810	54428
16.019	3.720	16	3.24	4.93	15-74	4.63	2½	2⅞	8½	10.750	12.000	12	½-20	10380	51208

18 INCH PITCH DIAMETER OF GEAR

SIZES				SPECIFICATION						DESIGN				CAPACITY	
O.D.		Pitch Dia.		Ratio	Combi-nation	Diam. Pitch	Face Width	Mounting Distance		Bore	Bolt Circle Dia.	No. of Bolts	Bolt Size	Torque Pinion *Lb. Inches*	Torque Gear *Lb. Inches*
Gear	Pinion	Gear	Pinion					Gear	Pinion (Min.)						
18.196	18.196	18	18	1.00	39-39	2.17	3 13/16	10	10	10.750	13.375	12	½-20	147373	147373
18.062	7.980	18	7.33	2.46	22-54	3.00	2¾	4¾	9½	12.500	14.125	12	½-20	33827	83030
18.015	6.558	18	5.89	3.06	18-55	3.06	2¾	4	9½	12.500	14.125	12	½-20	26219	80114
18.013	5.235	18	4.58	3.93	15-59	3.28	2¾	3½	9¼	12.500	14.125	12	½-20	19457	76531
18.034	4.235	18	3.65	4.93	14-69	3.83	2¾	3	9¼	12.500	14.125	12	½-20	14362	70784

20 INCH PITCH DIAMETER OF GEAR

20.218	20.218	20	20	1.00	39-39	1.95	4¼	11	11	12.500	14.625	12	⅝-18	196902	196902
20.086	8.795	20	8	2.5	20-50	2.50	3	5¼	10½	13.875	15.500	12	⅝-18	44196	110490
20.025	7.987	20	7.47	2.68	28-75	3.75	3	4¾	10½	13.875	15.500	12	⅝-18	36101	96702
20.026	7.466	20	6.93	2.88	26-75	3.75	3	4½	10½	13.875	15.500	12	⅝-18	33291	96032
20.023	6.318	20	5.71	3.50	20-70	3.50	3	4	10½	13.875	15.500	12	⅝-18	27588	96558
20.015	5.641	20	5.07	3.95	19-75	3.75	3	3½	10½	13.875	15.500	12	⅝-18	23520	92842
20.012	4.856	20	4.27	4.69	16-75	3.75	3	3¼	10½	13.875	15.500	12	⅝-18	19418	91022

22 INCH PITCH DIAMETER OF GEAR

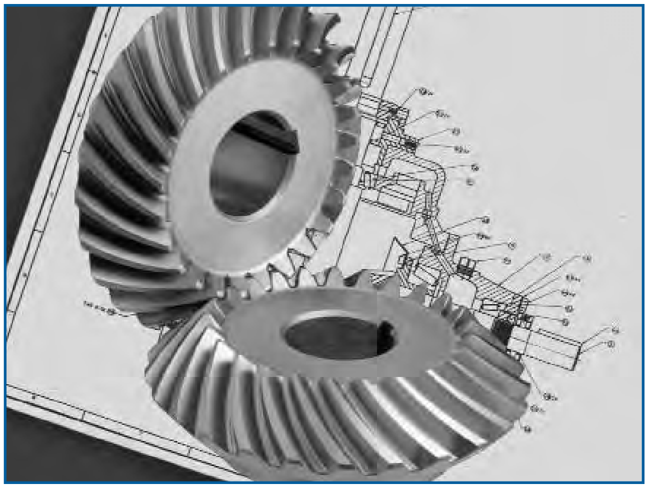
22.175	22.175	22	22	1.0	39-39	1.77	4 43/64	12¼	12¼	13.875	16.000	12	¾-16	255914	255914
22.079	8.069	22	7.33	3.00	21-63	2.86	3¼	4¾	11½	15.000	17.000	12	¾-16	43419	130257
22.042	6.171	22	5.50	4.00	18-72	3.27	3¼	4	11½	15.000	17.000	12	¾-16	30092	120372
22.012	5.633	22	4.99	4.41	17-75	3.41	3¼	3¾	11½	15.000	17.000	12	¾-16	26602	117362
22.010	5.057	22	4.40	5.00	15-75	3.41	3¼	3½	11½	15.000	17.000	12	¾-16	23122	115610

