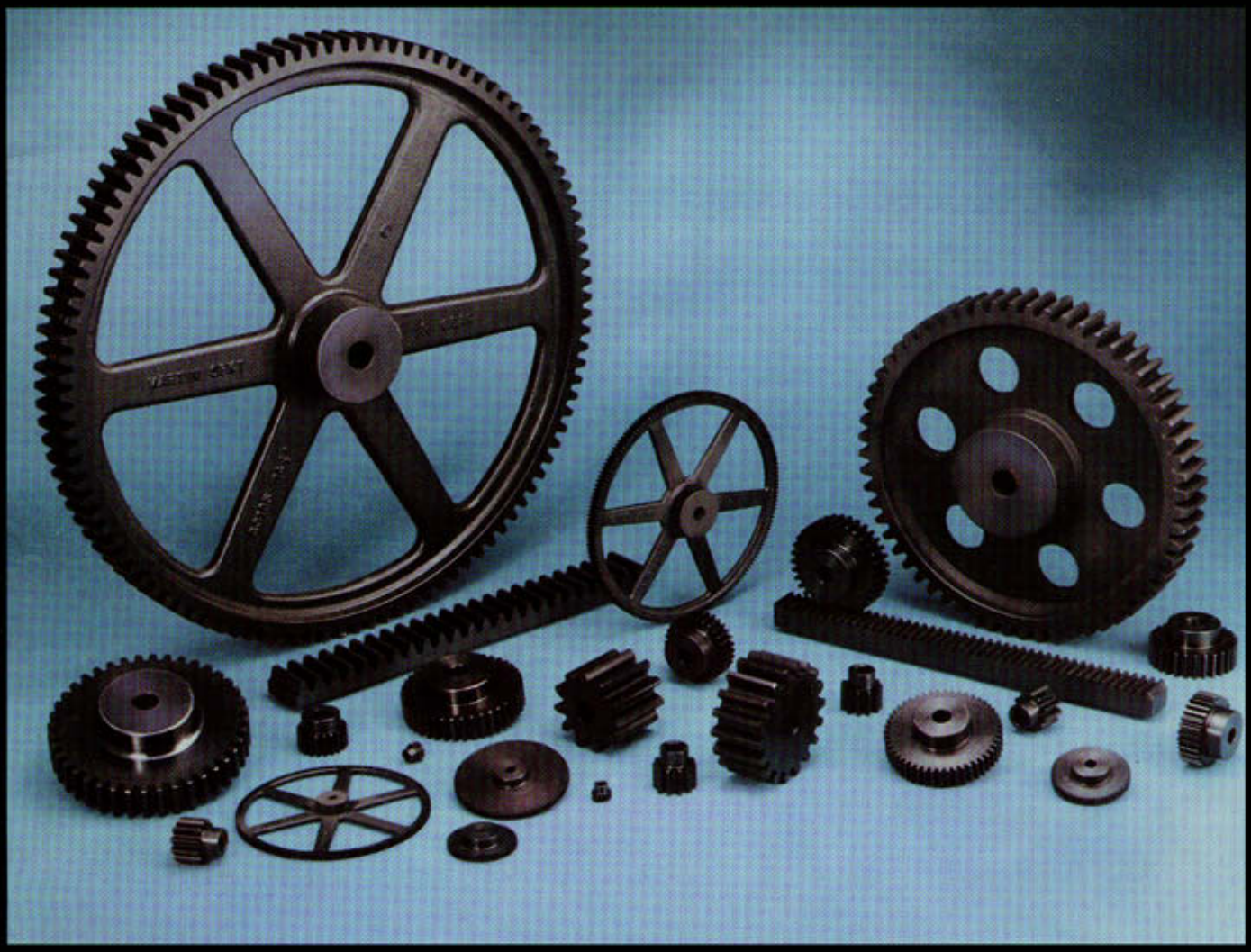
Martin 20 Degree Spur Gears



The most COMPLETE line in the Industry.
With STOCK parts ranging from
4 DP TO 20 DP

From Stock
Or
Fast Delivery On MADE-TO-ORDER Parts

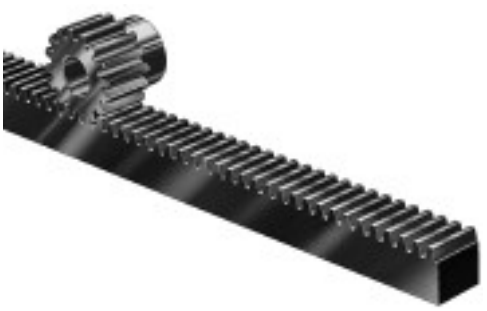
Stock Gears

Spur Gears

Bevel Gears

Miter Gears

Worm and Worm Gears



Gear Rack

“Made-To-Order” Gears

Stock Gears
Numbering System

Letters (Prefix) Indicate Material and Type Gear.
Letters (Suffix) Indicate Hardened, Number of Threads, Direction of Rotation and KW and SS.
Numbers Indicate Pitch, Number of Teeth, and Ratio (Suffix).

Spur Gears

S=Steel
TS=Steel 20°
C=Cast
TC=Cast 20°
H=Hardened Teeth
NM=Non-Metallic
Note: Pressure Angle is Shown as a Suffix to Part Number of All Our Spur Gears.

Examples
S620-14½° (Steel 6P 20T-14½°PA)
TS620-20° (Steel 6P 20T-20°PA)
C660-14½° (Cast 6P 60T-14½°PA)
TC660-20° (Cast 6P 60T-20°PA)
S620H-14½° (Steel 6P 20T-Hardened 14½°PA)
NM620-14½° (Non-Metallic 6P 20T-14½°PA)

Rack

R=Rack — Steel
RA=Rack — Steel Heavy Backing
T=Rack — Steel 20°
R20=Rack — Steel 20° Wide Face

Examples
R-6X2 (14½° STD Backing 6PX2′ Long)
RA-6X4 (14½° Heavy Backing 6PX4′ Long)
TR-6X6 (20° STD Width 6PX6′ Long)
R20-6X6 (20° Wide Face 6PX6′ Long)

Bevel Gears

B=Bevel — Cast Iron Gears
B=Bevel — Steel Pinions
BS=Bevel — Steel Gears
BS=Bevel — Steel Pinions
Note: B Steel Pinions May Run With BS Gears of Same Ratio

Examples
B1040-2 (Cast 10P 40T 2:1 Ratio)
B1020-2 (Steel 10P 20T 2:1 Ratio)
BS1040-2 (Steel 10P 40T 2:1 Ratio)
BS1020-2 (Steel 10P 20T 2:1 Ratio)

Miter Gears

M=Miter — Steel Gears
A or B=Larger Bore (Suffix)
HM=Miter-Hardened Teeth
K=KW & SS

Examples
M824 (Steel 8P 24T)
M824A (Steel 8P 24T Larger Bore)
M2424BR (Brass 24P 24T)
HM1020 (Steel-Hardened Teeth 10P 20T)
HMK1020 (Steel-Hardened 10P 20T With KW & SS)

Worm

W=Worm — Steel
WH=Worm — Steel With Hub Projection
WG=Worm — Steel Hardened Ground Threads
WHG=Worm — Steel Hardened Ground Threads With Hub Projection
L=(Prefix) Longer Face
D or Q=(Suffix) Double or Quadruple Thread
R=Right Hand

Examples
W6R (Steel 6P Right Hand)
WH6R (Steel with Hub Projection 6P Right Hand)
WG6R (Steel-Hardened Ground Threads 6P Right Hand
WHG6R (Steel with Hub Projection Hardened Ground Threads 6P Right Hand)
LW6R Steel Long Face 6P Right Hand)
W6DR (Steel 6P Double Thread Right Hand)

Worm Gears

W=Worm Gear — Cast Iron
WB=Worm Gear — Bronze
D or Q=Double or Quadruple Thread (Suffix)
R=Right Hand (Suffix)

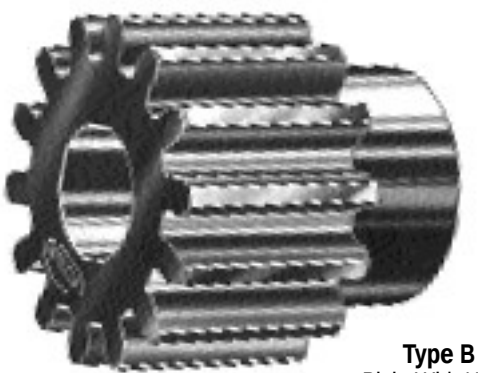
Examples
W660R (Cast Iron 6P 60T Right Hand)
WB660R (Bronze 6P 60T Right Hand)
W660DR (Cast Iron 6P 60T Double Thread Right Hand)

Styles of Spur Gears

Type A
Plain Without Hubs
All Steel

Martin Stock Spur Gears are available in five different styles. Steel Gears are furnished in plain style and plain style with hub. Cast gears are furnished, plain with hub, web with lightening holes, and spoke. Cast gears are machined on all operating surfaces. Martin cast gears are cast with larger hub to provide extra strength and to allow for larger bores.

Type B_1
Web
All Steel
Cast



Type B
Plain With Hubs
All Steel
Cast

Type B_2
Web With Lighten Holes
All Steel
Cast

Type B_3
Web With Spokes
Cast

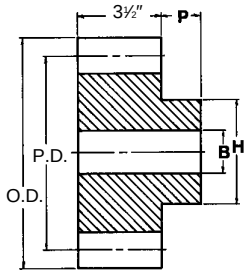
4 DP
3½" Face

Steel Stock Spur Gears
20° Pressure Angle

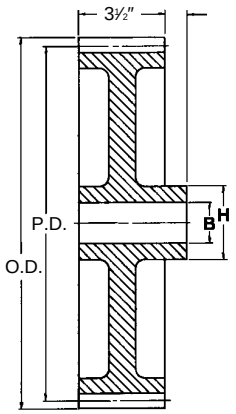
Type B
Plain With Hub
All Steel

Type B_1
Web
All Steel

Type B_2
Web With
Lighten Holes
All Steel



Type B



Type B_1, B_2

Steel

No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Max.*	Diameter	Proj.	
12	TS412	20	3.000	3.500	B	1⅛	1 5/16	2 1/64	⅞	6.8
14	TS414	20	3.500	4.000	B	1⅛	1¼	2 9/64	⅞	9.8
15	TS415	20	3.750	4.250	B	1⅛	1⅜	3 3/64	⅞	11.5
16	TS416	20	4.000	4.500	B	1⅛	2⅜	3 1/64	⅞	13.3
18	TS418	20	4.500	5.000	B	1⅛	2⅜	3 9/64	⅞	17.3
20	TS420	20	5.000	5.500	B	1⅛	2¾	4 1/64	⅞	21.8
22	TS422	20	5.500	6.000	B	1⅛	3	4 9/64	⅞	26.7
24	TS424	20	6.000	6.500	B	1⅛	3⅜	5	1¼	33.7
28	TS428	20	7.000	7.500	B	1⅛	3⅜	5	1¼	43.8
30	TS430	20	7.500	8.000	B	1⅛	3⅜	5	1¼	49.4
32	TS432	20	8.000	8.500	B	1¼	3⅜	5	1½	56.8
36	TS436	20	9.000	9.500	B	1¼	3⅜	5	1½	70.0
40	TS440	20	10.000	10.500	B	1¼	3⅜	5⅛	1½	85.2
44	TS444	20	11.000	11.500	B	1¼	3⅜	5⅛	1½	101.6
48	TS448	20	12.000	12.500	B	1¼	3⅜	5⅛	1½	119.5
56	TS456	20	14.000	14.500	B_1	1¼	3¼	5½	1½	96.9
60	TS460	20	15.000	15.500	B_2	1¼	3¼	5½	1½	88.1
64	TS464	20	16.000	16.500	B_2	1¼	3¼	5½	1½	86.9
72	TS472	20	18.000	18.500	B_2	1¼	3¼	5½	1½	86.5
80	TS480	20	20.000	20.500	B_2	1¼	3¼	5½	1½	90.9

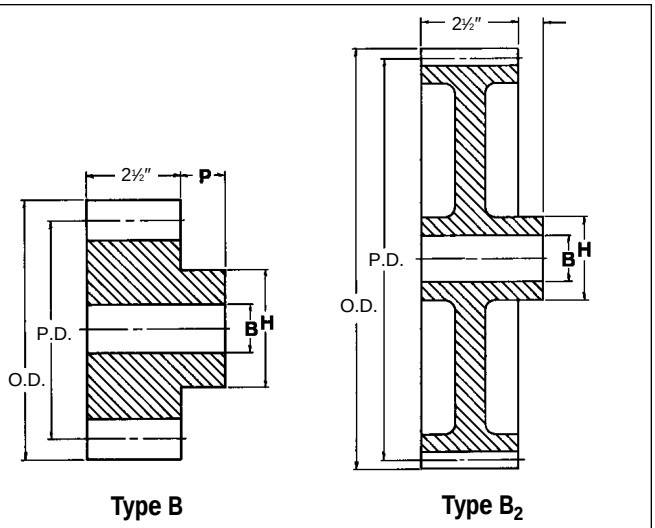
* Recommended maximum bore with keyway and set screw.

