

ASME B29.11M-1994
(REVISION OF ANSI/ASME B29.11M-1984)

Combination Chains, Attachments, and Sprocket Teeth

AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

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The American Society of
Mechanical Engineers

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FOREWORD

(This Foreword is not part of ASME B29.11M-1994.)

In 1886 a patent was granted for a chain comprised of cast metal block links, fitted with bronze bushings, and connected with wrought steel sidebars and removable pins. This chain was the forerunner of the present combination chain, later placed on the market around 1900. Many sizes and types of combination chains were developed and marketed in the next several years.

During World War I, the War Industries Board insisted that chain manufacture be confined to the necessary sizes. This caused elimination of several types and sizes, and planted the seed for future standardization. Following World War I, the Malleable Chain Manufacturers Institute was formed, and this group did considerable work on standardization of chain and sprocket dimensions for combination chains of the more popular sizes. There were still dimensional variations that would not permit universal intercoupling of chains of different manufacture, necessitating repairs made with chains of the original manufacturer.

The ASCMA (now the American Chain Association), recognizing the need for a complete standard providing intercoupling and direct replacement of chains of different manufacture, established this Standard utilizing the minimum number of chains to meet requirements of industry for the chains widely used in conveyor and elevator applications.

To facilitate the use of this Standard in the international market, the metric equivalents of all dimensions are given.

This Standard was presented to the USASI (now the American National Standards Institute) B29 Committee in December 1963 and, upon approval by the USASI on May 24, 1968, was adopted and published.

The 1974 revision included minor changes in metric units and change from ultimate strengths to proof test loads with the corresponding explanatory and caution notes.

The American National Standards Institute approved the previous revision in 1984.

The 1994 revision defines the proof test loads as "minimum" in Table 1 and adds minimum attachment hole diameters to Tables 4 through 9. The information in Fig. 4 was modified to strengthen the recommendation for undersized root diameters and pocket radii.

The American National Standards Institute Approved the current revision on November 14, 1994.

ASME STANDARDS COMMITTEE B29

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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COMBINATION CHAINS, ATTACHMENTS, AND SPROCKET TEETH

1 NOMENCLATURE

combination chains — a series of block links having barrels to contact the sprocket teeth, alternating with links composed of sidebars and pins that articulate in the barrels of the block link.

Pins are fixed against rotation in sidebar pitch holes by mechanical locks, such as flats, or by interference fits, or both. Assembly of pins may be from either side or alternated, at the manufacturer's option.

Figures 1, 2, and 3 illustrate a typical chain and the principal dimensions of a chain.

2 GENERAL CHAIN PROPORTIONS AND DESIGNATIONS

2.1 Proof Test Load

The proof test load is the tensile load in pounds (or kilonewtons) the chain has withstood at the time of assembly at the factory.

All chains must be subjected to this test.

WARNING: Do not use these proof test loads for chain application. For application guide consult manufacturers' catalogs.

The values listed in Table 1 cover the two most common materials used in the links:

(a) Class M — Malleable Iron (ASTM Specification A 47–68, Grade 32510 or Grade 35018)

(b) Class P — Pearlitic Malleable Iron (ASTM Specification A 220–68, Grade 60004)

Class P chains are approximately 25% stronger than Class M chains.

2.2 Measuring Load

Measuring load is approximately 6% of proof test load as listed in Table 1. This is the load under which a dry or lightly lubricated chain should be measured for length.

2.3 Strand Length Tolerance

New chains under measuring load may be over theoretical length up to 0.75 in. in 120 in. (19.05 mm in 3048 mm), but must not be under theoretical length.

2.4 Dimensions for Chain Links

To assure interchangeability of links as produced by the different makers of chain, standard maximum and minimum dimensions are listed. They are not actual dimensions used in manufacturing, but limiting dimensions, maximum or minimum, required to assure the desired interchangeability.

All dimensions are given in a decimal inch system. The metric equivalent dimensions are for reference only.

