ASME B29.2M-2007

[Revision of ANSI B29.2M-1982 (R2004)]

Inverted Tooth (Silent) Chains and Sprockets

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AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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The American Society of Mechanical Engineers
Three Park Avenue • New York, NY 10016

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This Standard will be revised when the Society approves the issuance of a new edition. There will be no addenda or written interpretations of the requirements of this Standard issued to this edition.

Periodically certain actions of the ASME B29 Committee may be published as Cases. Cases are published on the ASME Web site under the Committee Pages at http://cstools.asme.org as they are issued.

The American Society of Mechanical Engineers
Three Park Avenue, New York, NY 10016-5990

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FOREWORD

Preparatory work during the late 1930s and early 1940s by the Silent Chain Division of the Association of Roller and Silent Chain Manufacturers (ARSCM, now the American Chain Association) resulted in agreement on standardization of silent chain primarily on the basis of standardized sprocket tooth design. Since individual chain manufacturers employed various chain joint designs, it was agreed that standards on chain detail would be limited to ensure interchangeability of chains on sprockets of any number of teeth. At a meeting of representatives of all major American silent chain manufacturers in September 1944, under the auspices of the ARSCM, recommended "Engineering Standards for Industrial Silent Chain and Sprockets" were agreed upon. Formulas for sprocket design were expanded into tables, which were approved and adopted by the ARSCM in April 1945. Supplementary information on sprocket tooth cutters was added, and all of the data were incorporated in a comprehensive report, Industrial Standards for Industrial Silent Chains, Sprockets, and Cutters. This report, with further refinements by minor revisions in 1949 and 1950, was then submitted to the Sectional Committee for review and approval as an American Standard.

The Sectional Committee accepted the recommendations with some minor revisions in 1950 and referred it to ASME and The Society of Automotive Engineers (SAE) for their approval as sponsors of the Committee, with subsequent transmission to the American Standards Association (ASA) for final acceptance as an American Standard. After approval by ASME and SAE, it was accepted by ASA on November 9, 1950 as American Standard B29.2.

In 1956, the Sectional Committee authorized a revision to the standard to bring it up to date. The revised standard was approved by the American Standards Association on July 11, 1957. This revision was in use for many years and was reaffirmed by ANSI on January 4, 1971. (ASA became ANSI in 1969.)

In 1945, the formulation of a recommended standard for "small pitch" silent chain (pitch sizes less than $\frac{3}{8}$ in.) and sprocket tooth form became a matter of consideration by ARSCM's Silent Chain Division. As in the case of the larger chain series, the objective was to provide interchangeability of chains on sprockets and the development of recommended practices for power transmission ratings and selection procedure. After a number of years of usage as an ARSCM Industrial Standard, the recommendations became American Standard B29.9 in 1958. Although it was originally anticipated that there might be a need for two or three pitch sizes of the miniature silent chains, only one, the $\frac{3}{8}$ in. size, has been developed. The information that has heretofore been published as B29.9 was incorporated in the basic Silent Chain Standard, B29.2, as part of the 1982 revision.

In 2006, the B29 Committee undertook a review of the B29.2M Standard and adjusted the contents consistent with developments in industry since the standard had been most recently revised. The list of chain widths was modified to eliminate the $1\frac{1}{4}$ in. pitch and some uncommon chain sizes. The illustrations of the side guide silent chain and center guide silent chains were revised; tables of service factors and horsepower rating per inch of chain width were revised, with the $1\frac{1}{4}$ in. pitch deleted in the latter listing; and the errata sheet of the previous revision was corrected in the formula for G (max.).

This Standard was approved by ANSI on February 12, 2007.

ASME B29 COMMITTEE
Chains, Attachments, and Sprockets for Power Transmission and Conveying

(The following is the roster of the Committee at the time of approval of this Standard.)

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General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by proposing revisions and attending Committee meetings. Correspondence should be addressed to:

Secretary, B29 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the standard, the paragraph, figure or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the standard to which the proposed Case applies.

Attending Committee Meetings. The B29 Standards Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B29 Standards Committee.

INVERTED TOOTH (SILENT) CHAINS AND SPROCKETS

1 SILENT CHAINS

1.1 Nomenclature

(a) Silent chain is a series of toothed links alternately assembled with pins or a combination of joint components in such a way that the joint articulates between adjoining pitches. As shown in Fig. 1, illustration (a), side guide silent chain has guide links which straddle the sprocket sides to control the chain laterally. As shown in Fig. 1, illustration (b), center guide silent chain has guide links which run within a circumferential groove or grooves for lateral control.

(b) Typical Links. Since joint components, connectors, and offset sections vary with each manufacturer, these items are not included in this Standard. See Fig. 2 for examples of typical links.

1.2 General Configuration

Link contour may vary but must engage standard sprocket teeth so that joint centers lie on sprocket pitch circle.

(a) 3/8 in. Pitch Chain and Larger. Chain widths equal to, or exceeding, two times the pitch have center guides. Narrower chains may be side guide or center guide. Chain widths exceeding 16 times the pitch are not recommended.

(b) 3/16 in. Pitch Chain. Chain may be side guide or center guide as indicated in para. 1.8.

(c) Maximum Chain Width. Maximum chain width should be limited to approximately eight times the pitch.

1.3 Numbering System

(a) 3/8 in. Pitch Chain and Larger. Two letters (SC) as a prefix, one or two numerals indicating pitch in eighths of an inch, and two or three numerals indicating nominal chain width in quarters of an inch. Thus, SC302 designates a silent chain, 3/8 in. pitch by 1/2 in. nominal width, and SC1012 designates a silent chain, 1 1/4 in. pitch by 3 in. nominal width.

