

AS 1353.1—1997

Australian Standard<sup>®</sup>

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**Flat synthetic-webbing slings**

**Part 1: Product specification**

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This Australian Standard was prepared by Committee ME/25, Lifting Tackle. It was approved on behalf of the Council of Standards Australia on 8 August 1997 and published on 5 December 1997.

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Australian Chamber of Commerce and Industry  
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Australian Forging Group  
Australian Maritime Safety Authority  
Department of Defence  
Institution of Engineers, Australia  
Metal Trades Industry Association of Australia  
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AS 1353.1—1997

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**Part 1: Product specification**

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## PREFACE

This Standard was prepared by the Standards Australia Committee ME/25, Lifting Tackle, to supersede AS 1353.1—1990.

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.

This edition includes the following changes:

- (a) References to and the definitions of 'statutory authority' and 'soft eye' have been deleted.
- (b) Clause 5.4.1 no longer recommends widths for webbing.
- (c) Clauses 5.2, 5.3 and 5.10 have been added.
- (d) The colours of a sling to identify its WLL (as specified by Clause 7.1) for 4 t and not less than 10 t have been reversed, to align with the latest overseas practice.
- (e) In Appendix B, the requirements for the rate of application of a test force have been deleted.

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STANDARDS AUSTRALIA  


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**Australian Standard**  
**Flat synthetic-webbing slings**  


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**Part 1: Product specification**  


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**1 SCOPE** This Standard specifies requirements for flat synthetic-webbing slings that are intended for lifting purposes.

This Standard does not apply to slings that have been repaired.

**NOTES:**

- 1 Guidance on information that should be supplied with enquiries and orders is given in Appendix A.
- 2 Recommendations for the care and use of flat synthetic-webbing slings are given in AS 1353.2.

**2 REFERENCED DOCUMENTS** The following documents are referred to in this Standard:

AS	
1199	Sampling procedures and tables for inspection by attributes
1353	Flat synthetic-webbing slings
1353.2	Part 2: Care and use
1399	Guide to AS 1199—Sampling procedures and tables for inspection by attributes
2193	Methods for calibration and grading of force-measuring systems of testing machines
3585	End fittings for flat-webbing slings
3776	Lifting components for Grade T chain slings
AS/NZS	
ISO 9000	Quality management and quality assurance standards
ISO 9000.1	Part 1: Guidelines for selection and use
ISO 9004	Quality management and quality system elements
ISO 9004.1	Part 1: Guidelines
SAA	
HB18	Guidelines for third-party certification and accreditation
HB18.28	Guide 28—General rules for a model third-party certification scheme for products

**3 DEFINITIONS** For the purpose of this Standard, the definitions below apply.

**3.1 Competent person**—a person having practical and theoretical knowledge and relevant experience, sufficient to enable that person to detect and evaluate any defects and any weaknesses that may affect the intended performance of the equipment.

**3.2 Constructions of slings**

**3.2.1 Endless sling**—a sling consisting of a webbing having its ends sewn to each other (see Figures 1(a) and 1(b)).

**3.2.2 Load-bearing seam (or splice)**—a seam by means of which one end of the webbing is joined either to the body of the webbing to form an eye or to carry a metal attachment, or to itself to form an endless sling.

**3.2.3 Multiply (or multilayer) sling**—a sling consisting of two or more plies (or layers) of identical webbings superimposed in the lengthwise direction (see Figures 1(b), 1(d), 1(e) and 1(g)).

**3.2.4 Multiwidth sling**—a sling formed by widths of webbing configured edge-to-edge (see Figures 1(f) and 1(h)).

**3.2.5 Protective sleeve**—a sleeve providing extra protection to load-bearing webbing, but having no effect on the breaking force of a sling.

**3.2.6 Single-ply (or single-layer) sling**—a sling consisting of a webbing having each end sewn to form an eye (see Figures 1(c) and 1(f)).

**3.3 Effective length**—the distance between the bearing points of the sling, including any end fittings, while stretched out by hand (without noticeable tension) on a flat surface (see Clause 5.2.2 and Figure 1).

