INTERNATIONAL STANDARD

ISO 1977

First edition
2000-11-01

Conveyor chains, attachments and sprockets

Chaînes de manutention, plaques-attaches et roues dentées

Reference number
ISO 1977:2000(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 1977 was prepared by Technical Committee ISO/TC 100, *Chains and chain wheels for power transmission and conveyors*.

This first edition of ISO 1977 cancels and replaces ISO 1977-1:1976, ISO 1977-2:1974, and ISO 1977-3:1974, which have been technically revised.

Annex A forms an integral part of this International Standard.

Introduction

ISO 1977 combines into a single document ISO 1977-1, ISO 1977-2 and ISO 1977-3, which covered metric-series chains and attachments, and chain wheels, while at the same time revising their technical content.

The principle technical changes are: a reduction in the flanged roller dimensions and the width between outer plates in the MC series of chains, an increase in the width between inner plates in M-series, MC56, MC112 and MC224 chains, and the addition of the small roller diameter to the MC series. New information on the calculation of sprocket tip diameters and tooth heights above root diameters is also given.

Conveyor chains, attachments and sprockets

1 Scope

This International Standard specifies the characteristics of bush, plain and flanged roller chains of both solid and hollow bearing pin types designed for general conveying and mechanical handling duties, together with associated chain sprockets and attachments. The chain dimensions specified in this International Standard will ensure interchangeability of complete chains and individual links for repair purposes.

This International Standard is applicable to sprockets with from 6 to 40 teeth. Control criteria for sprockets are defined to ensure correct meshing, operation and transmission of load in use under normal operating conditions.

NOTE Controls do not necessarily determine sprocket design parameters.

Specifications are also given for K attachments and deep plates for use with the conveyor chains conforming to this International Standard.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 286-2:1988, *ISO system of limits and fits — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts*.

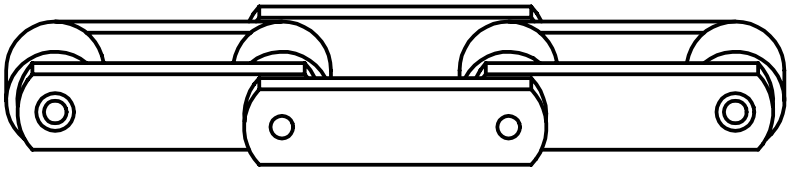
3 Chains

3.1 Nomenclature

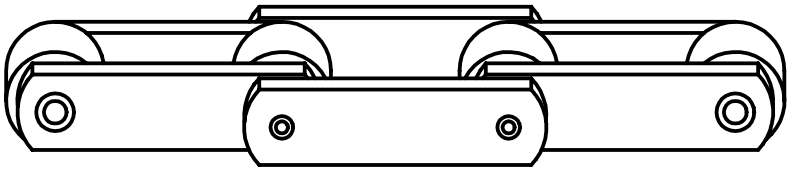
The nomenclature of the chains and their component parts is presented in Figure 1.

3.2 Dimensions

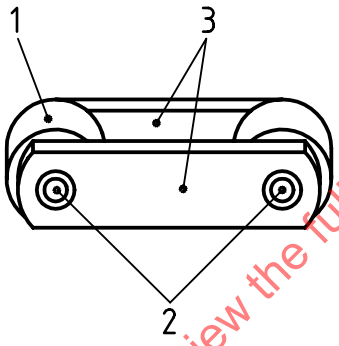
Conveyor chain dimensions shall conform to those given in Table 1 or Table 2 (see Figure 2). Both maximum and minimum dimensions are specified to ensure the interchangeability of links made by different chain manufacturers. Although these represent limits for interchangeability, they are not necessarily to be regarded as limits of tolerance for manufacture.



