भारतीय मानक

Indian Standard

IS 1072 : 2024
ISO 4347 : 2015

पत्ती चैन, कड़ी और ढेर — आयाम, मापने के बल, तन्यता ताकत और गतिशील ताकत

(चौथा पुनरीक्षण)

Leaf Chains, Clevises and Sheaves — Dimensions, Measuring Forces, Tensile Strengths and Dynamic Strengths

(Fourth Revision)

ICS 21.220.30

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Price Group 10

Transmission Devices Sectional Committee, PGD 33

NATIONAL FOREWORD

This Indian Standard (Fourth Revision) which is identical to ISO 4347 : 2015 'Leaf chains, clevises and sheaves — Dimensions, measuring forces, tensile strengths and dynamic strengths' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Transmission Devices Sectional Committee and approval of the Production and General Engineering Division Council.

This standard was first published in 1964. The first, second and third revisions of this standard were published in 1980, 1996 and 2014 respectively. This revision has been undertaken to align it with ISO 4347 : 2015.

This edition specifies the minimum dynamic strength of the chains.

The text of ISO standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'; and
b) Comma (,) has been used as a decimal marker while in Indian Standards, the current-practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards, which are to be substituted in their respective places, are given below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 606 Short-pitch transmission precision roller and bush chains, attachments and associated chain sprockets	IS 2403 : 2024/ISO 606 : 2015 Short-pitch transmission precision roller and bush chains, attachments and associated chain sprockets (*third revision*)	Identical
ISO 15654 Fatigue test methods for transmission precision roller chains and leaf chains	IS 15790 : 2008/ISO 15654 : 2004 Fatigue test method for transmission precision roller chains	Identical

The Committee has reviewed the provisions of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard:

International Standard	*Title*
ASME B29.8	Leaf chains, clevises and sheaves

The standard also makes a reference to the BIS Certification Marking of the product. Details of which are given in National Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'.

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Introduction

This International Standard includes two series of chains: one derived from the ISO 606 A/ASME B29.8 series, designated by the symbol “LH” or “BL”; the other derived from the ISO 606 B series, designated by the symbol “LL”.

In Table 1 and Table 2, requirements for minimum dynamic strengths are specified. See informative Annex A for calculation details.

Indian Standard

LEAF CHAINS, CLEVISES AND SHEAVES — DIMENSIONS, MEASURING FORCES, TENSILE STRENGTHS AND DYNAMIC STRENGTHS

(Fourth Revision)

1 Scope

This International Standard specifies the characteristics of chains used for general lifting purposes, together with the rim profiles of sheaves and the chain attachment ends of clevises. It gives dimensions, limits for interchangeability, length measurement, preloading, minimum tensile strengths and minimum dynamic strengths.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 606, *Short-pitch transmission precision roller and bush chains, attachments and associated chain sprockets*

ISO 15654[1)], *Fatigue test methods for transmission precision roller chains and leaf chains*

