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INTERNATIONAL STANDARD ISO 4348

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Flat-top chains and associated chainwheels for conveyors

Chaînes charnières et roues pour convoyeurs

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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.

International Standard ISO 4348 was developed by Technical Committee ISO/TC 100, *Chains and chain wheels for power transmission and conveyors*, and was circulated to the member bodies in July 1977.

It has been approved by the member bodies of the following countries :

Australia	Italy	Sweden
Belgium	Japan	Turkey
Czechoslovakia	Korea, Rep. of	United Kingdom
Finland	Mexico	U.S.A.
France	Netherlands	U.S.S.R.
Germany	Romania	Yugoslavia
India	South Africa, Rep. of	
Ireland	Spain	

No member body expressed disapproval of the document.

Flat-top chains and associated chainwheels for conveyors

0 INTRODUCTION

This International Standard lays down the dimensions of a selected range of flat-top chains which are manufactured in various countries and which are in world-wide use. Flat-top chains are also known as "slat band" and "table top" chains.

It should be noted that the specified dimensions for the chains are based upon inch units.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the characteristics of flat-top chains and associated chainwheels as used principally on conveyors for bottles. It covers dimensions, limits for interchangeability, measuring loads and minimum ultimate tensile strengths.

2 CHAINS

2.1 Nomenclature

Two types of chain are specified :

- single-hinge (see figure 1 and tables 1 and 1M);
- double-hinge (see figure 4 and tables 2 and 2M).

2.2 Designation

Flat-top chains are designated by the letter C followed by the nominal slat width expressed in units of 0.25 in, followed by S or D depending upon whether the chains are of single-hinge or double-hinge design.

Example : C12S designates a single-hinge chain with a nominal slat width of 3.0 in.

2.3 Dimensions

2.3.1 The chains shall conform to the dimensions given in tables 1, 1M, 2 and 2M. Maximum and minimum dimensions are specified to ensure interchangeability of slats produced by different manufacturers.

2.3.2 Hinge clearance dimensions e and f are both based on the maximum values of t and d_1 as given in tables 1 and 1M, and must be recalculated for any other values.

The basis for the calculations shall be that no part of an adjacent slat may come within the swept clearance k as shown in figures 2 and 3.

2.3.3 The dimensions d_2 and d_3 given in tables 1 and 1M ensure free movement of the articulating curls around the bearing pin.

The methods of torsional and axial bearing pin restraint within the fixed curls shall be at the manufacturer's discretion.

