

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS B 8812 : 2004

Link chain for chain hoists

ICS 53.020.30

Reference number : JIS B 8812 : 2004 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Health, Labour and Welfare, and the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS B 8812 : 1999** is replaced with **JIS B 8812 : 2004**.

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Date of Establishment: 1981-01-15

Date of Revision: 2004-11-25

Date of Public Notice in Official Gazette: 2004-11-25

Investigated by: Japanese Industrial Standards Committee

Standards Board

Technical Committee on Logistics and
Distribution of Goods

JIS B 8812:2004, First English edition published in 2005-04

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

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Printed in Japan

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Link chain for chain hoists

Introduction This Japanese Industrial Standard has been prepared with the corresponding International Standard, which is the third edition of **ISO 3077** *Short-link chain for lifting purposes—Grade T (types T, DAT and DT), fine-tolerance hoist chain* published in 2001, described as annex 5 (informative) since it is not practical to establish **JIS** based on the corresponding International Standard owing to the difference between two standards in technical contents.

In addition, the comparison table between **JIS** and the corresponding International Standard is given in annex 6 (informative).

1 Scope This Standard specifies the link chain used for chain hoists⁽¹⁾, chain lever hoists⁽²⁾, electric chain hoists⁽³⁾, etc. (hereafter referred to as “chain”).

Notes (1) **JIS B 8802**

(2) **JIS B 8819**

(3) **JIS B 8815**

- NOTES**
- 1 The chain to be specified shall be a fine-tolerance hoist chain and a hand chain, and the hand chain is specified in annex 1.
 - 2 The basis of calculation of fine-tolerance hoist chains is specified in annex 2.
 - 3 The grade V (type CV) surface hardened chain is specified in annex 3.
 - 4 The use standard and inspection standard of a fine-tolerance hoist chain is specified in annex 4.
 - 5 The International Standard corresponding to the chain of grade T, (types T, DAT, and DT) is given in annex 5 as the informative reference.
 - 6 The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the content between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

ISO 3077 : 2001 *Short-link chain for lifting purposes—Grade T (types T, DAT and DT), fine-tolerance hoist chain* (NEQ)

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions (including amendments) indicated below shall be applied.

JIS B 0148 *Lifting equipments—Terminology*

JIS B 8802 *Manually operated chain hoists*

JIS B 8815 *Electric chain hoists*

JIS B 8819 *Manually operated chain lever hoists*

- JIS B 8841 *Toughness test of link chains—Impact test method of chain links*
 JIS G 0551 *Methods of austenite grain size determination for steel*
 JIS G 0557 *Methods of measuring case depth hardened by carburizing treatment for steel*
 JIS Z 2244 *Vickers hardness test—Test method*
 JIS Z 8601 *Preferred numbers*

3 Definitions For the purposes of this Standard, the definitions given in **JIS B 0148** and **JIS B 8841** and the following definition apply.

- a) **bending strength** the performance to withstand pressurization when a chain link is put on a 90° V block horizontally and the centre section of a link is pressurized with an indenter

4 Classification and kind of fine-tolerance hoist chains

4.1 Classification The fine-tolerance hoist chain shall be classified into a non-quenched and tempered chain⁽⁴⁾, a quenched and tempered chain and a surface hardened chain.

Note ⁽⁴⁾ The chain which may omit heat treatment.

4.2 Kind The kind of fine-tolerance hoist chains shall be as given in table 1 according to classification, grade, type, and nominal size.