20° P.A. Gears Will Not Operate With 14½° P.A.

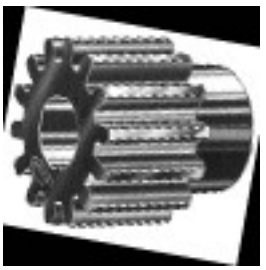
Steel Stock Spur Gears

20° Pressure Angle

5 DP
2½" Face



Type B **Type B_2**



Type B
Plain With Hub
All Steel
Cast

Type B_2
Web With Lighten Holes
All Steel

Steel

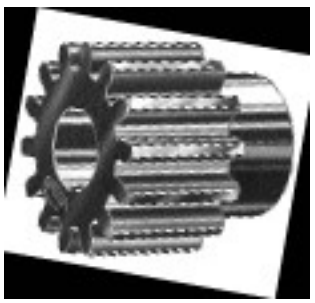
No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Max.*	Diameter	Proj.	
12	TS512	20	2.400	2.800	B	1⅛	1⅛	1²⁷⁄₃₂	⅞	2.9
14	TS514	20	2.800	3.200	B	1⅛	1⅛	2³⁄₁₆	⅞	4.3
15	TS515	20	3.000	3.400	B	1⅛	1⅛	2⅜	⅞	5.2
16	TS516	20	3.200	3.600	B	1⅛	1⅛	2¹³⁄₃₂	⅞	6.1
18	TS518	20	3.600	4.000	B	1⅛	1⅛	3	⅞	8.0
20	TS520	20	4.000	4.400	B	1⅛	2¼	3⅜	⅞	10.2
24	TS524	20	4.800	5.200	B	1⅛	2⅜	3¾	1¼	15.7
25	TS525	20	5.000	5.400	B	1⅛	2⅜	3¾	1¼	20.3
28	TS528	20	5.600	6.000	B	1⅛	2⅜	3¾	1¼	22.9
30	TS530	20	6.000	6.400	B	1⅛	2⅜	3¾	1¼	23.9
35	TS535	20	7.000	7.400	B	1¼	2⅜	3¾	1¼	29.9
40	TS540	20	8.000	8.400	B	1¼	2⅜	3¾	1¼	38.2
45	TS545	20	9.000	9.400	B	1¼	2⅜	3¾	1¼	47.7
50	TS550	20	10.000	10.400	B	1¼	2¹³⁄₁₆	4⅝	1¼	60.3
60	TS560	20	12.000	12.400	B	1¼	2¹³⁄₁₆	4⅝	1¼	84.7
70	TS570	20	14.000	14.400	B_2	1³⁄₁₆	3⅜	5¼	1¼	51.6
80	TS580	20	16.000	16.400	B_2	1³⁄₁₆	3⅜	5¼	1¼	55.8
90	TS590	20	18.000	18.400	B_2	1³⁄₁₆	3⅜	5¼	1¼	59.7
100	TS5100	20	20.000	20.400	B_2	1⅜	3¼	5¾	1½	69.2
110	TS5110	20	22.000	22.400	B_2	1⅜	3¼	5¾	1½	72.3
120	TS5120	20	24.000	24.400	B_2	1⅜	3½	6¼	1½	80.2

* Recommended maximum bore with keyway and set screw.

20° P.A. Gears Will Not Operate With 14½° P.A.

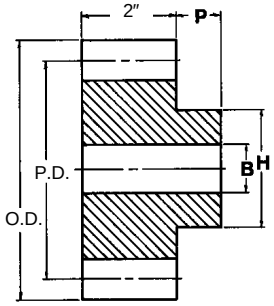
6 DP
2″ Face

Steel Stock Spur Gears
20° Pressure Angle

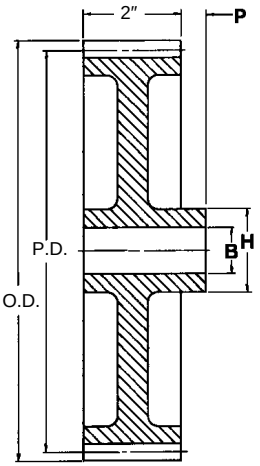


Type B
Plain With Hub
All Steel

Type B_2
Web With Lighten Holes
All Steel



Type B



Type B_2

Steel

No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Max.*	Diameter	Proj.	
11	TS611†	20	2.000	2.333	B	1	1	1½	⅞	1.6
12	TS612	20	2.000	2.333	B	1	1	1½	⅞	1.6
14	TS614	20	2.333	2.666	B	1	1	1 3⁄16	⅞	2.4
15	TS615	20	2.500	2.833	B	1	1¼	2	⅞	2.9
16	TS616	20	2.666	3.000	B	1	1 5⁄16	2⅛	⅞	3.4
18	TS618	20	3.000	3.333	B	1	1½	2½	⅞	4.6
21	TS621	20	3.500	3.833	B	1	1⅞	3	⅞	6.6
24	TS624	20	4.000	4.333	B	1⅛	1⅞	3	⅞	8.1
27	TS627	20	4.500	4.833	B	1⅛	2⅜	3½	⅞	10.6
30	TS630	20	5.000	5.333	B	1⅛	2½	4	⅞	13.4
33	TS633	20	5.500	5.833	B	1⅛	2½	4	1½	17.8
36	TS636	20	6.000	6.333	B	1⅛	2½	4	1½	20.4
42	TS642	20	7.000	7.333	B	1⅛	2½	4	1½	26.2
48	TS648	20	8.000	8.333	B	1⅛	2½	4	1½	32.8
54	TS654	20	9.000	9.333	B	1⅛	2½	4	1½	40.4
60	TS660	20	10.000	10.333	B	1¼	2 1⁄16	4⅝	1½	50.0
64	TS664	20	10.666	11.000	B	1¼	2 1⁄16	4⅝	1½	56.5
66	TS666	20	11.000	11.333	B	1¼	2 1⁄16	4⅝	1½	59.8
72	TS672	20	12.000	12.333	B	1¼	2 1⁄16	4⅝	1½	70.0
84	TS684	20	14.000	14.333	B_2	1¼	2 1⁄16	5	1½	42.8
96	TS696	20	16.000	16.333	B_2	1¼	2 1⁄16	5	1½	46.0
108	TS6108	20	18.000	18.333	B_2	1¼	2 1⁄16	5	1½	48.8
120	TS6120	20	20.000	20.333	B_2	1¼	2 1⁄16	5	1½	51.3

* Recommended maximum bore with keyway and set screw.
† Enlarged pitch diameter with special tooth form.

20° P.A. Gears Will Not Operate With 14½° P.A.

Bored-to-Size

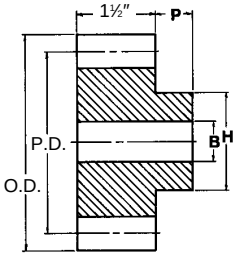
No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Set Screw	Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Keyway		Diameter	Proj.	
12	TS612BS 1	20	2.000	2.333	B	1	¼ X ⅛	(1) 1/4-20 @90	1½	⅞	1.60
14	TS614BS 1	20	2.333	2.667	B	1	¼ X ⅛	(1) 5/16-18 @90	1 13⁄16	⅞	2.40
14	TS614BS 1-1/8	20	2.333	2.667	B	1⅛	¼ X ⅛	(1) 5/16-18 @90	1 13⁄16	⅞	2.40
15	TS615BS 1	20	2.500	2.833	B	1	¼ X ⅛	(1) 5/16-18 @90	2	⅞	2.90
15	TS615BS 1-1/8	20	2.500	2.833	B	1⅛	¼ X ⅛	(1) 5/16-18 @90	2	⅞	2.90
15	TS615BS 1-3/16	20	2.500	2.833	B	1 3⁄16	¼ X ⅛	(1) 5/16-18 @90	2	⅞	2.90
15	TS615BS 1-1/4	20	2.500	2.833	B	1¼	¼ X ⅛	(1) 5/16-18 @90	2	⅞	2.90
16	TS616BS 1	20	2.667	3.000	B	1	¼ X ⅛	(1) 5/16-18 @90	2⅛	⅞	3.40
16	TS616BS 1-1/8	20	2.667	3.000	B	1⅛	¼ X ⅛	(1) 5/16-18 @90	2⅛	⅞	3.40
16	TS616BS 1-3/16	20	2.667	3.000	B	1 3⁄16	¼ X ⅛	(1) 5/16-18 @90	2⅛	⅞	3.40
16	TS616BS 1-1/4	20	2.667	3.000	B	1¼	¼ X ⅛	(1) 5/16-18 @90	2⅛	⅞	3.40
18	TS618BS 1	20	3.000	3.333	B	1	¼ X ⅛	(1) 5/16-18 @90	2½	⅞	4.60
18	TS618BS 1-1/8	20	3.000	3.333	B	1⅛	¼ X ⅛	(1) 5/16-18 @90	2½	⅞	4.60
18	TS618BS 1-3/16	20	3.000	3.333	B	1 3⁄16	¼ X ⅛	(1) 5/16-18 @90	2½	⅞	4.60
18	TS618BS 1-1/4	20	3.000	3.333	B	1¼	¼ X ⅛	(1) 5/16-18 @90	3	⅞	4.60
21	TS621BS 1	20	3.500	3.833	B	1	¼ X ⅛	(1) 5/16-18 @90	3	⅞	6.60
21	TS621BS 1-1/8	20	3.500	3.833	B	1⅛	¼ X ⅛	(1) 5/16-18 @90	3	⅞	6.60
21	TS621BS 1-3/16	20	3.500	3.833	B	1 3⁄16	¼ X ⅛	(1) 5/16-18 @90	3	⅞	6.60
21	TS621BS 1-1/4	20	3.500	3.833	B	1¼	¼ X ⅛	(1) 5/16-18 @90	3	⅞	6.60

Steel & Cast Stock Spur Gears

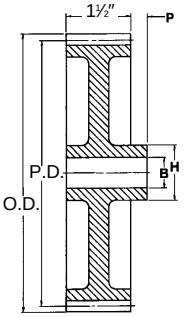
20° Pressure Angle

8 DP

1½" Face



Type B



Type B_2, B_3

Type B
Plain With Hub All Steel

Type B_3
Web With Spokes Cast

Steel

No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Max.*	Diameter	Proj.	
12	TS812	20	1.500	1.750	B	¾	¾	1⅛	¾	0.7
14	TS814	20	1.750	2.000	B	¾	13/16	1 5/16	¾	1.0
15	TS815	20	1.875	2.125	B	¾	⅞	1 7/16	¾	1.2
16	TS816	20	2.000	2.250	B	⅞	15/16	1 9/16	⅞	1.4
18	TS818	20	2.250	2.500	B	⅞	1⅛	1 13/16	⅞	1.9
19	TS819	20	2.375	2.625	B	⅞	1¼	2	⅞	2.3
20	TS820	20	2.500	2.750	B	⅞	1 5/16	2 1/16	⅞	2.5
22	TS822	20	2.750	3.000	B	⅞	1½	2 5/16	⅞	3.2
24	TS824	20	3.000	3.250	B	⅞	1⅜	2 9/16	⅞	3.9
26	TS826	20	3.250	3.500	B	⅞	1¾	2¾	⅞	4.6
28	TS828	20	3.500	3.750	B	⅞	1¾	2¾	⅞	5.2
30	TS830	20	3.750	4.000	B	1	1¾	2¾	⅞	5.6
32	TS832	20	4.000	4.250	B	1	1⅞	3¼	⅞	6.6
36	TS836	20	4.500	4.750	B	1	2⅛	3½	⅞	8.6
40	TS840	20	5.000	5.250	B	1	2⅛	3½	⅞	10.2
42	TS842	20	5.250	5.500	B	1	2⅛	3½	1	11.4
44	TS844	20	5.500	5.750	B	1	2⅛	3½	1	12.3
48	TS848	20	6.000	6.250	B	1	2⅛	3½	1	14.2