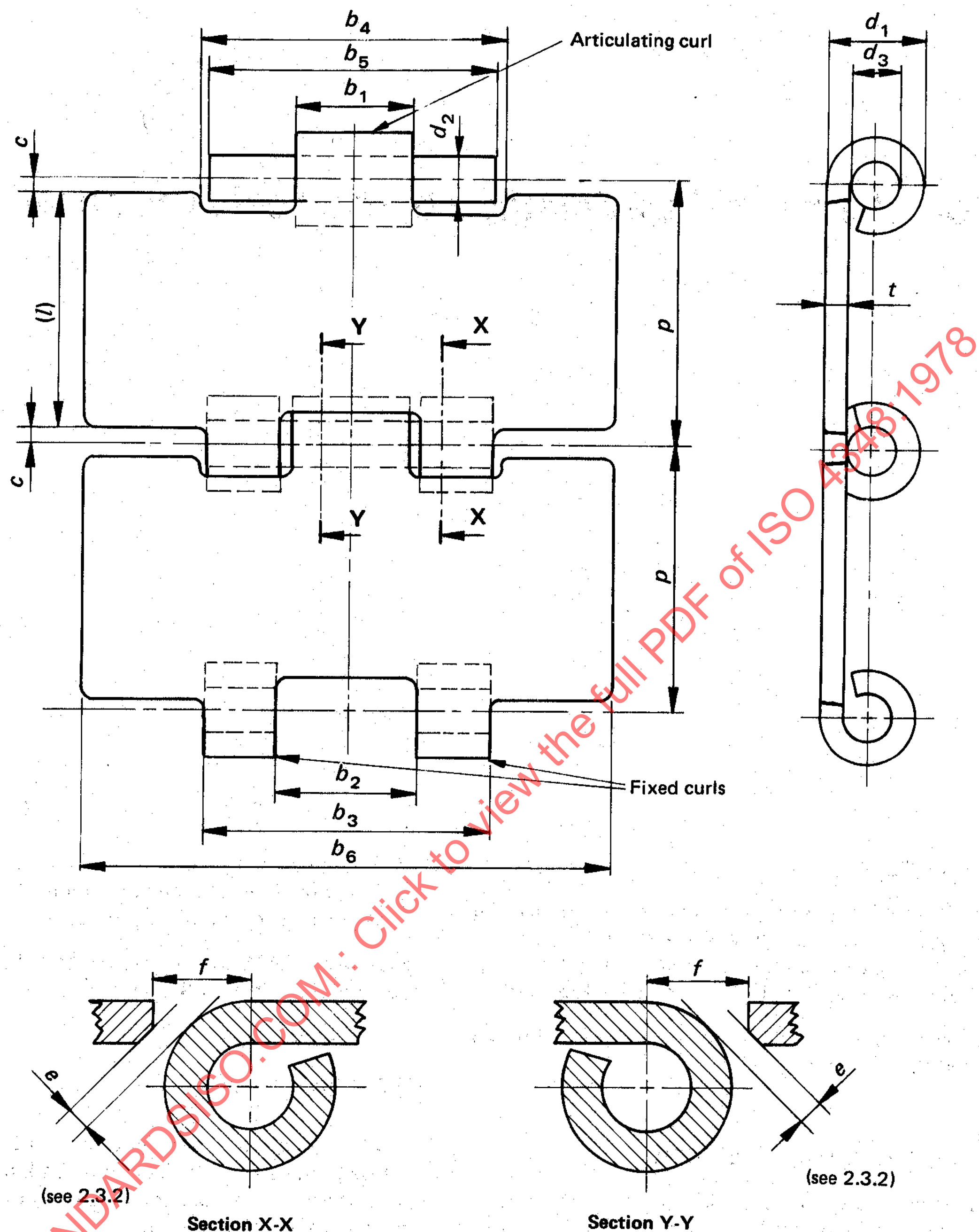
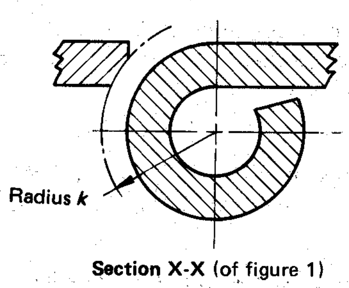


FIGURE 1 – **Single-hinge chain**



k = 6,70 mm (0.264 in)

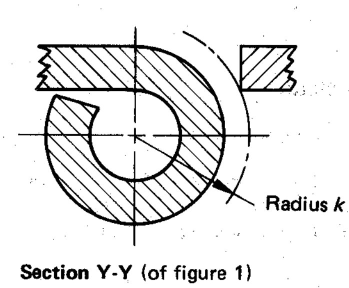


FIGURE 2 – **Hinge clearance of chamfered slat**

FIGURE 3 – **Hinge clearance of slat with square edge**

TABLE 1 – Chain dimensions, measuring loads and tensile strength of single-hinge flat-top chains (inch-pound units)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ISO chain number	Pitch[1]	Curl diameter	Bearing pin diameter	Articulating curl bore diameter	Slat thickness	Width over articulating curl	Width between fixed curls	Width over fixed curls	Slat hinge clearance width	Width over bearing pins	Slat width b_6		Slat length[2]	Slat clearance	Hinge clearance		Measuring load	Ultimate tensile strength
											Maximum	Nominal			Tangential[3]	Linear[3)4)]		
	p	d_1 max.	d_2 max.	d_3 min.	t max.	b_1 max.	b_2 min.	b_3 max.	b_4 min.	b_5 max.			l	c min.	e min.	f min.		min.
	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	lbf	lbf
C 12 S											3.040	3.000					In carbon steel 45	2 250
C 13 S											3.290	3.250					or	or
C 14 S											3.540	3.500					in corrosion-resistant steel grade 1[5]	
C 16 S	1.50	0.517	0.251	0.252	0.132	0.787	0.791	1.656	1.657	1.677	4.040	4.000	1.468	0.016	0.006	0.200	36	1 800
C 18 S											4.540	4.500					or	or
C 24 S											6.040	6.000					grade 2[5]	
C 30 S											7.540	7.500					28	1 400

1) Chain pitch p is a theoretical dimension used in calculating strand lengths and chainwheel dimensions; it is not intended for the inspection of individual links.