ASME[2)] B29.8, *Leaf chains, clevises and sheaves*

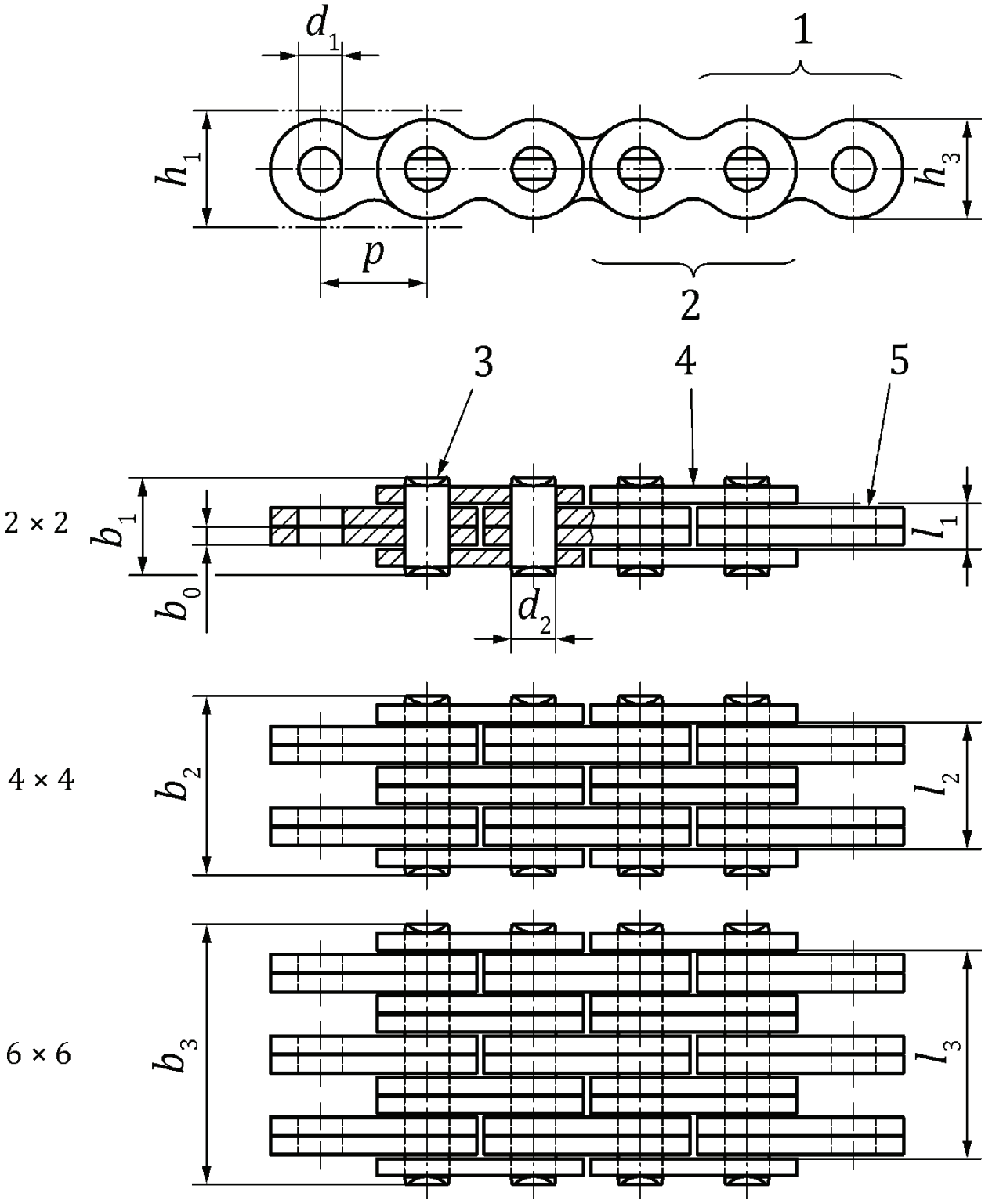
3 Chains

3.1 Nomenclature

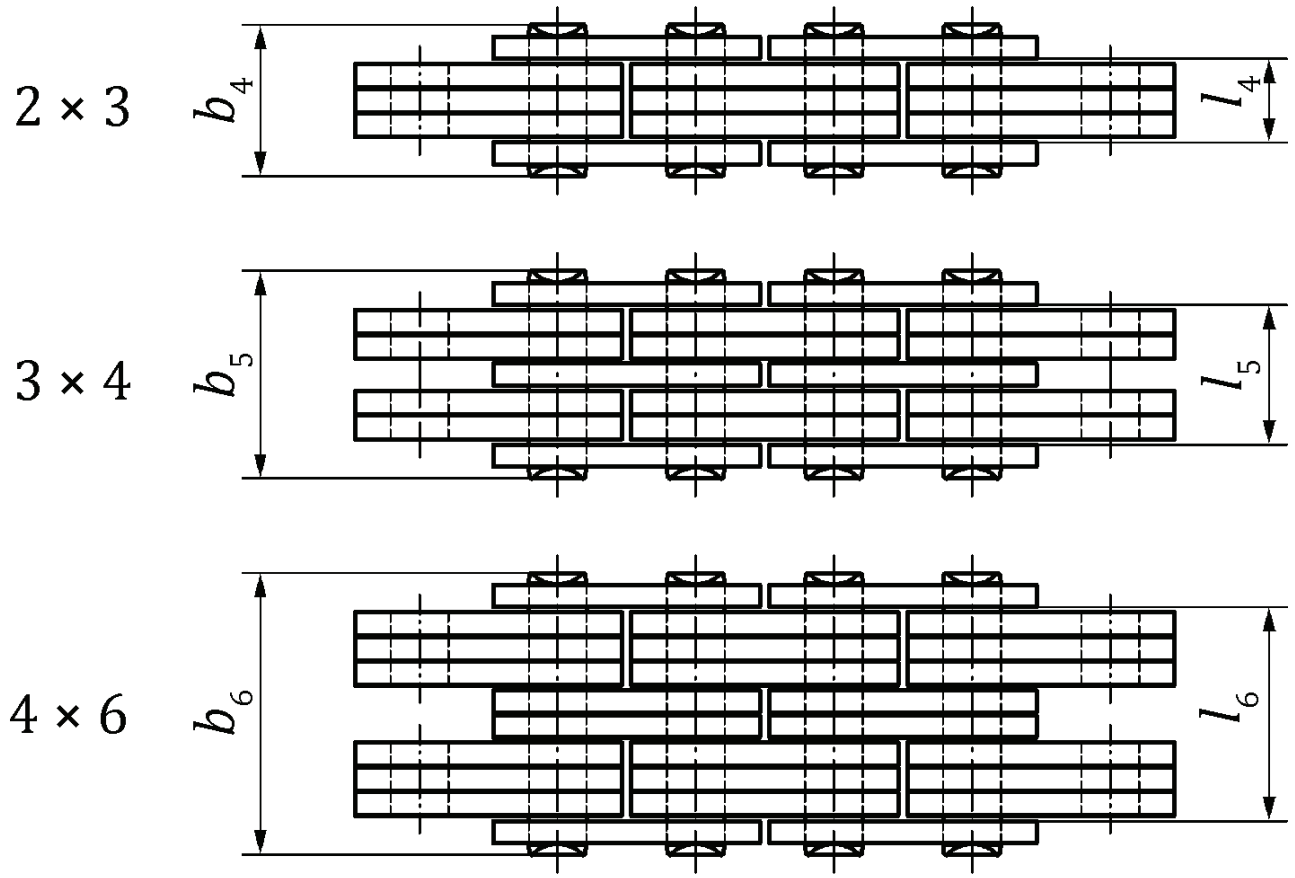
The nomenclature of chains is shown in Figure 1 (which does not necessarily define the actual form of the chain plates) and as given in Table 1 and Table 2.

1) To be published (Revision of ISO 15654:2004).

2) American Society of Mechanical Engineers.



a) Even lacing



b) Uneven lacing

Key

1 inner link
2 outer link
3 pin
4 outer plate
5 inner plate

Figure 1 — Symbols related to Tables 1 and 2

3.2 Chain designation

Leaf chain shall be designated by the prefix "LH" ["BL"] for chains derived from the ISO 606 A [ASME B29.8] series, or by the prefix "LL" for chains derived from ISO 606 B series, followed by a number of which the first two digits indicate the pitch expressed in sixteenths of an inch and the last two digits indicate the lacing (number of plates in the outer plate pitch and inner plate pitch).

To obtain the ASME "BL" reference, the same principle is used, except that the pitch is expressed in eighths of an inch using only one or two digits, dependent on pitch.

EXAMPLE 1 A chain with nominal pitch of 12,7 mm derived from chain ISO 08B, consisting of outer plates and inner plates each comprising two plates would be designated by

LL 0822

EXAMPLE 2 A chain with nominal pitch of 19,05 mm derived from ISO 12A [ASME chain No. 60], consisting of outer plates comprising three plates and inner plates comprising four plates would be designated by

LH 1234 [BL 634]

3.3 Dimensions

The dimensions given in Table 1 and Table 2 provide minimum and maximum limits, ensuring interchangeability and connection to standard design clevises.

Manufacturers are responsible for the actual dimensional features of their products.

Chains from different manufacturers shall never be placed together within the same application.

Table 1 — Principal chain dimensions, measuring forces, tensile strengths and dynamic strengths, LH series

