



Lifting points

Part 1: Collared eyebolts and collared eyenuts—Grade 4



AS 2317.1:2018

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Preface

This Standard was prepared by the Standards Australia Committee ME-025, Lifting Tackle, to supersede AS 2317—1998, *Collared eyebolts*.

This Standard is intended to promote the safety of collared eyebolts and collared eyenuts.

This edition includes the following technical changes from the superseded edition:

- (a) The inclusion of collared eyenuts.
- (b) A definition for a competent person has been included.
- (c) The definitions for working load have been amended.
- (d) The permitted types of screw threads have been extended to include a wider range of threads.
- (e) The range of nominal sizes for eyebolts has been extended. The working load limit (WLL) values and testing regimes have been altered to align more closely with ISO.
- (f) The requirements for testing of mechanical properties have been revised.
- (g) WLL marking requirements have been included.
- (h) The marked WLL is the transverse (or trunnion) loading.

This Standard is Part 1 of the AS 2317, *Lifting points*, series. When complete the series will include other parts that provide requirements for high tensile lifting points.

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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Introduction

Eyebolts are used in lifting, tensioning and staying systems to connect the systems to a tapped hole or through a hole into a nut. Eyenuts are used in lifting, tensioning and staying systems to connect to a threaded stud.

In any lifting, tensioning or staying system, the working load of each component needs to take account of the conditions (such as the classification of load application as specified by AS 1418.1) and be compatible with any loads inherent in and applied to the system, and each component should readily connect with each adjacent component. Therefore, it is important that components of lifting, tensioning or staying systems be quickly and positively identified in service for size, lifting capacity and quality grade.

Only one grade of fitting is detailed in this Standard because the materials into which the eyebolts are fitted may have low mechanical strength properties. The material specified in this Standard is equivalent to the quality Grade 4 (previously referred to as Grade M) materials used for the manufacture of other types of lifting components. Eyebolts and eyenuts of a quality grade material greater than 4 are not excluded from use, provided they are interfaced with compatible materials and meet the required performance criteria.

NOTES

Australian Standard®

Lifting points

Part 1: Collared eyebolts and collared eye nuts—Grade 4

Section 1 Scope and general

1.1 Scope and application

1.1.1 Scope

This Standard specifies requirements for Grade 4 forged collared eyebolts and collared eye nuts used for lifting.

1.1.2 Application

[Section 2](#) specifies design and manufacturing requirements.

[Section 3](#) provides test methods for verification of product conformity.

[Section 4](#) provides requirements and guidance on the safe use and inspection of eyebolts and eye nuts.

[Appendix H](#) covers other aspects of product conformity.

NOTE 1 Guidance on information that should be supplied with enquiries and orders is given in [Appendix B](#).

NOTE 2 A list of hazards associated with eyebolts and their use is provided in [Appendix C](#).

NOTE 3 Guidance on the lifting capacity of eyebolts is given in [Appendix D](#).

NOTE 4 Standards for components that are used in lifting systems are listed in [Appendix E](#).

1.2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

NOTE Documents for informative purposes are listed in the Bibliography.

AS 1112.1, *ISO metric hexagon nuts, Part 1: Style 1 — Product grades A and B*

AS 1171, *Non-destructive testing — Magnetic particle testing of ferromagnetic products, components and structures*

AS 1275, *Metric screw threads for fasteners*

AS 1391, *Metallic materials — Tensile testing at ambient temperature*

AS 1418.1, *Cranes, hoists and winches, Part 1: General requirements*

AS 1442, *Carbon steels and carbon-manganese steels — Hot rolled bars and semi-finished products*

AS 1444, *Wrought alloy steels — Standard hardenability (H) series and hardened and tempered to designated mechanical properties*

AS 1721, *General purpose metric screw threads*

AS 2062, *Non-destructive testing — Penetrant testing of products and components*

AS 2193, *Calibration and classification of force-measuring systems*

AS 3635, *Unified (ISO inch) screw threads, associated gauges, and gauging practice*

AS ISO 9712, *Non-destructive testing — Qualification and certification of NDT personnel*

AS ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 898-2, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 2: Nuts with specified property classes — Coarse thread and fine pitch thread*

1.3 Terms and definitions

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

1.3.1

anchorage

where lifting equipment is attached to the *substrate* ([1.3.15](#)). The combination of the eyebolt, substrate and any reinforcements (or other components) provided as a means of withstanding a load

1.3.2

axial loading

loading applied along the axis of the thread

Note 1 to entry: For an example, see [Figure 1.1](#).

