



Short-link chain for lifting purposes



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Australian Standard[®]

Short-link chain for lifting purposes

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PREFACE

This Standard was prepared by the Standards Australia Committee ME-025, Lifting Tackle, to supersede AS 2321—2006.

The objective of all lifting tackle standards is to provide manufacturers, users, regulatory and accrediting authorities and importers with a basis for identifying products which are safe and fit for their purpose. AS 2321 is a Standard for Grade L(3), Grade P(5), Grade T(8) and Grade V(10) short link chains for lifting purposes.

NOTE: Each chain grade is referred to by a letter or one of three numbers shown below:

- (a) L, 3, 30 or 300.
- (b) P, 5, 50 or 500.
- (c) T, 8, 80 or 800.
- (d) V, 10, 100 or 1000.

This edition includes the following changes from the previous edition:

- (a) Revision to link tolerances.
- (b) Revision to chain marking.
- (c) Addition of Grade V(10, 100, 1000).
- (d) Provision for a bend test.
- (e) Delete Grades M and S.
- (f) Clarification of elongation requirements.
- (g) Specification of impact testing for specific Grade V materials.
- (h) Cognisance of ISO 3076, *Round steel short link chains for general lifting purposes—Medium tolerance slings for chain slings—Grade 8*.
- (i) Includes the basis for calculation of dimensions and tolerances of Grade T chain.
- (j) Includes the basis for working load limit and test requirements for Grades T and V chain.

Statements expressed in mandatory terms in notes to tables are deemed to be requirements of this Standard.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard

Short-link chain for lifting purposes

1 SCOPE

This Standard specifies requirements for non-calibrated short-link chain for lifting purposes, which is manufactured from welded round-steel short links.

NOTES:

- 1 This is a Standard to which chain is manufactured.
- 2 Guidance on information that should be supplied with enquiries and orders is given in Appendix A.
- 3 Guidance on care and use of chain is given in Appendix B.
- 4 Standards for components that are used in lifting systems are listed in Appendix C.

2 INNOVATION

It is not intended that this Standard should impose any unnecessary restriction on the use of new or unusual methods that meet its intent.

3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

NOTE: Documents that contain further information on this topic are listed in the Bibliography in Appendix H.

AS

- | | |
|--------|---|
| 1418 | Cranes, hoists and winches |
| 1418.1 | Part 1: General requirements |
| 1442 | Carbon steels and carbon-manganese steels—Hot-rolled bars and semi-finished products |
| 1444 | Wrought alloy steels—Standard, hardenability (H) series and hardened and tempered to designated mechanical properties |
| 1544 | Methods for impact tests on metals |
| 1544.2 | Part 2: Charpy V-notch |
| 1627 | Metal finishing—Preparation and pretreatment of surfaces |
| 1627.6 | Part 6: Chemical conversion treatment of metals |
| 1733 | Methods for the determination of grain size in metals |
| 1789 | Electroplated zinc (electrogalvanized) coatings on ferrous articles (batch process) |
| 2193 | Calibration and classification of force-measuring systems |

AS/NZS

- | | |
|------|---|
| 4680 | Hot-dip galvanized (zinc) coatings on fabricated ferrous articles |
|------|---|

ISO

- | | |
|------|---|
| 3076 | Round steel short link chains for general lifting purposes—Medium tolerance sling chains for chain slings—Grade 8 |
|------|---|

4 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

4.1 Barrel

The straight side of a link, which may include the weld zone adjoining the curved ends.

4.2 Bend test

A test applied to a self-colour sample of chain to assist in the verification of the integrity of the weld. (Refer to Appendix G and Clause 9.3.)

4.3 Breaking force

The maximum force that a test sample of a chain withstands during a destruction test.

NOTE: Minimum forces that test samples of a chain are required to withstand are detailed in Tables E1 and E2.

4.4 Competent person

A person who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to correctly perform a specific task.

NOTE: Requirements for competent persons are specified in Clause 5.