ISO chain number	ASME chain number	Pitch p nom.	Lacing	Thickness of plates b_0 max.	Hole diameter of inner plates d_1 min.	Pin diameter d_2 max.	Chain path depth h_1[a] min.	Plate depth h_3 max.	Width over riveted pin b_1 to b_6 max.	Width between outer plates l_1 to l_6 min.	Measuring force	Minimum tensile strength F_u	Minimum dynamic strength [c] F_d
		mm		mm							N	kN	kN
LH 0822 [b]	BL 422	12,7	2 × 2	2,08	5,11	5,09	12,32	12,07	11,1	4,2	222	22,2	3,10
LH 0823	BL 423	12,7	2 × 3	2,08	5,11	5,09	12,32	12,07	13,2	6,3	222	22,2	3,74
LH 0834	BL 434	12,7	3 × 4	2,08	5,11	5,09	12,32	12,07	17,4	10,4	334	33,4	4,13
LH 0844 [d]	BL 444	12,7	4 × 4	2,08	5,11	5,09	12,32	12,07	19,6	12,4	445	44,5	4,66
LH 0846	BL 446	12,7	4 × 6	2,08	5,11	5,09	12,32	12,07	23,8	16,6	445	44,5	4,65
LH 0866	BL 466	12,7	6 × 6	2,08	5,11	5,09	12,32	12,07	28,0	21,0	667	66,7	6,21
LH 1022 [b]	BL 522	15,875	2 × 2	2,48	5,98	5,96	15,34	15,09	12,9	4,9	334	33,4	4,80
LH 1023	BL 523	15,875	2 × 3	2,48	5,98	5,96	15,34	15,09	15,4	7,4	334	33,4	5,77
LH 1034	BL 534	15,875	3 × 4	2,48	5,98	5,96	15,34	15,09	20,4	12,3	489	48,9	6,39
LH 1044 [d]	BL 544	15,875	4 × 4	2,48	5,98	5,96	15,34	15,09	22,8	14,7	667	66,7	7,20
LH 1046	BL 546	15,875	4 × 6	2,48	5,98	5,96	15,34	15,09	27,7	19,5	667	66,7	7,19
LH 1066	BL 566	15,875	6 × 6	2,48	5,98	5,96	15,34	15,09	32,7	24,6	1 000	100,1	9,60
LH 1222 [b]	BL 622	19,05	2 × 2	3,3	7,96	7,94	18,34	18,11	17,4	6,6	489	48,9	7,05
LH 1223	BL 623	19,05	2 × 3	3,3	7,96	7,94	18,34	18,11	20,8	9,9	489	48,9	8,47
LH 1234	BL 634	19,05	3 × 4	3,3	7,96	7,94	18,34	18,11	27,5	16,5	756	75,6	9,38
LH 1244 [d]	BL 644	19,05	4 × 4	3,3	7,96	7,94	18,34	18,11	30,8	19,8	979	97,9	10,6
LH 1246	BL 646	19,05	4 × 6	3,3	7,96	7,94	18,34	18,11	37,5	26,4	979	97,9	10,6
LH 1266	BL 666	19,05	6 × 6	3,3	7,96	7,94	18,34	18,11	44,2	33,2	1 468	146,8	14,1
LH 1622 [b]	BL 822	25,4	2 × 2	4,09	9,56	9,54	24,38	24,13	21,4	8,2	845	84,5	12,3
LH 1623	BL 823	25,4	2 × 3	4,09	9,56	9,54	24,38	24,13	25,5	12,3	845	84,5	14,8
LH 1634	BL 834	25,4	3 × 4	4,09	9,56	9,54	24,38	24,13	33,8	20,5	1 290	129,0	16,3
LH 1644 [d]	BL 844	25,4	4 × 4	4,09	9,56	9,54	24,38	24,13	37,9	24,6	1 690	169,0	18,4
LH 1646	BL 846	25,4	4 × 6	4,09	9,56	9,54	24,38	24,13	46,2	32,7	1 690	169,0	18,4
LH 1666	BL 866	25,4	6 × 6	4,09	9,56	9,54	24,38	24,13	54,5	41,1	2 536	253,6	24,6

Table 1 *(continued)*

ISO chain number	ASME chain number	Pitch p nom.	Lacing	Thickness of plates b_0 max.	Hole diameter of inner plates d_1 min.	Pin diameter d_2 max.	Chain path depth h_1[a] min.	Plate depth h_3 max.	Width over riveted pin b_1 to b_6 max.	Width between outer plates l_1 to l_6 min.	Measuring force	Minimum tensile strength F_u	Minimum dynamic strength [c] F_d
		mm		mm							N	kN	kN
LH 2022 [b]	BL 1022	31,75	2 × 2	4,9	11,14	11,11	30,48	30,18	25,4	9,8	1 156	115,6	18,8
LH 2023	BL 1023	31,75	2 × 3	4,9	11,14	11,11	30,48	30,18	30,4	14,8	1 156	115,6	22,6
LH 2034	BL 1034	31,75	3 × 4	4,9	11,14	11,11	30,48	30,18	40,3	24,5	1 824	182,4	25,0
LH 2044 [d]	BL 1044	31,75	4 × 4	4,9	11,14	11,11	30,48	30,18	45,2	29,5	2 313	231,3	28,2
LH 2046	BL 1046	31,75	4 × 6	4,9	11,14	11,11	30,48	30,18	55,1	39,4	2 313	231,3	28,2
LH 2066	BL 1066	31,75	6 × 6	4,9	11,14	11,11	30,48	30,18	65,0	49,2	3 470	347,0	37,6
LH 2422 [b]	BL 1222	38,1	2 × 2	5,77	12,74	12,71	36,55	36,2	29,7	11,6	1 512	151,2	26,7
LH 2423	BL 1223	38,1	2 × 3	5,77	12,74	12,71	36,55	36,2	35,5	17,4	1 512	151,2	32,0
LH 2434	BL 1234	38,1	3 × 4	5,77	12,74	12,71	36,55	36,2	47,1	28,9	2 446	244,6	35,4
LH 2444 [d]	BL 1244	38,1	4 × 4	5,77	12,74	12,71	36,55	36,2	52,9	34,4	3 025	302,5	40,0
LH 2446	BL 1246	38,1	4 × 6	5,77	12,74	12,71	36,55	36,2	64,6	46,3	3 025	302,5	39,9
LH 2466	BL 1266	38,1	6 × 6	5,77	12,74	12,71	36,55	36,2	76,2	57,9	4 537	453,7	53,3
LH 2822 [b]	BL 1422	44,45	2 × 2	6,6	14,32	14,29	42,67	42,24	33,6	13,2	1 913	191,3	35,4
LH 2823	BL 1423	44,45	2 × 3	6,6	14,32	14,29	42,67	42,24	40,2	19,7	1 913	191,3	42,6
LH 2834	BL 1434	44,45	3 × 4	6,6	14,32	14,29	42,67	42,24	53,4	32,7	3 158	315,8	47,1
LH 2844 [d]	BL 1444	44,45	4 × 4	6,6	14,32	14,29	42,67	42,24	60,0	39,1	3 826	382,6	53,2
LH 2846	BL 1446	44,45	4 × 6	6,6	14,32	14,29	42,67	42,24	73,2	52,3	3 826	382,6	53,0
LH 2866	BL 1466	44,45	6 × 6	6,6	14,32	14,29	42,67	42,24	86,4	65,5	5 783	578,3	70,9
LH 3222 [b]	BL 1622	50,8	2 × 2	7,52	17,49	17,46	48,74	48,26	40.0	15,0	2 891	289,1	43,4
LH 3223	BL 1623	50,8	2 × 3	7,52	17,49	17,46	48,74	48,26	46,6	22,5	2 891	289,1	52,1
LH 3234	BL 1634	50,8	3 × 4	7,52	17,49	17,46	48,74	48,26	61,8	37,5	4 404	440,4	57,7
LH 3244 [d]	BL 1644	50,8	4 × 4	7,52	17,49	17,46	48,74	48,26	69,3	44,8	5 783	578,3	65,1
LH 3246	BL 1646	50,8	4 × 6	7,52	17,49	17,46	48,74	48,26	84,5	59,9	5 783	578,3	65,0
LH 3266	BL 1666	50,8	6 × 6	7,52	17,49	17,46	48,74	48,26	100,0	75,0	8 674	867,4	86,8
LH 4022 [b]	BL 2022	63,5	2 × 2	9,91	23,84	23,81	60,88	60,33	51,8	19,9	4 337	433,7	64,4