Cast

No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Max.*	Diameter	Proj.	
52	TC852	20	6.500	6.750	B	1	1⅛	3	1	11.9
56	TC856	20	7.000	7.250	B	1	1⅛	3	1	13.0
60	TC860	20	7.500	7.750	B_2	1	1⅛	3	1	12.0
64	TC864	20	8.000	8.250	B_3	1	1⅛	3	1	12.1
72	TC872	20	9.000	9.250	B_3	1	2 1/16	3¼	1	14.4
80	TC880	20	10.000	10.250	B_3	1⅛	2 1/16	3¼	1¼	17.0
88	TC888	20	11.000	11.250	B_3	1⅛	2 1/16	3¼	1¼	19.0
96	TC896	20	12.000	12.250	B_3	1⅛	2⅛	3½	1¼	23.7
112	TC8112	20	14.000	14.250	B_3	1⅛	2⅛	3½	1¼	25.0
120	TC8120	20	15.000	15.250	B_3	1⅛	2⅛	3½	1¼	25.8
128	TC8128	20	16.000	16.250	B_3	1⅛	2⅛	3½	1¼	28.0
144	TC8144	20	18.000	18.250	B_3	1⅛	2¼	3¾	1¼	32.0
160	TC8160	20	20.000	20.250	B_3	1¼	2¼	3¾	1½	34.8

Bored-to-Size

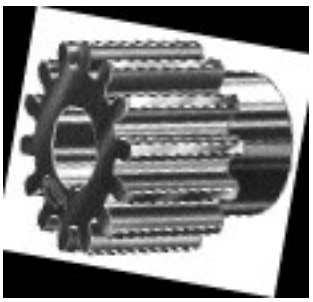
No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Set Screw	Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Keyway		Diameter	Proj.	
12	TS812BS 3/4	20	1.500	1.750	B	¾	3/16 X 3/32	(1) 10-24 @ 90	1⅛	¾	0.70
14	TS814BS 3/4	20	1.750	2.000	B	¾	3/16 X 3/32	(1) 1/4-20 @ 90	1 5/16	¾	1.00
15	TS815BS 3/4	20	1.875	2.125	B	¾	3/16 X 3/32	(1) 1/4-20 @ 90	1 7/16	¾	1.20
15	TS815BS 7/8	20	1.875	2.125	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	1 7/16	¾	1.20
16	TS816BS 7/8	20	2.000	2.250	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	1 9/16	⅞	1.40
16	TS816BS 1	20	2.000	2.250	B	1	¼ X ⅛	(1) 5/16-18 @ 90	1 9/16	⅞	1.40
18	TS818BS 7/8	20	2.250	2.500	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	1 13/16	⅞	1.90
18	TS818BS 1	20	2.250	2.500	B	1	¼ X ⅛	(1) 5/16-18 @ 90	1 13/16	⅞	1.90
18	TS818BS 1-1/8	20	2.250	2.500	B	1⅛	¼ X ⅛	(1) 5/16-18 @ 90	1 13/16	⅞	1.90
20	TS820BS 7/8	20	2.500	2.750	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	2 1/16	⅞	2.50
20	TS820BS 1	20	2.500	2.750	B	1	¼ X ⅛	(1) 5/16-18 @ 90	2 1/16	⅞	2.50
20	TS820BS 1-1/8	20	2.500	2.750	B	1⅛	¼ X ⅛	(1) 5/16-18 @ 90	2 1/16	⅞	2.50
22	TS822BS 7/8	20	2.750	3.000	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	2 5/16	⅞	3.20
22	TS822BS 1	20	2.750	3.000	B	1	¼ X ⅛	(1) 5/16-18 @ 90	2 5/16	⅞	3.20
22	TS822BS 1-1/8	20	2.750	3.000	B	1⅛	¼ X ⅛	(1) 5/16-18 @ 90	2 5/16	⅞	3.20
24	TS824BS 7/8	20	3.000	3.250	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	2 9/16	⅞	3.90
24	TS824BS 1	20	3.000	3.250	B	1	¼ X ⅛	(1) 5/16-18 @ 90	2 9/16	⅞	3.90
24	TS824BS 1-1/8	20	3.000	3.250	B	1⅛	¼ X ⅛	(1) 5/16-18 @ 90	2 9/16	⅞	3.90

* Recommended maximum bore with keyway and set screw.

20° P.A. Gears Will Not Operate With 14½° P.A.

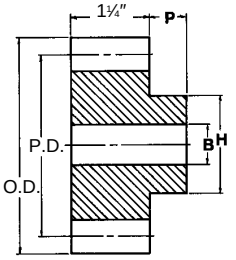
10 DP
1¼" Face

Steel & Cast Stock Spur Gears
20° Pressure Angle



Type B
Plain With Hub
All Steel

Type B_3
Web With Spokes
Cast



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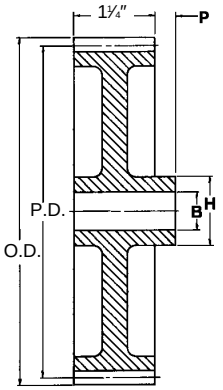


Type B_3

Steel

No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Max.*	Diameter	Proj.	
12	TS1012	20	1.200	1.400	B	⅝	⅝	29/32	⅝	0.4
14	TS1014	20	1.400	1.600	B	¾	¾	1 7/64	⅝	0.6
15	TS1015	20	1.500	1.700	B	¾	¾	1 7/32	⅝	0.6
16	TS1016	20	1.600	1.800	B	¾	¾	1 5/16	⅝	0.7
18	TS1018	20	1.800	2.000	B	¾	13/16	1 1/32	⅝	0.9
20	TS1020	20	2.000	2.200	B	⅞	⅞	1 39/64	⅝	1.2
22	TS1022	20	2.200	2.400	B	⅞	1 1/16	1 13/16	⅝	1.5
24	TS1024	20	2.400	2.600	B	⅞	1 3/16	2 1/64	⅝	1.8
25	TS1025	20	2.500	2.700	B	⅞	1¼	2 7/64	⅝	2.0
26	TS1026	20	2.600	2.800	B	⅞	1¼	2⅛	⅝	2.2
28	TS1028	20	2.800	3.000	B	⅞	1 5/16	2 13/32	⅝	2.7
30	TS1030	20	3.000	3.200	B	⅞	1⅜	2½	⅝	3.4
32	TS1032	20	3.200	3.400	B	⅞	1⅜	2½	⅞	3.7
35	TS1035	20	3.500	3.700	B	1	1⅜	2½	⅞	4.2
36	TS1036	20	3.600	3.800	B	1	1⅜	2½	⅞	4.3
40	TS1040	20	4.000	4.200	B	1	2⅛	3½	⅞	6.4
45	TS1045	20	4.500	4.700	B	1	2⅛	3½	⅞	7.5
48	TS1048	20	4.800	5.000	B	1	2⅛	3¾	⅞	8.7
50	TS1050	20	5.000	5.200	B	1	2½	4	⅞	9.6
55	TS1055	20	5.500	5.700	B	1	2½	4	1	11.5
60	TS1060	20	6.000	6.200	B	1	2½	4	1	13.1

Cast

No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Max.*	Diameter	Proj.	
70	TC1070	20	7.000	7.200	B_3	1	1 1/16	2¾	1	8.2
80	TC1080	20	8.000	8.200	B_3	1	1 1/16	2¾	1	11.2
90	TC1090	20	9.000	9.200	B_3	1	1 3/16	3	1	11.7
100	TC10100	20	10.000	10.200	B_3	1⅛	1 3/16	3	1⅛	12.2

* Recommended maximum bore with keyway and set screw.

20° P.A. Gears Will Not Operate With 14½° P.A.

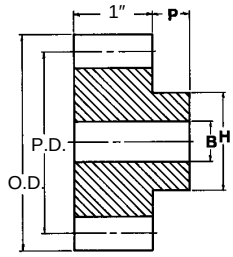
Bored-to-Size

No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Set Screw	Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Keyway		Diameter	Proj.	
12	TS1012BS 5/8	20	1.200	1.400	B	⅝	3/16 X 3/32	(1) 10-24 @ 90	29/32	⅝	0.40
14	TS1014BS 5/8	20	1.400	1.600	B	⅝	3/16 X 3/32	(1) 1/4-20 @ 90	1 7/64	⅝	0.60
15	TS1015BS 3/4	20	1.500	1.700	B	¾	3/16 X 3/32	(1) 1/4-20 @ 90	1 7/32	⅝	0.60
16	TS1016BS 3/4	20	1.600	1.800	B	¾	3/16 X 3/32	(1) 1/4-20 @ 90	1 5/16	⅝	0.70
18	TS1018BS 7/8	20	1.800	2.000	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	1 11/32	⅝	0.90
20	TS1020BS 7/8	20	2.000	2.200	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	1 39/64	⅝	1.20
20	TS1020BS 1	20	2.000	2.200	B	1	¼ X ⅛	(1) 5/16-18 @ 90	1 39/64	⅝	1.20
24	TS1024BS 7/8	20	2.400	2.600	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	1 13/16	⅝	1.50
24	TS1024BS 1	20	2.400	2.600	B	1	¼ X ⅛	(1) 5/16-18 @ 90	1 13/16	⅝	1.50
25	TS1025BS 7/8	20	2.500	2.700	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	2 1/64	⅝	2.00
25	TS1025BS 1	20	2.500	2.700	B	1	¼ X ⅛	(1) 5/16-18 @ 90	2 1/64	⅝	2.00
28	TS1028BS 7/8	20	2.800	3.000	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	2 13/32	⅝	2.70
28	TS1028BS 1	20	2.800	3.000	B	1	¼ X ⅛	(1) 5/16-18 @ 90	2 13/32	⅝	2.70

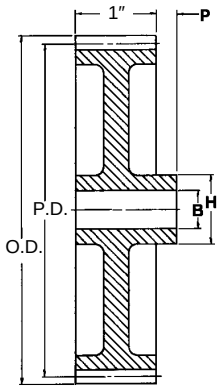
Steel & Cast Stock Spur Gears

20° Pressure Angle

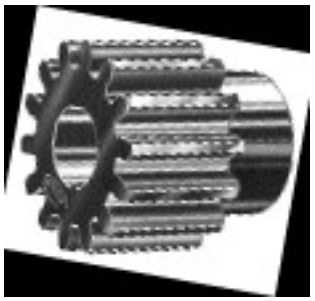
12 DP
1″ Face



Type B



Type B_3



Type B
Plain With Hub All Steel

Type B_3
Web With Spokes Cast

Steel

No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Max.*	Diameter	Proj.	
12	TS1212	20	1.000	1.167	B	½	½	¾	⅝	0.21
13	TS1213	20	1.083	1.250	B	⅝	⅝	1 3/16	⅝	0.21
14	TS1214	20	1.167	1.333	B	⅝	⅝	2 9/32	⅝	0.28
15	TS1215	20	1.250	1.417	B	⅝	⅝	63/64	⅝	0.34
16	TS1216	20	1.333	1.500	B	⅝	⅝	1 1/16	⅝	0.41
18	TS1218	20	1.500	1.667	B	¾	¾	1¼	⅝	0.51
19	TS1219	20	1.583	1.750	B	¾	¾	1 5/16	⅝	0.59
20	TS1220	20	1.667	1.833	B	¾	¾	1 5/16	⅝	0.65
21	TS1221	20	1.750	1.917	B	¾	13/16	1 25/64	⅝	0.75
22	TS1222	20	1.833	2.000	B	¾	⅞	1 9/16	⅝	0.88
24	TS1224	20	2.000	2.166	B	¾	15/16	1 41/64	⅝	1.06
25	TS1225	20	2.083	2.250	B	¾	1 1/16	1 13/16	⅝	1.22
26	TS1226	20	2.167	2.333	B	¾	1⅛	1⅞	⅝	1.33
28	TS1228	20	2.333	2.500	B	¾	1¼	2 1/16	⅝	1.60
30	TS1230	20	2.500	2.667	B	¾	1 5/16	2 5/32	⅝	1.83
32	TS1232	20	2.667	2.833	B	¾	1 5/16	2¼	⅝	2.08
36	TS1236	20	3.000	3.167	B	¾	1⅜	2½	⅞	2.98
42	TS1242	20	3.500	3.666	B	¾	1⅜	2½	⅞	3.71
48	TS1248	20	4.000	4.166	B	⅞	1⅞	3	⅞	4.99
54	TS1254	20	4.500	4.666	B	⅞	2⅛	3½	⅞	6.57
60	TS1260	20	5.000	5.166	B	⅞	2⅛	3½	⅞	7.63
66	TS1266	20	5.500	5.666	B	⅞	2⅛	3½	⅞	8.80
72	TS1272	20	6.000	6.166	B	⅞	2⅛	3½	⅞	10.08