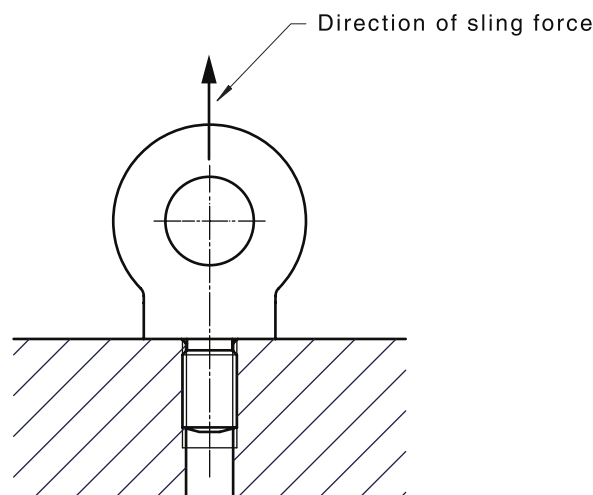


Figure 1.1 — Axial loading

1.3.3

axial strength

force when load is applied in an axial direction

1.3.4

competent person

person who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to correctly perform a specific task. Requirements for competent persons are specified in [Appendix A](#)

1.3.5

grade 4

classification relating to the nominal tensile strength of the steel from which the eyebolt or eyenut is formed

Note 1 to entry: This classification is also used in ISO 3266.

1.3.6**lateral loading**

loading that is neither axial nor transverse. See Figure 1.2

Note 1 to entry: Lateral loading is not permitted (refer to Clause 4.8.3).

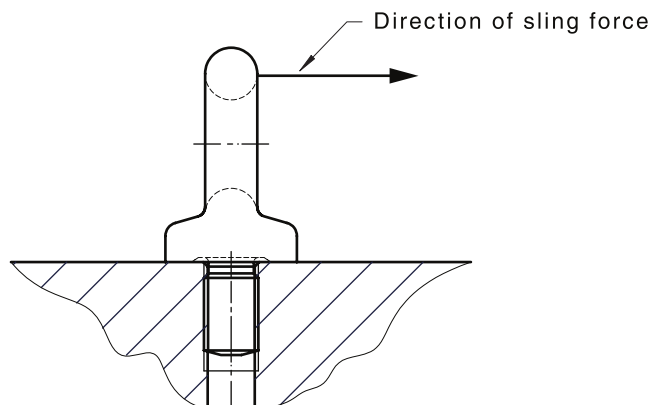


Figure 1.2 — Lateral loading

1.3.7**lot**

specified number of eyebolts or eye nuts from which samples are selected for testing purposes that have been manufactured from the same heat of steel and subjected to the same heat treatment

1.3.8**nominal size**

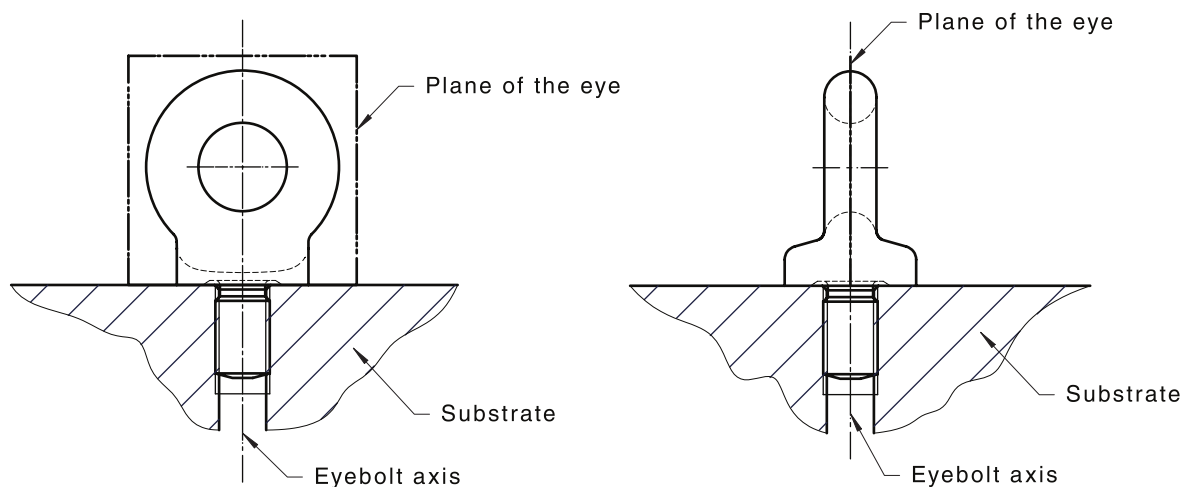
nominal diameter of the thread of an eyebolt (see dimension A in [Figure 2.2](#))