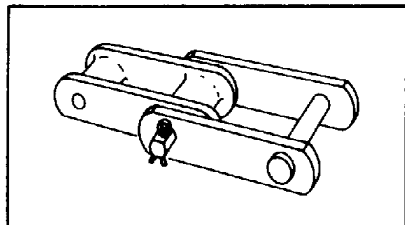


FIG. 1 ASSEMBLED CHAIN

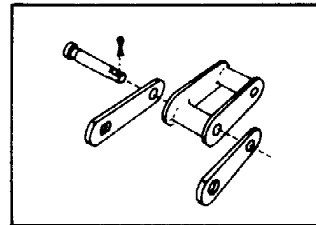


FIG. 2 DISASSEMBLED CHAIN

- A = inside width for sprocket contact, between corner fillets and 60 deg. both sides of vertical center line as shown
 B = inside diameter of barrel
 D = pin diameter
 F = overall chain height
 G = barrel dimension pitchwise
 H = barrel height
 J = pin head to center line
 K = pin end to centerline
 M = barrel dimension pitchwise
 P = assembled chain pitch (this is a theoretical reference dimension used for basic calculations)
 T = sidebar thickness
 V = sidebar end clearance radius
 W = inside width
 X = block link width
 Z = width between outer sidebars

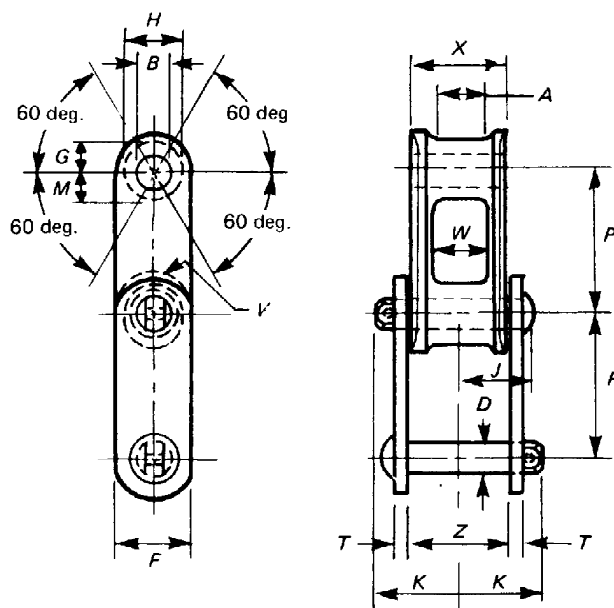


FIG. 3 DIMENSIONS OF CHAIN

**TABLE 1 GENERAL CHAIN DIMENSIONS, PROOF TEST LOAD, STRAND LENGTH,
AND MEASURING LOAD FOR CHECKING CHAIN LENGTHS**

CAUTION: The numerical values set forth in this Table must be read in connection with the definitions and explanatory notes appearing in Section 2 and in Tables 2 and 3. The proof test load values do not afford a sufficient or appropriate basis for determining chain application.

Dimensions, in.							
Chain No.	C 55	C 102 B	C 110	C 111	C 131	C 132	C 188
P = chain pitch	1.631	4.000	6.000	4.760	3.075	6.050	2.609
D = pin diameter	0.375	0.625	0.625	0.750	0.625	1.000	0.500
F = overall chain height	0.75	1.50	1.50	1.75	1.50	2.00	1.12
H = barrel height	0.72	0.98	1.26	1.44	1.22	1.74	0.88
T = sidebar thickness	0.19	0.38	0.38	0.38	0.38	0.50	0.25
Proof test loads, lb (min.)							
Class M	3600	9600	9600	14400	9600	20000	5600
Class P	4500	12000	12000	18000	12000	25000	7000
No. of pitches/nominal 120 in. strand	74	30	20	26	40	20	46
Maximum measuring length of nominal 120 in. strand	121.44	120.75	120.75	124.51	123.75	121.75	120.76
Minimum measuring length of nominal 120 in. strand	120.69	120.00	120.00	123.76	123.00	121.00	120.01
Measuring load	100	300	300	500	300	700	200

Dimensions, mm							
Chain No.	C 55	C 102 B	C 110	C 111	C 131	C 132	C 188
P = chain pitch	41.43	101.60	152.40	120.90	78.11	153.67	66.27
D = pin diameter	9.52	15.88	15.88	19.05	15.88	25.40	12.70
F = overall chain height	19.0	38.1	38.1	44.5	38.1	50.8	28.4
H = barrel height	18.3	24.9	32.0	36.6	31.0	44.2	22.4
J = sidebar thickness	4.8	9.7	9.7	9.7	9.7	12.7	6.4
Proof test loads, kN (min.)							
Class M	16.00	42.70	42.70	64.00	42.70	89.00	24.90
Class P	20.00	53.40	53.40	80.00	53.40	111.20	31.10
No. of pitches/nominal 3048 mm strand	74	30	20	26	40	20	46
Maximum measuring length of nominal 3048 mm strand	3084.6	3067.0	3067.0	3162.6	3143.2	3092.4	3067.0
Minimum measuring length of nominal 3048 mm strand	3065.5	3048.0	3048.0	3143.5	3124.2	3073.4	3048.3
Measuring load, N	450	1340	1340	2230	1340	3120	900

