

INTERNATIONAL STANDARD



487

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Steel roller chains, type S 32 to S 88, with their associated chain wheels

Chaînes à rouleaux en acier, types S 32 à S 88 et roues dentées correspondantes

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Descriptors : chain drives, chains, chain wheels, dimensions, marking, designation.

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the technical committees were published as ISO Recommendations; these documents are in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 100, *Chain and chain wheels for power transmission and conveyors*, has reviewed ISO Recommendation R 487-1966 and found it technically suitable for transformation. International Standard ISO 487 therefore replaces ISO Recommendation R 487-1966, to which it is technically identical.

ISO Recommendation R 487 had been approved by the member bodies of the following countries :

Belgium	Germany	Romania
Colombia	Greece	Spain
Czechoslovakia	Italy	Sweden
Denmark	Japan	United Kingdom
France	New Zealand	U.S.A.

The member body of the following country had expressed disapproval of the Recommendation on technical grounds :

U.S.S.R.

No member body disapproved the transformation of the Recommendation into an International Standard.

Steel roller chains, type S 32 to S 88, with their associated chain wheels

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the characteristics of a range of steel roller chains dimensionally derived from the malleable iron type, suitable for conditions of operation and maintenance prevailing in such fields as agriculture, building, quarrying and similar machinery, mechanical handling, etc., together with the associated chain wheels. The dimensions are given in inches and in millimetres; the latter are conversions from the basic inch dimensions.

2 REFERENCES

ISO/R 185, *Classification of grey cast iron*.

ISO/R 606, *Short pitch transmission precision roller chains and chain wheels*.

3 CHAINS

3.1 Nomenclature

The illustrations shown in figure 1 do not define the actual form of the chain plates.

3.2 Designation

Steel roller chains shall be designated by the standard ISO chain number given in table 1.

3.3 Dimensions

Chains shall conform to the dimensions given in table 1. Maximum and minimum dimensions are specified to ensure interchangeability of links as produced by different makers of chain. They represent limits for interchangeability, but are not the actual tolerances that should be used in manufacture.

3.4 Breaking loads

The test length shall have a minimum of 5 free pitches. The ends shall be attached to the testing machine shackles by a pin through the plate holes or the bushes and not by anchorage to the rollers. The shackles shall be so designed as to allow universal movement; the actual method is left to the discretion of the manufacturer.

Tests in which failures occur adjacent to the shackles shall be disregarded.

The minimum tensile breaking loads shall be those given in table 1.

3.5 Proof loading

All chains should be proof loaded during manufacture to at least one-third of the minimum tensile breaking load given in table 1.

3.6 Length accuracy

Finished chains shall be measured after proof loading (where applicable) but before lubricating.

The standard length for measurement shall be a minimum of 20 times the pitch with a maximum length of 1,5 m (5 ft), and shall terminate with an inner link at each end.

The chain shall be supported throughout its entire length and the measuring load in table 1 shall be applied.

To comply with this International Standard, the length shall be the nominal length subject to the limits of tolerance :

$$\begin{matrix} +0,25\% \\ 0 \end{matrix}$$

The length accuracy of chains which have to work in parallel shall be within the limits above but matched in agreement with the manufacturer.

3.7 Protective finish

It is strongly recommended that a rust-preventive finish be applied to all components, including attachment plates.

3.8 Bearing pin

The bearing pin ends shall be rivetted on all outer links. A detachable link may, however, be used for connecting the ends of the chain, where the use of a rivetted link is convenient.

3.9 Cranked link

To obtain an odd number of pitches in a chain, a cranked link is required. The crank shall be central between pins. Using the symbols of table 1, its length shall not exceed $p - 1,15 h_2$.

Attachment plates shall not be part of a cranked link.

3.10 Marking

The chain should be marked with :

- the manufacturer's name or trade mark;
- the ISO chain number (see column 1 of table 1).