(b) 3/16 in. Pitch Chain. Two letters (SC) as a prefix, a zero followed by a numeral indicating pitch in sixteenths of an inch, and two numerals indicating nominal width of chain in thirty-seconds of an inch. Thus, SC0309 designates a silent chain, 3/16 in. pitch by 9/32 in. nominal width.

NOTE: Where links are all of equal thickness 0.03 in. (0.76 mm), it is understood that the width indication also designates the total number of links across the width of the chain.

1.4 Tolerance for Chain Length

(a) 3/8 in. Pitch Chain and Larger. Chains will be designed and manufactured to fit gage sprockets. Tolerance for chain length for new chains may be over nominal length 0.03 in./ft (0.76 mm/m), but must not be underlength.

(b) 3/16 in. Pitch Chain. Chain length tolerance is 0.02 in./ft (0.51 mm/m) over nominal length but must not be underlength.

1.5 Measuring Loads

(a) 3/8 in. Pitch Chain and Larger. Chain should be measured under a load of 25 lb × pitch in inches × width in inches + 20 lb (0.1724 N × pitch in mm × width in mm + 89 N). Length measurements are to be taken over a length of at least 12 in. (300 mm).

(b) 3/16 in. Pitch Chain. The measuring load for 3/16 in. pitch silent chain shall be approximately equal to 1 lb (4.45 N) for each link in the total chain width, i.e., the load for SC0315 would be 15 lb (67 N). Length measurements are to be taken over a length of at least 12 in. (300 mm).

1.6 General Chain Dimensions for 3/8 in. Pitch Chain and Larger

See Fig. 3 and Tables 1 and 2.

1.7 Chain Widths and Sprocket Face Profiles for 3/8 in. Pitch Chain and Larger

See Fig. 4 and Tables 3 and 4.

1.8 Chain Widths and Sprocket Face Profile for 3/16 in. Pitch Chain

See Fig. 5 and Tables 5 and 6.

2 SPROCKETS

2.1 Tooth Form Dimensions for 3/8 in. Pitch Chain and Larger

See Fig. 6.

2.2 Tooth Form Dimensions for 3/16 in. Pitch Chain

See Fig. 7.

2.3 Diameters and Measuring Dimensions for 3/8 in. Pitch Chain and Larger

The following dimensions apply to Fig. 8:

$$PD = \frac{P}{\sin \frac{180 \text{ deg}}{N}}$$

$$D_p = 0.625P$$

$$OPD \text{ (even number of teeth)} = PD - 0.125P \csc\left(30 \text{ deg} - \frac{180 \text{ deg}}{N}\right) + 0.625P$$

$$OPD \text{ (odd number of teeth)} = \cos\frac{90 \text{ deg}}{N} \times \left[PD - 0.125P \csc\left(30 \text{ deg} - \frac{180 \text{ deg}}{N}\right)\right] + 0.625P$$

$$O.D. \text{ (rounded teeth)} = P\left(\cot\frac{180 \text{ deg}}{N} + 0.08\right)$$

$$O.D. \text{ (square teeth)} = 2\sqrt{X^2 + L^2 - 2XL\cos\alpha}$$

where

$$L = Y + E/2 \text{ (see Fig. 6 for } E)$$
$$X = Y\cos\alpha - \sqrt{(0.15P)^2 - (Y\sin\alpha)^2}$$
$$Y = P(0.500 - 0.375\sec\alpha)\cot\alpha + 0.11P$$
$$\alpha = 30 \text{ deg} - 360 \text{ deg}/N$$

$$G \text{ (max.)} = P\left(\cot\frac{180 \text{ deg}}{N} - 1.16\right)$$

2.4 Diameters and Measuring Dimensions for 3/16 in. Pitch Chain

The following measurements apply to Fig. 9:

$$D_p = 0.667P$$

$$OPD \text{ (even number of teeth)} = PD - 0.160P \csc\left(35 \text{ deg} - \frac{180 \text{ deg}}{N}\right) + 0.667P$$

$$OPD \text{ (odd number of teeth)} = \cos\frac{90 \text{ deg}}{N} \times \left[PD - 0.160P \csc\left(35 \text{ deg} - \frac{180 \text{ deg}}{N}\right)\right] + 0.667P$$

$$O.D. \text{ (nominal rounded teeth)} = P\left(\cot\frac{180 \text{ deg}}{N} - 0.032\right)$$

$$G \text{ (max.)} = P\left(\cot\frac{180 \text{ deg}}{N} - 1.20\right)$$

2.5 Tolerances for Diameters, Over Pin Dimensions, and Eccentricity for 3/8 in. Pitch Chain and Larger

See Tables 7 and 8.

2.6 Tolerances for Diameters, Over Pin Dimensions, and Eccentricity for 3/16 in. Pitch Chain

See Tables 9 and 10.

2.7 Hub Diameter for 3/8 in. Pitch Chain and Larger

See Table 11. [For other pitches (3/8 in. pitch and larger), multiply these values by pitch.]

2.8 Tabulation of Pitch Diameter, Outside Diameter, Over Pin Dimensions, and Guide Groove Diameter for Chain of Unity Pitch (Applicable to 3/8 in. Pitch Chain and Larger)

See Table 12. [For other pitches (3/8 in. pitch and larger), multiply these values by pitch.]

2.9 Tabulation of Pitch Diameter, Outside Diameter, Over Pin Dimensions, and Guide Groove Diameter for 3/16 in. Pitch Chain

See Tables 13 and 14.