**TABLE 2 MAXIMUM AND MINIMUM CONTROLLING DIMENSIONS FOR
INTERCHANGEABLE CHAIN LINKS**

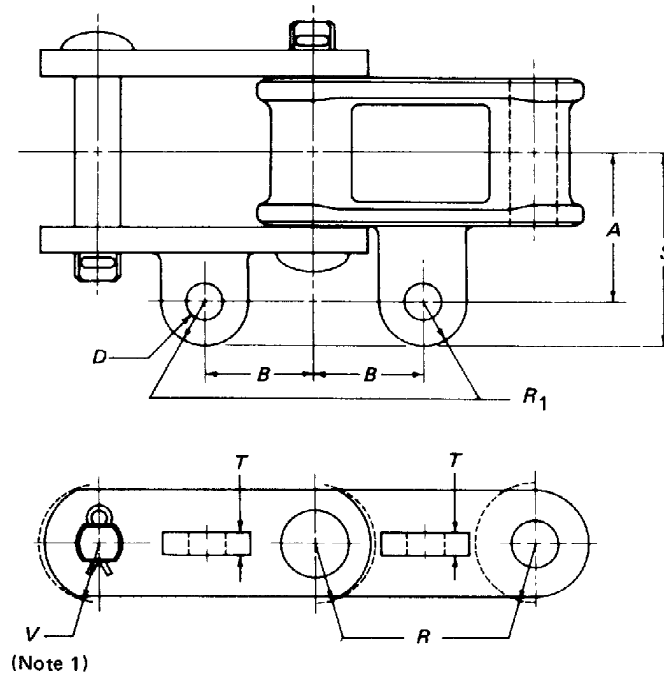
Dimensions, in.							
Chain No.	C 55	C 102 B	C 110	C 111	C 131	C 132	C 188
<i>P</i> (Ref.) = chain pitch	1.631	4.000	6.000	4.760	3.075	6.050	2.609
<i>D</i> = pin diameter (max.)	0.378	0.628	0.628	0.753	0.628	1.003	0.503
<i>B</i> = inside diameter of barrel (min.)	0.383	0.633	0.633	0.758	0.633	1.008	0.508
<i>G</i> = barrel dimension pitchwise (max.)	0.38	0.68	0.77	0.91	0.75	1.05	0.52
<i>M</i> = barrel dimension pitchwise (max.)	0.38	0.50	0.64	0.74	0.63	0.88	0.46
<i>H</i> = barrel height (max.)	0.76	1.00	1.28	1.48	1.26	1.76	0.92
<i>W</i> = inside width (min.)	0.80	2.06	2.06	2.56	1.24	3.24	1.04
<i>A</i> = inside width of barrel for sprocket contact (min.)	0.72	1.92	1.92	2.42	1.14	3.04	0.94
<i>X</i> = block link width (max.)	1.20	2.92	2.92	3.42	2.08	4.38	1.60
<i>Z</i> = inside width between outer sidebars (min.)	1.22	2.94	2.94	3.44	2.10	4.40	1.62

Dimensions, mm							
Chain No.	C 55	C 102 B	C 110	C 111	C 131	C 132	C 188
<i>P</i> (Ref.) = chain pitch	41.43	101.60	152.40	120.90	78.10	153.67	66.27
<i>D</i> = pin diameter (max.)	9.60	15.95	15.95	19.16	15.95	25.48	12.78
<i>B</i> = inside diameter of barrel (min.)	9.73	16.07	16.07	19.25	16.08	25.60	12.90
<i>G</i> = barrel dimension pitchwise (max.)	9.7	17.3	19.6	23.1	19.0	26.7	13.2
<i>M</i> = barrel dimension pitchwise (max.)	9.7	12.7	16.3	18.8	16.0	22.4	11.7
<i>H</i> = barrel height (max.)	19.3	25.4	32.5	37.6	32.0	44.7	23.4
<i>W</i> = inside width (min.)	20.3	52.3	52.3	65.0	31.5	82.3	26.4
<i>A</i> = inside width of barrel for sprocket contact (min.)	18.3	48.8	48.8	61.5	29.0	77.2	23.9
<i>X</i> = block link width (max.)	30.5	74.2	74.2	86.9	52.8	111.3	40.6
<i>Z</i> = inside width between outer sidebars (min.)	31.0	74.7	74.7	87.4	53.3	111.8	41.1