Table 1 *(continued)*

ISO chain number	ASME chain number	Pitch p nom.	Lacing	Thickness of plates b_0 max.	Hole diameter of inner plates d_1 min.	Pin diameter d_2 max.	Chain path depth h_1[a] min.	Plate depth h_3 max.	Width over riveted pin b_1 to b_6 max.	Width between outer plates l_1 to l_6 min.	Measuring force	Minimum tensile strength F_u	Minimum dynamic strength [c] F_d
		mm		mm							N	kN	kN
LH 4023	BL 2023	63,5	2 × 3	9,91	23,84	23,81	60,88	60,33	61,7	29,8	4 337	433,7	77,4
LH 4034	BL 2034	63,5	3 × 4	9,91	23,84	23,81	60,88	60,33	81,7	49,4	6 494	649,4	85,7
LH 4044 [d]	BL 2044	63,5	4 × 4	9,91	23,84	23,81	60,88	60,33	91,6	59,1	8 674	867,4	96,6
LH 4046	BL 2046	63,5	4 × 6	9,91	23,84	23,81	60,88	60,33	111,5	78,9	8 674	867,4	96,4
LH 4066	BL 2066	63,5	6 × 6	9,91	23,84	23,81	60,88	60,33	131,4	99,0	13 011	1 301,1	128,9

[a] Chain path depth is the minimum depth of channel through which the assembled chain will pass.

[b] These chains have reduced fatigue strength and wear life compared with uneven lacings of the same pitch and same minimum tensile strength. This should be taken into account when selecting a chain for a particular application.

[c] Dynamic strength values are based on test specimen each of 5 free pitches for $P \leq 50,8$ mm and each of three free pitches for $P > 50,8$ mm. See Annex A for method of calculation.

[d] These chains have reduced wear life compared with uneven lacings of the same pitch and same minimum tensile strength. This should be taken into account when selecting a chain for a particular application.

Table 2 — Principal chain dimensions, measuring forces, tensile strengths and dynamic strengths, LL series

ISO chain number	Pitch p nom.	Lacing	Thickness of plates b_0 max.	Hole diameter of inner plates d_1 min.	Pin diameter d_2 max.	Chain path depth h_1[a] min.	Plate depth h_3 max.	Width over riveted pin b_1 to b_3 max.	Width between outer plates l_1 to l_3 min.	Measuring force	Minimum tensile strength F_u	Minimum dynamic strength [c] F_d
	mm		mm							N	kN	kN
LL 0822	12,7	2 × 2	1,55	4,46	4,45	11,18	10,92	8,5	3,1	180	18	2,14
LL 0844	12,7	4 × 4	1,55	4,46	4,45	11,18	10,92	14,6	9,1	360	36	3,21
LL 0866	12,7	6 × 6	1,55	4,46	4,45	11,18	10,92	20,7	15,2	540	54	4,28
LL 1022	15,875	2 × 2	1,65	5,09	5,08	13,98	13,72	9,3	3,4	220	22	3,01
LL 1044	15,875	4 × 4	1,65	5,09	5,08	13,98	13,72	16,1	10,1	440	44	4,52
LL 1066	15,875	6 × 6	1,65	5,09	5,08	13,98	13,72	22,9	16,8	660	66	6,03
LL 1222	19,05	2 × 2	1,9	5,73	5,72	16,39	16,13	10,7	3,9	290	29	4,13
LL 1244	19,05	4 × 4	1,9	5,73	5,72	16,39	16,13	18,5	11,6	580	58	6,20
LL 1266	19,05	6 × 6	1,9	5,73	5,72	16,39	16,13	26,3	19,0	870	87	8,27
LL 1622	25,4	2 × 2	3,2	8,3	8,28	21,34	21,08	17,2	6,2	600	60	8,36
LL 1644	25,4	4 × 4	3,2	8,3	8,28	21,34	21,08	30,2	19,4	1 200	120	12,5
LL 1666	25,4	6 × 6	3,2	8,3	8,28	21,34	21,08	43,2	31,0	1 800	180	16,7
LL 2022	31,75	2 × 2	3,7	10,21	10,19	26,68	26,42	20,1	7,2	950	95	12,0
LL 2044	31,75	4 × 4	3,7	10,21	10,19	26,68	26,42	35,1	22,4	1 900	190	17,9
LL 2066	31,75	6 × 6	3,7	10,21	10,19	26,68	26,42	50,1	36,0	2 850	285	23,9
LL 2422	38,1	2 × 2	5,2	14,65	14,63	33,73	33,4	28,4	10,2	1 700	170	18,9
LL 2444	38,1	4 × 4	5,2	14,65	14,63	33,73	33,4	49,4	30,6	3 400	340	28,4
LL 2466	38,1	6 × 6	5,2	14,65	14,63	33,73	33,4	70,4	51,0	5 100	510	37,9
LL 2822	44,45	2 × 2	6,45	15,92	15,9	37,46	37,08	34,0	12,8	2 000	200	25,8
LL 2844	44,45	4 × 4	6,45	15,92	15,9	37,46	37,08	60,0	38,4	4 000	400	38,7
LL 2866	44,45	6 × 6	6,45	15,92	15,9	37,46	37,08	86,0	64,0	6 000	600	51,6
LL 3222	50,8	2 × 2	6,45	17,83	17,81	42,72	42,29	35,0	12,8	2 600	260	29,0
LL 3244	50,8	4 × 4	6,45	17,83	17,81	42,72	42,29	61,0	38,4	5 200	520	43,5
LL 3266	50,8	6 × 6	6,45	17,83	17,81	42,72	42,29	87,0	64,0	7 800	780	58,0

Table 2 *(continued)*

ISO chain number	Pitch p nom.	Lacing	Thickness of plates b_0 max.	Hole diameter of inner plates d_1 min.	Pin diameter d_2 max.	Chain path depth h_1[a] min.	Plate depth h_3 max.	Width over riveted pin b_1 to b_3 max.	Width between outer plates l_1 to l_3 min.	Measuring force	Minimum tensile strength F_u	Minimum dynamic strength [c] F_d
	mm		mm							N	kN	kN
LL 4022	63,5	2 × 2	8,25	22,91	22,89	53,49	52,96	44,7	16,2	3 600	360	43,1
LL 4044	63,5	4 × 4	8,25	22,91	22,89	53,49	52,96	77,9	48,6	7 200	720	64,6
LL 4066	63,5	6 × 6	8,25	22,91	22,89	53,49	52,96	111,1	81,0	10 800	1 080	86,1
LL 4822	76,2	2 × 2	10,3	29,26	29,24	64,52	63,88	56,1	20,2	5 600	560	58,3
LL 4844	76,2	4 × 4	10,3	29,26	29,24	64,52	63,88	97,4	60,6	11 200	1 120	87,4
LL 4866	76,2	6 × 6	10,3	29,26	29,24	64,52	63,88	138,9	101,0	16 800	1 680	116,6

[a] Chain path depth is the minimum depth of channel through which the assembled chain will pass.