Table 1 Kind of fine-tolerance hoist chains

Classification		Non-quenched and tempered chain	Quenched and tempered chain		Surface hardened chain ⁽⁶⁾	
Grade		M	T	V	T	T
Type		MH	TH	VH	DT	DAT
Nominal size ⁽⁵⁾ mm	3	—	TH-3	VH-3	DT-3	DAT-3
	3.2	—	TH-3.2	VH-3.2	DT-3.2	DAT-3.2
	3.6	—	TH-3.6	VH-3.6	DT-3.6	DAT-3.6
	4	—	TH-4	VH-4	DT-4	DAT-4
	4.5	—	TH-4.5	VH-4.5	DT-4.5	DAT-4.5
	5	MH-5	TH-5	VH-5	DT-5	DAT-5
	5.6	MH-5.6	TH-5.6	VH-5.6	DT-5.6	DAT-5.6
	6.3	MH-6.3	TH-6.3	VH-6.3	DT-6.3	DAT-6.3
	7.1	MH-7.1	TH-7.1	VH-7.1	DT-7.1	DAT-7.1
	8	MH-8	TH-8	VH-8	DT-8	DAT-8
	9	MH-9	TH-9	VH-9	DT-9	DAT-9
	10	MH-10	TH-10	VH-10	DT-10	DAT-10
	11.2	MH-11.2	TH-11.2	VH-11.2	DT-11.2	DAT-11.2
	12.5	MH-12.5	TH-12.5	VH-12.5	DT-12.5	DAT-12.5
	14	MH-14	TH-14	VH-14	—	—

Notes ⁽⁵⁾ The numerical values are in accordance with **JIS Z 8601**.

⁽⁶⁾ The surface hardened chain has two types according to the performance (see table 4).

5 Performance

5.1 Working load limit The working load limit⁽⁷⁾ of fine-tolerance hoist chains shall be as given in table 2 and table 4.

Note ⁽⁷⁾ See annex 4 table 1.

Table 2 Mechanical properties of non-quenched and tempered chain and quenched and tempered chain (1)

Mechanical properties ⁽⁸⁾		Working load limits t			Manufacturing proof force kN			Breaking force kN			Total ultimate elongation %			Surface hardness HV10	
Grade		M	T	V	M	T	V	M	T	V	M	T	V	T	V
Type		MH	TH	VH	MH	TH	VH	MH	TH	VH	MH	TH	VH	TH	VH
Nominal size mm	3	—	0.28	0.36	—	7.1 min.	8.9 min.	—	11.4 min.	14.2 min.	17 min.	15 min.	17 min.	360 min.	430 min.
	3.2	—	0.32	0.4	—	8.1 min.	10.1 min.	—	12.9 min.	16.1 min.					
	3.6	—	0.4	0.51	—	10.3 min.	12.8 min.	—	16.3 min.	20.4 min.					
	4	—	0.5	0.63	—	12.5 min.	16 min.	—	20 min.	25 min.					
	4.5	—	0.63	0.81	—	16 min.	20 min.	—	25.5 min.	31.9 min.					
	5	0.4	0.8	1	10 min.	20 min.	25 min.	16 min.	31.5 min.	40 min.					
	5.6	0.5	1	1.25	12.5 min.	25 min.	31.5 min.	20 min.	40 min.	50 min.					
	6.3	0.63	1.25	1.6	16 min.	31.5 min.	40 min.	25 min.	50 min.	63 min.					
	7.1	0.8	1.6	2	20 min.	40 min.	50 min.	31.5 min.	63 min.	80 min.					
	8	1	2	2.5	25 min.	50 min.	63 min.	40 min.	80 min.	100 min.					
	9	1.25	2.5	3.2	31.5 min.	63 min.	80 min.	50 min.	100 min.	128 min.					
	10	1.6	3.2	4	40 min.	80 min.	100 min.	63 min.	128 min.	160 min.					
	11.2	2	4	5	50 min.	100 min.	125 min.	80 min.	160 min.	200 min.					
	12.5	2.5	5	6.3	63 min.	125 min.	160 min.	100 min.	200 min.	250 min.					
	14	3.2	6.3	8	80 min.	160 min.	200 min.	128 min.	250 min.	315 min.					

Note ⁽⁸⁾ The basis of calculation of mechanical properties of a chain of which nominal size is not described in this table is specified in annex 2.