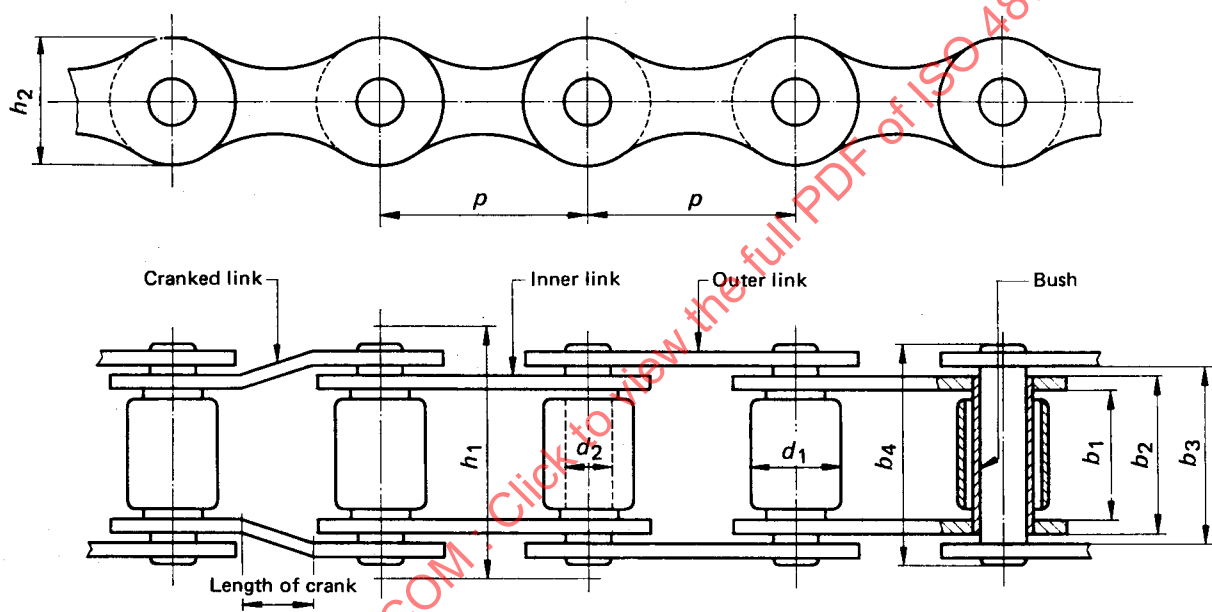


FIGURE 1 — Chain characteristics and key to table 1

TABLE 1 — Chain dimensions, measuring loads and breaking loads

Dimensions in millimetres and loads in decanewtons

ISO chain number	Pitch p	Roller diameter d_1	Width between inner plates b_1	Width between outer plates b_3	Plate depth h_2	Bearing pin body diameter d_2	Width over			Breaking load min.	Measuring load
							inner link b_2	bearing pins b_4	detachable joint h_7		
							max.	max.	max.		
S 32	29,21	11,43	15,88	20,57	13,5	4,47	20,19	26,7	31,8	8 00	13
S 42	34,93	14,27	19,05	25,65	19,8	7,01	25,40	34,3	39,4	2 700	22
S 45	41,40	15,24	22,23	28,96	17,3	5,74	28,58	38,1	43,2	1 800	22
S 52	38,10	15,24	22,23	28,96	17,3	5,74	28,58	38,1	43,2	1 800	22
S 55	41,40	17,78	22,23	28,96	17,3	5,74	28,58	38,1	43,2	1 800	22
S 62	41,91	19,05	25,40	32,00	17,3	5,74	31,80	40,6	45,7	2 700	22
S 77 ¹⁾	58,34	18,26	22,23	31,50	26,2	8,92	31,17	43,2	52,1	4 450	56
S 88 ²⁾	66,27	22,86	28,58	37,85	26,2	8,92	37,52	50,8	58,4	4 450	56

Dimensions in inches and loads in pounds-force

ISO chain number	Pitch p	Roller diameter d_1	Width between inner plates b_1	Width between outer plates b_3	Plate depth h_2	Bearing pin body diameter d_2	Width over			Breaking load min.	Measuring load
							inner link b_2	bearing pins b_4	detachable joint h_7		
							max.	max.	max.		
S 32	1.150	0.450	0.625	0.81	0.53	0.176	0.795	1.05	1.25	1 800	30
S 42	1.375	0.562	0.750	1.01	0.78	0.276	1.000	1.35	1.55	6 000	50
S 45	1.630	0.600	0.875	1.14	0.68	0.226	1.125	1.50	1.70	4 000	50
S 52	1.500	0.600	0.875	1.14	0.68	0.226	1.125	1.50	1.70	4 000	50
S 55	1.630	0.700	0.875	1.14	0.68	0.226	1.125	1.50	1.70	4 000	50
S 62	1.650	0.750	1.000	1.26	0.68	0.226	1.252	1.60	1.80	6 000	50
S 77 ¹⁾	2.297	0.719	0.875	1.24	1.03	0.351	1.227	1.70	2.05	10 000	125
S 88 ²⁾	2.609	0.900	1.125	1.49	1.03	0.351	1.477	2.00	2.30	10 000	125

1) Also covers S 57 and S 67.