[c] Dynamic strength values are based on test specimen each of 5 free pitches for $P \leq 50{,}8$ mm and each of 3 free pitches for $P > 50{,}8$ mm. See Annex A for method of calculation.

3.4 Performance Requirements

3.4.1 General

WARNING — The test requirements are not to be taken as working loads.

Certain standards, covering one particular type of machine, could contain specific static and dynamic stress limits. Those stress limits were established by the developers of the subject standards based upon long experience in the design and use of the particular type of machinery. The developers of the subject standards are solely responsible for the stress limitation factor.

The test results shall be invalid if the chain has previously been in service or stressed in any way (other than by preloading in accordance with 3.5).

The tensile test shall be considered as a destructive test. Even though a chain may not visibly fail when subjected to a force equivalent to the minimum tensile strength, it will have been stressed beyond the yield point and will be unfit for service.

3.4.2 Minimum tensile strength

The minimum tensile strength shall be that value exceeded when a tensile force is applied to a sample tested to destruction in accordance with 3.4.3.

NOTE The minimum tensile strength is not a working force. It is intended primarily as a comparative figure between chains of different construction. For application information, it is necessary to consult the manufacturers or their published data.

3.4.3 Application of tensile force

Slowly apply a tensile force of not less than the minimum tensile strength F_u specified in Table 1 and Table 2 for that particular chain number to the ends of a chain length containing at least five free pitches by means of fixtures permitting free movement on both sides of the chain centreline, 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 force, i.e. the summit of the force/extension diagram.

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

3.4.4 Dynamic testing

Chains in conformance with this International Standard shall survive a conformance test, following the specifications of ISO 15654, using the dynamic strength values given in Table 1 and Table 2 for the particular chain. These requirements do not apply to connecting links, as their dynamic strength could be reduced. The methods used for calculating the minimum dynamic strength are given in Annex A. The method for determining the maximum test force for the conformance test is given in Annex B.

3.5 Pre-loading

Chain manufactured in accordance with this International Standard shall be preloaded by applying a tensile force equivalent to at least 30 % of the minimum tensile strength given in Table 1 and Table 2.

3.6 Length validation

Finished chains shall be measured after preloading, but before lubricating.

The standard length for measurement shall be a minimum of

a) 610 mm for ISO chains up to 19,05 mm pitch, or

b) 1 220 mm for ISO chains above 19,05 mm pitch.

The chain shall be supported throughout its entire length and a measuring force specified in Table 1 and Table 2 for the particular chain number shall be applied.

The measured length shall be nominal pitch times the number of pitches specified by the manufacturer, subject to a tolerance of ±0,25 %. The number of pitches shall conform to the minimum specified in a) or b) of this subclause.

"LL" series chains can be constructed from plates that are also used for short-pitch transmission roller chains, the actual pitch of the chain not necessarily being equal to its nominal pitch but depending upon the manufacturer.

3.7 Cranked links

Cranked links shall not be used in leaf chains.

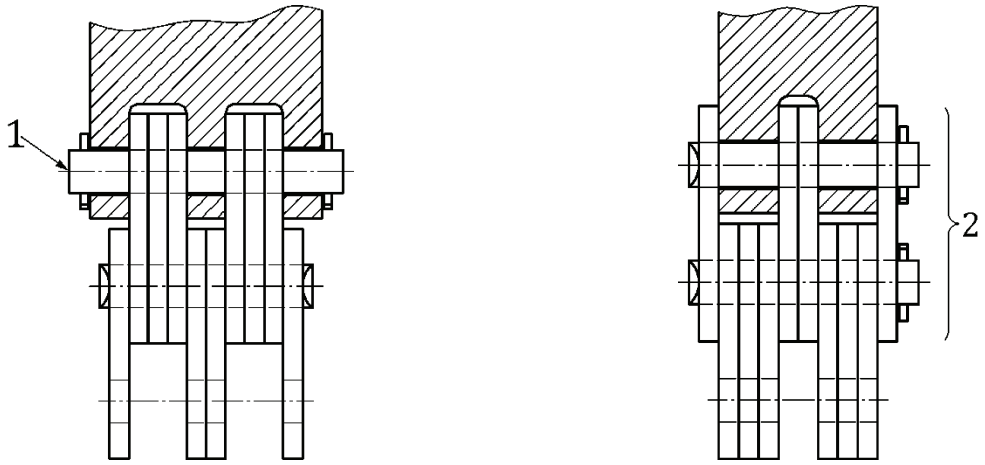
3.8 Marking

The chains shall be marked with the manufacturer's name or trademark. The chain numbers quoted in Table 1 or Table 2, less the digits indicating lacing, should be marked on the chain.

4 Clevises

4.1 Types

There are two basic types of leaf chain clevis: the outside and the inside clevis (see Figure 2).



a) Outside clevis **b) Inside clevis**

Key

1 connecting pin

2 connecting link[a]

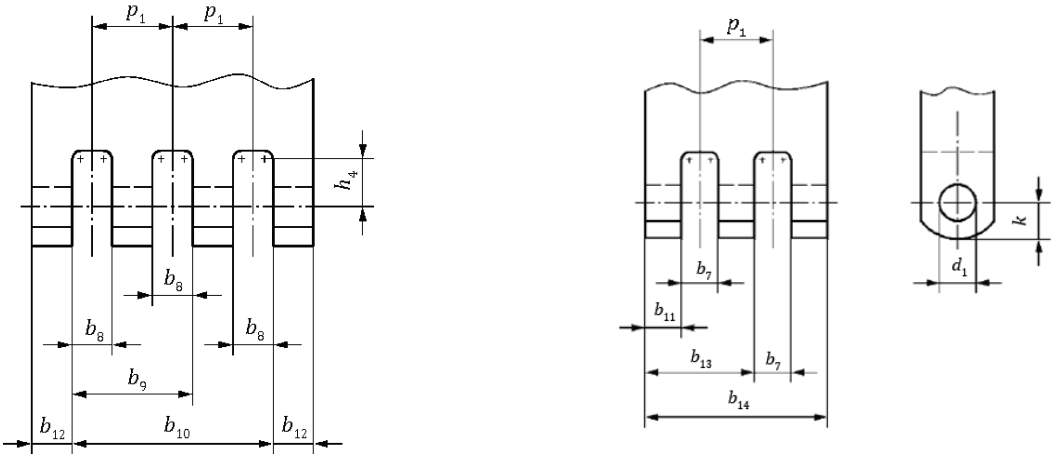
[a] The connecting link should be used with a press fit outer plate.