#### **3.4 Ends of slings**

**3.4.1 End fitting**—a fitting attached to the end of a sling by stitching the webbing, or by mechanical means (see Figures 2(e) and 2(f)).

**3.4.2 Flat eye**—an eye produced by sewing webbing back on to itself without twisting (see Figure 2(a)).

**3.4.3 Folded eye**—an eye produced by folding the webbing lengthwise to form an eye of reduced width (see Figure 2(c)).

**3.4.4 Protected eye**—an eye with a sleeve providing extra protection to load-bearing webbing in the crown of the eye, but having no effect on the breaking force of the sling (see Figures 1(c), 1(d) and 1(e)).

**3.4.5 Reversed eye**—an eye produced by sewing webbing to itself with a 180-degree twist so that the eye is at 90 degrees to the face of the sling (see Figure 2(b)).

**3.5 Flat synthetic-webbing sling**—a sling made of flat woven synthetic-fibre webbing, which may incorporate end fittings complying with AS 3585 or AS 3776, for the lifting and handling of loads (see also Clause 3.2 for definitions of types of construction of slings and Clause 3.4 for definitions of types of ends of slings).

NOTE: Flat synthetic-webbing slings are often referred to in this Standard as just 'slings'.

**3.6 Shall**—indicates that a statement is mandatory.

**3.7 Should**—indicates a recommendation.

#### **3.8 Working load**

**3.8.1 Working load limit (WLL)**—the maximum load that may be applied to the sling, in tension uniformly distributed across its full width, under general conditions of use.

**3.8.2 Safe working load (SWL)**—the maximum load that may be applied to the sling under the particular conditions of use (see AS 1353.2).

### **4 MATERIAL**

**4.1 Webbing** The webbing yarn of the slings shall be constructed from a high-tenacity continuous-multi-filament synthetic fibre, which may be covered with a suitable protection. Typical fibre materials include aramid polyamide, nylon (i.e. polyamide), polyester and ultraviolet-light-stabilized polypropylene.

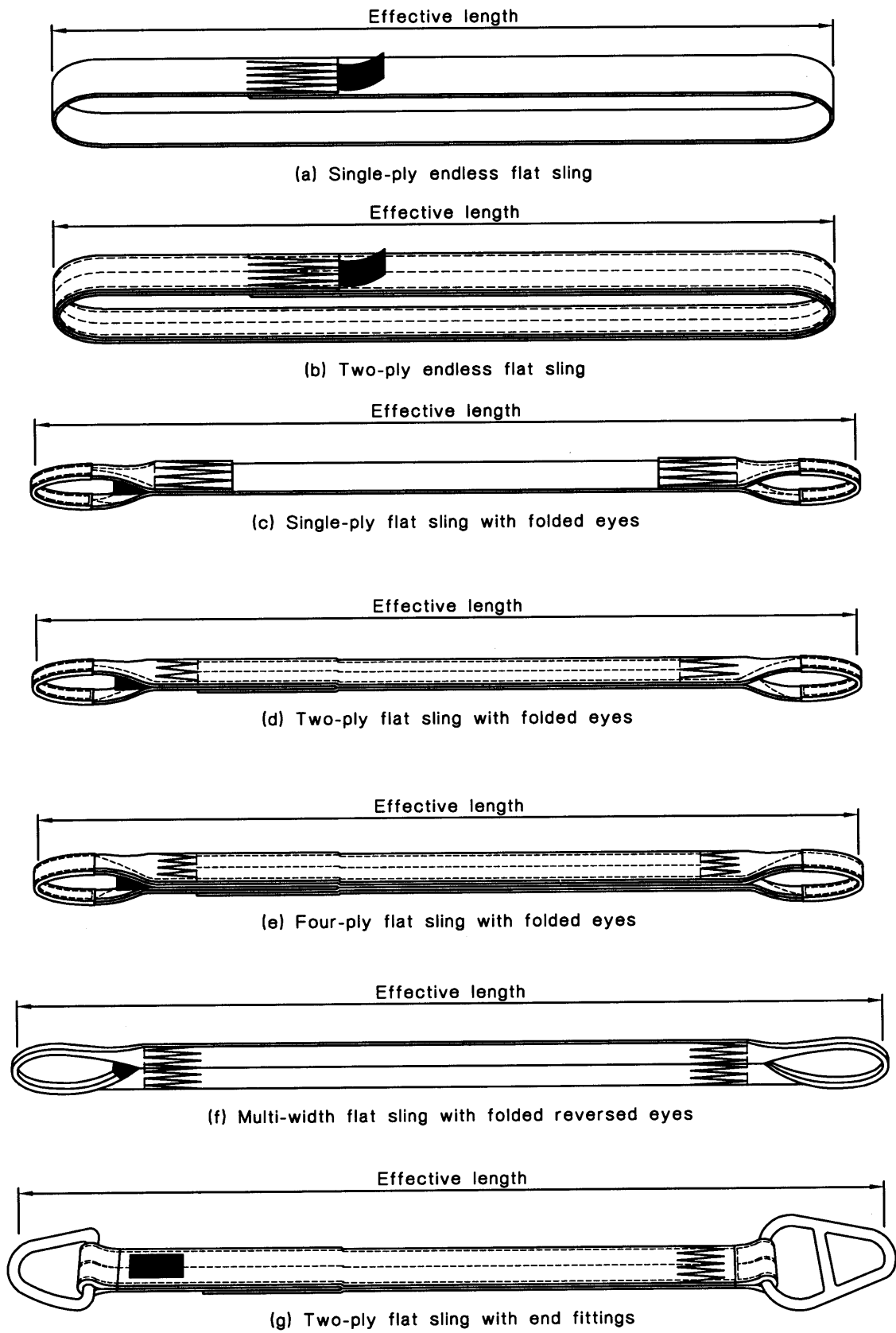
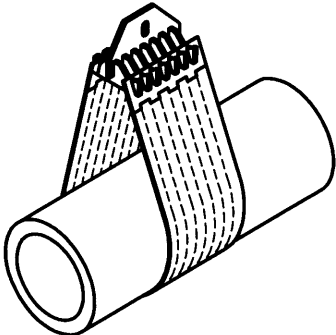