2) Dimension l is quoted for reference only and will be dependent upon actual dimension c.

3) See 2.3.2 according to the option chosen.

4) Dimension given only for guidance in tool manufacture.

5) These grades are purely arbitrary and relate only to the appropriate tensile strength of the corrosion-resistant steel. The manufacturer should be consulted for details of the corrosion-resisting properties of the steels.

TABLE 1M – Chain dimensions, measuring loads and tensile strength of single-hinge flat-top chains (metric units)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ISO chain number	Pitch[1]	Curl diameter	Bearing pin diameter	Articulating curl bore diameter	Slat thickness	Width over articulating curl	Width between fixed curls	Width over fixed curls	Slat hinge clearance width	Width over bearing pins	Slat width b_6		Slat length[2]	Slat clearance	Hinge clearance		Measuring load	Ultimate tensile strength
											Maximum	Nominal			Tangential[3]	Linear[3][4]		
	p	d_1 max.	d_2 max.	d_3 min.	t max.	b_1 max.	b_2 min.	b_3 max.	b_4 min.	b_5 max.			l	c min.	e min.	f min.		min.
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	daN	daN
C 12 S											77,20	76,20					In carbon steel	
C 13 S											83,60	82,60					20 or	1 000 or
C 14 S											89,90	88,90					in corrosion-resistant steel grade 1[5]	
C 16 S	38,10	13,13	6,38	6,40	3,35	20,00	20,10	42,05	42,10	42,60	102.60	101,60	37,28	0,41	0,14	5,08	16 or	800 or
C 18 S											115,30	114,30					grade 2[5]	
C 24 S											153,40	152,40					12	625
C 30 S											191,50	190,50						