24 INCH PITCH DIAMETER OF GEAR

24.243	24.243	24	24	1.00	42-42	1.75	5 7/64	13¼	13¼	15.250	17.000	12	¾-16	319016	319016
24.045	11.932	24	11.37	2.11	36-76	3.17	3¼	6¾	12½	17.500	19.500	12	¾-16	69528	146781
24.041	9.667	24	9.00	2.67	27-72	3.00	3¼	5½	12½	17.500	19.500	12	¾-16	54907	146419
24.048	8.586	24	7.73	3.11	19-59	2.46	3¼	5	12½	17.500	19.500	12	¾-16	49704	154344
24.027	8.146	24	7.44	3.23	22-71	2.96	3¼	5	12½	17.500	19.500	12	¾-16	44722	144330
24.012	7.585	24	6.86	3.50	20-70	2.92	3¼	4½	12½	17.500	19.500	12	¾-16	41120	143920
23.985	6.141	24	5.44	4.41	17-75	3.13	3¼	4	12½	17.500	19.500	12	¾-16	30977	136667

Now...from the spiral bevel gear specialists

GROUND TOOTH SPIRAL BEVEL GEARS ...FROM STOCK



China Gear Manufacturing Inc. was the first gear manufacturer to offer ground tooth spiral bevel gears . . .
from stock. The most popular sizes of 1:1 and 2:1 ratios are currently available for time-saving, off-the-shelf delivery.

Every stock ground tooth gear is designed and manufactured to fulfill the following requirements for discriminating gear buyers.

Speeds in Excess of 8,000 SFPM

Ground tooth spiral bevel gears should be used for speeds exceeding 8000 surface feet per minute. Ground tooth spiral bevel gears make velocity factor devaluation unnecessary. (See page 4.)
A constant velocity factor of 1.00 means you transmit more torque or horsepower . . . up to
30% more with the same size gear and pinion.

Reduce Gear Noise

Ground tooth spiral bevel gears are a design "must" at high speeds to reduce the decibel level of your gear box. Tooth contact ratios are maintained to a minimum of 2.0 to assure quiet operations.

Eliminate Positioning Errors

To achieve near "zero" positioning error, designers and manufacturers of radar systems, navigational gear, printing presses and machine tools specify ground tooth spiral bevel gears.

Higher Quality

All China Gear ground tooth spiral bevel gears are manufactured to AGMA Quality Number 11 or better.

High Capacity

Have your gear capacity requirements outgrown your present housing and mountings? Eliminate unnecessary redesigning or gear box size increases. Investigate the possible use of ground tooth spiral bevel gears for increased capacity. All China Gear ground tooth gears are shot peened for additional fatigue life.

Uniform Load-Carrying Capabilities

Grinding gear teeth corrects heat treat distortion to minimize tooth spacing errors and increase load capacity.

Arrow's On Demand Program for Ground Tooth Spiral Bevel Gears

China Gear is able to produce ground tooth spiral bevel gears from a wide variety of our stock gears, and do so in a fraction of the time when compared to producing a ground tooth gear from scratch. This ability promises to offer many benefits to manufacturers of power transmission systems.