1.3.9**permanent set**

irreversible deformation that remains in a structure or material after it has been subjected to stress

1.3.10**plane of eye**

plane through the centre of an eyebolt, as illustrated in [Figure 1.3](#)



(a) Looking at the plane of the eye

(b) Looking along the plane of the eye

Figure 1.3 — Plane of the eye

1.3.11**self-coloured**

surface finish arising from essential manufacturing processes without additional surface treatment

1.3.12**service eyebolts and eyenuts**

eyebolts and eyenuts that are used for a variety of lifting operations or transferred from job to job

1.3.13**shall**

indicates that a statement is mandatory

1.3.14**should**

indicates a recommendation

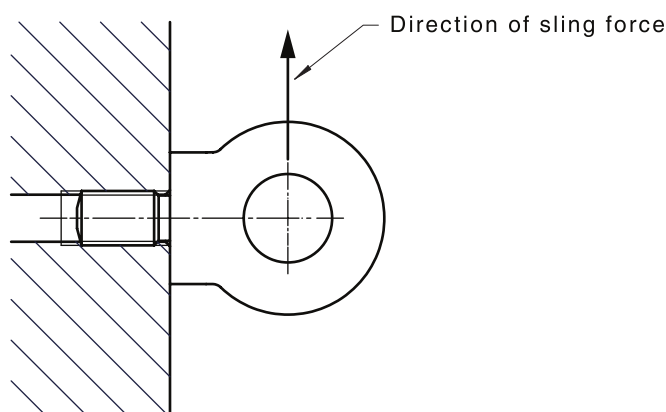
1.3.15**substrate**

material that directly engages the thread and collar of the eyebolt or eyenut

Note 1 to entry: The substrate may include multiple components which connect to the material provided by the manufacturer of the eyebolt or eyenut itself.

1.3.16**transverse (trunnion) loading**

loading applied perpendicular to the axis of the thread. See [Figure 1.4](#)



[Refer to [Table 2.2](#)]

Figure 1.4 — Transverse loading

1.3.17**transverse strength**

minimum allowable breaking force when load is applied in a direction perpendicular to the axis of the thread (see [Table 2.2](#))

1.3.18**working load limit****WLL**

maximum load that may be applied to the eyebolt, in tension along the axis of the threaded end, under general conditions of use

Note 1 to entry: The working load limit may need to be de-rated for particular conditions of use (refer [Appendix D](#)).

1.3.19**WLL transverse****WLL TR**

maximum load that may be applied to the eyebolt, under a state of transverse loading, under general conditions of use

Note 1 to entry: The transverse working load limit may need to be de-rated for particular conditions of use (refer [Appendix D](#)).

Section 2 Design and manufacture**2.1 Material****2.1.1 Quality of material**

The type of steel shall be selected to be used so that the finished component conforms to the mechanical properties specified in this Standard.

2.1.2 Type of steel production

The steel shall be produced by an electric process or by an oxygen-blown process.

2.1.3 Deoxidation

The steel shall be fully killed and not susceptible to strain age embrittlement.

2.1.4 Material requirements

The material shall be a steel in accordance with the relevant requirements of [Table 2.1](#). The steel shall be in accordance with either AS 1442 or AS 1444, or be of steel that meets the performance and chemical requirements of this Standard.

The raw material and any subsequent heat treatment shall provide a finished product that exhibits plastic deformation prior to failure.

Where eyebolts and eyenuts are manufactured from material with a carbon content exceeding 0.25 %, they shall be quenched and tempered.

Table 2.1 — Material

Steel type	Product analysis of elements, maximum allowable, %		
	Carbon	Phosphorus	Sulfur
Fully-killed	0.45	0.03	0.03
NOTE: The use of steels up to 0.25 % carbon is preferred.			

2.1.5 Traceability

The steel shall be suitably identified to ensure that the steel manufacturer, the steel heat number and rolling number can be traced. Any subsequent manufacturing process shall be traceable.

2.1.6 Temperature requirements

Eyebolts and eyenuts shall be suitable for use within a temperature range of 0°C to 200°C.

2.1.7 Ductility

Eyebolts and eyenuts shall be manufactured from ductile materials, with a total elongation as determined by AS 1391. The determined total elongation shall be not less than 20 % for pearlitic and austenitic steels and not less than 15 % for martensitic steels.

2.2 Heat treatment

2.2.1 General

After forging, heat treatment need not be applied if the product meets the requirements of this Standard. Eyebolts and eyenuts that are heat treated shall be either hardened and tempered or normalized. For carbon steels and carbon-manganese steels that are hardened and tempered, the tempering temperature should be at least 550°C.

