Starting Motor Pinions and Ring Gears —SAE J543c

SAE Standard
Last Revised April 1976

THIS IS A PREPRINT AND WILL APPEAR IN THE NEXT EDITION OF THE SAE HANDBOOK

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PREPRINT

STARTING MOTOR PINIONS AND RING GEARS—SAE J543c SAE Standard

Report of Electrical Equipment Division approved August 1917 and last revised by Electrical Equipment Committee April 1976.

The following table and illustrations are to be used as a guide in establishing starting motor pinions and ring gear designs. Consult the gear manufacturer for detail dimensions.

Ring Gear Design—Ring gears of 10/12 pitch and finer are normally not chamfered. Gears coarser than 10/12 pitch should be chamfered in accordance with Fig. 1.

Ring Gear and Pinion Installation—Backlash is necessary for free meshing and running of the pinion with the ring gear. Backlash may be obtained by increasing the center distance as shown in Fig. 2 or by reducing the tooth thickness.

Ring Gear Hardness—Hardness range for typical ring gears after assembly is:

8/10 pitch and coarser Rockwell C45-52
10/12 pitch and finer Rockwell C48-55

Center Distance—The formula for calculating center distance (C.D.) is:

$$\text{C. D.} = \frac{\text{No. Ring Gear Teeth (Blank)}^a + \text{No. Pinion Teeth (Blank)}^a}{2 \times \text{Diametral Pitch}^b} + \Delta C^c$$

where:

[a] = the number of teeth is equal to the number used to determine blank size. A blank is a disk or cylinder of such size as to relate to a standard gear of standard addendum, dedendum and given number of teeth. To increase tooth strength and improve cranking ratio, many pinion gears are cut on an oversize blank (example: 10 teeth on 11 tooth blank). In this example, 11 would be used for the number of pinion teeth in calculating center distance.

[b] = for fractional diametral pitch (example: 8/10 pitch), use the numerator (8 in this example) for center distance calculation.

[c] = ΔC is the increase in center distance to obtain backlash. See Fig. 2. If backlash is obtained by reducing tooth thickness, omit ΔC from the C.D. formula.

Pinion and Gear Data		Pinion Data[a]				
Diametral Pitch[b]	Pressure Angle, deg	No. of Teeth	Maximum Root Dia,[c] in	Maximum Outside Dia, in	Maximum Circular Tooth Thickness at Theoretical Pitch Dia, in	Layout Pitch Dia, in
12/14	12	9	0.695	1.016	0.161	0.873
12	14½	9	0.698	1.017	0.167	0.874
12	14½	9	0.648	1.027	0.167	0.874
10	14½	9	0.812	1.200	0.194	1.000
10	14½	10	0.839	1.300	0.194	1.100
10/12	20	9	0.789	1.167	0.188	1.000
10/12	20	9	0.821	1.167	0.198	1.000
10/12	20	10	0.889	1.267	0.187	1.100
10/12	20	10	0.942	1.307	0.204	1.140
10/12	20	11	0.989	1.367	0.187	1.200
10/12	20	12	1.089	1.467	0.187	1.300
8/10	20	9	1.000	1.450	0.245	1.250
8/10	20	10	1.109	1.556	0.235	1.356
8/10	20	10	1.125	1.562	0.237	1.375
8/10	20	10	1.125	1.575	0.245	1.375
8/10	20	11	1.250	1.700	0.245	1.500
8/10	20	12	1.375	1.825	0.237	1.625
8/10	20	12	1.375	1.825	0.245	1.625
8/10	20	13	1.393	1.825[d]	0.196	1.625
8/10	20	13	1.525	1.950	0.244	1.750
6/8	20	11	1.521	2.083[d]	0.262	1.833
6/8	20	11	1.688	2.240	0.317	2.000
6/8	20	12	1.688	2.240[d]	0.262	2.000

[a] Dimensions are for maximum metal conditions. Tolerances will result in increased clearances.
[b] The two diametral pitch gear data are based on Fellows stub tooth system.
[c] If larger root diameter is desired, consult gear manufacturers.
[d] Standard blank. All others oversize blanks.

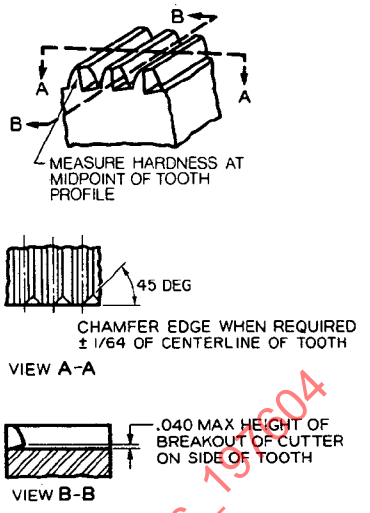
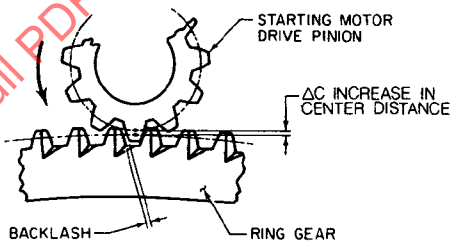


FIG. 1



NOTE: BACKLASH OBTAINED BY INCREASING CENTER DISTANCE OR REDUCING TOOTH THICKNESS.

FIG. 2