1 TO 1 RATIO

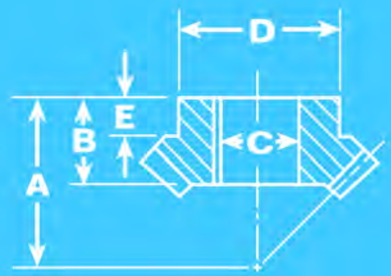


Figure 22

2 TO 1 RATIO

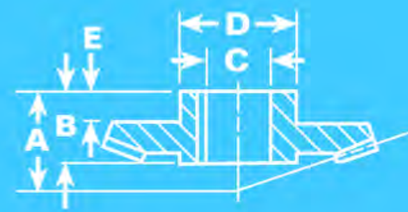


Figure 23

Part No.	35GT35L35	35GT35R35	40GT35L35	40GT35R35	50GT35L35	50GT35R35	60GT35L35	60GT35R35	45GT46L23	45GT23R46	54GT40L20	54GT20R40	67GT46L23	67GT23R46
	22	22	22	22	22	22	22	22	22	23	22	23	22	23
Gear Outside Dia. / Pitch Dia.	3.560 / 3.500		4.075 / 4.000		5.110 / 5.000		6.144 / 6.000		4.518 / 4.500		5.446 / 5.429		6.664 / 6.667	
Pinion Outside Dia. / Pitch Dia.	3.560 / 3.500		4.075 / 4.000		5.110 / 5.000		6.144 / 6.000		2.424 / 2.250		2.935 / 2.714		3.596 / 3.333	
Combination	35	35	35	35	35	35	35	35	23	46	20	40	23	46
Diametral Pitch	10		8.75		7		5.833		10.222		7.368		6.9	
Face Width	1 13/16		1		1 3/16		1 5/16		13/16		1		1 3/16	
A Mount Dist.	2 9/16		2 13/16		3 7/16		4 1/8		2 9/16	2 1/16	3	2 7/16	3 11/16	2 15/16
B Bore Length	1 1/4		1 3/8		1 5/8		1 7/8		1	1 3/8	1 1/8	1 5/8	1 3/8	1 7/8
C Bore Dia. +.0005 -.0000	1 3/16		1 5/16		1 7/16		1 11/16		7/8	1 5/16	1 1/16	1 7/16	1 5/16	1 11/16
D Hub Dia.	2 1/2		2 3/4		3 1/4		3 5/8		1 3/4	2 1/2	2 1/8	2 7/8	2 3/4	3 1/8
E Hub Length	9/16		9/16		9/16		3/4		1/4	9/16	3/16	5/8	9/32	13/16
Keyway	1/4x3/32		3/8x1/8		3/8x1/8		3/8x1/8		3/16x1/16	3/8x1/8	1/4x3/32	3/8x1/8	3/8x1/8	3/8x1/8
***Max. Bore**	1 11/16		1 7/8		2 1/2		2 3/4		1	1 1/2	1 3/16	2	1 5/8	2 1/4
Wt. each, lbs.	1.88		2.69		5.25		8.25		.62	2.87	1.00	5.00	2.00	8.00
Torque (lb. in.) **Gear**	1807		2809		4929		7496			2300		3922		6686
Torque (lb. in.) **Pinion**	1807		2809		4929		7496		1150		1961		3343	

Note: All dimensions are in inches. *Keyway Unchanged.

BEAR GEAR

TANGENTIAL LOAD COEFFICIENTS FOR BEARING LOADS

The normal load on spiral bevel gear tooth surfaces may be resolved into three (3) components: (Wt) tangential; (Wx) axial and (Wr) radial.

The tangential and radial components act in a plane perpendicular to the gear axis and produce radial bearing loads. The axial component acts in a direction parallel to the axis producing thrust plus additional radial bearing loads.

The value of the axial and radial loads can be determined by multiplying the tangential load at mid face (Wtm) by the applicable coefficient (Kx) or (Kr) for the concave or convex load face of either the pinion (p) or the gear (g).

Fig. 24 is a table of coefficients (Kx) and (Kr) vs. gear ratios for 35° spiral bevel gears with 90° shaft angles and 20° pressure angle. Note the (+) values indicate forces tending to separate the two gears and the (-) values indicate forces drawing the gears into tighter mesh.

Fig. 24 - Tangential Load Coefficients for Bearing Loads

Coefficients for Spiral Bevel Gears:
$\Sigma = 90°$ Shaft Angle / $\phi = 20°$ Pressure Angle / $\psi = 35°$ Spiral Angle