2.2.2 Hardness requirement

Eyebolts and eyenuts shall have a maximum Brinell hardness value of 214 HBW or a maximum Rockwell hardness value of 96 HRB.

2.3 Design and manufacturing requirements

2.3.1 Design requirements

Eyebolts are used to connect to a tapped hole or through a hole into a nut. See [Figure 2.1](#). Eyenuts are used to connect to the threaded stud of an eyebolt.

Eyebolts and eyenuts shall be designed to interface with the connecting point and substrate of the item to be lifted in such a way that the working load of the eyebolt or eyenut can be achieved.

Eyebolts and eyenuts shall be designed to accommodate a compatible lifting component to enable free articulation so that the force applied is transmitted axially with respect to the lifting component.

The eye component and seat for tapping shall have compatible load capacities with the threaded components.

NOTE Typical dimensions and designs are shown in [Appendix E](#).

2.3.2 Forging

The whole of each eyebolt shall be cleanly forged in one piece.

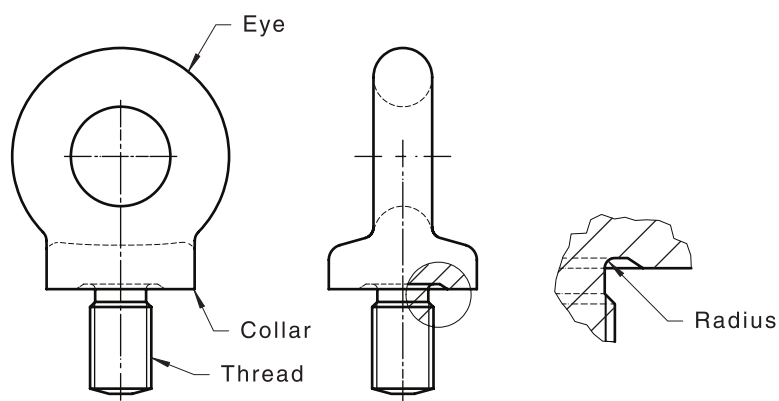


Figure 2.1 — Typical eyebolt

2.3.3 Machining

Machined surfaces shall be free of flaws and defects that adversely affect the product. The underside of the collar shall be machined normal to the axis of the threaded end, and shall include a radiused recess (see [Figure 2.1](#)).

The distance K between the axis of the threaded end and the axis of the eyebolt shall not exceed 5 % of the nominal diameter A (see [Figure 2.2](#)).

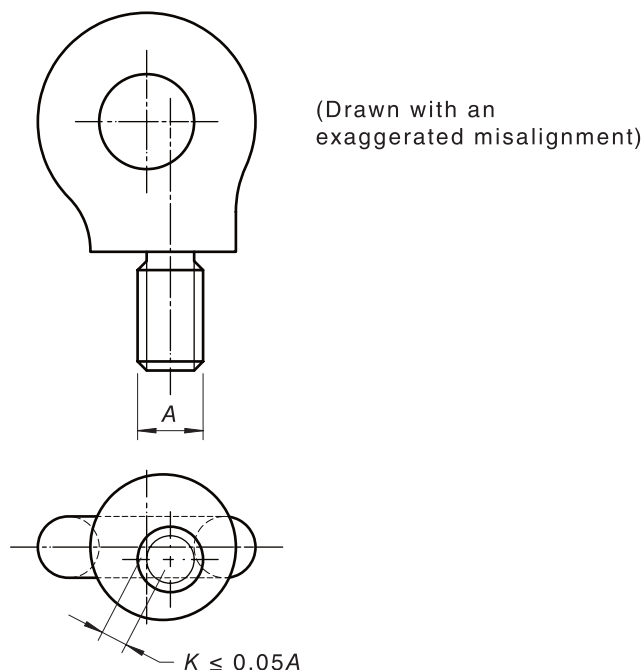


Figure 2.2 — Alignment of eye to threaded end

2.3.4 Screw thread

Screw thread shall be parallel and one of the following:

- (a) Metric thread complying with AS 1721, with a tolerance class of 6g.
- (b) A thread conforming to an Australian or International Standard that meets performance requirements of this Standard.
- (c) A thread manufactured subject to manufacturer's design specifications and that meets the intent of this Standard.

NOTE As a general rule coarse pitch threads are most common.

2.3.5 Surface finish

The surface finish shall not be deleterious to the mechanical properties. The surface finish may be one of the following:

- (a) Self-coloured.
- (b) Hot-dip galvanized coating conforming with AS 4680 and/or AS/NZS 1214.
- (c) Class A1, Class A2 or Class B phosphate coating conforming with AS 1627.6.
- (d) Fe/Zn 12c electroplated zinc coating conforming with AS 1789.