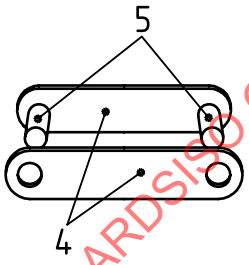
a) Solid-bearing pin chain



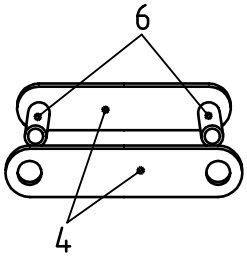
b) Hollow-bearing pin chain



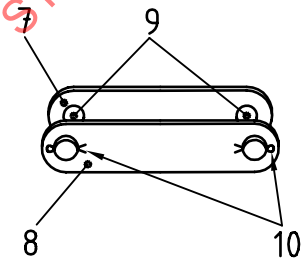
c) Inner link



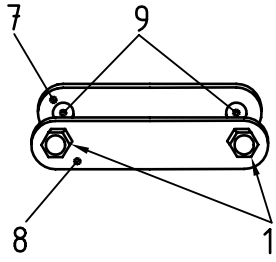
d) Outer link (solid-bearing pins)



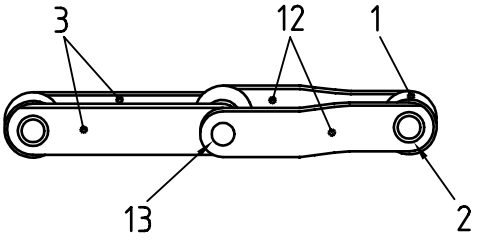
e) Outer link (hollow-bearing pins)



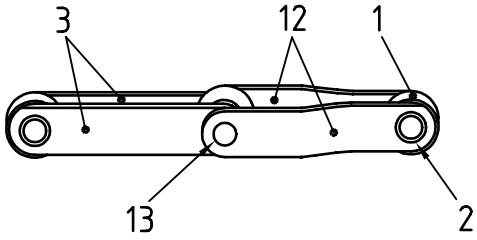
f) Connecting link (cotter pin fasteners)



g) Connecting link (nut fasteners)



h) Cranked link double (solid-bearing pin)



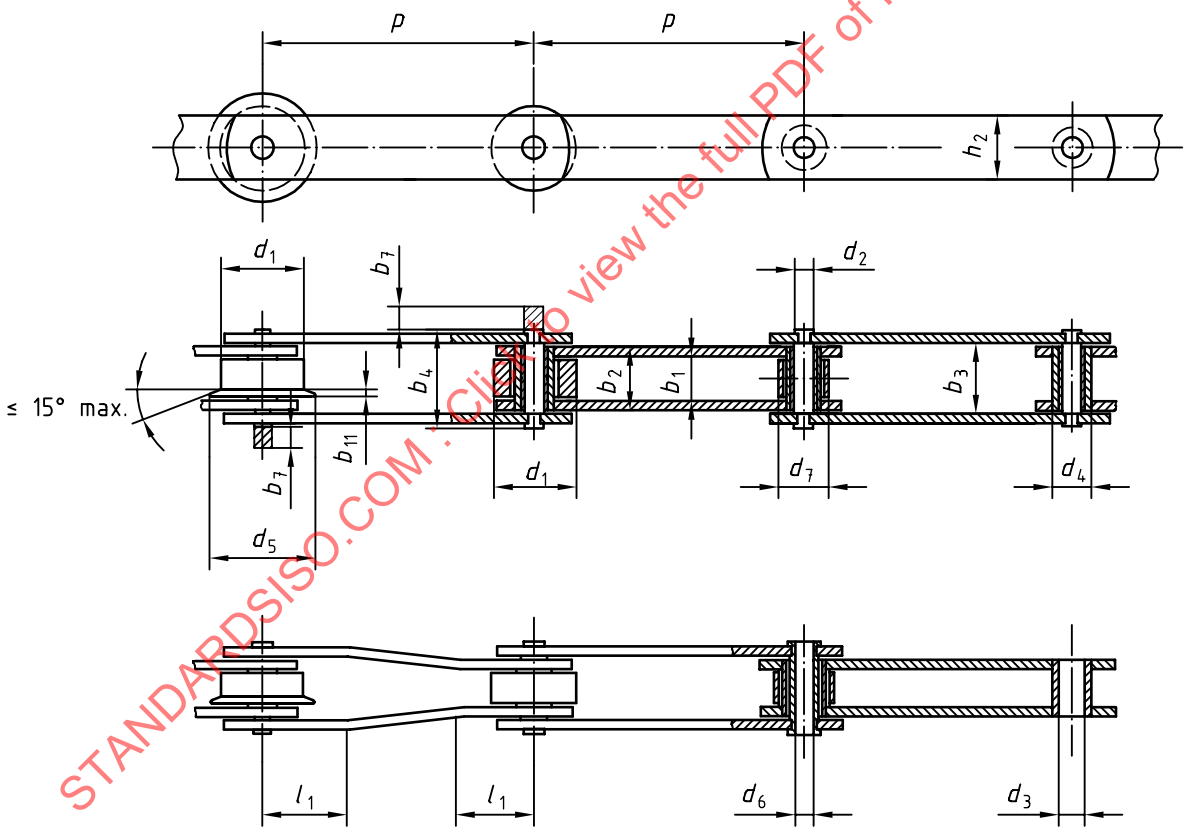
i) Cranked link double (hollow-bearing pin)