Table 3 Mechanical properties of non-quenched and tempered chain and quenched and tempered chain (2)

Mechanical properties	Impact value of chain link T_c J/mm ²		Bending strength (amount of deformation mm)			Minimum breaking stress N/mm ²		
Grade	T	V	M	T	V	M	T	V
Type	TH	VH	MH	TH	VH	MH	TH	VH
	0.08 min.		0.8d _n			400	800	1 000

Table 4 Mechanical properties of surface hardened chain (1)

Mechanical properties ⁽⁸⁾	Working load limit	Manu- facturing proof force		Breaking force		Total ultimate elongation		Surface hardness		Total case depth ⁽⁹⁾			
	t	kN		kN		%		HV0.3		mm			
Grade		T											
Type		DT	DAT	DT	DAT	DT	DAT	DT	DAT	DT	DAT	DT	DAT
Nominal size mm	3	0.23		7.1 min.		11.4 min.		6 min.	10 min.	600 min.	500 min.	0.06 min.	
	3.2	0.26		8.1 min.		12.9 min.						0.06 min.	
	3.6	0.33		10.3 min.		16.3 min.						0.07 min.	
	4	0.4		12.5 min.		20 min.						0.08 min.	
	4.5	0.5		16 min.		25.5 min.						0.09 min.	
	5	0.63		20 min.		31.5 min.						0.10 min.	
	5.6	0.8		25 min.		40 min.						0.11 min.	
	6.3	1		31.5 min.		50 min.						0.13 min.	
	7.1	1.25		40 min.		63 min.						0.14 min.	
	8	1.6		50 min.		80 min.						0.16 min.	
	9	2		63 min.		100 min.						0.18 min.	
	10	2.5		80 min.		128 min.						0.20 min.	
	11.2	3.2		100 min.		160 min.						0.22 min.	
	12.5	4		125 min.		200 min.						0.25 min.	

Note (9) The total case depth is not less than 2 % of nominal size.

Table 5 Mechanical properties of surface hardened chain (2)

Mechanical properties	Impact value of chain link T_c J/mm ³		Bending strength		Minimum breaking stress N/mm ²	
Grade	T					
Type	DT	DAT	DT	DAT	DT	DAT
	0.035 min.		Not less than 2.5 times force equivalent to working load limit		800	

5.2 Manufacturing proof force The fine-tolerance hoist chain shall not be broken with the manufacturing proof force specified in table 2 and table 4 applied. Furthermore, the permanent elongation after the manufacturing proof force was applied, when the test is performed in accordance with the method specified in 10.1, shall be not more than 0.5 % for non-quenched and tempered chains and quenched and tempered chains, not more than 0.25 % for surface hardened chains.

5.3 Static strength The breaking force and total ultimate elongation of fine-tolerance hoist chain, when the test is performed in accordance with the method specified in 10.2, shall conform to the specification in table 2 and table 4.

5.4 Fatigue strength The surface hardened chain of fine-tolerance hoist chains, when the fatigue test specified in 10.3 is performed, shall not be broken for 2×10^6 cycles.

5.5 Surface hardness The surface hardness of fine-tolerance hoist chain, when the test is performed in accordance with the method specified in 10.4, shall conform to the specification in table 2 and table 4.

5.6 Total case depth The total case depth of surface hardened chain, when the test is performed in accordance with the method specified in 10.5, shall conform to the specification in table 4.

5.7 Impact value of chain link The impact value of chain link, when the test is performed in accordance with the method specified in 10.7, shall conform to the specification in table 3 and table 5.

5.8 Bending strength The bending strength of non-quenched and tempered chains and quenched and tempered chains, when the test is performed in accordance with the method specified in 10.8, shall withstand deformation of not less than the value specified in table 3, and shall not generate defects which can be checked visually. The bending strength of surface hardened chains, when the test is performed in accordance with the method specified in 10.8, shall withstand load specified in table 5, and shall not generate surface cracks and defects which can be checked visually.

6 Shape and dimensions The shape and dimensions of fine-tolerance hoist chains shall be as follows:

- a) The shape and dimensions of fine-tolerance hoist chains shall be as shown in figure 1, figure 2 and table 6.
- b) The weld of fine-tolerance hoist chains shall have the shape and dimensions which have no difficulty for use.