FIGURE 1 (in part) TYPICAL SLINGS

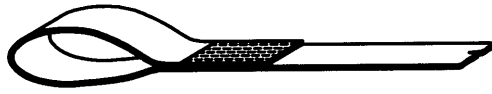


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(h) Pipe lifting sling

FIGURE 1 (in part) TYPICAL SLINGS



(a) Flat eye



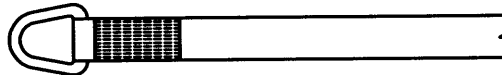
(b) Reversed eye



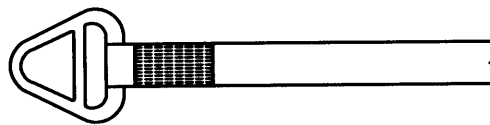
(c) Folded eye



(d) Protected eye



(e) D-ring end fittings



(f) End fitting that allows for choke hitching

FIGURE 2 TYPICAL SLING TERMINATIONS

Where the webbing has been woven on a shuttleless loom, lock threads of maximum runproof construction shall have been embedded in the webbing to stop it from unravelling in the event of a thread being damaged.

NOTE: For positive identification, the sling manufacturer should ensure that the rolls of webbing used in the manufacture of synthetic-webbing flat slings are marked with the webbing manufacturer's name or trade mark and the batch identification.

**4.2 Protection** The webbing shall minimize any ingress of harmful particles, by—

- (a) heat setting (i.e. thermofixing);
- (b) having a protective covering; or
- (c) being woven in a relatively impenetrable type of construction.

**4.3 Thread** Thread used to sew webbing and to attach sleeves and labels shall be of the same type of high-tenacity continuous-multifilament fibre as that of the webbing, so that it will be as resistant to fibre degradation as is the fibre in the webbing.