Key

1 Roller
2 Bush
3 Inner plate
4 Outer plate
5 Bearing pins (solid)
6 Bearing pins (hollow)
7 Fixed outer plate
8 Detachable plate
9 Connecting pins
10 Cotter pin fasteners [a]
11 Nut fasteners
12 Cranked plate
13 Bearing pin (riveted)

[a] The type of fastener (cotter pin, nut, etc.) is optional.

Figure 1 — Chain parts



d_1 plain roller diameter
d_2 bearing-pin body diameter
d_3 bush bore
d_4 bush diameter
h_2 plate depth
b_1 width between inner plates
b_2 width over inner links
b_3 width between outer plates
b_4 width over bearing pins
b_7 additional width for joint faster
l_1 cranked link dimension

Flange roller dimensions:
— d_5 flange diameter
— b_{11} flange width

d_6 hollow-pin bore
d_7 small roller diameter

NOTE 1 Bearing pins may be of necked design, as shown here, or plain as in Figure 1.

NOTE 2 These illustrations do not define the true form of the chain plates, pins, bushes or rollers.

Figure 2 — Chain dimensions and symbols (*see Table 1 and Table 2*)

Table 1 — Solid pin conveyor chain dimensions and characteristics

ISO chain No. (basic)	Tensile strength kN min.	d_1 mm max.	Pitch[a b c] p mm														
			40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000
M20	20	25	X														
M28	28	30		X													
M40	40	36															
M56	56	42			X												
M80	80	50															
M112	112	60				X											
M160	160	70					X										
M224	224	85						X									
M315	315	100							X								
M450	450	120															
M630	630	140															
M900	900	170									X						

[a] Pitch, p, is a theoretical reference dimension used in the calculation of chain lengths and sprocket dimensions, and is not intended for use in the inspection of individual links.

[b] Those pitches indicated by an X are for bush and small roller chains only.

[c] Those pitches within the shaded area are the preferred pitches.

[d] The cranked link dimension l_1 also determines the maximum plate length and the limit of the path of articulation taking minimum play into account.

Table 2 — Hollow pin conveyer chain dimensions and characteristics

ISO chain No. (basic)	Tensile strength kN	d_1 mm max.	Pitch[a b] p mm									d_2 mm max.	d_3 mm min.	d_4 mm max	h_2 mm max.
			63	80	100	125	160	200	250	315	400	500				
MC28	28	36											13	13,1	17,5	26
MC56	56	50											15,5	15,6	21,0	36
MC112	112	70											22	22,2	29,0	51
MC224	224	100											31	31,2	41,0	72

[a] Pitch, p, is a theoretical reference dimension used in the calculation of chain lengths and sprocket dimensions, and is not intended for use in the inspection of individual links.