TABLE 3 CHAIN CLEARANCE DIMENSIONS

Dimensions, in.							
Chain No.	C 55	C 102 B	C 110	C 111	C 131	C 132	C 188
<i>F</i> = chain height (max.)	0.80	1.56	1.56	1.82	1.56	2.06	1.18
<i>V</i> = sidebar end clearance radius (max.)	0.48	0.94	0.94	1.10	0.94	1.20	0.67
<i>R</i> = attachment clearance radius (min.)	0.50	0.96	0.94	1.12	0.96	1.22	0.69
<i>K</i> = pin end to center line (max.)	1.22	2.31	2.31	2.72	1.91	3.38	1.44

Dimensions, mm							
Chain No.	C 55	C 102 B	C 110	C 111	C 131	C 132	C 188
<i>F</i> = chain height (max.)	20.3	39.6	39.6	46.2	39.6	52.3	30.5
<i>V</i> = sidebar end clearance radius (max.)	12.2	23.9	23.9	27.9	23.9	30.5	17.0
<i>R</i> = attachment clearance radius (min.)	12.7	24.4	24.4	28.4	24.4	31.0	17.5
<i>K</i> = pin end to center line (max.)	31.0	58.6	58.6	69.1	48.5	85.8	36.6


TABLE 4 A22 ATTACHMENT

Dimensions, in.								
Chain No.	A	B	S Max.	T Max.	R Min.	R_1 Max.	Bolt Size	D Min. Hole
C 55	1.50	0.82	2.00	0.28	0.50	0.50	0.31	0.34
C 188	1.44	1.30	2.41	0.41	0.69	0.97	0.38	0.40

Dimensions, mm								
Chain No.	A	B	S Max.	T Max.	R Min.	R_1 Max.	Bolt Size	D Min. Hole
C 55	38.1	20.7	50.8	7.1	12.7	12.7	7.9	8.6
C 188	36.6	33.1	61.2	10.4	17.5	24.6	9.7	10.2

NOTE:

(1) For V dimension, see Table 3.

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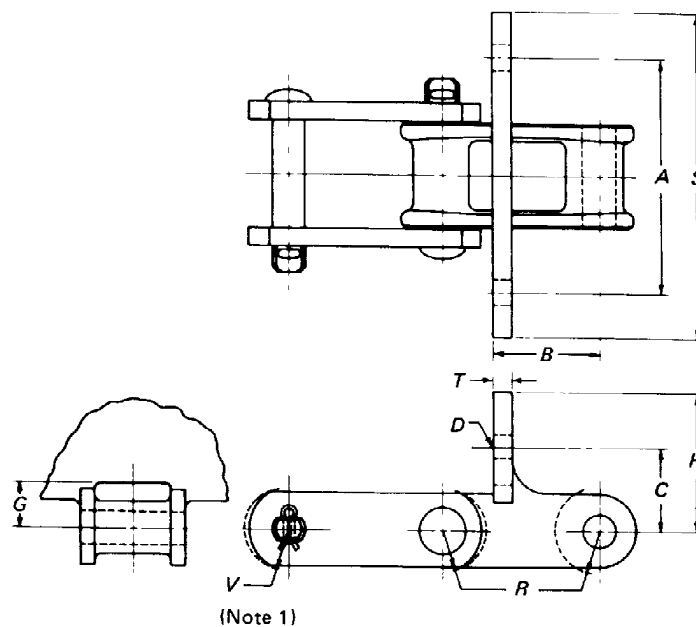


TABLE 5 F2 ATTACHMENT

Dimensions, in.

Chain No.	A	B	C	H Max.	S Max.	T Max.	R Min.	Bolt Size	G	D Min. Hole
C 111	6.38	3.00	2.00	3.03	7.82	0.41	1.12	0.38	1.03	0.40
C 131	4.69	2.14	1.69	2.78	6.50	0.34	0.96	0.38	0.90	0.40
C 188	2.00	1.38	1.50	2.21	2.82	0.34	0.69	0.31	0.71	0.34

Dimensions, mm

Chain No.	A	B	C	H Max.	S Max.	T Max.	R Min.	Bolt Size	G	D Min. Hole
C 111	162.1	76.2	50.8	77.0	198.6	10.4	28.4	9.7	26.1	10.2
C 131	119.1	54.4	42.9	70.6	165.1	8.6	24.4	9.7	22.9	10.2
C 188	50.8	35.1	38.1	56.1	71.6	8.6	17.5	7.9	18.0	8.6

NOTE:

(1) For V dimension, see Table 3.