2) Also covers S 75 and S 78.

NOTE — The minimum bush bore is 0,1 mm (0.004 in) larger than the maximum pin body diameter d_2 .

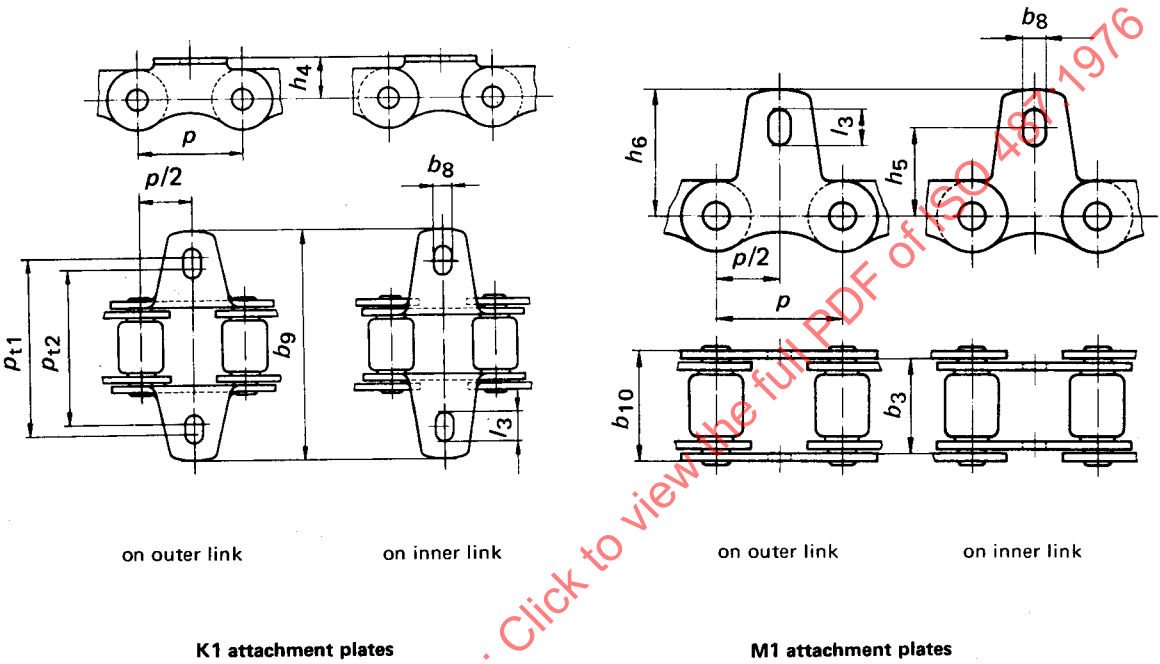


FIGURE 2 — Attachment plates and key to table 2

TABLE 2 — Dimensions and attachment plates

Dimensions in millimetres

ISO chain number	Pitch p	K1 plates						M1 plates					
		Transverse pitch for bolts ¹⁾		Slot width	Slot length	Width over attachments	Platform height	Height of slot centre	Overall height	Slot width	Slot length	Width between outer plates	Width over outer plates
		p_{t1}	p_{t2}	b_8	l_3	b_9	h_4	h_5	h_6	b_8	l_3	b_3	b_{10}
		max.	min.	min.	min.	max.			max.	min.	min.	min.	max.
S 32	29,21	44,5	41,3	5,3	6,9	61,0	8,6	17,3	26,2	5,3	6,9	20,57	24,4
S 42	34,93	57,2	50,8	8,3	11,5	74,9	14,0	23,6	34,3	8,3	11,5	25,65	31,8
S 45	41,40	57,2	50,8	8,3	11,5	74,9	11,4	19,8	30,2	8,3	11,5	28,96	35,1
S 52	38,10	60,3	57,2	8,3	9,9	77,5	11,4	22,1	31,8	8,3	9,9	28,96	35,1
S 55	41,40	57,2	50,8	8,3	11,5	74,9	11,4	19,8	30,2	8,3	11,5	28,96	35,1
S 62	41,91	73,0	60,3	8,3	14,7	95,3	11,4	24,6	38,6	8,3	14,7	32,00	38,1
S 77	58,34	79,4	73,0	8,3	11,5	101,6	20,8	36,3	50,0	8,3	11,5	31,50	40,1
S 88	66,27	98,4	95,3	8,3	9,9	119,4	20,8	43,7	55,6	8,3	9,9	37,85	46,5