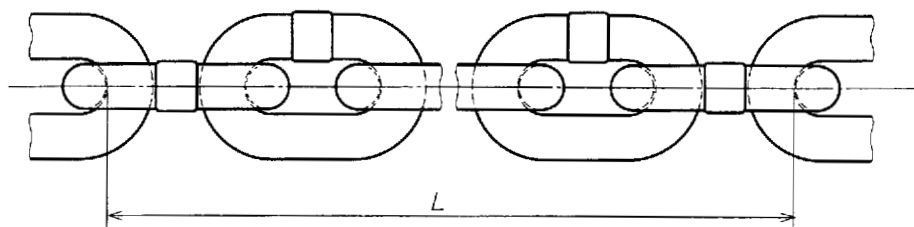


Figure 1 Shape of fine-tolerance hoist chain

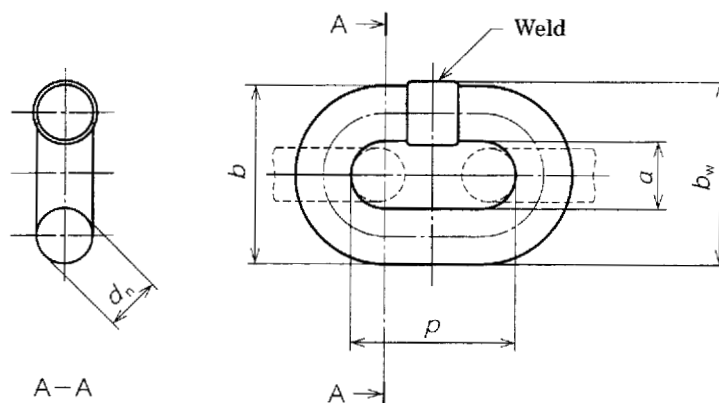


Figure 2 Enlarged view of chain link

- c) The dimensional tolerance of the sum (L) of pitch of fine-tolerance hoist chain where n links are connected shall be calculated according to the following formula.

In addition, the dimensional tolerance of pitch of one link shall be as given in table 6.

$$(\text{Dimensional tolerance of upper section}) = +n \cdot p \left[\frac{1.6}{n} + 0.33 \right] \times \frac{1}{100} \text{ (mm)}$$

$$(\text{Dimensional tolerance of lower section}) = 0 \text{ (mm)}$$

where, n : number of links

p : basic dimension of pitch of one link (mm)

Table 6 Dimensions of fine-tolerance hoist chains⁽¹⁰⁾

Grade					Nominal size d_n	Pitch p	Inside link width ⁽¹¹⁾ a	Outside link width	
M	T			V				b ⁽¹¹⁾	b_w ⁽¹²⁾
—	TH-3,	DT-3,	DAT-3	VH-3	3 ± 0.15	9 ^{+0.2} ₀	3.7 min.	10.5 max.	10.8 max.
—	TH-3.2,	DT-3.2,	DAT-3.2	VH-3.2	3.2 ± 0.15	9.6 ^{+0.2} ₀	4 min.	11.2 max.	11.5 max.
—	TH-3.6,	DT-3.6,	DAT-3.6	VH-3.6	3.6 ± 0.15	10.8 ^{+0.2} ₀	4.5 min.	12.6 max.	12.9 max.
—	TH-4,	DT-4,	DAT-4	VH-4	4 ± 0.2	12 ^{+0.23} ₀	5 min.	14 max.	14.3 max.
—	TH-4.5,	DT-4.5,	DAT-4.5	VH-4.5	4.5 ± 0.2	13.5 ^{+0.26} ₀	5.6 min.	15.8 max.	16.1 max.
MH-5	TH-5,	DT-5,	DAT-5	VH-5	5 ± 0.2	15 ^{+0.29} ₀	6.2 min.	17.5 max.	17.9 max.
MH-5.6	TH-5.6,	DT-5.6,	DAT-5.6	VH-5.6	5.6 ± 0.2	17 ^{+0.33} ₀	7 min.	20 max.	20.1 max.
MH-6.3	TH-6.3,	DT-6.3,	DAT-6.3	VH-6.3	6.3 ± 0.3	19 ^{+0.37} ₀	7.8 min.	22 max.	22.6 max.
MH-7.1	TH-7.1,	DT-7.1,	DAT-7.1	VH-7.1	7.1 ± 0.3	21 ^{+0.41} ₀	8.8 min.	25 max.	25.4 max.
MH-8	TH-8,	DT-8,	DAT-8	VH-8	8 ± 0.3	24 ^{+0.47} ₀	10 min.	28 max.	28.6 max.
MH-9	TH-9,	DT-9,	DAT-9	VH-9	9 ± 0.4	27 ^{+0.53} ₀	11.2 min.	32 max.	32.2 max.
MH-10	TH-10,	DT-10,	DAT-10	VH-10	10 ± 0.4	30 ^{+0.59} ₀	12.5 min.	35 max.	35.8 max.
MH-11.2	TH-11.2,	DT-11.2,	DAT-11.2	VH-11.2	11.2 ± 0.4	34 ^{+0.67} ₀	14 min.	39 max.	40.1 max.
MH-12.5	TH-12.5,	DT-12.5,	DAT-12.5	VH-12.5	12.5 ± 0.5	38 ^{+0.75} ₀	15.6 min.	44 max.	44.7 max.
MH-14	TH-14,	—,	—	VH-14	14 ± 0.6	42 ^{+0.83} ₀	17.5 min.	49 max.	50.1 max.