4.5 Design factor

The numerical value, generally expressed as a ratio, to express the relationship of the minimum breaking force, in kilonewtons, to the working load limit (WLL), in tonnes, of the chain.

NOTE: Design factor = $\frac{\text{Minimum breaking force}}{(9.81 \times \text{WLL})}$.

4.6 Finished condition

The condition of chain after completion of all processing.

4.7 Gauge length

The portion of the tensile test sample containing the number of links for the purpose of undertaking a specified destructive test.

4.8 Mean diameter (d_m)

The mean of two measurements, at right angles to each other, of a section (of the material of a chain link) clear of the weld.

4.9 Nominal stress

Force divided by two times the cross sectional area of the straight section of the link. Refer to Appendix E, Table E2, Note 4, for an example.

4.10 Nominal chain size (d)

The designated size of a chain.

4.11 Nominal material size (d_n)

The nominal diameter of the material from which a chain is made.

4.12 Non-calibrated chain

Chain manufactured to specified link dimensions, tolerances and mechanical properties, but not to a dimensional accuracy, over a series of links (which would be required where the chain is to operate on a sprocket or a pocketed or toothed wheel).

4.13 Processing

Any treatment of a chain subsequent to welding including heat treatment, proof-testing and protective coating.

4.14 Proof force

The minimum force to which the whole of a chain is subjected to (refer to Clause 9.1 and Tables E1 and E2 of Appendix E).

4.15 Self-colour

A surface finish arising from the essential manufacturing operations, usually being a closely adhering oxide film due to the heat treatment and subsequent handling.

4.16 Shall

Indicates that a statement is mandatory.

4.17 Should

Indicates a recommendation.

4.18 Tensile test sample

A length of chain that is representative of the lot from which it has been taken and containing the gauge length and any adjoining links that may be necessary to engage with the jaws of the tensile testing machine.

4.19 Total elongation

The elongation at the point of fracture of a chain expressed as a percentage of the gauge length, and comprising plastic elongation and elastic elongation. (See Appendix F.)

4.20 Type test

The test to validate any new design changes in specification, to material chemistry, to material supplier and/or to process.

4.21 Working load limit (WLL)

The maximum load that is permitted to be applied to the chain.

NOTE: The WLL may be derated for particular conditions of use.

5 COMPETENT PERSONS REQUIREMENTS

5.1 General

Competent persons shall be suitably trained, qualified by knowledge and practical experience, and with the necessary instruction to enable assessments of short link chain for lifting purposes to be carried out. They shall be able to detect and evaluate defects and weaknesses that may affect the intended performance of the equipment.

5.2 Competency standards and procedures

Competency standards and procedures relating to the role and duties of competent persons shall include the requirements of this Standard. They shall incorporate an established competency-based training course. Documentation of competency standards and procedures shall be maintained.

5.3 Visual acuity

The competent person shall have satisfactory near and medium range vision. The visual acuity of a competent person shall be tested periodically, with a maximum duration of 2 years between each test, by an optometrist or suitably trained person. The competent person shall be able to demonstrate clear near vision. Near vision acuity (Jaeger No. 1) shall permit reading a minimum of Times Roman 4.5 points vertical height at not less than 300 mm with one or both eyes, either corrected or uncorrected.

NOTE: AS 3978 gives guidance on visual acuity for visual inspections.