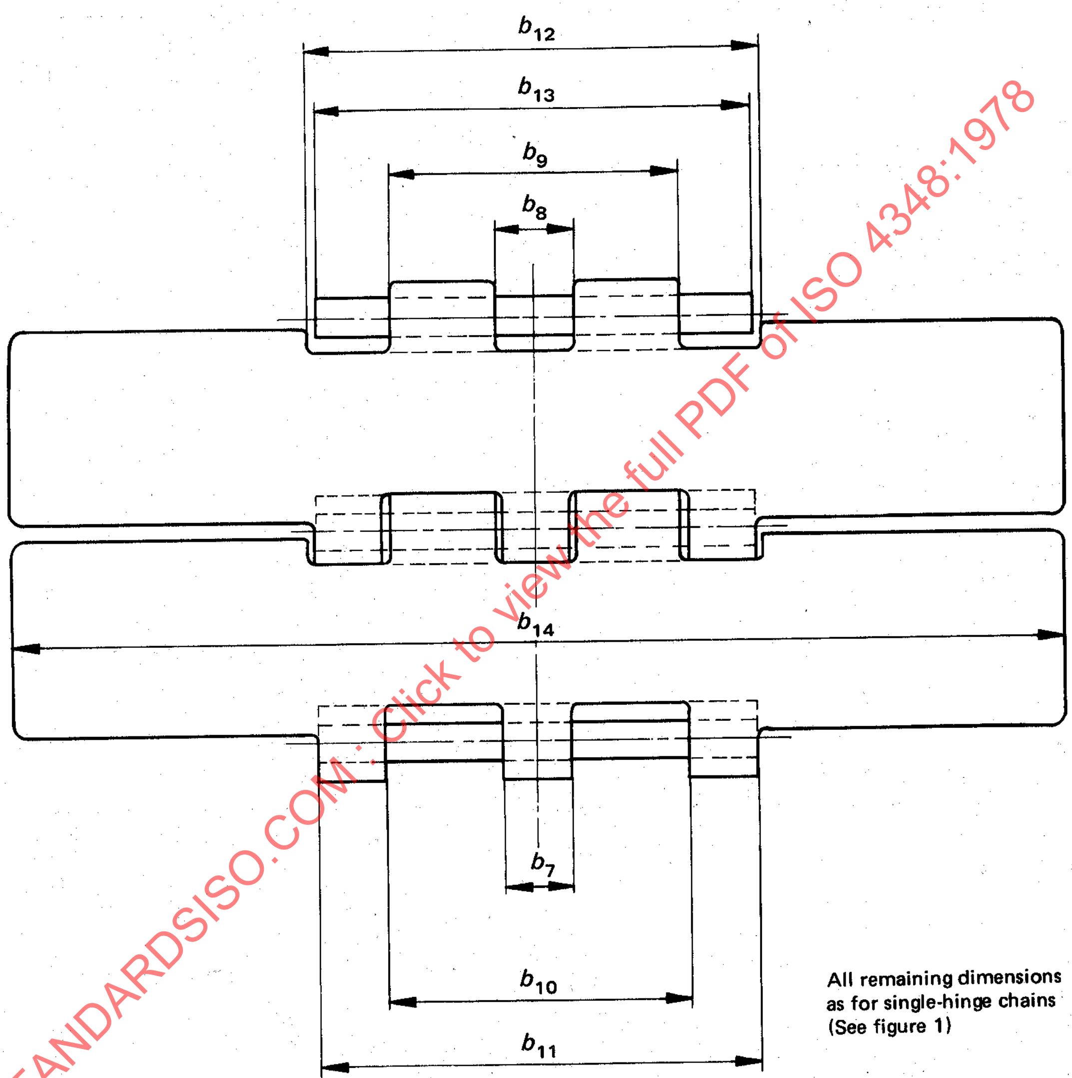
1) Chain pitch p is a theoretical dimension used in calculating strand lengths and chainwheel dimensions; it is not intended for the inspection of individual links.

2) Dimension l is quoted for reference only and will be dependent upon actual dimension c.

3) See 2.3.2 according to the option chosen.

4) Dimension given only for guidance in tool manufacture.

5) These grades are purely arbitrary and relate only to the appropriate tensile strength of the corrosion-resistant steel. The manufacturer should be consulted for details of the corrosion-resisting properties of the steels.



All remaining dimensions as for single-hinge chains (See figure 1)

FIGURE 4 — **Double-hinge chain**

TABLE 2 — Chain dimensions, measuring loads and tensile strength of double-hinge flat-top chains (inch-pound units)

1	2	3	4	5	6	7	8	9	10	11	12
ISO chain number	Width over centre fixed curl b_7 max.	Width between articulating curls b_8 min.	Width over articulating curls b_9 max.	Width between outer fixed curls b_{10} min.	Width over outer fixed curls b_{11} max.	Slat hinge clearance width b_{12} min.	Width over bearing pins b_{13} max.	Slat width b_{14} Maximum	Slat width b_{14} Nominal	Measuring load	Ultimate tensile strength min.
	in	in	in	in	in	in	in	in	in	lbf	lbf
C 30 D	0.531	0.539	2.106	2.110	3.169	3.173	3.190	7.540	7.500	in carbon steel	
										90	4 500
										in corrosion-resistant steel grade 1	
										72	3 600
										grade 2	
										56	2 800

TABLE 2M — Chain dimensions, measuring loads and tensile strength of double-hinge flat-top chains (metric units)