Load Face	Concave Pinion	Convex Gear	Convex Pinion	Concave Gear
Ratio Ng/np	Kxp=(Krg)	Kxg=(Krp)	Kxp=(Krg)	Kxg=(Krp)
1.0	.809	-.181	-.181	.809
1.1	.817	-.142	-.219	.800
1.2	.822	-.107	-.253	.790
1.3	.826	-.075	-.284	.779
1.4	.828	-.045	-.312	.769
1.5	.829	-.019	-.336	.758
1.6	.829	.006	-.358	.748
1.7	.829	.028	-.378	.738
1.8	.828	.048	-.396	.728
1.9	.827	.067	-.413	.719
2.0	.825	.084	-.428	.711
2.5	.815	.152	-.485	.673
3.0	.805	.200	-.524	.643
3.5	.795	.235	-.551	.620
4.0	.787	.261	-.572	.601
4.5	.780	.282	-.587	.586
5.0	.774	.298	-.599	.573
5.5	.768	.312	-.609	.562
6.0	.764	.323	-.618	.553
6.5	.760	.333	-.625	.546
7.0	.756	.341	-.630	.539
7.5	.753	.348	-.635	.533
8.0	.750	.354	-.640	.528
8.5	.747	.359	-.643	.523
9.0	.745	.364	-.647	.519
9.5	.743	.369	-.650	.515
10.0	.741	.372	-.653	.512

W_t = Tangential Load = $\dfrac{126050\ HP}{d\ RPM_p}$

W_{tm} = Tangential Load at Mid-Face = $\dfrac{W_t}{\left[1-\dfrac{F}{d\sqrt{1+mg^2}}\right]}$

W_x = Axial Load Component = $K_x W_{tm}$
W_r = Radial Load Component = $K_r W_{tm}$
$r_{mp} = \dfrac{d}{2} - \dfrac{F}{\sqrt{2\,(1+mg)^2}}$

HP = Horsepower
d = Pinion Pitch Diameter
F = Face Width
mg = Ratio NG/NP
K_x = Axial Coefficient
K_r = Radial Coefficient
RPM_p = Pinion RPM
r_{mp} = pinion mean pitch radius
r_{mg} = gear mean pitch radius
$r_{mg} = r_{mp} \times mg$

Fig. 25 - Normal Tooth Load Components

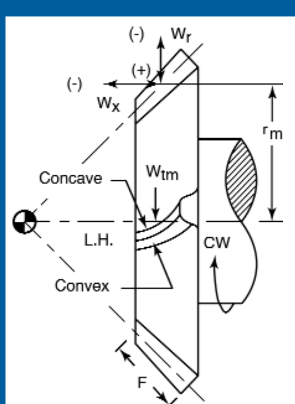


Fig. 26 - Normal Backlash at Tightest Point of Mesh

Diametral Pitch	Backlash
1	.020" to .030"
2	.012" to .016"
3	.008" to .011"
4	.006" to .008"
6	.004" to .006"
10	.002" to .004"
20 and Finer	.001" to .003"

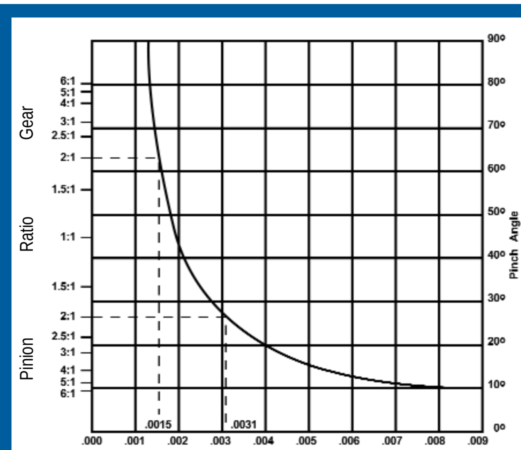


Fig. 27 - Axial Movement Per .001" Change in Backlash (Inches)

A means of inspecting the gears in mesh is desirable both from an assembly standpoint and for periodic check. An inspection hole and cover should be arranged so that the contact pattern can be observed on the teeth of both members of the gear set.

In storage or during shipment lapped gears should always be fastened together in pairs or sets, and they should not be separated until ready to assemble.

INSTALLATION

Mounting Distance

The correct setting or adjustment of the pinion at assembly is most important. Provision should be made for adjusting both the gear and pinion axially. It is advisable to first adjust the pinion to its correct mounting distance (See figure 28), determined by measurement or by a gage centered on the gear shaft or a “dummy” shaft made for this purpose. The gage may be arranged to measure from the center of the gear shaft to a flat on the extreme small end of the pinion teeth or to the back face of the pinion hub. After the pinion has been correctly positioned, the gear should then be adjusted to mesh with the pinion to obtain the desired amount of backlash.