[b] Those pitches within the shaded area are the preferred pitches.

[c] The cranked link dimension l_1 also determines the maximum plate length and the limit of the path of articulation taking minimum play into account.

Table 1 (*continued*)

d_2	d_3	d_4	h_2	b_1	b_2	b_3	b_4	b_7	**Measuring Force**	l_1[d]	d_5	b_{11}	d_7
mm									kN	mm			
max.	min.	max.	max.	min.	max.	min.	max.	max.		min.	max.	max.	max.
6	6,1	9	19	16	22	22,2	35	7	0,4	12,5	32	3,5	12,5
7	7,1	10	21	18	25	25,2	40	8	0,56	14	36	4	15
8,5	8,6	12,5	26	20	28	28,3	45	9	0,8	17	42	4,5	18
10	10,1	15	31	24	33	33,3	52	10	1,12	20,5	50	5	21
12	12,1	18	36	28	39	39,4	62	12	1,6	23,5	60	6	25
15	15,1	21	41	32	45	45,5	73	14	2,24	27,5	70	7	30
18	18,1	25	51	37	52	52,5	85	16	3,2	34	85	8,5	36
21	21,2	30	62	43	60	60,6	98	18	4,5	40	100	10	42
25	25,2	36	72	48	70	70,7	112	21	6,3	47	120	12	50
30,	30,2	42	82	56	82	82,8	135	25	9	55	140	14	60
36	36,2	50	103	66	96	97	154	30	12,5	66,5	170	16	70
44	44,2	60	123	78	112	113	180	37	18	81	210	18	85

Table 2 (*continued*)

b_1	b_2	b_3	b_4	b_7	**Measuring Force**	l_1[c]	d_5	b_{11}	d_6	d_7
mm					kN	mm				
min.	max.	min.	max.	max.		min.	max.	max.	min.	max.
20	28	28,3	42	10	0,56	17,0	42	4,5	8,2	25
24	33	33,3	48	13	1,12	23,5	60	5	10,2	30
32	45	45,5	67	19	2,24	34,0	85	7	14,3	42
43	60	60,6	90	24	4,50	47,0	120	10	20,3	60

3.3 Tensile testing

The test length shall have a minimum of three free pitches. The ends shall be attached to the testing-machine shackles by a pin through the plate holes or the bushes. The shackles shall be designed so as to allow universal movement. The actual test method shall be left to the manufacturer's discretion. Tests in which failures occur adjacent to the shackles shall be disregarded.

3.4 Length accuracy

3.4.1 General

When measured in accordance with the requirements given in 3.4.2, 3.4.3 and 3.4.4, the finished chain shall be accurate to within $^{0,25\%}_{0}$ of the nominal chain length.

NOTE Chains that work in parallel can be matched by agreement between the purchaser and manufacturer.

3.4.2 Standard test-measurement length

The length of chain for measurement shall be that nearest to 3 000 mm with an odd number of pitches, terminating with inner links at each end.

3.4.3 Support

The chain, in unlubricated condition, shall be supported throughout its entire length.

3.4.4 Measuring force

A force equal to 1/50 of the appropriate tensile strength given in Table 1 or Table 2 shall be applied.

3.5 Cranked links

In order to obtain an odd number of pitches in an endless chain, a cranked link is used [see Figure 1 h) and 1 i)]. The cranked link dimension of a chain shall correspond to its respective l_1 as given in Table 1 or Table 2 and as appropriate.

3.6 Designation

The designation numbers for conveyor chains are based on the ISO numbers given in Table 1 and Table 2. These numbers are derived from the minimum tensile strength (in kilonewtons) and have been given the prefixes M, to indicate a solid-bearing pin chain, and MC, to indicate a hollow-bearing pin chain.