Cast

No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Max.*	Diameter	Proj.	
84	TC1284	20	7.000	7.166	B_3	⅞	1 1/16	2½	⅞	5.9
96	TC1296	20	8.000	8.166	B_3	⅞	1 1/16	2½	⅞	7.0
108	TC12108	20	9.000	9.166	B_3	⅞	1 1/16	2½	⅞	7.6
120	TC12120	20	10.000	10.166	B_3	1	1 1/16	2½	⅞	10.3
144	TC12144	20	12.000	12.166	B_3	1	1 1/16	2¾	1	10.4

Bored-to-Size

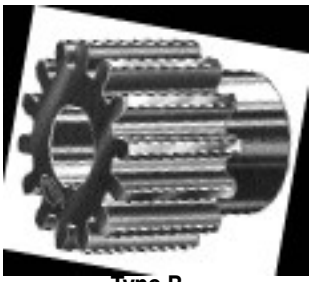
No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Set Screw	Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Keyway		Diameter	Proj.	
12	TS1212BS 1/2	20	1.000	1.167	B	½	NONE	(1) 10-24	¾	⅝	0.21
13	TS1213BS 5/8	20	1.083	1.250	B	⅝	3/16 X 3/32	(1) 10-24 @ 90	1 5/16	⅝	0.21
14	TS1214BS 5/8	20	1.167	1.333	B	⅝	3/16 X 3/32	(1) 10-24 @ 90	2 9/32	⅝	0.28
15	TS1215BS 5/8	20	1.250	1.417	B	⅝	3/16 X 3/32	(1) 10-24 @ 90	63/64	⅝	0.34
16	TS1216BS 5/8	20	1.333	1.500	B	⅝	3/16 X 3/32	(1) 1/4-20 @ 90	1 1/16	⅝	0.41
18	TS1218BS 3/4	20	1.500	1.667	B	¾	3/16 X 3/32	(1) 1/4-20 @ 90	1¼	⅝	0.51
20	TS1220BS 3/4	20	1.667	1.833	B	¾	3/16 X 3/32	(1) 1/4-20 @ 90	1 1/16	⅝	0.65
21	TS1221BS 3/4	20	1.750	1.917	B	¾	3/16 X 3/32	(1) 1/4-20 @ 90	1 25/64	⅝	0.75
21	TS1221BS 7/8	20	1.750	1.917	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	1 25/64	⅝	0.75
24	TS1224BS 3/4	20	2.000	2.167	B	¾	3/16 X 3/32	(1) 1/4-20 @ 90	1 41/64	⅝	1.06
24	TS1228BS 7/8	20	2.000	2.167	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	1 41/64	⅝	1.06
24	TS1228BS 1	20	2.000	2.167	B	1	¼ X ⅛	(1) 5/16-18 @ 90	1 41/64	⅝	1.06
28	TS1228BS 3/4	20	2.333	2.500	B	¾	3/16 X 3/32	(1) 1/4-20 @ 90	2 1/16	⅝	1.60
28	TS1228BS 7/8	20	2.333	2.500	B	⅞	3/16 X 3/32	(1) 1/4-20 @ 90	2 1/16	⅝	1.60
28	TS1228BS 1	20	2.333	2.500	B	1	¼ X ⅛	(1) 5/16-18 @ 90	2 1/16	⅝	1.60

* Recommended maximum bore with keyway and set screw.

20° P.A. Gears Will Not Operate With 14½° P.A.

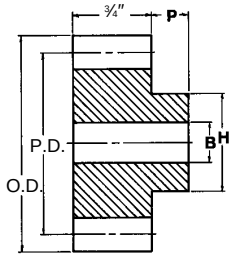
16 DP
3/4" Face

Steel & Cast Stock Spur Gears
20° Pressure Angle



Type B
Plain With Hub All Steel

Type B_3
Web With Spokes Cast



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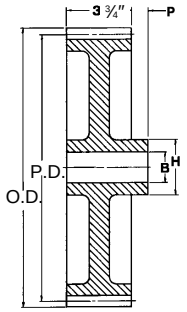


Type B_3

Steel

No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Max.*	Diameter	Proj.	
12	TS1612	20	.750	.875	B	3/8	3/8	9/16	1/2	0.09
13	TS1613	20	.812	.938	B	3/8	3/8	5/8	1/2	0.11
14	TS1614	20	.875	1.000	B	3/8	3/8	11/16	1/2	0.14
15	TS1615	20	.937	1.063	B	3/8	1/2	3/4	1/2	0.17
16	TS1616	20	1.000	1.125	B	1/2	1/2	13/16	1/2	0.17
17	TS1617	20	1.062	1.188	B	1/2	1/2	7/8	1/2	0.20
18	TS1618	20	1.125	1.250	B	1/2	1/2	15/16	1/2	0.24
20	TS1620	20	1.250	1.375	B	5/8	5/8	1 1/16	1/2	0.28
21	TS1621	20	1.312	1.438	B	5/8	5/8	1 1/8	1/2	0.32
22	TS1622	20	1.375	1.500	B	5/8	5/8	1 3/16	1/2	0.36
24	TS1624	20	1.500	1.625	B	5/8	3/4	1 5/16	1/2	0.46
26	TS1626	20	1.625	1.750	B	5/8	7/8	1 7/16	1/2	0.56
28	TS1628	20	1.750	1.875	B	5/8	7/8	1 1/2	1/2	0.65
30	TS1630	20	1.875	2.000	B	5/8	15/16	1 5/8	1/2	0.77
32	TS1632	20	2.000	2.125	B	5/8	1	1 3/4	1/2	0.90
36	TS1636	20	2.250	2.375	B	5/8	1 1/4	2	1/2	1.18
40	TS1640	20	2.500	2.625	B	5/8	1 1/4	2	5/8	1.48
48	TS1648	20	3.000	3.125	B	5/8	1 1/4	2	5/8	1.94
56	TS1656	20	3.500	3.625	B	5/8	1 3/8	2 1/2	5/8	2.79
60	TS1660	20	3.750	3.875	B	5/8	1 1/2	2 3/4	5/8	3.28
64	TS1664	20	4.000	4.125	B	3/4	1 1/2	2 3/4	3/4	3.74
72	TS1672	20	4.500	4.625	B	3/4	1 7/8	3	3/4	4.69
80	TS1680	20	5.000	5.125	B	3/4	2 1/8	3 1/2	3/4	6.03
84	TS1684	20	5.250	5.375	B	3/4	2 1/8	3 1/2	3/4	6.46
96	TS1696	20	6.000	6.125	B	3/4	2 1/8	3 1/2	3/4	7.86
104	TS16104	20	6.500	6.625	B	3/4	2 1/8	3 1/2	3/4	8.91

Cast

No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Max.*	Diameter	Proj.	
112	TC16112	20	7.000	7.125	B_3	3/4	1 7/16	2 1/2	3/4	4.4
128	TC16128	20	8.000	8.125	B_3	3/4	1 11/16	2 3/4	3/4	5.5
144	TC16144	20	9.000	9.125	B_3	3/4	1 11/16	2 3/4	3/4	6.4
160	TC16160	20	10.000	10.125	B_3	7/8	1 11/16	2 3/4	3/4	8.1
192	TC16192	20	12.000	12.125	B_3	7/8	1 13/16	3	1	10.1

* Recommended maximum bore with keyway and set screw.

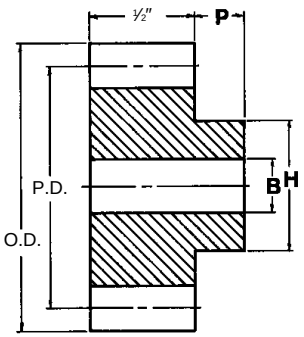
20° P.A. Gears Will Not Operate With 14½° P.A.

Bored-to-Size

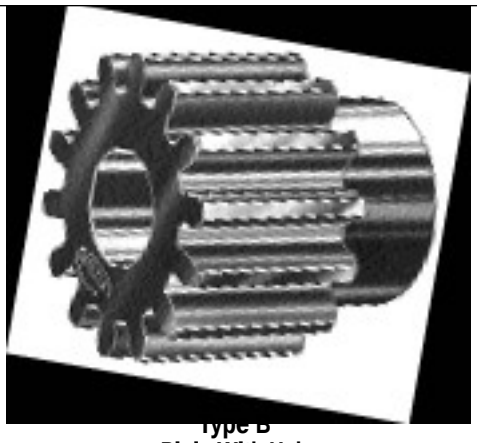
No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Set Screw	Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Keyway		Diameter	Proj.	
12	TS1612BS 3/8	20	0.750	0.875	B	3/8	NONE	(1) 8-32	9/16	1/2	0.09
14	TS1614BS 3/8	20	0.875	1.000	B	3/8	NONE	(1) 10-24	11/16	1/2	0.14
15	TS1615BS 3/8	20	0.937	1.063	B	3/8	NONE	(1) 10-24	3/4	1/2	0.17
15	TS1615BS 1/2	20	0.937	1.063	B	1/2	NONE	(1) 10-24	3/4	1/2	0.17
16	TS1616BS 1/2	20	1.000	1.125	B	1/2	NONE	(1) 10-24	13/16	1/2	0.17
18	TS1618BS 1/2	20	1.125	1.250	B	1/2	NONE	(1) 1/4-20	15/16	1/2	0.24
20	TS1620BS 5/8	20	1.250	1.375	B	5/8	3/16 X 3/32	(1) 1/4-20 @ 90	1 1/16	1/2	0.28
24	TS1624BS 5/8	20	1.500	1.625	B	5/8	3/16 X 3/32	(1) 1/4-20 @ 90	1 5/16	1/2	0.46
24	TS1624BS 3/4	20	1.500	1.625	B	3/4	3/16 X 3/32	(1) 1/4-20 @ 90	1 5/16	1/2	0.46
28	TS1628BS 5/8	20	1.750	1.875	B	5/8	3/16 X 3/32	(1) 1/4-20 @ 90	1 1/2	1/2	0.65
28	TS1628BS 3/4	20	1.750	1.875	B	3/4	3/16 X 3/32	(1) 1/4-20 @ 90	1 1/2	1/2	0.65
30	TS1630BS 5/8	20	1.875	2.000	B	5/8	3/16 X 3/32	(1) 1/4-20 @ 90	1 5/8	1/2	0.77
30	TS1630BS 3/4	20	1.875	2.000	B	3/4	3/16 X 3/32	(1) 1/4-20 @ 90	1 5/8	1/2	0.77
30	TS1630BS 7/8	20	1.875	2.000	B	7/8	3/16 X 3/32	(1) 1/4-20 @ 90	1 5/8	1/2	0.77
32	TS1632BS 5/8	20	2.000	2.125	B	5/8	3/16 X 3/32	(1) 1/4-20 @ 90	1 3/4	1/2	0.90
32	TS1632BS 3/4	20	2.000	2.125	B	3/4	3/16 X 3/32	(1) 1/4-20 @ 90	1 3/4	1/2	0.90
32	TS1632BS 7/8	20	2.000	2.125	B	7/8	3/16 X 3/32	(1) 1/4-20 @ 90	1 3/4	1/2	0.90
32	TS1632BS 1	20	2.000	2.125	B	1	1/4 X 1/8	(1) 5/16-18 @ 90	1 3/4	1/2	0.90