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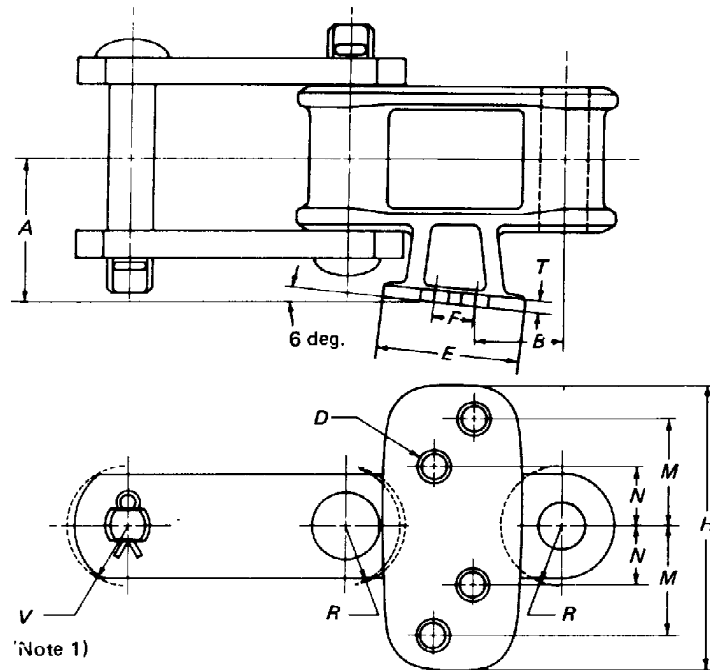
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TABLE 6 G6 ATTACHMENT

Dimensions, in.

Chain No.	A	B	E Max.	F	H Max.	M	N	T Max.	R Min.	Bolt Size	D Min. Hole
C 131	2.06	1.25	2.06	0.56	4.30	1.53	0.86	0.34	0.96	0.38	0.40
C 188	1.50	1.03	1.41	0.56	3.94	1.53	0.86	0.34	0.96	0.25	0.28

Dimensions, mm

Chain No.	A	B	E Max.	F	H Max.	M	N	T Max.	R Min.	Bolt Size	D Min. Hole
C 131	52.3	31.8	52.3	14.2	109.2	38.9	21.8	8.6	24.4	9.7	10.2
C 188	38.1	26.2	35.8	14.2	100.1	38.9	21.8	8.6	17.5	6.4	7.1

NOTE:

(1) For V dimension, see Table 3.

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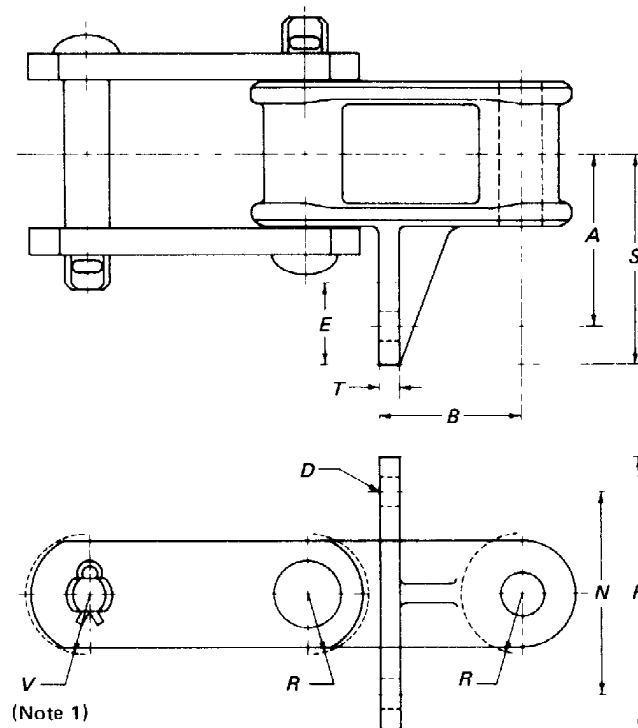


TABLE 7 G19 ATTACHMENT

Dimensions, in.