EXAMPLE M80 signifies a solid-bearing pin chain of 80 kN tensile strength.

MC224 signifies a hollow-bearing pin chain of 224 kN tensile strength.

The addition of the letter B, F, P or S indicates type: bush, flanged roller, plain or small roller, respectively. The addition of further digits indicates the pitch in millimetres.

EXAMPLE MC224 chain with flanged roller and pitch of 200 mm:

MC224-F-200

3.7 Marking

The chains shall be marked with the manufacturer’s name or trademark, and should be marked with the respective ISO chain number given in Table 1 or Table 2.

4 Attachments

4.1 K attachments

4.1.1 Dimensions

K attachments are shown in Figure 3, and their respective dimensions are given in Table 3.

4.1.2 Designation

This International Standard specifies three types of K attachment:

— K1, which has one attachment hole centrally disposed in each plate;

— K2, which has two attachment holes disposed in each plate (see Figure 3);

— K3, which has two attachment holes disposed in each plate and a third hole centrally positioned between the two.

Attachments may be fitted on one or both sides of the chain.

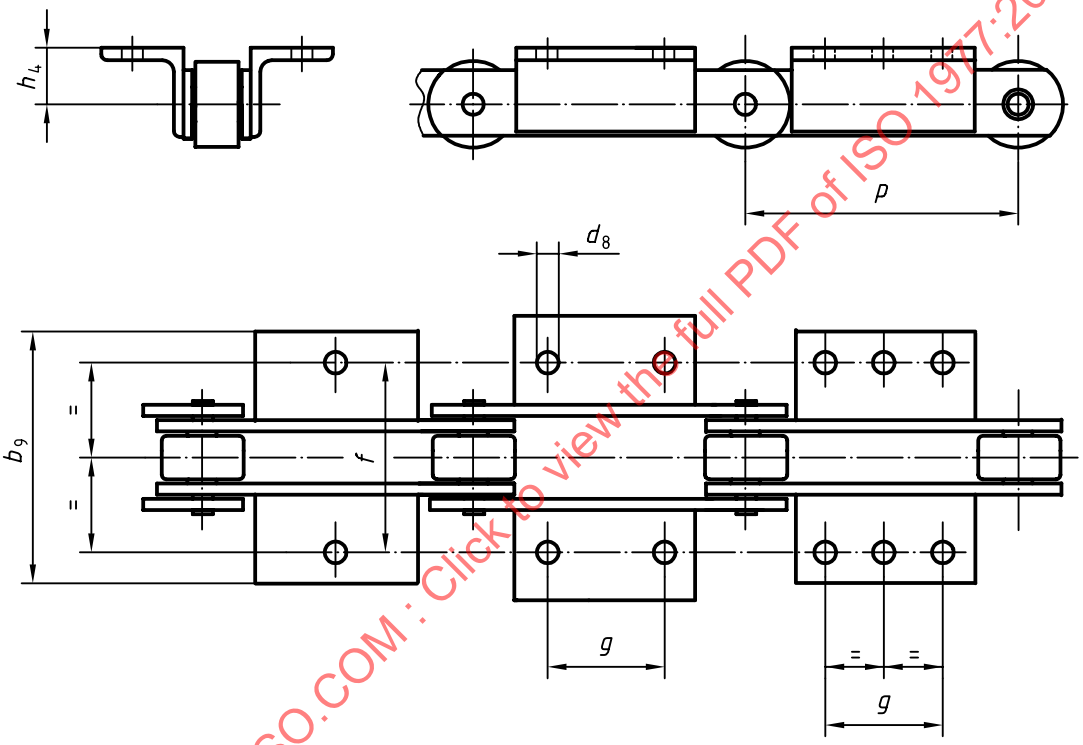
4.1.3 Manufacture

For convenience, the K attachments are shown in Figure 3 as being made of rolled-steel angle section. However, their construction shall be at the discretion of the manufacturer and may be of integral form, whereby the actual chain plates will be bent over to form the platform.