The shims used in adjusting the gear and pinion location, and the bearing preload, should not be less than 0.015" thick and should preferably be on the stationary member of the bearing.

Backlash

Bevel gears should be manufactured and assembled to have a definite amount of backlash, which varies according to pitch and operating conditions. Backlash is necessary for safe operation. If gears are set too tight they will be noisy, wear excessively, and possibly scuff the tooth surfaces, or even break. Figure 27 shows the ratio at which the axial movement of either member affects the backlash.

Figure 26 suggests the recommended normal backlash at tightest point of mesh for gears assembled, ready to run. The backlash values etched on China gears are derived from this table and apply to the tightest point of mesh.(See also Figure 29). In many instances, these limits will require modifications to suit the special conditions of operation.

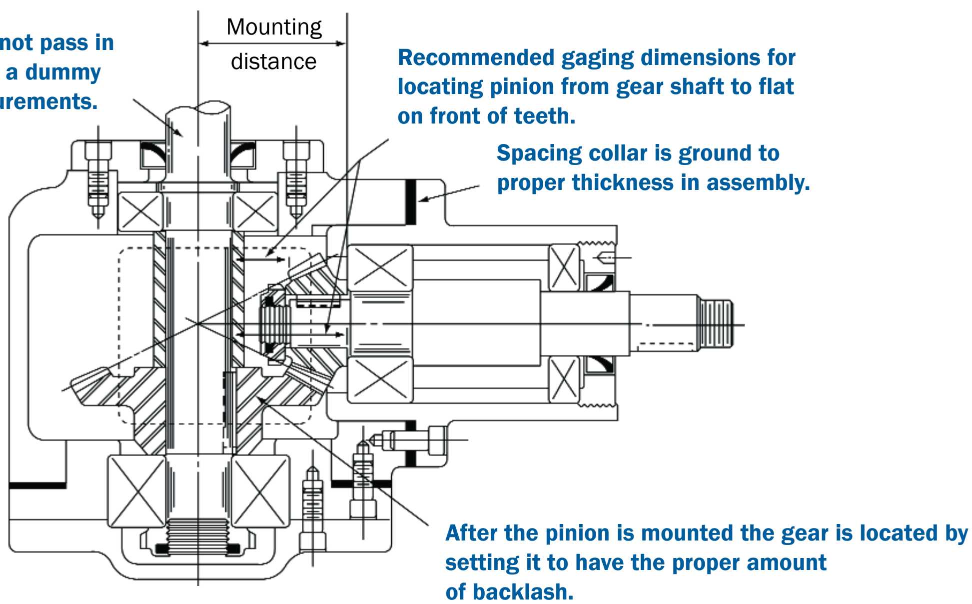


Fig. 28 - Measuring or gaging as shown is the recommended method for locating the pinion. Pinion should be set to mounting distance marked on pinion, and gear should be adjusted to give correct backlash.

Courtesy: The Gleason Works

MOUNTINGS

Rigid mountings should be provided to hold the displacements of the gears under operating loads within recommended limits. Care should be taken to see that keys are hardened, properly fitted and that couplings are not out of true or out of square.

For a number of years the Gleason Works has been making deflection tests on gears and their mountings and observing these same units in service. From these tests the recommended allowable deflections under maximum service load have been determined for gears from 6" to 15" diameter:

1. The pinion should not lift or depress more than 0.003".
2. The pinion should not yield axially more than 0.003" in either direction.
3. The gear should not lift or depress more than .003".
4. The gear should not yield axially more than 0.003" in either direction on miters or near miters or more than 0.010" away from the pinion on higher ratios.

Spiral bevel gears should in general be mounted on anti-friction bearings in an oil-tight case. While designs may be made for a given set of conditions using plain bearings for radial and thrust loads, the problem of maintaining the gears in satisfactory alignment is usually more easily accomplished with ball or roller bearings.