Chain No.	A	B	E	H Max.	N	S Max.	T Max.	R Min.	Bolt Size	D Min. Hole
C 131	2.38	2.00	1.12	4.00	2.88	3.15	0.34	0.96	0.38	0.40
C 188	1.94	1.86	1.50	3.68	1.50	2.72	0.34	0.96	0.31	0.34

Dimensions, mm

Chain No.	A	B	E	H Max.	N	S Max.	T Max.	R Min.	Bolt Size	D Min. Hole
C 131	60.5	50.8	28.4	101.6	73.2	80.0	8.6	24.4	9.7	10.2
C 188	49.3	47.2	38.1	93.5	38.1	69.1	8.6	17.5	7.9	8.6

NOTE:

(1) For V dimension, see Table 3.

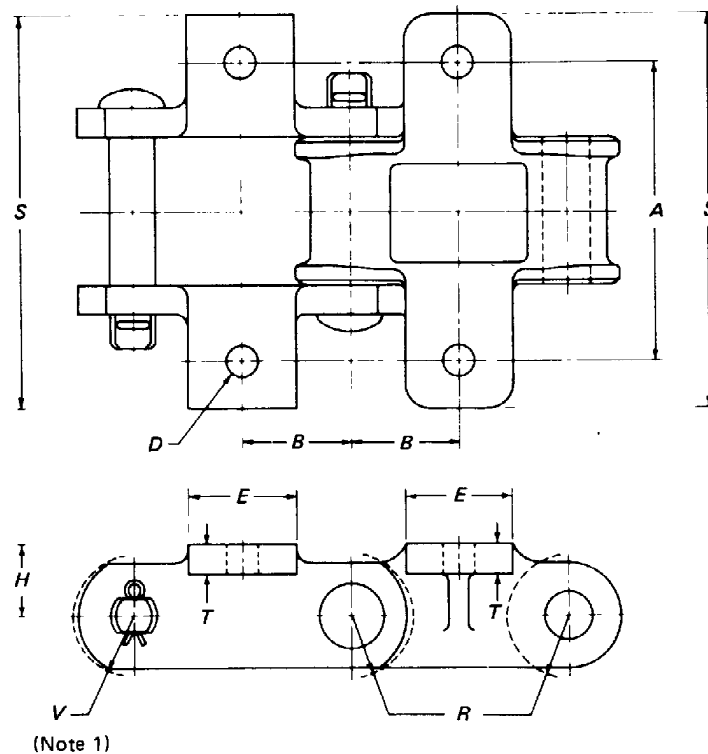


TABLE 8 K1 ATTACHMENT

Dimensions, in.

Chain No.	A	B	E Max.	H	S Max.	T Max.	R Min.	Bolt Size	D Min. Hole
C 55	2.04	0.82	0.84	0.50	3.00	0.19	0.50	0.25	0.28
C 102 B	4.75	2.00	3.03	1.00	7.12	0.14	0.96	0.38	0.40
C 131	4.12	1.54	2.91	1.00	6.18	0.41	0.96	0.50	0.53
C 188	3.75	1.30	2.15	0.81	5.18	0.28	0.69	0.38	0.40

Dimensions, mm

Chain No.	A	B	E Max.	H	S Max.	T Max.	R Min.	Bolt Size	D Min. Hole
C 55	51.8	20.7	21.3	12.7	76.2	4.8	12.7	6.4	7.1
C 102 B	120.6	50.8	76.9	25.4	180.9	10.4	24.4	9.7	10.2
C 131	104.6	39.1	73.9	25.4	157.0	10.4	24.4	12.7	13.5
C 188	95.2	33.1	54.6	20.6	131.6	7.1	17.5	9.7	10.2

NOTE:

(1) For V dimension, see Table 3.

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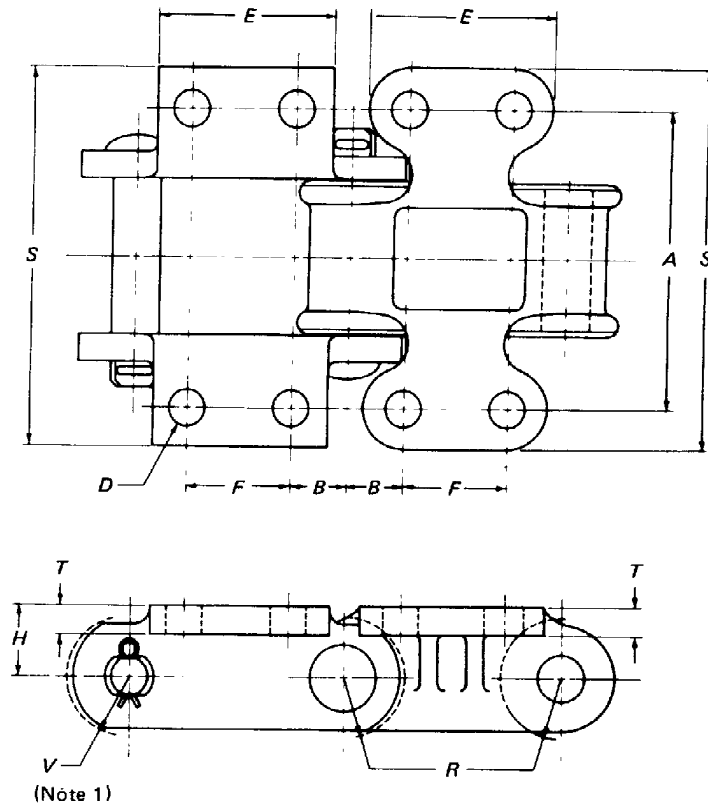