6 DIMENSIONS

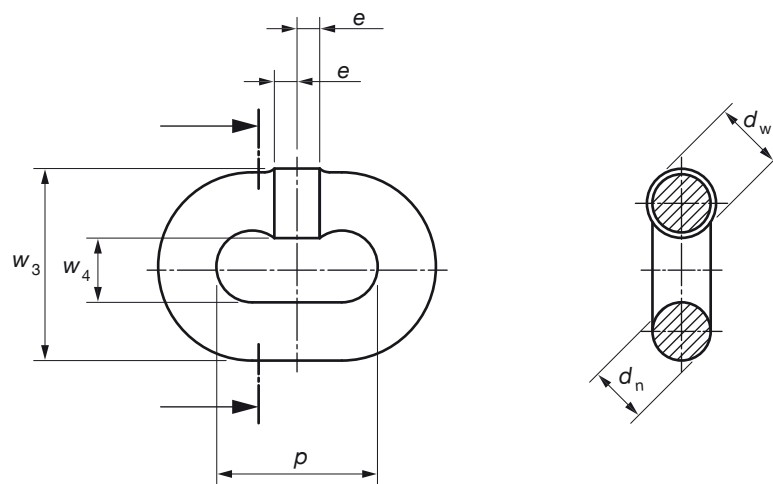
6.1 General

The chain shall comprise links that conform to one of the nominal sizes, dimensions and tolerances specified in Clauses 6.2 and 6.3.

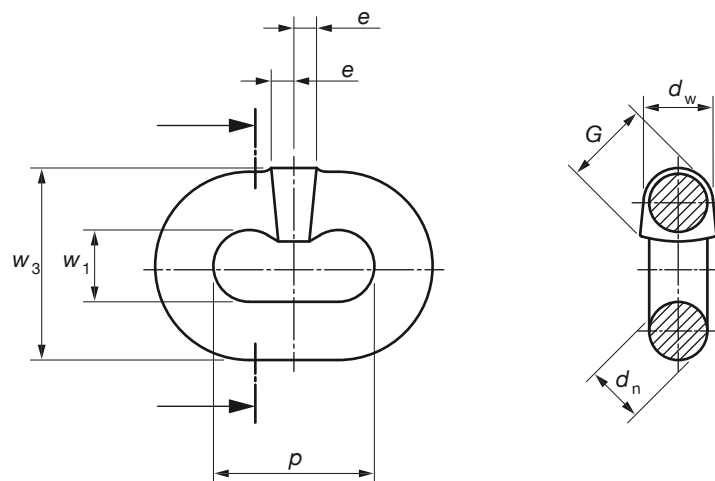
6.2 Grades L, P and T

Figure 1 illustrates Type 1 (smooth welds) and Type 2 (asymmetric welds) of Grades L, P and T chain links.

Table 1 sets out the dimensions (including tolerances) of Grades L, P and T chain links.



(a) Type 1 (Smooth welds)



(b) Type 2 (Asymmetric welds)

LEGEND:

- p pitch (internal link length)
- d_n measured diameter of the material, except at the weld
- d_w measured diameter of the material at the weld (type 1) or weld dimension perpendicular to the plane of the link (type 2)
- G dimension in other planes (type 2)
- e length affected by welding, on either side of the centre of the link
- w_1 internal link width away from the weld (type 2)
- w_3 external link width over the weld (types 1 and 2)
- w_4 internal link width at the weld (type 1)

FIGURE 1 CHAIN LINK—DIMENSIONS (GRADES L, P AND T)

TABLE 1
DIMENSIONS OF LINKS (GRADES L, P and T)
 (Refer to Figure 1)