Dimensions in inches

ISO chain number	Pitch p	K1 plates						M1 plates					
		Transverse pitch for bolts ¹⁾		Slot width	Slot length	Width over attachments	Platform height	Height of slot centre	Overall height	Slot width	Slot length	Width between outer plates	Width over outer plates
		p_{t1}	p_{t2}	b_8	l_3	b_9	h_4	h_5	h_6	b_8	l_3	b_3	b_{10}
		max.	min.	min.	min.	max.			max.	min.	min.	min.	max.
S 32	1.150	1.750	1.625	0.209	0.272	2.40	0.34	0.68	1.03	0.209	0.272	0.81	0.96
S 42	1.375	2.250	2.000	0.328	0.453	2.95	0.55	0.93	1.35	0.328	0.453	1.01	1.25
S 45	1.630	2.250	2.000	0.328	0.453	2.95	0.45	0.78	1.19	0.328	0.453	1.14	1.38
S 52	1.500	2.375	2.250	0.328	0.390	3.05	0.45	0.87	1.25	0.328	0.390	1.14	1.38
S 55	1.630	2.250	2.000	0.328	0.453	2.95	0.45	0.78	1.19	0.328	0.453	1.14	1.38
S 62	1.650	2.875	2.375	0.328	0.579	3.75	0.45	0.97	1.52	0.328	0.579	1.26	1.50
S 77	2.297	3.125	2.875	0.328	0.453	4.00	0.82	1.43	1.97	0.328	0.453	1.24	1.58
S 88	2.609	3.875	3.750	0.328	0.390	4.70	0.82	1.72	2.19	0.328	0.390	1.49	1.83

1) Nominal centre distance of slots = $\frac{p_{t1} + p_{t2}}{2}$

4 ATTACHMENT PLATES

The two types of attachment plates covered by this International Standard are as follows :

- a) **K1 attachment plates**, forming a platform suitable to accommodate slats and similar attachments. Each attachment plate accepts one fixing bolt for this purpose. Dimensions shall conform to those shown in table 2 and figure 2.
- b) **M1 attachment plates**, to serve as pushers or to accept staybars and similar attachments. The dimensions shall conform to those shown in table 2 and figure 2.

The form and length of attachment plates should provide for the possibility of their use on adjoining links of the chain, noting that the attachment plates may be placed on one side or on both sides of the chain, and on either the inner or the outer link or both.

The length of M1 attachment plates (in direction along the chain) shall not exceed 87 % of the pitch (half this amount on either side of the link centre).

The maximum length of K1 attachment plates and/or of their bending radius shall be such as to preclude interference with the plates of adjoining links having the maximum depth (as shown in column h_2 of table 1).

5 CHAIN WHEELS

5.1 Materials

Grey iron castings of grade 15, in accordance with ISO/R 185, are of adequate strength for the chain wheels.

5.2 Finish of teeth

Unless teeth are to be "machined all over", teeth shall have a cast finish with the tooth form specified in 6.1. The specific form of machined teeth shall be agreed between the purchaser and the wheel manufacturer (see 7.1).

5.3 Range of teeth

This International Standard applies primarily to the following range of teeth :

preferred : 9, 11, 13, 15, 17, 18, 27 and 30

non-preferred : 10, 12, 14, 16 and 34.

5.4 Marking

Chain wheels should be marked with :

- a) manufacturer's name or trademark;
- b) number of teeth;
- c) chain designation.

6 DIMENSIONS OF CAST FINISH TEETH

6.1 Tooth form

The teeth shall have the form illustrated in figure 3 and the dimensions given in table 3.

6.2 Tooth profile

The teeth shall have the profile illustrated in figure 4 and the dimensions given in table 4.

6.3 Root diameters

Root diameters are given in table 5. They may be checked by using the measurement over pins procedure, given in the annex, with the measuring pins touching the working faces of the teeth.