1	2	3	4	5	6	7	8	9	10	11	12
ISO chain number	Width over centre fixed curl b_7 max.	Width between articulating curls b_8 min.	Width over articulating curls b_9 max.	Width between outer fixed curls b_{10} min.	Width over outer fixed curls b_{11} max.	Slat hinge clearance width b_{12} min.	Width over bearing pins b_{13} max.	Slat width b_{14} Maximum	Slat width b_{14} Nominal	Measuring load	Ultimate tensile strength min.
	mm	mm	mm	mm	mm	mm	mm	mm	mm	daN	daN
C 30 D	13,50	13,70	53,50	53,60	80,50	80,60	81,00	191,50	190,50	in carbon steel	
										40	2 000
										in corrosion-resistant steel grade 1	
										32	1 600
										grade 2	
										25	1 250

2.4 Minimum ultimate tensile strength

2.4.1 The minimum tensile strength is the minimum strength of samples tested to destruction in tensile loading, as defined in 2.4.2. This strength is not a working load. It is intended primarily as a comparative figure between chains of various materials and constructions. For application information, the manufacturers or their published data should be consulted.

2.4.2 A tensile load shall be applied to the ends of a chain length, containing at least five free pitches, by means of shackles permitting free movement on both sides of the chain centre line, in the normal plane of articulation.

Failure shall be considered to have occurred at the first point where increasing extension is no longer accompanied by increasing load, i.e. the first crest on the load/extension diagram.

NOTE — This will indicate failure in the terms of this International Standard whether hinges break or uncurl.

2.4.3 The tensile test shall be considered a destructive test. Even though a chain may not fail when subjected to the minimum ultimate tensile load, as given in table 1, 1M, 2 or 2M, it will have been stressed beyond the yield point and will be unfit for service.

2.5 Length accuracy

The standard length for measurement shall be 40 pitches measured before lubrication.

The chain shall be supported throughout its entire length and the measuring load specified in table 1, 1M, 2 or 2M applied. To comply with this International Standard, the nominal standard length shall be subject to a tolerance of $^{+0,3}_{-0,1}$ %.

2.6 Marking

It is recommended that the chains should be marked with :

a) the manufacturer's name or trade mark;

b) the ISO chain number (column 1 of tables 1, 1M, 2 and 2M).

3 CHAINWHEELS (SPROCKETS)

NOTE — The following applies to single-hinge and double-hinge chains.

3.1 Nomenclature

The nomenclature for chainwheels is as shown in figure 5.

The given chainwheel design is proposed as a minimum and is the less expensive approach since only one cutter is utilized. There are other tooth forms which optimize load absorption and allowable chain elongation. For the latter designs, the chain and sprocket manufacturer should be consulted.

Wheels for flat-top chains are provided with two effective sets of teeth each having a number of teeth z, the location of the tooth spaces of the second set being midway between those of the first. The total number of teeth is z_1. With such double-cut sprockets, z_1 will be an integer, but z will be fractional if z_1 is an odd number.

The effective number of teeth z is always the value used in rim diameter calculations.

3.2 Dimensions

NOTE — Values for p and d_1 will be found in tables 1 and 1M.

3.2.1 *Pitch circle diameter*

$$d = \frac{p}{\sin \frac{180^\circ}{z}}$$

3.2.2 *Measuring pin diameter*

$$d_R = d_1$$

3.2.3 *Root diameter*

$$d_f \text{ max.} = d - d_1$$

3.2.4 *Measurement over measuring pins*

$$M_R \text{ for even number of teeth} = d + d_R$$

$$M_R \text{ for odd numbers of teeth} = d \cos \frac{90^\circ}{z} + d_R$$

For an even number of teeth, measurement is made over pins inserted in diametrically opposed tooth spaces.

For an odd number of teeth, measurement is made over pins inserted in the tooth space most nearly diametrically opposite.

During measurement, the pins shall always be in contact with the working faces of the teeth.

3.2.5 *Tip diameter*

The tooth shall not foul the underside of the slat.

The tip diameter at which first contact will occur is given by

$$d_a = d \cos \frac{180^\circ}{z} + 0.25 \text{ in}$$

$$= d \cos \frac{180^\circ}{z} + 6{,}35 \text{ mm}$$

Double cutting has the effect of flatting a tooth; therefore, at the manufacturer's discretion, advantage may be taken of this "flat" and the tip diameter increased.

3.2.6 *Pitch line clearance*

$s = 0.080$ in (2,0 mm)