The attachment length shall be at the discretion of the manufacturer.

4.2 Deep plates

The deep-plate height, h_6 is shown in Figure 4, with respective heights given in Table 4. All other data, including chain tensile strengths, are specified in Tables 1 and 2.



d_8 hole diameter

h_4 platform height

f transverse distance between hole centres

b_9 width over attachments

g longitudinal distance between hole centres

p pitch

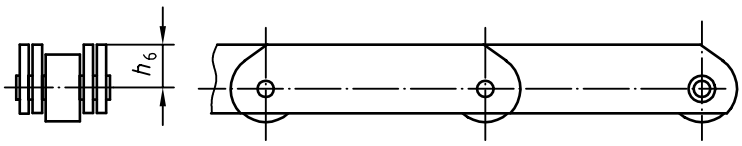
Figure 3 — K attachment dimensions and symbols (*see Table 3*)

Table 3 — K-attachment dimensions

Dimensions in millimetres

ISO chain number	d_8	h_4	f	b_9 max.	Longitudinal distance between hole centres					
					short		medium		long	
					p [a] min.	g	p [a] min.	g	p [a] min.	g
M20	6,6	16	54	84	63	20	80	35	100	50
M28	9	20	64	100	80	25	100	40	125	65
M40	9	25	70	112	80	20	100	40	125	65
M56	11	30	88	140	100	25	125	50	160	85
M80	11	35	96	160	125	50	160	85	200	125
M112	14	40	110	184	125	35	160	65	200	100
M160	14	45	124	200	160	50	200	85	250	145
M224	18	55	140	228	200	65	250	125	315	190
M315	18	65	160	250	200	50	250	100	315	155
M450	18	75	180	280	250	85	315	155	400	240
M630	24	90	230	380	315	100	400	190	500	300
M900	30	110	280	480	315	65	400	155	500	240
MC28	9	25	70	112	80	20	100	40	125	65
MC56	11	35	88	152	125	50	160	85	200	125
MC112	14	45	110	192	160	50	200	85	250	145
MC224	18	65	140	220	200	50	250	100	315	155

[a] Minimum chain pitch for longitudinal distance between hole centres g.



h_6 plate height

Figure 4 — Deep-plate height (*see Table 4*)

Table 4 — Deep plate heights

Dimensions in millimetres

ISO chain number	h_6
M20	16
M28	20
M40	22,5
M56	30
M80	32,5
M112	40
M160	45
M224	60
M315	65
M450	80
M630	90
M900	120
MC28	22,5
MC56	32,5
MC112	45
MC224	65
NOTE All other data, including those relating to tensile strength, are as those given for the basic chain plates in clause 3.	

5 Sprockets

5.1 Diametral dimensions

5.1.1 General

The sprocket diametral dimensions are shown in Figure 5, and specified in 5.1.2 to 5.1.6.