Steel Stock Spur Gears
20° Pressure Angle

20 DP
1/2″ Face



Type B



Type B
Plain With Hub
All Steel

Steel

No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Max.*	Diameter	Proj.	
12	TS2012	20	.600	.700	B	5/16	5/16	15/32	7/16	0.04
14	TS2014	20	.700	.800	B	5/16	5/16	35/64	7/16	0.06
15	TS2015	20	.750	.850	B	3/8	3/8	39/64	7/16	0.07
16	TS2016	20	.800	.900	B	3/8	3/8	21/32	7/16	0.08
18	TS2018	20	.900	1.000	B	3/8	3/8	3/4	7/16	0.12
20	TS2020	20	1.000	1.100	B	1/2	1/2	55/64	7/16	0.13
21	TS2021	20	1.050	1.150	B	1/2	1/2	7/8	7/16	0.15
22	TS2022	20	1.100	1.200	B	1/2	1/2	31/32	7/16	0.17
24	TS2024	20	1.200	1.300	B	1/2	9/16	1 1/16	7/16	0.22
25	TS2025	20	1.250	1.350	B	1/2	5/8	1 7/64	7/16	0.24
28	TS2028	20	1.400	1.500	B	1/2	11/16	1 13/64	7/16	0.32
30	TS2030	20	1.500	1.600	B	1/2	13/16	1 23/64	7/16	0.38
32	TS2032	20	1.600	1.700	B	1/2	7/8	1 1/16	1/2	0.46
35	TS2035	20	1.750	1.850	B	1/2	7/8	1 9/16	1/2	0.56
36	TS2036	20	1.800	1.900	B	1/2	15/16	1 5/8	1/2	0.60
40	TS2040	20	2.000	2.100	B	1/2	1 1/16	1 13/16	1/2	0.76
45	TS2045	20	2.250	2.350	B	1/2	1 1/4	2	1/2	0.95
50	TS2050	20	2.500	2.600	B	1/2	1 1/4	2	1/2	1.08
60	TS2060	20	3.000	3.100	B	1/2	1 5/16	2 1/8	1/2	1.45
70	TS2070	20	3.500	3.600	B	1/2	1 1/16	2 3/8	1/2	1.93
72	TS2072	20	3.600	3.700	B	1/2	1 1/16	2 3/8	1/2	2.01
80	TS2080	20	4.000	4.100	B	5/8	1 1/2	2 1/2	5/8	2.35
84	TS2084	20	4.200	4.300	B	5/8	1 1/2	2 1/2	5/8	2.53
90	TS2090	20	4.500	4.600	B	5/8	1 1/2	2 1/2	5/8	2.82
96	TS2096	20	4.800	4.900	B	5/8	1 1/2	2 1/2	5/8	3.14
100	TS20100	20	5.000	5.100	B	5/8	1 1/2	2 1/2	5/8	3.35
120	TS20120	20	6.000	6.100	B	5/8	1 1/2	2 1/2	5/8	4.58

* Recommended maximum bore with keyway and set screw.

20° P.A. Gears Will Not Operate With 14½° P.A.

Bored-to-Size

No. Teeth	Catalog Number	Pressure Angle (Deg.)	Diameter		Type	Bore (Inches)		Set Screw	Hub (Inches)		Weight Lbs. (App.)
			Pitch	Outside		Stock	Keyway		Diameter	Proj.	
12	TS2012BS 5/16	20	0.600	0.700	B	5/16	NONE	#35 P.H.	15/32	7/16	0.04
14	TS2014BS 5/16	20	0.700	0.800	B	5/16	NONE	#35 P.H.	35/64	7/16	0.06
15	TS2015BS 3/8	20	0.750	0.850	B	3/8	NONE	(1) 8-32	39/64	7/16	0.07
16	TS2016BS 1/2	20	0.800	0.900	B	3/8	NONE	(1) 8-32	21/32	7/16	0.08
18	TS2018BS 3/8	20	0.900	1.000	B	3/8	NONE	(1) 10-24	3/4	7/16	0.12
20	TS2020BS 1/2	20	1.000	1.100	B	1/2	NONE	(1) 10-24	55/64	7/16	0.13
24	TS2024BS 1/2	20	1.200	1.300	B	1/2	NONE	(1) 1/4-20	1 1/16	7/16	0.22
25	TS2025BS 1/2	20	1.250	1.350	B	1/2	NONE	(1) 1/4-20	1 7/64	7/16	0.24
30	TS2030BS 1/2	20	1.500	1.600	B	1/2	NONE	(1) 1/4-20	1 23/64	7/16	0.38
35	TS2035BS 1/2	20	1.750	1.850	B	1/2	NONE	(1) 1/4-20	1 9/16	1/2	0.56
40	TS2040BS 1/2	20	2.000	2.100	B	1/2	NONE	(1) 1/4-20	1 13/16	1/2	0.76
40	TS2040BS 5/8	20	2.000	2.100	B	5/8	3/16 X 3/32	(1) 1/4-20 @ 90	1 13/16	1/2	0.76
40	TS2040BS 3/4	20	2.000	2.100	B	3/4	3/16 X 3/32	(1) 1/4-20 @ 90	1 13/16	1/2	0.76

Gear Selection

Stock Spur Gear Drive Selection

When designing a stock gear drive using the horsepower tables in Catalog 2001, the following steps must be taken:

I. Find out these five necessary things:

a. Exact center distance in inches
b. Ratio and speeds
c. Service factor (from page G-84)
d. Actual horsepower
e. Bore sizes of both gears

II. Determine Design Horsepower using formula:

$$DHP = HP \times SF$$

Where: DHP = Design Horsepower

HP = Actual Horsepower

SF = Service Factor (from page G-84)

III. Determine Pitch Diameters using the formulas:

$$PD_1 = \frac{CD \times 2}{Ratio + 1}$$

$$PD_2 = PD_1 \times Ratio$$

Where: PD_1 = Pitch Diameter of Pinion (small gear)

PD_2 = Pitch Diameter of Gear (large gear)

CD = Center Distance

IV. Check the Center Distance:

$$CD = \frac{PD_1 + PD_2}{2}$$

V. Select Pitch from Horsepower tables on pages G-25 — G-27.

VI. Check Selected pitch for necessary Pitch Diameters.

VII. Check Horsepower capacity of Large Gear.

VIII. Check maximum bore capacity of selected Gears.

Spur Gear Drive Selection II (Other Than Stock)

When designing a gear drive when horsepower and speeds exceed the stock gear tables on pages G-25 — G-27, the following steps must be taken:

I. We must obtain all of the following data:

a. Exact center distance in inches
b. Ratio and speeds
c. Service factor (from page G-84)
d. Actual horsepower
e. Bore sizes of both gears

II. Determine Design Horsepower using formula:

$DHP = HP \times SF$

Where: DHP = Design Horsepower

HP = Actual Horsepower

SF = Service Factor (from page G-84)

III. Determine Pitch Diameters using the formulas:

$$PD_1 = \frac{CD \times 2}{Ratio + 1}$$

$PD_2 = PD_1 \times Ratio$

Where: PD_1 = Pitch Diameter of Pinion (small gear)

PD_2 = Pitch Diameter of Gear (large gear)

CD = Center Distance

IV. Determine velocity using the formula:

$V = .262 \times PD \times RPM$

Where: V = Velocity in feet per minute @ pitch line

PD = Pitch Diameter

RPM = Revolutions per minute of either gear*

V. Determine approximate pitch using the formula:

$$DP = \sqrt{\frac{3.1416 \times S \times 3 \times V \times .25}{DHP \times 27.5\ (1200 + V)}}$$

Where: DP = Diametral Pitch

S = Safe Static Stress per Square Inch of material (see table one, page G-84)

V = Velocity in FPM

DHP = Design Horsepower

Note: To round off answers, go to the nearest DP (standard DP's larger than 3 DP are: 1 DP, 1¼ DP, 1½ DP, 1¾ DP, 2 DP, 2½ DP)

VI. Determine number of teeth on both gears:

$N = PD \times DP$

Where: N = Number of teeth

PD = Pitch Diameter of gear

DP = Diametral Pitch of gear

NOTE: Velocities of both gears will always be the same. When using the above formula make sure to use the proper speed (RPM)with the proper pitch diameter.

Spur Gear Drive Selection II
(Other Than Stock)

VII. Determine Face Width:

$$F = DP\frac{\left(\frac{DHP \times 33{,}000}{V}\right)}{SY\left(\frac{600}{600 + V}\right)}$$

Where: F = Face Width

DP = Diametral Pitch

V = Velocity in FPM

S = Safe Static Stress per Square Inch of material (Table 1, page G-84)

Y = Outline formula from Table 2, page G-84

Note: To round off each answer, go to the next one inch.

VIII. Check HP rating of selected pinion using the formula:

$$HP = \frac{LV}{33{,}000}$$

Where: $L = \frac{SYF}{DP} \times \frac{600}{600 + V}$

From horsepower formulas on page G-83.

Note: If the horsepower capacity is below the design horsepower, the following options can be taken:
A. Harden pinion (check gear HP capacity first)
B. Increase face
C. Increase pitch

Center Distance, Pitch Diameters and Ratios of Spur Gears

To determine the pitch diameters of a gear set, we must find two basic things:

1. Required ratio
2. Required center distance

Knowing this, first figure out the pitch diameter of the pinion (smaller gear) using the formula:

$$PD_1 = \frac{CD \times 2}{Ratio + 1}$$

Where: PD_1 = Pitch Diameter of the Pinion

CD = Center Distance

Then, find the pitch diameter of the larger gear, PD_2, by using the formula:

$$PD_2 = PD_1 \times Ratio$$

Then check the center distance by using the formula:

$$CD = \frac{PD_1 \times PD_2}{2}$$

Horsepower Formulas

See page G-84 for tables one, two and three

Engineering Data
Lewis Formula (with Barth Revision)

L = Load in pounds at pitch line

S = Safe static stress per square inch of material (see table one)

DP = Diametral Pitch

F = Face width of gear

Y = Strength factor based on Pressure Angle and Number of Teeth (See table two)

V = Velocity in feet per minute
V = .262 x PD x RPM

PD = Pitch Diameter

RPM = Revolutions Per Minute

HP = Horsepower

$$L = \frac{SFY}{DP} \times \frac{600}{600 + V}$$

Maximum allowable torque (T) that should be imposed on a gear will be the safe tooth load (L) multiplied by

$$\frac{DP}{2} \text{ or } T = \frac{L \times PD}{2}$$

The safe Horsepower capacity of the gear (at a given RPM) can be calculated from $HP = \frac{T \times RPM}{63{,}025}$

or directly from (L) and (V):

$$*HP = \frac{LV}{33{,}000}$$

$$\text{For a known HP, } T = \frac{63025 \times HP}{RPM}$$

For NON-METALLIC GEARS, the modified Lewis Formula shown below may be used with (S) values of 6000 PSI for Phenolic Laminated material.

$$L = \frac{SFY}{DP}\left(\frac{150}{200 + V} + .25\right)$$

* Apply SERVICEFACTOR (table three) for required horsepower.

Gear Standards

Table One

(S) Average values in pounds per square inch

Material	S
Steel — .40 Carbon	25000
— .20 Carbon	20000
Steel — .40 Carbon Heat Treated	35000
Cast Iron	12000
Bronze	10000
Non-Metallic	6000

Table Two

Outline factor Y for use with Diametral Pitch

Number of Teeth	14½ P.A. Involute	20 P.A. Involute	Number of Teeth	14½ P.A. Involute	20 P.A. Involute
10	.176	.201	26	.308	.344
11	.192	.226	28	.314	.352
12	.210	.245	30	.318	.358
13	.223	.264	35	.327	.373
14	.235	.276	40	.336	.389
15	.245	.289	45	.340	.399
16	.255	.295	50	.346	.408
17	.264	.302	60	.355	.421
18	.270	.308	70	.360	.429
19	.277	.314	80	.363	.436
20	.283	.320	90	.366	.442
21	.289	.326	100	.368	.446
22	.292	.330	150	.375	.458
23	.296	.333	200	.378	.463
24	.302	.337	RACK	.390	.484
25	.305	.340			

Table Three

Service factors

Multiply required horsepower by service factor recommended for type of service

Type of Load	Intermittent or 3 Hours per Day	8-10 Hours per Day	Continuous 24 Hours per Day
UNIFORM	.80	1.00	1.25
LIGHT SHOCK	1.00	1.25	1.50
MEDIUM SHOCK	1.25	1.50	1.80
HEAVY SHOCK	1.50	1.80	2.00

Spur Gear Dimensional Formulas Diametral Pitch

Rules and Formulas For Spur Gear Calculations

Diametral Pitch
Diametral Pitch is the Number of Teeth to Each Inch of the Pitch Diameter.