There are two general types of pinion mountings, namely the straddle and the overhung mounting. Either ball or roller bearings may be used in both types of mountings.

Ball bearings with extremely small axial yield should be used behind each pinion to take care of combined thrust and radial loads.

Matched angular contact or double row deep groove angular contact bearings are preferred. At the other end of the shaft a single row radial bearing may be used as shown in Figures 30 and 33.

When mounted on taper roller bearings, the indirect mounting should be used. That is, the large ends of the tapered rollers of each bearing should point outward as shown in Figures 31 and 32. The thrust load of the pinion is thus absorbed by the bearing adjacent to the pinion and the reverse thrust load will be taken by the opposite bearing.

In either type of mounting both the gears and thrust bearings should be locked against thrust in either direction. This applies to straight bevel and Zerol® bevel gears as well as to spiral bevel and hypoid gears. It is accepted practice to preload the bearings to remove initial freedom in the mounting. The amount of preload depends upon the mounting load and operating speed, and should be established by the bearing manufacturer.

Fig. 29 - All China Gear Stock Gears are marked with the above assembly information.

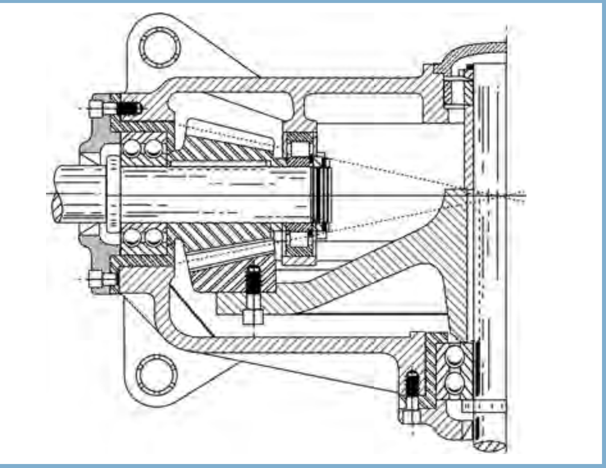


Fig. 30 - Typical straddle mounting for both members of a spiral bevel pair

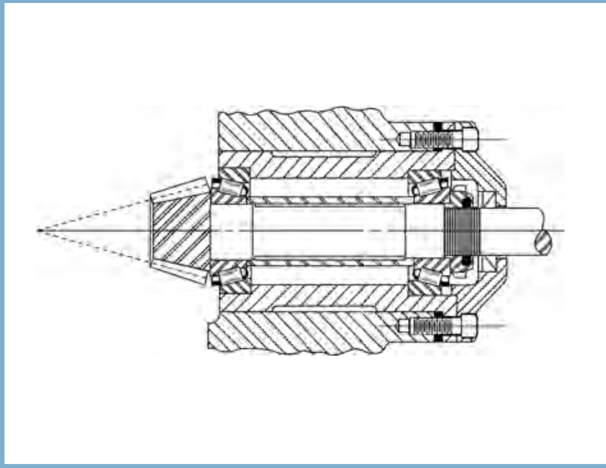


Fig. 31 - This mounting is another form of bearing arrangement for overhung pinions.

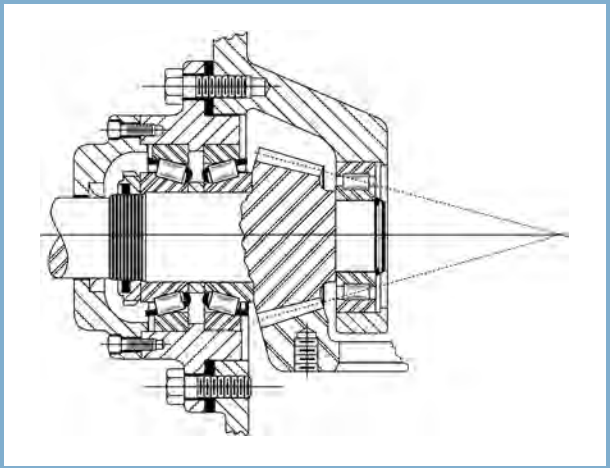


Fig. 32 - Straddle pinion mounting for short shafts showing use of combined thrust and radial bearings. Gear mounted in oil-tight case.