6.4 Tolerances

The dimensions in tables 3 and 4 (cast finish teeth) are subject to limits of tolerance obtainable with industrial casting techniques, except for the following :

$$\text{tooth width } b_{f1} \pm 5 \% \text{ tooth depth } h \begin{matrix} 0 \\ - 10 \% \end{matrix}$$

The dimensions for root diameters in table 5 are subject to the following tolerances :

Root diameters up to	Tolerances
mm	mm
250	0 - 2,5
560	0 - 3,8
860	0 - 5,1
1 170	0 - 6,4

Root diameters up to	Tolerances
in	in
10	0 - 0.10
22	0 - 0.15
34	0 - 0.20
46	0 - 0.25

For applications where some build-up of foreign matter in the roller seating pocket is encountered, the lower ranges of the root diameter tolerances may be used, widening, if necessary, the tolerance for root diameters 250 mm (10 in) and below to 0 to 3,0 mm (0 to 0.125 in) and/or relieving the sides of the roller seating.

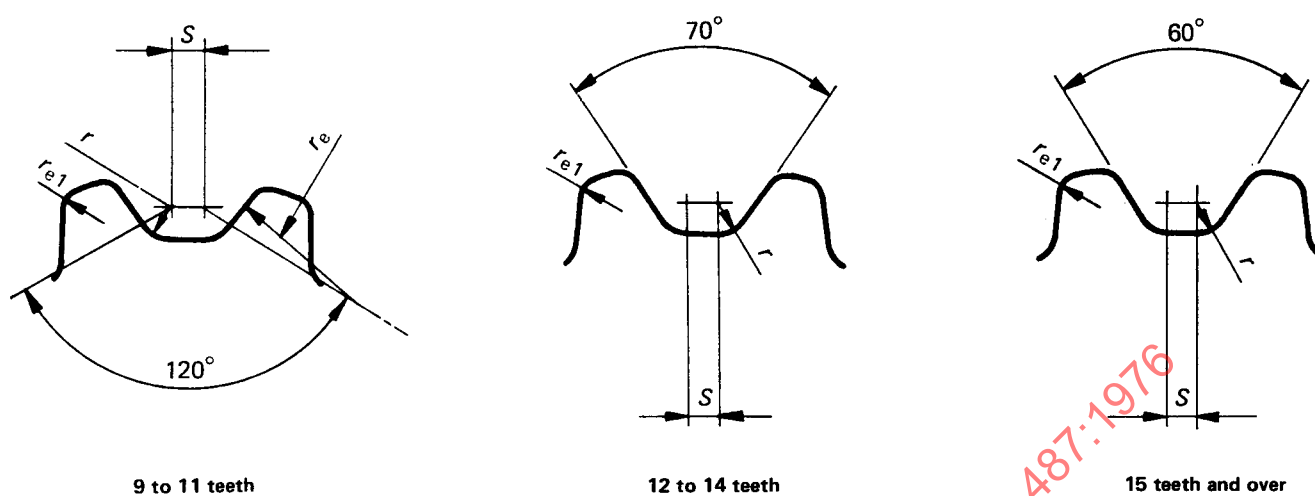


FIGURE 3 — Form of cast finish teeth and key to table 3

TABLE 3 — Dimensions of cast finish tooth form

ISO chain number	Tooth form (millimetres)				Tooth form (inches)			
	r_e	$r^1)$	$S^1)$	r_{e1}	r_e	$r^1)$	$S^1)$	r_{e1}
		min.	max.			min.	max.	
S 32	21,6	5,1	6,4	2,5	0.85	0.20	0.25	0.10
S 42	26,7	6,4	6,4	5,1	1.05	0.25	0.25	0.20
S 45	29,2	6,4	10,2	5,1	1.15	0.25	0.40	0.20
S 52	29,2	6,4	8,9	5,1	1.15	0.25	0.35	0.20
S 55	33,0	7,6	8,9	5,1	1.30	0.30	0.35	0.20
S 62	35,6	7,6	7,6	5,1	1.40	0.30	0.30	0.20
S 77	34,3	7,6	14,0	5,1	1.35	0.30	0.55	0.20
S 88	43,2	10,2	15,2	7,6	1.70	0.40	0.60	0.30

1) $S + 2r$ should be greater than d_1 plus 5 % of the pitch.

7 DIMENSIONS OF TEETH "MACHINED ALL OVER"

7.1 Tooth form

The tooth form is that provided by rotary tooth form cutters as used for transmission steel roller chain wheels, as in ISO/R 606, with the same number of teeth and of the same roller diameter, or, if there is no such size, of the nearest larger roller diameter.

7.2 Tooth profiles

Tooth profiles are given in table 4.

7.3 Root diameters

The dimensions for bottom diameters shall be identical with those for cast finish teeth; see table 5. The measurements should be made as shown in the annex.