Figure 2 — Clevis types

4.2 Dimensions

The dimensions of terminal clevises for use with LH and LL series leaf chains shall be in accordance with Table 3 and Table 4 and Figure 3.

NOTE Limiting dimensions given in those tables are for the purpose of ensuring connection to chains built in accordance with previous editions of this International Standard.



a) Outside clevis **b) Inside clevis**

Figure 3 — Symbols related to Table 3 and Table 4

Table 3 — Clevis dimensions, LH series

ISO chain number	ASME chain number	b_7	b_8	b_9	b_{10}	b_{11}	b_{12}	b_{13}	b_{14}	p_1	d_1	h_4	k
		H12[a]				max.	min.	max.	max.	nom.	min.	min.	max.
		mm											
LH 0822	BL 422	—	4,41	—	—	4,03	3,12	—	—	—	5,11	6,35	6,35
LH 0823	BL 423	—	6,53	—	—	6,05	3,12	—	—	—	5,11	6,35	6,35
LH 0834	BL 434	2,21	4,33	10,68	—	4,03	3,12	10,20	—	6,35	5,11	6,35	6,35
LH 0844	BL 444	4,41	4,41	12,89	—	4,03	3,12	12,25	—	8,47	5,11	6,35	6,35
LH 0846	BL 446	4,41	6,53	17,12	—	6,05	3,12	16,32	—	10,59	5,11	6,35	6,35
LH 0866	BL 466	4,41	4,41	12,89	21,36	4,03	3,12	12,25	20,47	8,47	5,11	6,35	6,35
LH 1022	BL 522	—	5,24	—	—	4,80	3,72	—	—	—	5,98	7,92	7,92
LH 1023	BL 523	—	7,76	—	—	7,20	3,72	—	—	—	5,98	7,92	7,92
LH 1034	BL 534	2,62	5,14	12,69	—	4,80	3,72	12,12	—	7,55	5,98	7,92	7,92
LH 1044	BL 544	5,24	5,24	15,31	—	4,80	3,72	14,56	—	10,07	5,98	7,92	7,92
LH 1046	BL 546	5,24	7,76	20,35	—	7,20	3,72	19,40	—	12,59	5,98	7,92	7,92
LH 1066	BL 566	5,24	5,24	15,31	25,38	4,80	3,72	14,56	24,31	10,07	5,98	7,92	7,92
LH 1222	BL 622	—	6,96	—	—	6,41	4,95	—	—	—	7,96	9,53	9,53
LH 1223	BL 623	—	10,31	—	—	9,61	4,95	—	—	—	7,96	9,53	9,53
LH 1234	BL 634	3,48	6,83	16,88	—	6,41	4,95	16,18	—	10,05	7,96	9,53	9,53
LH 1244	BL 644	6,96	6,96	20,36	—	6,41	4,95	19,43	—	13,40	7,96	9,53	9,53
LH 1246	BL 646	6,96	10,31	27,06	—	9,61	4,95	25,89	—	16,75	7,96	9,53	9,53
LH 1266	BL 666	6,96	6,96	20,36	33,76	6,41	4,95	19,43	32,45	13,40	7,96	9,53	9,53
LH 1622	BL 822	—	8,59	—	—	7,93	6,13	—	—	—	9,56	12,70	12,70
LH 1623	BL 823	—	12,73	—	—	11,89	6,13	—	—	—	9,56	12,70	12,70
LH 1634	BL 834	4,29	8,43	20,86	—	7,93	6,13	19,97	—	12,42	9,56	12,70	12,70
LH 1644	BL 844	8,59	8,59	25,15	—	7,93	6,13	23,98	—	16,56	9,56	12,70	12,70
LH 1646	BL 846	8,59	12,73	33,43	—	11,89	6,13	31,96	—	20,70	9,56	12,70	12,70
LH 1666	BL 866	8,59	8,59	25,15	41,71	7,93	6,13	23,98	40,04	16,56	9,56	12,70	12,70
LH 2022	BL 1022	—	10,26	—	—	9,48	7,35	—	—	—	11,14	15,88	15,88
LH 2023	BL 1023	—	15,21	—	—	14,22	7,35	—	—	—	11,14	15,88	15,88
LH 2034	BL 1034	5,13	10,08	24,93	—	9,48	7,35	23,86	—	14,85	11,14	15,88	15,88
LH 2044	BL 1044	10,26	10,26	30,06	—	9,48	7,35	28,65	—	19,80	11,14	15,88	15,88
LH 2046	BL 1046	10,26	15,21	39,96	—	14,22	7,35	38,18	—	24,75	11,14	15,88	15,88
LH 2066	BL 1066	10,26	10,26	30,06	49,86	9,48	7,35	28,65	47,82	19,80	11,14	15,88	15,88
LH 2422	BL 1222	—	12,05	—	—	11,16	8,66	—	—	—	12,74	19,05	19,05
LH 2423	BL 1223	—	17,87	—	—	16,74	8,66	—	—	—	12,74	19,05	19,05
LH 2434	BL 1234	6,02	11,84	29,31	—	11,16	8,66	28,05	—	17,46	12,74	19,05	19,05
LH 2444	BL 1244	12,05	12,05	35,33	—	11,16	8,66	33,68	—	23,28	12,74	19,05	19,05
LH 2446	BL 1246	12,05	17,87	46,97	—	16,74	8,66	44,89	—	29,10	12,74	19,05	19,05
LH 2466	BL 1266	12,05	12,05	35,33	58,61	11,16	8,66	33,68	56,20	23,28	12,74	19,05	19,05
LH 2822	BL 1422	—	13,76	—	—	12,76	9,90	—	—	—	14,31	22,23	22,23
LH 2823	BL 1423	—	20,41	—	—	19,13	9,90	—	—	—	14,31	22,23	22,23
LH 2834	BL 1434	6,88	13,53	33,48	—	12,76	9,90	32,04	—	19,95	14,31	22,23	22,23
LH 2844	BL 1444	13,76	13,76	40,36	—	12,76	9,90	38,47	—	26,60	14,31	22,23	22,23

[a] Tolerance H12 is in accordance with ISO 286-2:2010, Clause 6.