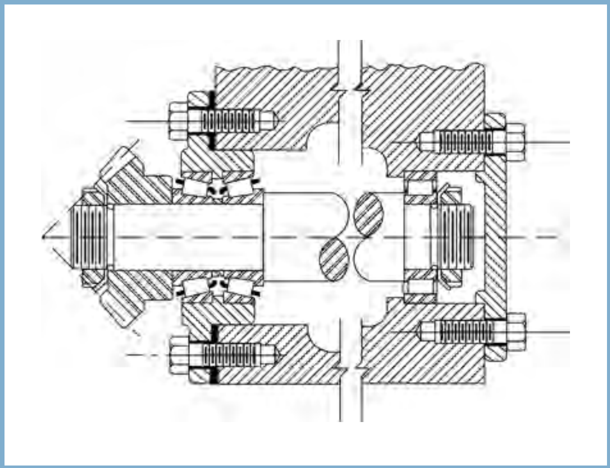


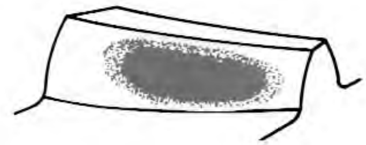
Fig. 33 - Arrangement recommended for long shafts to prevent temperature changes affecting position of gear mounted in oil-tight case.

Acknowledgment is gratefully extended to Gleason Works, Rochester, New York and to the American Gear Manufacturers Association for portions of the text and illustrative material used in this section.

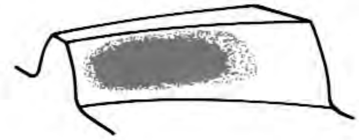
BEARING PATTERN

Using a suitable marking compound, check the bearing pattern. If the markings on the gear set have been followed, the pattern will conform to accepted standards.

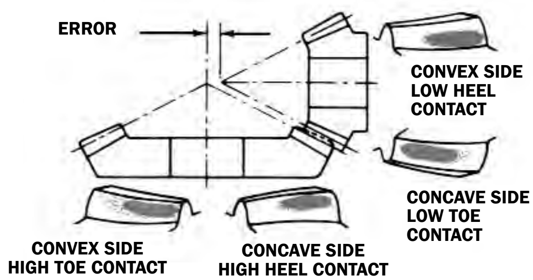
Gears are cut with a contact pattern about half the length of the tooth, the location slightly favoring the toe end of the tooth. Under load the pattern will shift somewhat toward the heel of the tooth, and will thus become more central. Under no circumstances must the pattern be concentrated on the ends of the teeth.



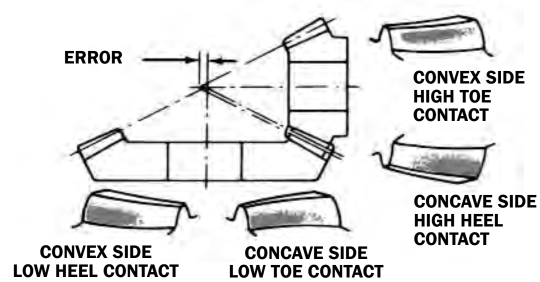
Desirable Bearing Pattern



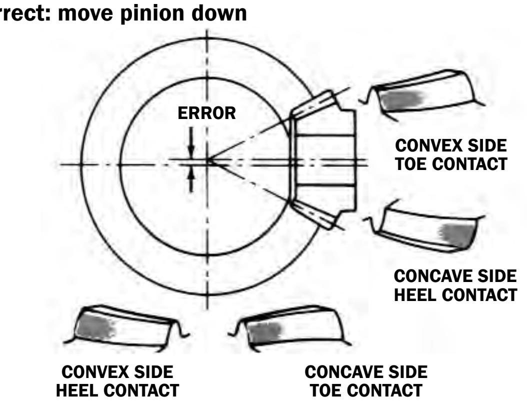
PROFILE ERROR
To correct: decrease mounting distance