Notes ⁽¹⁰⁾ The basis of calculation of dimensions which are not in this table shall be specified in annex 2.

⁽¹¹⁾ a and b shall be the dimension of the part away from weld.

⁽¹²⁾ b_w shall be the dimension of outside link width in weld.

7 Appearance The fine-tolerance hoist chains shall be free from hazardous defects such as a poor weld, a crack, remarkable rust.

8 Material The material of fine-tolerance hoist chains shall be as follows:

- a) The material of fine-tolerance hoist chains shall be killed steel with the chemical composition specified in table 7, and the weldability shall be excellent.

- b) For the austenite grain size of material of fine-tolerance hoist chains, the crystal-grain-size number of grade M and grade T shall be 5 or more, and that of grade V shall be 6 or more.

Table 7 Content of sulfur and phosphor

Chemical composition	Maximum content %			
	Cast analysis		Check analysis	
	Grade M	Grade T, V	Grade M	Grade T, V
S	0.030	0.020	0.035	0.025
P	0.030	0.020	0.035	0.025
S + P	0.055	0.035	0.065	0.045

9 Manufacturing method The manufacturing method of fine-tolerance hoist chains shall be as follows:

- Weld the fine-tolerance hoist chain at the centre of a chain link parallel portion as shown in figure 2.
- Apply the heat treatment of quenching and tempering to the quenched and tempered chain after weld, and apply the suitable carburized quenching and tempering to the surface hardened chain. For the non-quenched and tempered chain, the heat treatment may be omitted.
- Apply the tensile load of not less than the manufacturing proof force specified in table 2 and table 4 to the fine-tolerance hoist chain after the heat treatment, and perform the preset process⁽¹³⁾.

Note ⁽¹³⁾ For the fine-tolerance hoist chains which are not heat-treated, the preset treatment shall be performed after weld.

10 Test method

10.1 Test of manufacturing proof force For the fine-tolerance hoist chains, fix the sample specified in table 8 to the fixture of a tension tester as shown in figure 3, apply the 5 % initial testing force specified in the manufacturing proof force of table 2 and table 4, measure the gauge length⁽¹⁴⁾ and take it as the initial gauge length.

Next, apply the manufacturing proof force specified in table 2 and table 4, further measure the gauge length when returning to the initial testing force, and calculate permanent elongation according to the following formula.

$$\varepsilon_0 = \frac{l - l_0}{l_0} \times 100$$

where, ε_0 : permanent elongation (%)

l_0 : initial gauge length (mm)

l : gauge length when adding manufacturing proof force and further returning to initial testing force (mm)