7.4 Blank diameters

Blank diameters, i.e the diameters to which the blanks are turned and which equal the tip diameters of the finished

wheels, shall be determined from the following formula :

$$d_a = d_f + 2h$$

the dimensions being taken

for the root diameter d_f : from table 5;

for tooth depths h : from table 4.

7.5 Tolerances

The major dimensions are subject to limits of tolerance as follows :

a) tooth width b_{f1} (see table 4, under machined tooth profile) $\pm 1,5 \%$

b) root diameter d_f (see table 5) $+0, -0,2 \%$

with a maximum of $-0,51 \text{ mm}$ (-0.020 in) for diameters equal to and above 127 mm (5 in);

with a maximum of $-0,25 \text{ mm}$ (-0.010 in) for diameters less than 127 mm (5 in);

c) blank and tip diameters d_a
double the limits specified for root diameter d_f .

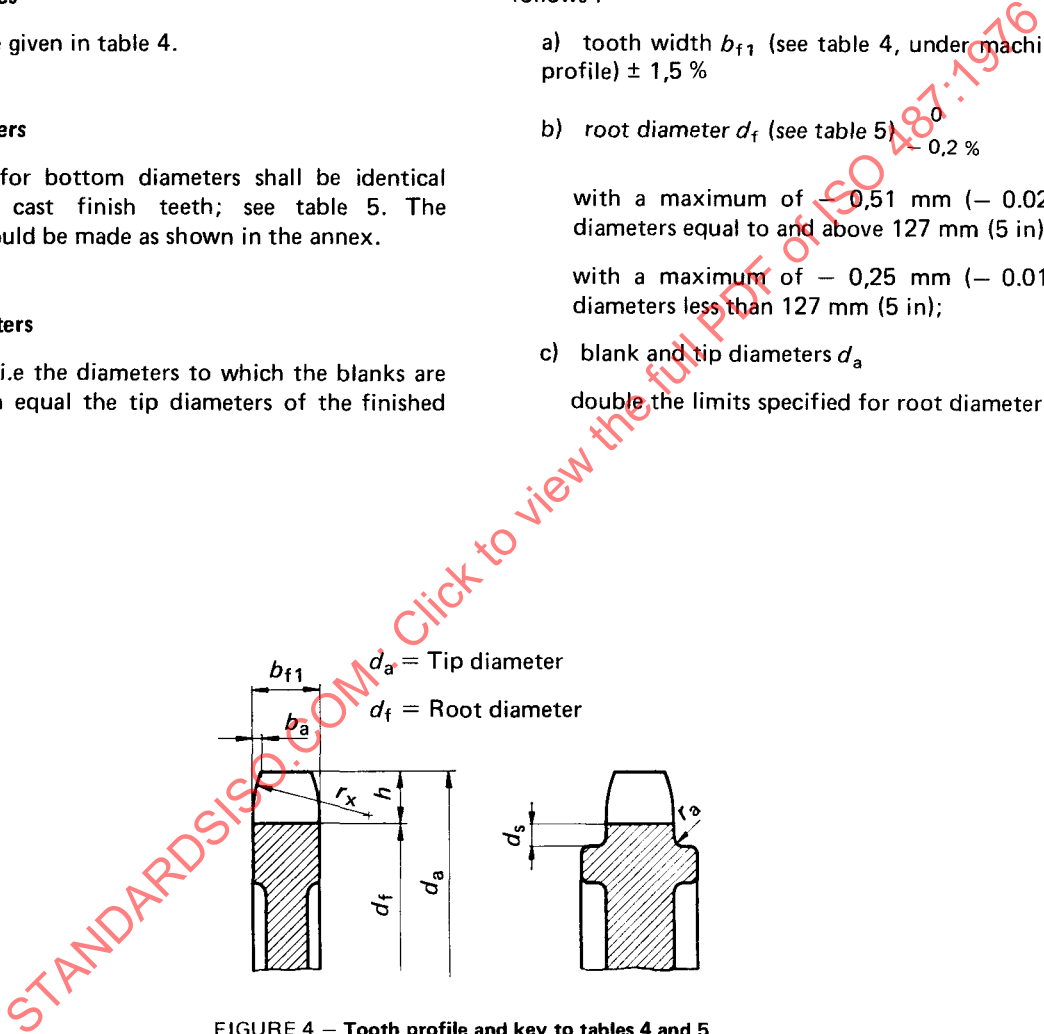


FIGURE 4 — Tooth profile and key to tables 4 and 5

TABLE 4 — Dimensions of tooth profile

Dimensions in millimetres

ISO chain number	Cast tooth profile						Machined tooth profile					
	Tooth width b_{f1}	Side radius r_x	Side relief b_a	Depth of shroud d_s	Tooth depth h	Shroud radius r_a	Tooth width b_{f1}	Side radius r_x	Side relief b_a	Depth of shroud d_s	Tooth depth h	Shroud radius r_a
		min.		min.				min.		min.		
S 32	14,0	19,1	2,8	4,8	10,2	2,5	14,8	19,1	2,8	2,8	10,2	1,3
S 42	16,8	25,4	3,3	6,6	13,7	2,5	17,9	25,4	3,3	4,6	13,7	1,3
S 45	19,8	25,4	4,0	4,8	14,2	2,5	20,9	25,4	4,0	2,8 ¹⁾	14,2	1,3
S 52	19,8	25,4	4,0	4,8	14,2	2,5	20,9	25,4	4,0	2,8 ¹⁾	14,2	1,3
S 55	19,8	31,8	4,0	3,6	15,5	2,5	20,9	31,8	4,0	1,5 ¹⁾	15,5	1,3