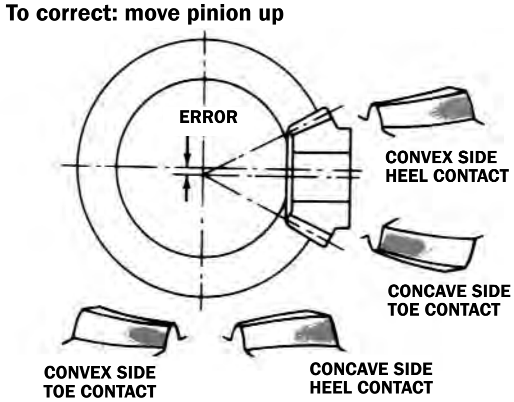
PROFILE ERROR
To correct: increase mounting distance



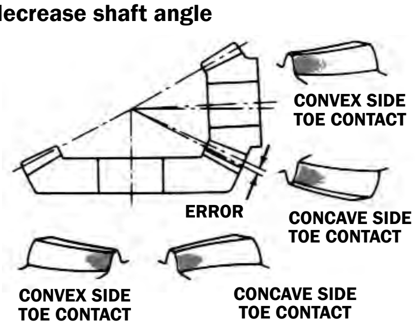
CROSS CONTACT
To correct: move pinion down



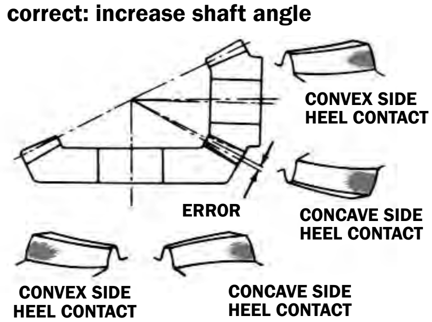
CROSS CONTACT
To correct: move pinion up



SHAFT ANGLE ERROR
To correct: decrease shaft angle



SHAFT ANGLE ERROR
To correct: increase shaft angle



(Note: Pinion member is left hand in all illustrations.)

All Illustrations: Courtesy of The Gleason Works.

APPLICATION ENGINEERING INFORMATION

GEARS AND GEARDRIVES

Provide the following data in line with your specific requirements.
Please complete the form, reproduce it, and send it along with a sketch of the application.

Company ______________________________

Name ____________________ Title ____________________

Street ______________________________

City ____________________ State ________ Zip ________ Country ________

Telephone ____________________ Fax ____________________

Email ____________________

1. QUANTITY: Prototype ____________ Production ____________

2. APPLICATION: ______________________________

3. RATIO: Approx ____________ Exact ____________ Reducer ☐ Increaser ☐
Reversing: Yes ☐ No ☐

4. RATING: Normal Input HP ________ @RPM ________ Torque ________
Maximum Input HP ________ @RPM ________ Torque ________

5. TYPE OF LOAD: Uniform ☐ Med. Shock ☐ Hi Shock ☐

Prime Mover ______________________________

GEAR DATA

Type:

- ☐ Spiral Bevel
- ☐ Zerol Bevel
- ☐ Straight Bevel
- ☐ Hypoid
- ☐ Spur
- ☐ Helical
- ☐ Other

Pitch ____________

No of teeth ____________

Pr Angle ____________

Spiral Angle ____________

Shaft Angle ____________

AGMA Class ____________

Material ____________

Part No. ____________

ENCLOSED DRIVES

Shaft Requirements:

☐ Parallel ☐ Intersect ☐ Skew

☐ Angle ____________

☐ Other ____________

Duty Cycle ____________

____

B10 Life ____________ hrs

Overhung load ____________

Type of Lub. ____________

6. Size Limitations ______________________________

7. IT IS ESSENTIAL THAT YOU SEND AN ASSEMBLY PRINT OR SKETCH SHOWING

a. driving member and direction of rotation
b. means of absorbing axial & radial gear loads
c. provisions for adjusting backlash
d. method of connecting the gearset to power source
e. size & mounting constraints

8. STATE ANY UNUSUAL DESIGN PARAMETERS ______________________________

____

____

____

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No. 49, Salkang Avenue, Furong Industrial Zone, Shajing, Baoan, Shenzhen, China 518125
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