5.1.2 Pitch circle diameter (d)

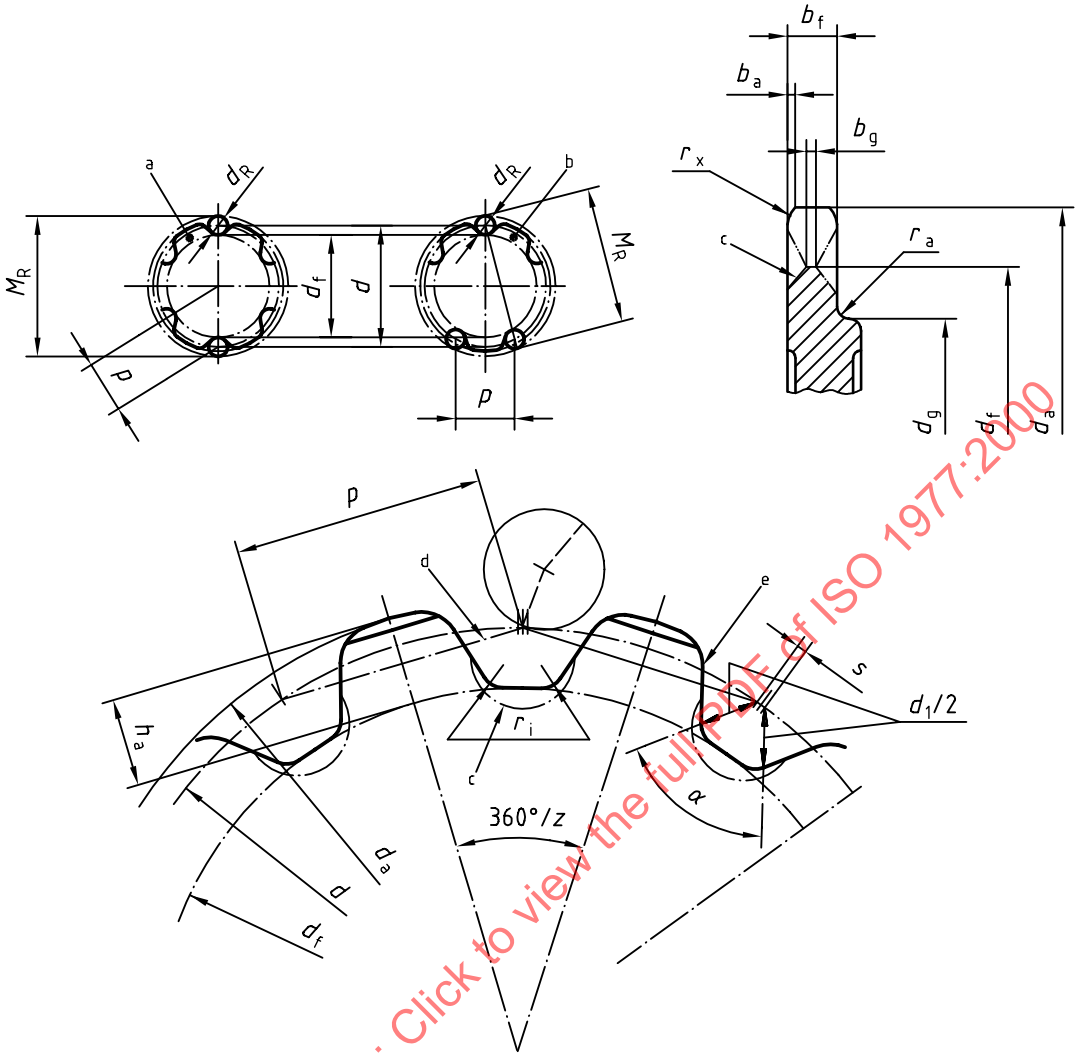
$$d = \frac{p}{\sin\frac{180°}{z}}$$

The unitary dimensions of the normal range of teeth are given in Annex A.

5.1.3 Tip diameter (d_a)

$$d_a \text{ max} = d + d_1$$

The minimum tip diameter shall ensure a tooth working face according to 5.2.2.



b_a	tooth side relief	d_R	measuring-pin diameter	r_i	roller seating radius
b_f	tooth width	d_1	plain roller diameter	r_x	minimum tooth side radius
b_g	relieved tooth width minimum	d_2	bearing-pin body diameter	s	pitch line clearance
d	pitch circle diameter	h_a	tooth height above root diameter	z	number of teeth
d_a	tip diameter	M_R	measurement over measuring pins	α	roller seating angle
d_f	root diameter	p	chordal pitch (= chain pitch)		
d_g	absolute maximum shroud diameter	r_a	shroud radius		

a	Even numbers of teeth	d	Pitch polygon
b	Odd numbers of teeth	e	Tooth flank
c	Roller seating relief	f	Depending on the type of roller, d_1 may be replaced with d_4 or d_7.

NOTE For other than roller chains, replace the term roller by the term bush.

Figure 5 — Sprocket parts and dimensions