S 62	22,6	31,8	4,6	3,1	16,0	2,5	23,9	31,8	4,6	1,0 ¹⁾	16,0	1,3
S 77	19,8	31,8	4,0	7,6	17,5	2,5	20,9	31,8	4,0	5,8 ¹⁾	17,5	1,3
S 88	25,4	38,1	5,1	5,6	21,8	2,5	26,9	38,1	5,1	3,6 ¹⁾	21,8	1,3

Dimensions in inches

ISO chain number	Cast tooth profile						Machined tooth profile					
	Tooth width b_{f1}	Side radius r_x	Side relief b_a	Depth of shroud d_s	Tooth depth h	Shroud radius r_a	Tooth width b_{f1}	Side radius r_x	Side relief b_a	Depth of shroud d_s	Tooth depth h	Shroud radius r_a
		min.		min.				min.		min.		
S 32	0.55	0.75	0.11	0.19	0.40	0.10	0.584	0.75	0.11	0.11	0.40	0.05
S 42	0.66	1.00	0.13	0.26	0.54	0.10	0.703	1.00	0.13	0.18	0.54	0.05
S 45	0.78	1.00	0.16	0.19	0.56	0.10	0.821	1.00	0.16	0.11 ¹⁾	0.56	0.05
S 52	0.78	1.00	0.16	0.19	0.56	0.10	0.821	1.00	0.16	0.11 ¹⁾	0.56	0.05
S 55	0.78	1.25	0.16	0.14	0.61	0.10	0.821	1.25	0.16	0.06 ¹⁾	0.61	0.05
S 62	0.89	1.25	0.18	0.12	0.63	0.10	0.940	1.25	0.18	0.04 ¹⁾	0.63	0.05
S 77	0.78	1.25	0.16	0.30	0.69	0.10	0.821	1.25	0.16	0.23 ¹⁾	0.69	0.05
S 88	1.00	1.50	0.20	0.22	0.86	0.10	1.059	1.50	0.20	0.14 ¹⁾	0.86	0.05

1) These dimensions should be increased by 0,5 mm (0.02 in) for 10 teeth, and by 1,00 mm (0.04 in) for 9 teeth.

The minimum depth of shroud d_s and the maximum tooth depth h are specified for the standard chain wheel range only (9 to 34 teeth). The datum line for these dimensions is the actual root diameter, which may differ from the theoretical value within the tolerances specified in 6.4 (cast finish) and 7.5 (machined).

If the shroud radius r_a exceeds the figure shown, the minimum shroud depth d_s shall be increased by the same amount.