To Find	Having	Rule	Formula
The Diametrical Pitch	The Circular Pitch	Divide 3.1416 by the Circular Pitch	$DP = \frac{3.1416}{CP}$
The Diametrical Pitch	The Pitch Diameter and the Number of Teeth	Divide the Number of Teeth by Pitch Diameter	$DP = \frac{N}{D'}$
The Diametrical Pitch	The Outside Diameter and Number of Teeth	Divide the Number of Teeth plus 2 by Outside Diameter	$DP = \frac{N+2}{D}$
Pitch Diameter	The Number of Teeth and the Diametral Pitch	Divide Number of Teeth by the Diametral Pitch	$D' = \frac{N}{P}$
Pitch Diameter	The Number of Teeth and Outside Diameter	Divide the product of Outside Diameter and Number of Teeth by Number of Teeth plus 2	$D' = \frac{DN}{N+2}$
Pitch Diameter	The Outside Diameter and the Diametral Pitch	Subtract from the Outside Diameter the Quotient of 2 Divided by the Diametral Pitch	$D' = D \frac{2}{P}$
Pitch Diameter	Addendum and the Number of Teeth	Multiply Addendum by the Number of Teeth	$D' = sN$
Outside Diameter	The Number of Teeth and the Diametral Pitch	Divide number of Teeth plus 2 by the Diametral Pitch	$D = \frac{N+2}{P}$
Outside Diameter	The Pitch Diameter and the Diametral Pitch	Add to the Pitch Diameter the quotient of 2 divided by the Diametral Pitch	$D = D' + \frac{2}{P}$
Outside Diameter	The Pitch Diameter and the Number of Teeth	Divide the Number of Teeth plus 2 by the quotient of Number of Teeth divided by Pitch Diameter	$D = \frac{N+2}{N \div D'}$
Outside Diameter	The Number of Teeth and Addendum	Multiply the Number of Teeth plus 2 by Addendum	$D = (N+2)s$
Number of Teeth	The Pitch Diameter and the Diametral Pitch	Multiply the Pitch Diameter by the Diametral Pitch	$N = D'P$
Number of Teeth	The Outside Diameter and the Diametral Pitch	Multiply Outside Diameter by the Diametral Pitch and subtract 2	$N = DP - 2$
Thickness of Tooth	The Diametral Pitch	Divide 1.5708 by the Diametral Pitch	$t = \frac{1.5708}{P}$
Addendum	The Diametral Pitch	Divide 1 by the Diametral Pitch or $A = \frac{D'}{N}$	$A = \frac{1}{P}$
Dedendum	The Diametral Pitch	Divide 1.157 by the Diametral Pitch	$A+L = \frac{1.157}{P}$
Working Depth	The Diametral Pitch	Divide 2 by the Diametral Pitch	$WD = \frac{2}{P}$
Whole Depth	The Diametral Pitch	Divide 2.157 by the Diametral Pitch	$D'' = \frac{2.157}{P}$
Clearance	The Diametral Pitch	Divide .157 by the Diametral Pitch	$L = \frac{.157}{P}$
Clearance	Thickness of Tooth	Divide Thickness of Tooth at Pitch Line by 10	$L = \frac{t}{10}$

NOTE: Rules and Formulas Relating to Tooth Depth and Outside Diameter Apply to Full-Depth, Equal Addendum Gears.

Diametral Pitch Tooth Dimensions

Dimensions of Standard Full-depth Teeth

Diametral Pitches and Equivalent Circular Pitches

Diametral Pitch	Circular Pitch	Module	Arc Thickness of Tooth on Pitch Line	Addendum	Working Depth of Tooth	Dedendum or Depth of Space Below Pitch Line	Whole Depth of Tooth*
½	6.2832	50.8	3.1416	2.0000	4.0000	2.3142	4.3142
¾	4.1888	33.8667	2.0944	1.3333	2.6666	1.5428	2.8761
1	3.1416	25.4	1.5708	1.0000	2.0000	1.1571	2.1571
1-¼	2.5133	20.32	1.2566	0.8000	1.6000	0.9257	1.7257
1-½	2.0944	16.9333	1.0472	0.6666	1.3333	0.7714	1.4381
1-¾	1.7952	14.5143	0.8976	0.5714	1.1429	0.6612	1.2326
2	1.5708	12.7	0.7854	0.5000	1.0000	0.5785	1.0785
2-¼	1.3963	11.2889	0.6981	0.4444	0.8888	0.5143	0.9587
2-½	1.2566	10.16	0.6283	0.4000	0.8000	0.4628	0.8628
2-¾	1.1424	9.2364	0.5712	0.3636	0.7273	0.4208	0.7844
3	1.0472	8.4667	0.5236	0.3333	0.6666	0.3857	0.7190
3-½	0.8976	7.2571	0.4488	0.2857	0.5714	0.3306	0.6163
4	0.7854	6.35	0.3927	0.2500	0.5000	0.2893	0.5393
5	0.6283	5.08	0.3142	0.2000	0.4000	0.2314	0.4314
6	0.5236	4.2333	0.2618	0.1666	0.3333	0.1928	0.3595
7	0.4488	3.6286	0.2244	0.1429	0.2857	0.1653	0.3081
8	0.3927	3.175	0.1963	0.1250	0.2500	0.1446	0.2696
9	0.3491	2.8222	0.1745	0.1111	0.2222	0.1286	0.2397
10	0.3142	2.54	0.1571	0.1000	0.2000	0.1157	0.2157
11	0.2856	2.3091	0.1428	0.0909	0.1818	0.1052	0.1961
12	0.2618	2.1167	0.1309	0.0833	0.1666	0.0964	0.1798
13	0.2417	1.9538	0.1208	0.0769	0.1538	0.0890	0.1659
14	0.2244	1.8143	0.1122	0.0714	0.1429	0.0826	0.1541
15	0.2094	1.6933	0.1047	0.0666	0.1333	0.0771	0.1438
16	0.1963	1.5875	0.0982	0.0625	0.1250	0.0723	0.1348
17	0.1848	1.4941	0.0924	0.0588	0.1176	0.0681	0.1269
18	0.1745	1.4111	0.0873	0.0555	0.1111	0.0643	0.1198
19	0.1653	1.3368	0.0827	0.0526	0.1053	0.0609	0.1135
20	0.1571	1.27	0.0785	0.0500	0.1000	0.0579	0.1079
22	0.1428	1.1545	0.0714	0.0455	0.0909	0.0526	0.0980
24	0.1309	1.0583	0.0654	0.0417	0.0833	0.0482	0.0898
26	0.1208	.9769	0.0604	0.0385	0.0769	0.0445	0.0829
28	0.1122	.9071	0.0561	0.0357	0.0714	0.0413	0.0770
30	0.1047	.8467	0.0524	0.0333	0.0666	0.0386	0.0719
32	0.0982	.7938	0.0491	0.0312	0.0625	0.0362	0.0674
34	0.0924	.7471	0.0462	0.0294	0.0588	0.0340	0.0634
36	0.0873	.7056	0.0436	0.0278	0.0555	0.0321	0.0599
38	0.0827	.6684	0.0413	0.0263	0.0526	0.0304	0.0568
40	0.0785	.635	0.0393	0.0250	0.0500	0.0289	0.0539

*NOTE: Dimensions listed are for HOBCUT TEETHONLY. Shaper cut teeth may be slightly larger. Consult factory for exact measurement.

All Gears In Stock Are Diametral Pitch

Spur Gear Dimensional Formulas Circular Pitch

Rules and Formulas For Spur Gear Calculations

Circular Pitch

Circular Pitch is the Distance from the Center of One Tooth to the Center of the Next Tooth, Measured Along the Pitch Circle.

To Find	Having	Rule	Formula
The Circular Pitch	The Diametral Pitch	Divide 3.1416 by the Diametral Pitch	$C' = \frac{3.1416}{DP}$
The Circular Pitch	The Pitch Diameter and the Number of Teeth	Divide Pitch Diameter by the product of .3183 and Number of Teeth	$C' = \frac{PD}{.3183N}$
The Circular Pitch	The Outside Diameter and the Number of Teeth	Divide Outside Diameter by the product of .3183 and Number of Teeth plus 2	$C' = \frac{OD}{.3183\ N + 2}$
Pitch Diameter	The Number of Teeth and the Circular Pitch	The continued product of the Number of Teeth, the Circular Pitch and .3183	$D' = NC' .3183$
Pitch Diameter	The Number of Teeth and the Outside Diameter	Divide the product of Number of Teeth and Outside Diameter by Number of Teeth plus 2	$D = \frac{N \times OD}{N + 2}$
Pitch Diameter	The Outside Diameter and the Circular Pitch	Subtract from the Outside Diameter the product of the Circular Pitch and .6366	$D' = OD - (C' .6366)$
Pitch Diameter	Addendum and the Number of Teeth	Multiply the Number of Teeth by the Addendum	$D' = NA$
Outside Diameter	The Number of Teeth and the Circular Pitch	The continued product of the Number of Teeth plus 2, the Circular Pitch and .3183	$D = (N + 2)\ C' .3183$
Outside Diameter	The Pitch Diameter and the Circular Pitch	Add to the Pitch Diameter the product of the Circular Pitch and .6366	$D = PD + (C' .6366)$
Outside Diameter	The Number of Teeth and the Addendum	Multiply Addendum by Number of Teeth plus 2	$D = A\ (N + 2)$
Number of Teeth	The Pitch Diameter and the Circular Pitch	Divide the product of Pitch Diameter and 3.1416 by the Circular Pitch	$N = \frac{PD3.1416}{C'}$
Thickness of Tooth	The Circular Pitch	One-half the Circular Pitch	$t = \frac{C'}{2}$
Addendum	The Circular Pitch	Multiply the Circular Pitch by .3183 or $s = \frac{D'}{N}$	$A = C'.3183$
Dedendum	The Circular Pitch	Multiply the Circular Pitch by .3683	$A + L = C' .3683$
Working Depth	The Circular Pitch	Multiply the Circular Pitch by .6366	$WD = C' .6366$
Whole Depth	The Circular Pitch	Multiply the Circular Pitch by .6866	$D'' = C' .6866$
Clearance	The Circular Pitch	Multiply the Circular Pitch by .05	$L = C\ .05$
Clearance	Thickness of Tooth	One-Tenth theThickness of Tooth at Pitch Line	$L = \frac{t}{10}$

NOTE: Rules and Formulas Relating to Tooth Depth and Outside Diameter Apply to Full-Depth, Equal Addendum Gears.

Circular Pitch Gears Made To Order Only

Circular Pitch
Tooth Dimensions

Dimensions of Standard Full-depth Teeth

Circular Pitches and Equivalent Diametral Pitches

Circular Pitch	Diametral Pitch	Module	Arc Thickness of Tooth on Pitch Line	Addendum	Working Depth of Tooth	Dedendum or Depth of Space Below Pitch Line	Whole Depth of Tooth
4	0.7854	32.3402	2.0000	1.2732	2.5464	1.4732	2.7464
3-½	0.8976	28.2581	1.7500	1.1140	2.2281	1.2890	2.4031
3	1.0472	24.2552	1.5000	0.9549	1.9098	1.1049	2.0598
2-¾	1.1424	22.2339	1.3750	0.8753	1.7506	1.0128	1.8881
2-½	1.2566	20.2117	1.2500	0.7957	1.5915	0.9207	1.7165
2-¼	1.3963	18.1913	1.1250	0.7162	1.4323	0.8287	1.5448
2	1.5708	16.1701	1.0000	0.6366	1.2732	0.7366	1.3732
1-⅞	1.6755	15.1595	0.9375	0.5968	1.1937	0.6906	1.2874
1-¾	1.7952	14.1488	0.8750	0.5570	1.1141	0.6445	1.2016
1-⅝	1.9333	13.1382	0.8125	0.5173	1.0345	0.5985	1.1158
1-½	2.0944	12.1276	0.7500	0.4775	0.9549	0.5525	1.0299
1-7/16	2.1855	11.6223	0.7187	0.4576	0.9151	0.5294	0.9870
1-⅜	2.2848	11.1169	0.6875	0.4377	0.8754	0.5064	0.9441
1-5/16	2.3936	10.6116	0.6562	0.4178	0.8356	0.4834	0.9012
1-¼	2.5133	10.1062	0.6250	0.3979	0.7958	0.4604	0.8583
1-3/16	2.6456	9.6010	0.5937	0.3780	0.7560	0.4374	0.8154
1-⅛	2.7925	9.0958	0.5625	0.3581	0.7162	0.4143	0.7724
1-1/16	2.9568	8.5904	0.5312	0.3382	0.6764	0.3913	0.7295
1	3.1416	8.0851	0.5000	0.3183	0.6366	0.3683	0.6866
15/16	3.3510	7.5798	0.4687	0.2984	0.5968	0.3453	0.6437
⅞	3.5904	7.0744	0.4375	0.2785	0.5570	0.3223	0.6007
13/16	3.8666	6.5692	0.4062	0.2586	0.5173	0.2993	0.5579
¾	4.1888	6.0639	0.3750	0.2387	0.4775	0.2762	0.5150
11/16	4.5696	5.5586	0.3437	0.2189	0.4377	0.2532	0.4720
⅔	4.7124	5.3903	0.3333	0.2122	0.4244	0.2455	0.4577
⅝	5.0265	5.0532	0.3125	0.1989	0.3979	0.2301	0.4291
9/16	5.5851	4.5479	0.2812	0.1790	0.3581	0.2071	0.3862
½	6.2832	4.0426	0.2500	0.1592	0.3183	0.1842	0.3433
7/16	7.1808	3.5373	0.2187	0.1393	0.2785	0.1611	0.3003
⅖	7.8540	3.2340	0.2000	0.1273	0.2546	0.1473	0.2746
⅜	8.3776	3.0319	0.1875	0.1194	0.2387	0.1381	0.2575
⅓	9.4248	2.6947	0.1666	0.1061	0.2122	0.1228	0.2289
5/16	10.0531	2.5266	0.1562	0.0995	0.1989	0.1151	0.2146
2/7	10.9956	2.3100	0.1429	0.0909	0.1819	0.1052	0.1962
¼	12.5664	2.0213	0.1250	0.0796	0.1591	0.0921	0.1716
⅛	14.1372	1.7967	0.1111	0.0707	0.1415	0.0818	0.1526
⅕	15.7080	1.6170	0.1000	0.0637	0.1273	0.0737	0.1373
3/16	16.7552	1.5160	0.0937	0.0597	0.1194	0.0690	0.1287
1/6	18.8496	.5053	0.0833	0.0531	0.1061	0.0614	0.1144