TABLE 9 K2 ATTACHMENT

Dimensions, in.

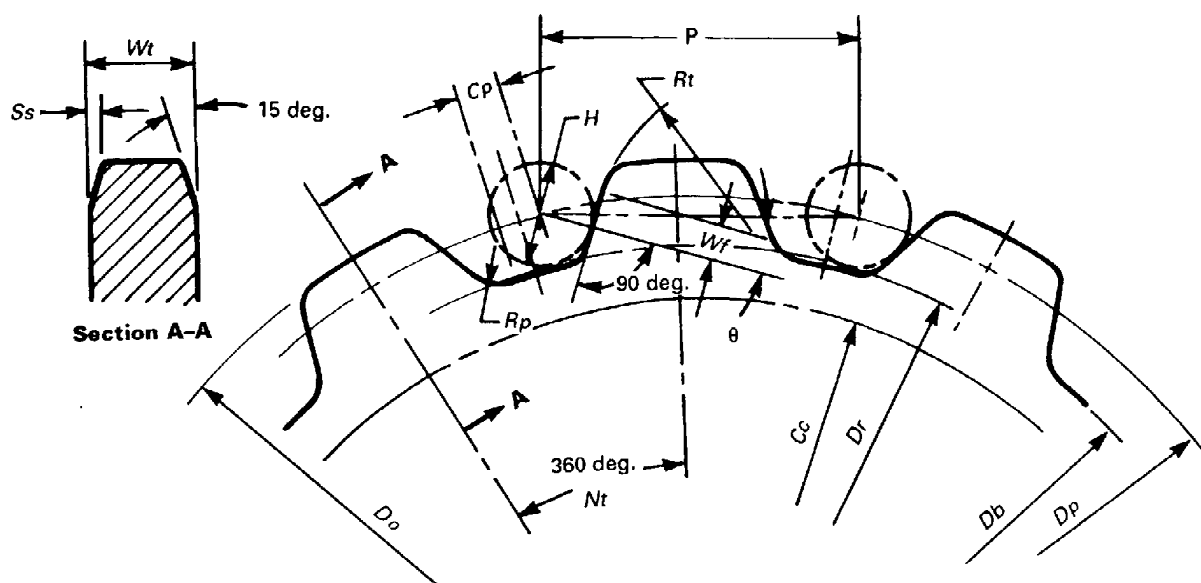
Chain No.	A	B	E Max.	F	H	S Max.	T Max.	R Min.	Bolt Size	D Min. Hole
C 102 B	5.31	1.12	3.03	1.75	1.00	7.12	0.41	0.96	0.38	0.40
C 110	5.31	2.12	3.53	1.75	1.00	7.12	0.41	0.96	0.38	0.40
C 111	6.25	1.22	3.65	2.31	1.12	8.30	0.41	1.12	0.50	0.53
C 131	4.12	0.79	2.91	1.50	1.00	6.18	0.41	0.96	0.50	0.53
C 132	7.50	1.65	4.28	2.75	1.25	9.68	0.53	1.22	0.50	0.53
C 188	4.19	0.68	2.15	1.25	0.81	5.18	0.28	0.69	0.31	0.34

Dimensions, mm

Chain No.	A	B	E Max.	F	H	S Max.	T Max.	R Min.	Bolt Size	D Min. Hole
C 102 B	134.9	28.4	76.9	44.5	25.4	180.8	10.4	24.4	9.7	10.2
C 110	134.9	53.8	89.6	44.5	25.4	180.8	10.4	24.4	9.7	10.2
C 111	158.8	31.0	92.7	58.7	28.4	210.8	10.4	28.4	12.7	13.5
C 131	104.6	20.1	73.9	38.1	25.4	157.0	10.4	24.4	12.7	13.5
C 132	190.5	41.9	108.7	69.9	31.8	245.9	13.5	31.0	12.7	13.5
C 188	106.4	17.3	54.6	31.8	20.6	131.6	7.1	17.5	7.9	8.6

NOTE:

(1) For V dimension, see Table 3.