Table 3 *(continued)*

ISO chain number	ASME chain number	b_7	b_8	b_9	b_{10}	b_{11}	b_{12}	b_{13}	b_{14}	p_1	d_1	h_4	k
		H12[a]				max.	min.	max.	max.	nom.	min.	min.	max.
		mm											
LH 2846	BL 1446	13,76	20,41	53,66	—	19,13	9,90	51,28	—	33,25	14,31	22,23	22,23
LH 2866	BL 1466	13,76	13,76	40,36	66,97	12,76	9,90	38,47	64,18	26,60	14,31	22,23	22,23
LH 3222	BL 1622	—	15,65	—	—	14,53	11,28	—	—	—	17,49	25,40	25,40
LH 3223	BL 1623	—	23,22	—	—	21,80	11,28	—	—	—	17,49	25,40	25,40
LH 3234	BL 1634	7,82	15,40	38,11	—	14,53	11,28	36,48	—	22,71	17,49	25,40	25,40
LH 3244	BL 1644	15,65	15,65	45,93	—	14,53	11,28	43,80	—	30,28	17,49	25,40	25,40
LH 3246	BL 1646	15,65	23,22	61,07	—	21,80	11,28	58,38	—	37,85	17,49	25,40	25,40
LH 3266	BL 1666	15,65	15,65	45,93	76,22	14,53	11,28	43,80	73,07	30,28	17,49	25,40	25,40
LH 4022	BL 2022	—	20,53	—	—	19,19	14,86	—	—	—	23,84	31,75	31,75
LH 4023	BL 2023	—	30,49	—	—	28,78	14,86	—	—	—	23,84	31,75	31,75
LH 4034	BL 2034	10,27	20,23	50,11	—	19,19	14,86	48,11	—	29,88	23,84	31,75	31,75
LH 4044	BL 2044	20,53	20,53	60,37	—	19,19	14,86	57,76	—	39,84	23,84	31,75	31,75
LH 4046	BL 2046	20,53	30,49	80,30	—	28,78	14,86	76,99	—	49,80	23,84	31,75	31,75
LH 4066	BL 2066	20,53	20,53	60,37	100,22	19,19	14,86	57,76	96,33	39,84	23,84	31,75	31,75

[a] Tolerance H12 is in accordance with ISO 286-2:2010, Clause 6.

Table 4 — Clevis dimensions, LL series

ISO chain number	b_7	b_8	b_9	b_{10}	b_{11}	b_{12}	b_{13}	b_{14}	p_1	d_1	h_4	k
	H12[a]				max.	min.	max.	max.	nom.	min.	min.	max.
	mm											
LL 0822	—	3,35	—	—	2,97	2,33	—	—	—	4,46	6	6,35
LL 0844	3,35	3,35	9,71	—	2,97	2,33	9,07	—	6,35	4,46	6	6,35
LL 0866	3,35	3,35	9,71	16,06	2,97	2,33	9,07	15,17	6,35	4,46	6	6,35
LL 1022	—	3,58	—	—	3,14	2,48	—	—	—	5,09	8	7,92
LL 1044	3,58	3,58	10,33	—	3,14	2,48	9,58	—	6,75	5,09	8	7,92
LL 1066	3,58	3,58	10,33	17,08	3,14	2,48	9,58	16,01	6,75	5,09	8	7,92
LL 1222	—	4,16	—	—	3,61	2,85	—	—	—	5,73	9	9,52
LL 1244	4,16	4,16	11,96	—	3,61	2,85	11,03	—	7,80	5,73	9	9,52
LL 1266	4,16	4,16	11,96	19,76	3,61	2,85	11,03	18,45	7,80	5,73	9	9,52
LL 1622	—	6,81	—	—	6,15	4,8	—	—	—	8,3	12	12,7
LL 1644	6,81	6,81	19,81	—	6,15	4,8	18,64	—	13	8,3	12	12,7
LL 1666	6,81	6,81	19,81	32,81	6,15	4,8	18,64	31,14	13	8,3	12	12,7
LL 2022	—	7,86	—	—	7,08	5,55	—	—	—	10,21	14	15,88
LL 2044	7,86	7,86	22,86	—	7,08	5,55	21,45	—	15	10,21	14	15,88
LL 2066	7,86	7,86	22,86	37,86	7,08	5,55	21,45	35,82	15	10,21	14	15,88
LL 2422	—	10,91	—	—	10,02	7,8	—	—	—	14,65	18	19,05
LL 2444	10,91	10,91	31,91	—	10,02	7,8	30,26	—	21	14,65	18	19,05
LL 2466	10,91	10,91	31,91	52,91	10,02	7,8	30,26	50,50	21	14,65	18	19,05
LL 2822	—	13,46	—	—	12,46	9,68	—	—	—	15,92	20	22,2
LL 2844	13,46	13,46	39,46	—	12,46	9,68	37,57	—	26	15,92	20	22,2
LL 2866	13,46	13,46	39,46	65,47	12,46	9,68	37,57	62,68	26	15,92	20	22,2

[a] Tolerance H12 is in accordance with ISO 286-2:2010, Clause 6.

Table 4 *(continued)*

ISO chain number	b_7	b_8	b_9	b_{10}	b_{11}	b_{12}	b_{13}	b_{14}	p_1	d_1	h_4	k
	H12[a]				max.	min.	max.	max.	nom.	min.	min.	max.
	mm											
LL 3222	—	13,51	—	—	12,39	9,68	—	—	—	17,83	23	25,4
LL 3244	13,51	13,51	39,51	—	12,39	9,68	37,38	—	26	17,83	23	25,4
LL 3266	13,51	13,51	39,51	65,52	12,39	9,68	37,38	62,37	26	17,83	23	25,4
LL 4022	—	17,21	—	—	15,87	12,38	—	—	—	22,91	28	31,75
LL 4044	17,21	17,21	50,41	—	15,87	12,38	47,80	—	33,2	22,91	28	31,75
LL 4066	17,21	17,21	50,41	83,62	15,87	12,38	47,80	79,73	33,2	22,91	28	31,75
LL 4822	—	21,41	—	—	19,84	15,45	—	—	—	29,26	34	38,1
LL 4844	21,41	21,41	62,82	—	19,84	15,45	59,72	—	41,4	29,26	34	38,1
LL 4866	21,41	21,41	62,82	104,2	19,84	15,45	59,72	99,60	41,4	29,26	34	38,1

[a] Tolerance H12 is in accordance with ISO 286-2:2010, Clause 6.

4.3 Minimum tensile strength

The clevises and the pins used to anchor chains shall withstand at least the same minimum tensile forces as the chains themselves (see 3.4.2 and 3.4.3).

4.4 Length adjustment

In multi-strand applications, where it becomes necessary within the chain assembly to compensate for small length differences between strands, it is always desirable to provide, within the anchoring device, a length adjustment equal to at least one pitch of the chain.

5 Sheaves

The sheaves shown in Figure 4 shall comply with the following formulae.

a) Minimum sheave diameter, D_1:

$$D_1 = 5 \times \text{nominal chain pitch} \quad (1)$$

Smaller diameters may be used if proved by testing.

b) Minimum width between flanges, b_{15}:

$$b_{15} = 1{,}05 \times \text{width over riveted bearing pins} \quad (2)$$

c) Minimum flange diameter, D_2:

$$D_2 = D_1 + h_3 \quad (3)$$

For dimensions h_3 and the width over riveted bearing pins (dimensions b_1 to b_6), see Figure 1 and Table 1 or Table 2.