All Circular Pitch Gears Are Made-To-Order

Spur Gear Dimensional Formulas Module

Rules and Formulas
For Module (Metric) Spur Gear Calculations

(Module Represents the Amount of Pitch Diameter per Tooth)

To Find	Having	Rule	Formula
Metric Module	Pitch Diameter and Number of Teeth	Divide Pitch Diameter in Millimeters by the Number of Teeth	$M = \frac{PD\ (Millimeters)}{N}$
Metric Module	Circular Pitch in Millimeter	Divide Circular Pitch in Millimeters by Pi (3.1416)	$M = \frac{C\ (Millimeters)}{3.1416}$
Metric Module	Diametral Pitch	Divide 25.4 by Diametral Pitch	$M = \frac{25.4}{DP}$
Metric Module	Outside Diameter and Number of Teeth	Divide Outside Diameter (in Millimeters) by the Number of Teeth plus 2	$M = \frac{OD}{N + 2}$
Pitch Diameter	Module and Number of Teeth	Multiply Module by Number of Teeth	D′ (In MM)= M x N
Pitch Diameter	Number of Teeth and Outside Diameter	Divide the product of Outside Diameter and No. of Teeth by No. of Teeth plus 2	$D' = \frac{OD \times N}{N + 2}$
Pitch Diameter	Outside Diameter and the Module	Multiply Module by 2 and Subtract from Outside Diameter	D′ = OD - 2M
Outside Diameter	Module and Number of Teeth	Number of Teeth plus 2 Multiplied by Module	OD (In MM) = (N + 2) x M
Diametral Pitch	Module	Divide 25.4 by Module	$DP = \frac{25.4}{M}$
Circular Pitch	Module	Multiply Module by Pi (3.1416)	C′ (In MM) = M x 3.1416
Addendum	Module Known	The Addendum equals the Module	A = M
Whole Depth	Module Known	Multiply 2.157 by Module	D″ (In MM) = 2.157 x M
Thickness of Tooth	Module and Outside Diameter	Multiply Pitch Diameter (in Millimeters) by the Sine of the Angle of 90 Divided by the Number of Teeth	$t\ (In\ MM) = PD\ (MM) \times Sine\ \frac{90}{N}$
English Module	Pitch Diameter in Inches and Number of Teeth	Divide Pitch Diameter in Inches by Number of Teeth	$M = \frac{PD\ (Inches)}{N}$ (Answer in Fraction)

NOTE: Rules and Formulas Relating to Tooth Depth and Outside Diameter Apply to Full-Depth, Equal Addendum Gears.

Module Pitch
Tooth Dimensions

Tooth Dimensions Based Upon Module System

(One millimeter equals 0.03937 inch)

Module, DIN Standard Series	Equivalent Diametral Pitch	Circular Pitch		Addendum, Millimeters	Dedendum, Millimeters†	Whole Depth,† Millimeters	Whole Depth,‡ Millimeters
		Millimeters	Inches				
0.3	84.667	0.943	0.0371	0.30	0.35	0.650	0.647
0.4	63.500	1.257	0.0495	0.40	0.467	0.867	0.863
0.5	50.800	1.571	0.0618	0.50	0.583	1.083	1.079
0.6	42.333	1.885	0.0742	0.60	0.700	1.300	1.294
0.7	36.286	2.199	0.0865	0.70	0.817	1.517	1.510
0.8	31.750	2.513	0.0989	0.80	0.933	1.733	1.726
0.9	28.222	2.827	0.1113	0.90	1.050	1.950	1.941
1	25.400	3.142	0.1237	1.00	1.167	2.167	2.157
1.25	20.320	3.927	0.1546	1.25	1.458	2.708	2.697
1.5	16.933	4.712	0.1855	1.50	1.750	3.250	3.236
1.75	14.514	5.498	0.2164	1.75	2.042	3.792	3.774
2	12.700	6.283	0.2474	2.00	2.333	4.333	4.314
2.25	11.289	7.069	0.2783	2.25	2.625	4.875	4.853
2.5	10.160	7.854	0.3092	2.50	2.917	5.417	5.392
2.75	9.236	8.639	0.3401	2.75	3.208	5.958	5.932
3	8.466	9.425	0.3711	3.00	3.500	6.500	6.471
3.25	7.815	10.210	0.4020	3.25	3.791	7.041	7.010
3.5	7.257	10.996	0.4329	3.50	4.083	7.583	7.550
3.75	6.773	11.781	0.4638	3.75	4.375	8.125	8.089
4	6.350	12.566	0.4947	4.00	4.666	8.666	8.628
4.5	5.644	14.137	0.5566	4.50	5.25	9.750	9.707
5	5.080	15.708	0.6184	5.00	5.833	10.833	10.785
5.5	4.618	17.279	0.6803	5.50	6.416	11.916	11.864
6	4.233	18.850	0.7421	6.00	7.000	13.000	12.942
6.5	3.908	20.420	0.8035	6.50	7.583	14.083	14.021
7	3.628	21.991	0.8658	7.00	8.166	15.166	15.099
8	3.175	25.132	0.9895	8.00	9.333	17.333	17.256
9	2.822	28.274	1.1132	9.00	10.499	19.499	19.413
10	2.540	31.416	1.2368	10.00	11.666	21.666	21.571
11	2.309	34.558	1.3606	11.00	12.833	23.833	23.728
12	2.117	37.699	1.4843	12.00	14.000	26.000	25.884
13	1.954	40.841	1.6079	13.00	15.166	28.166	28.041
14	1.814	43.982	1.7317	14.00	16.332	30.332	30.198
15	1.693	47.124	1.8541	15.00	17.499	32.499	32.355
16	1.587	50.266	1.9790	16.00	18.666	34.666	34.512
18	1.411	56.549	2.2263	18.00	21.000	39.000	38.826
20	1.270	62.832	2.4737	20.00	23.332	43.332	43.142
22	1.155	69.115	2.7210	22.00	25.665	47.665	47.454
24	1.058	75.398	2.9685	24.00	28.000	52.000	51.768
27	0.941	84.823	3.339	27.00	31.498	58.498	58.239
30	0.847	94.248	3.711	30.00	35.000	65.000	64.713
33	0.770	103.673	4.082	33.00	38.498	71.498	71.181
36	0.706	113.097	4.453	36.00	41.998	77.998	77.652
39	0.651	122.522	4.824	39.00	45.497	84.497	84.123
42	0.605	131.947	5.195	42.00	48.997	90.997	90.594
45	0.564	141.372	5.566	45.00	52.497	97.497	97.065
50	0.508	157.080	6.184	50.00	58.330	108.330	107.855
55	0.462	172.788	6.803	55.00	64.163	119.163	118.635
60	0.423	188.496	7.421	60.00	69.996	129.996	129.426
65	0.391	204.204	8.040	65.00	75.829	140.829	140.205
70	0.363	219.911	8.658	70.00	81.662	151.662	150.997
75	0.339	235.619	9.276	75.00	87.495	162.495	161.775

† Dedendum and total depth when clearance = 0.1666 x module, or one-sixth module.
‡ Total Depth equivalent to American standard full-depth teeth. (Clearance = 0.157 x Module.)

Bevel & Miter Gear Formulas

To Find	Rule	Formula
Pitch Diameter	Divide Number of Teeth by Diametral Pitch	$\text{Pitch Diameter} = \frac{\text{Number of Teeth}}{\text{Diametral Pitch}}$
Tangent of Pitch Angle Of Driven	Divide Number of Teeth in Driven by Number of Teeth in Driver	$\text{Tangent Pitch Angle of Driven} = \frac{\text{Number of Teeth in Driven}}{\text{Number of Teeth in Driver}} = \text{Ratio}$
Pitch Angle of Driver	Subtract Pitch Angle of Driven from 90 Degrees	Pitch Angle Of Driver = 90 Degrees - Pitch Angle of Driven
Pitch Cone Radius	Divide Pitch Diameter by Twice the Sine of the Pitch Angle	$\text{Pitch Cone Radius} = \frac{\text{Pitch Diamter}}{2 \times \text{Sine Pitch Angle}}$
Tangent of Addendum Angle	Divide Addendum by the Pitch Cone Radius	$\text{Tangent of Addendum Angle} = \frac{\text{Addendum}}{\text{Pitch Cone Radius}}$
Face Angle	Add Addendum Angle to Pitch Angle	Face Angle = Addendum Angle + Pitch Angle
Tangent of Dedendum Angle	Divide Dedendum by the Pitch Cone Radius	$\text{Tangent of Dedendum Angle} = \frac{\text{Dedendum}}{\text{Pitch Cone Radius}}$
Root Angle	Subtract Dedendum Angle from Pitch Angle	Root Angle = Pitch Angle - Dedendum Angle
Angular Addendum	Multiply Addendum by Cosine of Pitch Angle	Angular Addendum = Addendum x Cosine Pitch Angle
Outside Diameter	Add 2 Angular Addenda to Pitch Diameter	Outside Diameter = 2 Angular Addenda x Pitch Diamter
Mounting Distance	Add one-half the Pitch Diameter of Mating to Pitch Line	$\text{Mounting Distance} = \frac{\text{Pitch Diameter of Mate}}{2} + \text{Backing to Pitch Line}$
Distance From Cone Center to Crown	Multiply one-half Outside Diameter by Co-tangent of Face Angle	$\text{Cone Center to Crown} = \frac{\text{Outside Diameter}}{2} \times \text{Co-Tangent Face Angle}$
Backing to Crown	Subtract Cone Center to Crown from Mounting Distance	Backing to Crown = Mounting Distance - Cone Center to Crown
Ratio	Divide Teeth in Driven by Teeth in Driver	$\text{Ratio} = \frac{\text{Number of Teeth in Driven}}{\text{Number of Teeth in Driver}}$

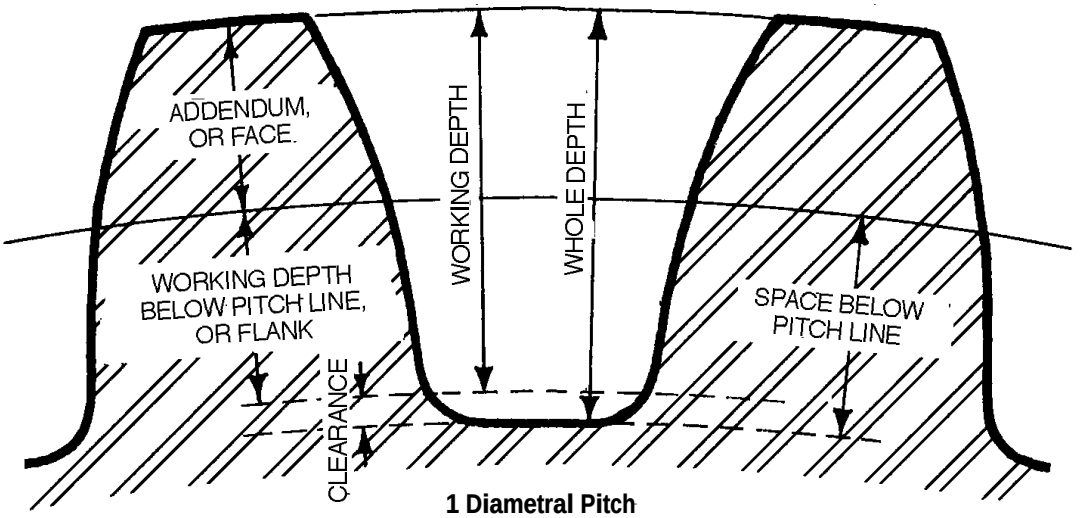
Formula For Worm Gears

(Based On Diametral Pitch)