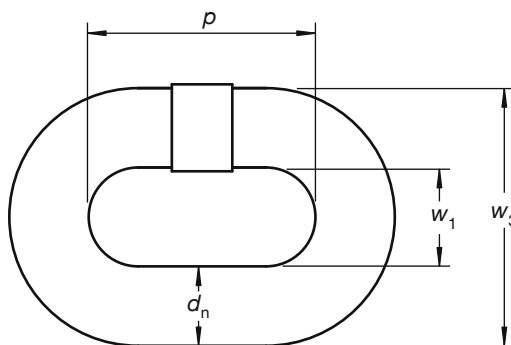
millimetres								
1	2	3	4	5	6	7	8	9
Nominal size d_n	Diameter tolerance	Pitch (internal link length)		Width			Weld diameter	
		p	Tolerance	Internal	External	Internal	Types 1 and 2	Type 2
				Type 2	Types 1 and 2	Type 1		
				w_1 min.	w_3 max.	w_4 min.	d_w max.	G max.
4	+0.08/−0.24	12	±0.4	5.0	14.8	5.2	4.4	5.0
6	+0.12/−0.36	18	±0.5	7.5	22.2	7.8	6.6	7.5
7	+0.14/−0.42	21	±0.6	8.8	25.9	9.1	7.7	8.8
8	+0.16/−0.48	24	±0.7	10.0	29.6	10.4	8.8	10.0
10	+0.20/−0.60	30	±0.9	12.5	37.0	13.0	11.0	12.5
13	+0.26/−0.78	39	±1.2	16.3	48.1	16.9	14.3	16.3
16	+0.32/−0.96	48	±1.4	20.0	59.2	20.8	17.6	20.0
18	±0.9	54	±1.6	22.5	66.6	23.4	19.8	22.5
19	±0.95	57	±1.7	23.8	70.3	24.7	20.9	23.8
20	±1.0	60	±1.8	25.0	74.0	26.0	22.0	25.0
22	±1.1	66	±2.0	27.5	81.4	28.6	24.2	27.5
26	±1.3	78	±2.3	32.5	96.2	33.8	28.6	32.5
28	±1.4	84	±2.5	35.0	104.0	36.4	30.8	35.0
32	±1.6	96	±2.9	40.0	118.0	41.6	35.2	40.0
36	±1.8	108	±3.2	45.0	133.0	46.8	39.6	45.0
40	±2.0	120	±3.6	50.0	148.0	52.0	44.0	50.0
45	±2.25	135	±4.1	56.3	167.0	58.5	49.5	56.3

NOTE: Basis for calculation—Dimensions and tolerances:

- (a) *Diameter tolerance* For nominal sizes less than 18 mm, the diameter of the material in the finished chain link should not differ from the nominal diameter by more than +2%, −6%, except at the weld.
 For nominal sizes 18 mm and greater, the diameter of the material in the finished chain link should not differ from the nominal diameter by more than ±5%, except at the weld.
- (b) *Pitch and tolerance* The values for the nominal pitch, p are based on $3 \times d_n$. The calculated values are rounded to 1 mm.
 The pitch tolerances are based on ±3%. The calculated values are rounded to 0.1 mm.
- (c) *Width* The values for the internal width of Type 2 w_1 are based on $1.25 \times d_n$. The calculated values are rounded to 0.1 mm.
 The values for the external width of Types 1 and 2 w_3 are based on $3.7 \times d_n$. The calculated values of <100 mm are round to 0.1 mm. The calculated values of ≥100 mm are rounded to 1 mm.
 The values for the internal width of Type 1 w_4 are based on $1.3 \times d_n$. The calculated values are rounded to 0.1 mm.
- (d) *Weld diameter* The values for the weld diameter of Type 1 or for the weld diameter perpendicular to the plane of the link of Type 2 d_w are based on $1.1 \times d_n$. The calculated values are rounded to 0.1 mm.
 The value for the dimension in other planes of Type 2 G are based on $1.25 \times d_n$. The calculated values are rounded to 0.1 mm.

6.3 Grade V

Figure 2 illustrates the dimensions required for Grade V chain links. Table 2 sets out the dimensions of Grade V chain links in V 200 category. Table 3 sets out the dimensions of Grade V chain links in V 400 category.



LEGEND:

- p = pitch (internal link length)
 w_1 = internal link width away from weld
 w_3 = external link width over the weld
 d_n = measured diameter of the material, except at the weld

FIGURE 2 CHAIN LINK—DIMENSIONS (GRADE V)

TABLE 2
GRADE V(100) DIMENSION CHART—V 200 INFORMATION
 (Refer to Figure 2)

d_n	Pitch (internal length, maximum) p	millimetres	
		Internal width	
		Minimum w_1	Maximum w_1
5	15.5	6.5	7.5
6	18.5	7.8	9.0
7	22.9	9.1	10.9
8	26.4	10.4	12.7
10	32.0	13.0	15.2
13	41.6	16.9	19.5
16	51.2	20.8	24.0
20	64.0	26.0	30.0
22	70.4	28.6	33.0
26	80.3	33.8	39.0
32	98.9	41.6	48.0

NOTE: Tolerance for d_n —refer to manufacturer's specifications.