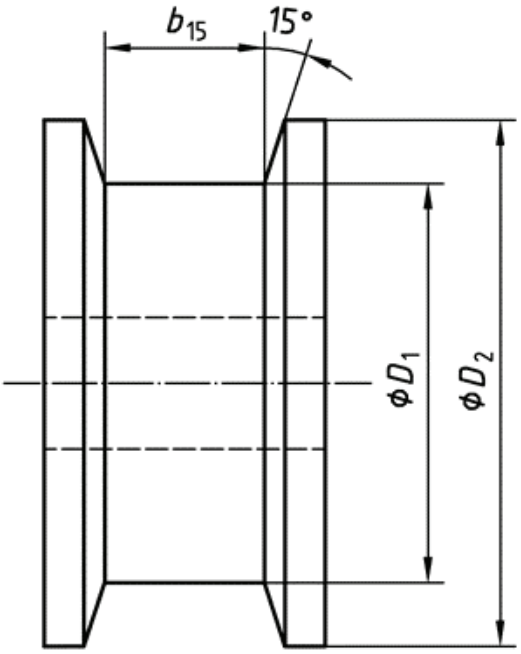


Figure 4 — Sheave dimensions

Annex A
(informative)

Method of calculating chain minimum dynamic strength

A.1 General

$$F_d = \min\left(F_{\mathrm{di}}; F_{\mathrm{do}}\right) \times f_{\mathrm{P}} \times f_{\mathrm{L}} \quad \text{for the chain} \tag{A.1}$$

$$F_{\mathrm{di}} = n_{\mathrm{iP}} \times \left(h_3 - d_1\right) \times b_0 \times K_{\mathrm{Si}} \quad \text{for the inner link} \tag{A.2}$$

$$F_{\mathrm{do}} = n_{\mathrm{oP}} \times \left(h_3 - d_1\right) \times b_0 \times K_{\mathrm{Si}} + 2 \times \left(h_3 - d_2\right) \times b_0 \times K_{\mathrm{So}} \quad \text{for the outer link} \tag{A.3}$$

where

F_{d} is the minimum dynamic strength of the chain at 3×10^6 cycles in newtons (N);

F_{do} is the dynamic strength of the outer link in newtons (N);

F_{di} is the dynamic strength of the inner link in newtons (N);

n_{iP} is the number of plates with loose fit within the inner chain link;

n_{oP} is the number of plates with loose fit within the outer chain link;

h_3 is the plate depth in mm;

d_1 is the hole diameter of inner plates in mm;

d_2 is the pin diameter in mm;

b_0 is the thickness of plates in mm;

K_{Si} is 110 N/mm^2 for inner plates (loose fit);

K_{So} is 150 N/mm^2 for outer plates (press fit);

f_{P} is the factor for the chain pitch according to Table A.1;

f_{L} is the factor for the chain lacing according to Table A.2.

Table A.1 — Factor f_P for chain pitch

Chain pitch	$f_{P,\ LL\ series}$	$f_{P,\ LH\ series}$
mm	—	—
12,7	0,971	0,975
15,875	0,961	0,965
19,05	0,951	0,956
25,4	0,929	0,936
31,75	0,906	0,916
38,1	0,883	0,895
44,45	0,859	0,874
50,8	0,836	0,852
63,5	0,789	0,810
76,2	0,743	0,768
NOTE Factor f_P for chain pitch according to ISO 606.		

Table A.2 — Factor f_L for chain lacing

Lacing	f_L	Derivation of f_L
2 × 2	1,000	= 1/1
2 × 3	0,880	= $f_{L2\times2}$·0,88
3 × 4	0,713	= $f_{L4\times4}$·f_R
4 × 4	0,750	= 1,5/2
4 × 6	0,633	= $f_{L6\times6}$·f_R
6 × 6	0,667	= 2/3
NOTE Reduction factor f_R = 0,95, the factor 0,88 and the definition of factor f_L based on empirical knowledge and is to be understood as a guideline.		

A.2 Example for chain LH 1666 [BL 866]

The minimum dynamic strength of the chain LH 1666 [BL 866] can be calculated by

$$F_{di} = 6 \times \left(24,13\ \text{mm} - 9,56\ \text{mm}\right) \times 4,09\ \text{mm} \times 110\ \text{N/mm}^2 = 39,3\ \text{kN} \quad \text{for the inner link} \tag{A.4}$$

$$F_{do} = 4 \times \left(24{,}13\,\text{mm} - 9{,}56\,\text{mm}\right) \times 4{,}09\,\text{mm} \times 110\ \text{N/mm}^2 + 2 \times \left(24{,}13\,\text{mm} - 9{,}54\,\text{mm}\right) \times 4{,}09\,\text{mm} \times 150\ \text{N/mm}^2 = 44{,}1\ \text{kN} \quad \text{for the outer link} \tag{A.5}$$

$$F_d = 39,3\ \text{kN} \times 0,936 \times 0,667 = \underline{\underline{24,6\ \text{kN}}} \quad \text{for the chain LH 1666} \tag{A.6}$$

Annex B
(informative)

Method of determining maximum test force F_{max} when conducting dynamic strength conformance test

B.1 General

The maximum test force F_{max} is calculated using

$$F_{max} = \frac{F_d F_u + \left[F_{min}\left(F_u - F_d\right)\right]}{F_u} \quad \text{(B.1)}$$

where

F_{max} is the maximum test force, in newtons (N);

F_d is the minimum dynamic strength as given in Table 1 or Table 2, in newtons (N);

F_u is the minimum tensile strength as given in Table 1 or Table 2, in newtons (N);

F_{min} is the minimum test force (1 % to 5 % of the minimum tensile strength F_u), in newtons (N)

B.2 Example for chain LH 1666 [BL 866]

If the chain manufacturer were to choose a minimum test force (F_{min}) of 11 412 N (i.e. 4,5 % of the minimum tensile strength according to Table 1). Then the maximum test force F_{max} would be determined as follows

$$F_{max} = \frac{F_d F_u + \left[F_{min}\left(F_u - F_d\right)\right]}{F_u} \quad \text{(B.2)}$$

and from Table 1

F_d = 24 600 N,

F_u = 253 600 N, and

F_{min} = 11 412 N,

then

$$F_{max} = \frac{(24\,600 \times 253\,600) + \left[11\,412 \times (253\,600 - 24\,600)\right]}{253\,600} = 34\,905\ N \quad \text{(B.3)}$$

Bibliography

[1] ISO 286-2:2010, *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes — Part 2: Tables of standard tolerance classes and limit deviations for holes and shafts*

National Annex A

(*National Foreword*)

A-1 BIS CERTIFICATION MARKING

The product(s) confirming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations frames thereunder, and the product(s) may be marked with the Standard Mark.

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