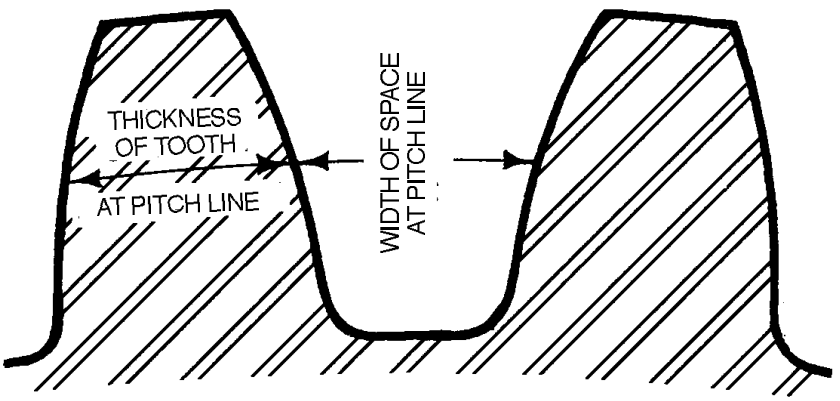
To Find	Rule	Formula
Worm Gear Pitch Diameter	Divide Number of Teeth by Diametral Pitch	$\text{Pitch Diameter} = \frac{\text{Number of Teeth in Worm Gear}}{\text{Diametral Pitch}}$
Worm Gear Throat Diameter	Add 2 Addenda to Pitch Diameter	Throat Diameter = (2 x Addendum) + Pitch Diameter
Worm Gear Outside Diameter	Add 3 Addenda to Pitch Diameter	Outside Diameter = (3 x Addendum) + Pitch Diameter
Worm Pitch Diameter	Subtract the Worm Gear Pitch Diameter from Twice the Center Distance	Worm Pitch Diameter = (2 x Center Distance) - Worm Gear Pitch Diameter
Worm Outside Diameter	Add 2 Addenda to Worm Pitch Diameter	Worm Outside Diameter = Worm Pitch Diameter + 2 x Addendum
Worm Lead	Divide 3.1416 by Diametral Pitch and Multiply by Number of Threads in Worm	$\text{Worm Lead} = \frac{3.1416}{\text{Diametral Pitch}}$ x Number of Threads in Worm
Co-Tangent of Worm Helix Angle	Multiply Worm Pitch Diameter by Diametral Pitch and Divide by Number of Worm Threads	$\text{Co-Tangent Worm Helix Angle} = \frac{\text{Worm Pitch Diameter x Diametral Pitch}}{\text{Number Worm Threads}}$
Center Distance	Add Worm Pitch Diameter to Worm Gear Pitch Diameter and Divide Sum by 2	$\text{Center Distance} = \frac{\text{Worm Pitch Diameter + Worm Gear Pitch Diameter}}{2}$
Ratio	Divide Number of Teeth in Worm Gear by Number of Worm Threads	$\text{Ratio} = \frac{\text{Number of Teeth in Worm Gear}}{\text{Number of Worm Threads}}$

NOTE: Tooth data (Addendum, Full Depth, Etc.) is same as for Spur Gears.

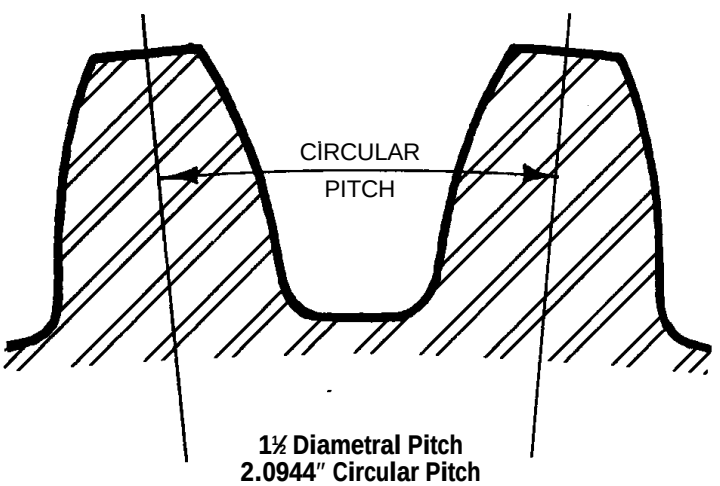
Comparative Sizes of Involute Gear Teeth



1 Diametral Pitch
3.1416″ Circular Pitch



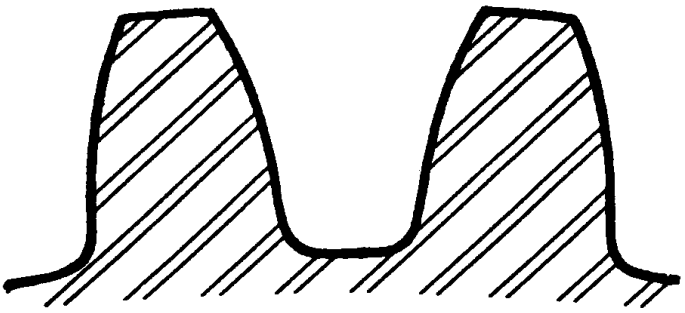
1¼ Diametral Pitch
2.5133″ Circular Pitch



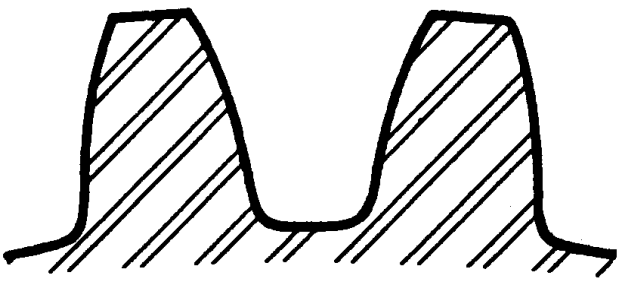
1½ Diametral Pitch
2.0944″ Circular Pitch

Cut Spur Gears
14½° P.A.

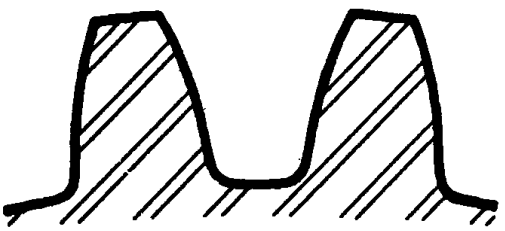
Comparative Sizes of Involute Gear Teeth



1¼ Diametral Pitch
1.7952″ Circular Pitch

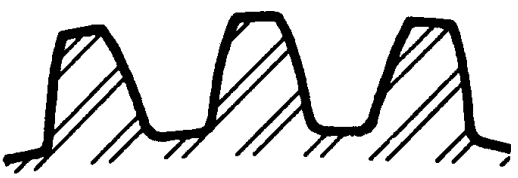


2 Diametral Pitch
1.5708″ Circular Pitch



2½ Diametral Pitch
1.2566″ Circular Pitch

3 Diametral Pitch
1.0472″ Circular Pitch



3½ Diametral Pitch
.8976″ Circular Pitch

4 Diametral Pitch
.7854″ Circular Pitch

5 Diametral Pitch
.6283″ Circular Pitch

6 Diametral Pitch
.5236″ Circular Pitch

Cut Spur Gears
14½° P.A.

Comparative Sizes of Involute Gear Teeth

7 Diametral Pitch
.4488″ Circular Pitch

8 Diametral Pitch
.3927″ Circular Pitch

10 Diametral Pitch
.3142″ Circular Pitch

12 Diametral Pitch
.2618″ Circular Pitch

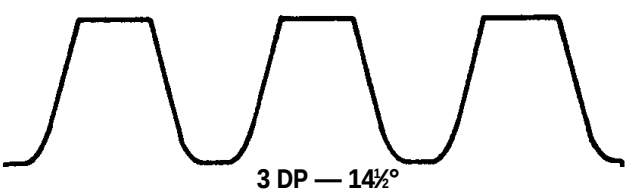
14 Diametral Pitch
.2244″ Circular Pitch

16 Diametral Pitch
.1963″ Circular Pitch

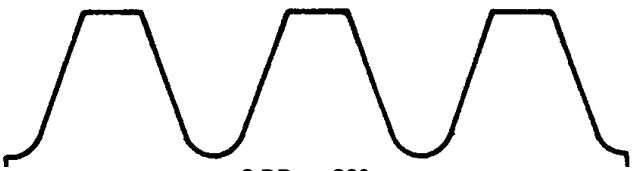
18 Diametral Pitch
.1745″ Circular Pitch

20 Diametral Pitch
.1571″ Circular Pitch

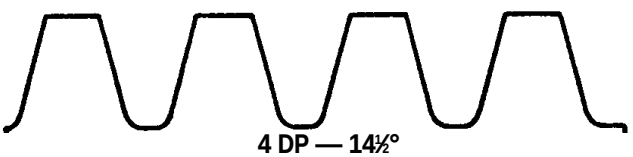
Gear Rack Comparison — 14½ and 20°



3 DP — 14½°



3 DP — 20°



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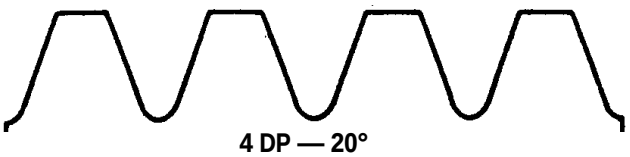

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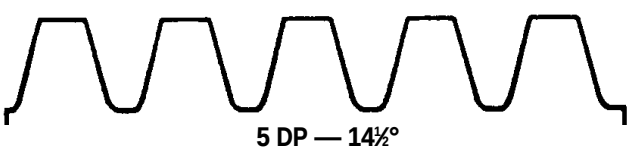

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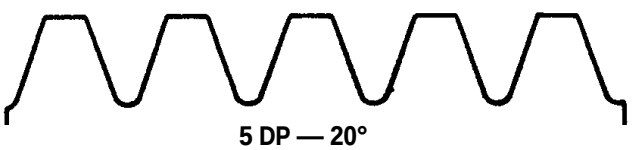

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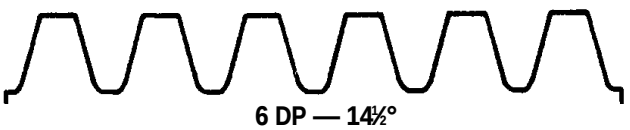
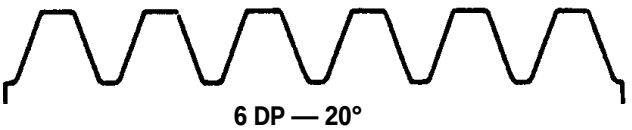


6 DP — 14½°



6 DP — 20°

Gear Materials

Stock Steel Gears

Martin steel gears are manufactured from high quality carbon steel material. This material is used for strength and good hardening characteristics. These gears may be hardened by any method acceptable to good practice such as flame or induction hardening. Flame hardening is preferred so that only the teeth are hardened. Distortion is virtually eliminated and the bore is left soft for subsequent work.

Cast Gears

Martin cast iron gears are manufactured from high quality close grained controlled specification irons.

Reboring of Stock Gears

Most of Martin's Stock Gears may be rebored. The maximum recommended bore size is given for each gear. In reboring gears, care must be taken to hold the bore concentric with the pitch diameter. In most cases this would require a great amount of time. To cut costly set-up time when reboring, Martin holds the outside diameter of its gears concentric with the bore which in turn is concentric with the pitch diameter. The outside diameter is held to a closer total indicator reading than the pitch diameter. In the finer pitches, care should be taken not to distort the outside diameter when chucking.

Martin 's steel gears are machined all over.

Rebore or rework may be accomplished by chucking on the hub. Concentricity must be controlled in order for gears to run at maximum efficiency.

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A broad inventory of equipment ensures prompt worldwide delivery.

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