TABLE 5 — Dimensions of root diameter d_f (see figure 4)

Dimensions in millimetres

ISO chain number	Number of teeth z												
	9	10	11	12	13	14	15	16	17	18	27	30	34
S 32	73,96	83,08	92,25	101,42	110,62	119,84	129,06	138,30	147,55	156,79	240,18	268,02	305,16
S 42	87,83	98,76	109,68	120,68	131,67	142,67	153,70	164,74	175,79	186,84	286,56	319,84	364,24
S 45	105,82	118,75	131,72	144,73	157,76	170,82	183,90	196,98	210,08	223,19	341,38	380,85	433,48
S 52	96,16	108,05	119,99	131,98	143,97	155,98	168,02	180,06	192,10	204,17	312,95	349,25	397,68
S 55	103,28	116,21	129,18	142,19	155,22	168,28	181,36	194,44	207,54	220,65	338,84	378,31	430,94
S 62	103,48	116,59	129,72	142,88	156,08	169,29	182,52	195,78	209,04	222,30	341,96	381,89	435,18
S 77	152,32	170,54	188,82	207,16	225,53	243,94	262,36	280,80	299,26	317,73	484,30	539,90	614,07
S 88	170,89	191,59	212,34	233,17	254,05	274,96	295,88	316,81	337,79	358,78	547,95	611,12	695,35

Dimensions in inches

ISO chain number	Number of teeth z												
	9	10	11	12	13	14	15	16	17	18	27	30	34
S 32	2.912	3.271	3.632	3.993	4.355	4.718	5.081	5.445	5.809	6.173	9.456	10.552	12.014
S 42	3.458	3.888	4.318	4.751	5.184	5.617	6.051	6.486	6.921	7.356	11.282	12.592	14.340
S 45	4.166	4.675	5.186	5.698	6.211	6.725	7.240	7.755	8.271	8.787	13.440	14.994	17.066
S 52	3.786	4.254	4.724	5.196	5.668	6.141	6.615	7.089	7.563	8.038	12.321	13.750	15.657
S 55	4.066	4.575	5.086	5.598	6.111	6.625	7.140	7.655	8.171	8.687	13.340	14.894	16.966
S 62	4.074	4.590	5.107	5.625	6.145	6.665	7.186	7.708	8.230	8.752	13.463	15.035	17.133
S 77	5.997	6.714	7.434	8.156	8.879	9.604	10.329	11.055	11.782	12.509	19.067	21.256	24.176
S 88	6.728	7.543	8.360	9.180	10.002	10.825	11.649	12.473	13.299	14.125	21.573	24.060	27.376

ANNEX

ROOT DIAMETER AND ITS MEASUREMENT OVER PINS

A.1 NOMENCLATURE

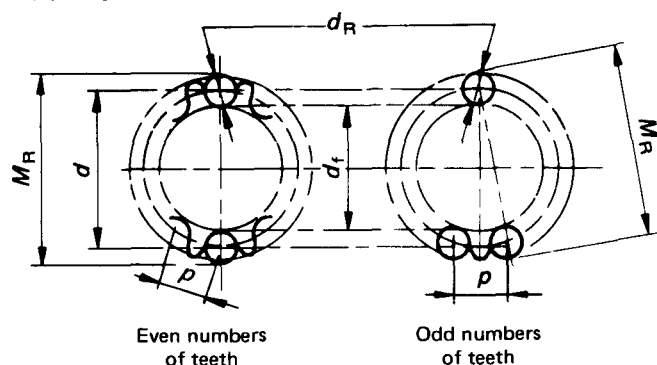


FIGURE 5 – Root diameter and measurement over pins

p = chordal pitch, equal to chain pitch

d_R = measuring pin diameter

z = number of teeth

d = pitch circle diameter

d_f = root diameter

M_R = measurement over pins

A.2 ROOT DIAMETER

The root diameter (see table 5) is determined from the following formula :

$$d_f = p \operatorname{cosec} \left(\frac{180^\circ}{z} \right) - d_1$$

where d_1 is the roller diameter (table 1).

The root diameter of chain wheels with *even* numbers of teeth is checked by measuring over pins inserted in opposite tooth spaces.

The root diameter of chain wheels with *odd* numbers of teeth is checked by measuring over pins inserted in the tooth spaces most nearly opposite.

A.3 MEASUREMENT OVER PINS

Measurement over pins is obtained from the following formulae :

a) For *even* numbers of teeth,

$$M_R = d_f + 2d_R$$

b) For *odd* numbers of teeth,

$$M_R = \frac{p}{2} \operatorname{cosec} \left(\frac{180^\circ}{z} \right) - d_1 + 2d_R$$

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NOTE – For cast teeth, the measuring pins shall, during measurement, touch the corresponding working faces of the teeth.

A.4 MEASURING PIN DIAMETER

The measuring pin diameter shall be,

a) for cast teeth, d_R equal to maximum roller diameter of the chain, d_1 ;

b) for machined teeth, d_R equal to the roller diameter, d_1 , of the chain for which the cutter is made.

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