The elements of a chain sprocket and the tooth form may be determined by the following

Pitch diameter	$D_p = P \times D_{pf}$	Clearance circle and outside diameter factor	$C_{cf} = \cot (180/N_t)$
Root diameter (max) (Note 1)	$D_r = (P \times D_{pf}) - H \text{ max.}$	Pressure angle θ (see Table 11)	
Chain clearance circle (Note 2)	$C_c = P (C_{cf} - 0.05) - F \text{ max}$	Working face (Note 4)	$W_f = 0.01 \times P \times N_t$
Outside diameter (Note 3)	$D_o = (P \times C_{cf}) + F \text{ max}$	Pocket radius (max) (Note 1)	$R_p = H/2$
Pitch line clearance	$C_p = P \times 0.10 \text{ to } P \times 0.15$	Topping radius	$R_t = 0.5 \times P$
Pitch diameter factor	$D_{pf} = \csc (180/N_t)$	Tooth width	$W_{t_{max}} = 0.954 \text{ min. of chain}$
Bottom diameter (Note 1)	$D_b = D_r - C_b$	Side slope	$S_s = \text{approx } 0.12 \times W_t \text{ not to exceed } 0.38 \text{ in (9.6 mm)}$

The symbols represent

- H = chain barrel height maximum (see Table 2)
 P = chain pitch
 C_{cf} = clearance circle and outside diameter factor (see Table 11)
 F = chain height maximum (see Table 3)
 D_{pf} = pitch diameter factor (see Table 11)
 N_t = number of teeth
 C_b = undersize compensation (typically .06 in.)

NOTES:

- (1) The bottom diameter shall be smaller than the root diameter, and the pocket radius should be smaller than $H/2$.
- (2) No portion of hub, beads, lugs, or fillets shall extend beyond this circle in the sidebar zone
- (3) Outside diameter may be increased to give a full height tooth when the top of the chain is clear of flights, pans, buckets, etc. Tooth working face length provides for approximately 6% chain pitch elongation.
- (4) Limitation on length of working face: the working face shall not extend beyond the line through the adjacent pitch point which is perpendicular to the working face.

FIG. 4 SPROCKET TOOTH FORM

TABLE 10 SPROCKETS — MAXIMUM ECCENTRICITY AND FACE RUNOUT AT ROOT DIAMETER

Pitch Diameter				Max. Face Runout TIR		Max. Eccentricity TIR	
in.		mm					
Over	Including	Over	Including	in.	mm	in.	mm
0	up to 12	0	up to 305	0.06	1.52	0.09	2.29
12	up to 24	305	up to 610	0.12	3.05	0.15	3.81
24	up to 36	610	up to 915	0.20	5.08	0.21	5.33
Over 36		Over 915		Consult Mfg.		Consult Mfg.	

TABLE 11 SPROCKET FACTORS

<i>Nt</i>	<i>D_pf</i>	θ_s deg.	<i>Ccf</i>	<i>Nt</i>
6	2.000	9	1.73	6
7	2.304	10	2.07	7
8	2.613	11	2.41	8
9	2.923	12	2.74	9
10	3.236	13	3.07	10
11	3.549	14	3.40	11
12	3.863	15	3.73	12
13	4.178	16	4.05	13
14	4.494	17	4.38	14
15	4.809	18	4.70	15
16	5.125	19	5.03	16
17	5.442	20	5.35	17
18	5.758	20	5.67	18
19	6.075	21	5.99	19
20	6.392	21	6.31	20
21	6.709	22	6.63	21
22	7.026	22	6.95	22
23	7.343	22	7.27	23
24	7.661	23	7.59	24
25	7.978	23	7.91	25
26	8.296	23	8.23	26
27	8.613	23	8.55	27
28	8.931	24	8.87	28
29	9.249	24	9.19	29
30	9.566	24	9.51	30
31	9.884	24	9.83	31
32	10.202	24	10.15	32
33	10.520	25	10.47	33
34	10.837	25	10.79	34
35	11.155	25	11.11	35
36	11.473	25	11.43	36

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