## 5 DESIGN AND MANUFACTURE

**5.1 Construction** Slings may be of any of the constructions defined in Clause 3.2.

**5.2 Multileg slings** The legs of multileg slings are normally interconnected by one of the following arrangements:

- (a) For two-leg slings, by attaching each of the legs directly to a master link.
- (b) For three-leg or four-leg slings, by using a master link assembly with two intermediate links and attaching two of the sling legs directly to one of the intermediate links and the other sling leg or two sling legs directly to the other intermediate link.

**5.3 Overcrowding** To prevent overcrowding of multileg slings, each link that supports two or more legs in a sling shall be of an adequate size that will allow these legs to support a load with an included angle between the legs of 60°, without the legs contacting each other.

### 5.4 Dimensions

**5.4.1 Width** The width of slings, measured without tension in the webbing, shall be not less than 25 mm and shall be expressed in millimetres. Actual widths should not differ from the nominal width by more than the following:

- (a) For widths of not more than 100 mm . . . . . ±10 percent.
- (b) For widths of more than 100 mm . . . . . ±8 percent.

**5.4.2 Effective length** The effective length (see Clause 3.3) of slings of synthetic fibre shall be measured more than 10 min after the release of any forces and shall be expressed in metres. Such a measured length shall have an accuracy of ±3 percent of the nominal length.

**5.4.3 Inside length of eyes** The inside length of eyes shall be—

- (a) for webbing widths of not less than 25 mm nor more than 33 mm . . . . . not less than 100 mm;
- (b) for webbing widths of more than 33 mm but not more than 150 mm . . . . . not less than 3.0 times the webbing width; and
- (c) for webbing widths of more than 150 mm . . . . . not less than 2.5 times the webbing width.

The inside length of eyes in webbing fitted around a round cross-sectional part of an end fitting shall be not less than 2.5 times the diameter of the part.

**5.5 Sewing** The sewing shall provide an even distribution of the load across the breadth of the webbing without damaging the selvedge. The beginning and the end of sewing threads shall be back sewn for not less than 25 mm.

Sewing shall be carried out by a lock-stitch machine or similarly suitable machine, and shall be evenly embedded into both surfaces of the webbing joint. Lock sewing shall not be visible from either side of the joint.

There shall be not less than 25 mm backtrack to lock the sewing of any broken thread.

The sewing method should minimize any loss of flexibility.

**5.6 Sewing faults** There shall be not more than one fault in the sewing, including an incomplete stitch, in any 125 mm length.

**5.7 Needle temperature** There shall be no damage caused by excessive temperature of the sewing needle.

**5.8 Ends** Heat-sealed ends shall not be oversewn, unless either the thread is protected from abrasion or the form of the heat seal cannot cause damage to the thread. Soft-cut ends may be oversewn.

**5.9 Protective sleeves** Any protective sleeves used on slings, other than those fully bonded to the sling to prevent the ingress of harmful particles, shall meet the following requirements:

- (a) *Not sewn to sling* If not sewn to the sling, protective sleeves shall be capable of being moved to enable the full length of the load-bearing component of the sling to be inspected.
- (b) *Sewn to sling* If sewn to the sling, protective sleeves—
  - (i) shall be of the same fibre material and have the same mechanical properties as the sling; and
  - (ii) shall be fully sewn to the sling around the outer edges of the sleeve, to minimize the ingress of material between the sling and the sleeve.

Aramid polyamide webbing shall be sheathed or coated, to provide protection from sunlight and other ultraviolet sources.

**5.10 Termination** Slings may have the types of termination defined in Clause 3.4.

Two end fittings on a sling need not be identical. If a sling is designed for choked slinging, one fitting should be able to pass through the other fitting.

Any end fittings shall have a working load limit of not less than that of the sling and shall comply with AS 3585 or AS 3776. The interface between the webbing and the end fitting shall be such that the strength of the sling leg will not be compromised by either overcrowding or the interface contact area.

## 6 MECHANICAL PROPERTIES

**6.1 Webbing** The webbing component of each sling shall be capable of withstanding a test force equivalent to  $T$  times the working load limit of the sling under the conditions specified in Appendix B, where  $T = 9.4$  for nylon fibres and  $T = 8$  for other fibres.

### NOTES:

- 1 The test force is generally referred to as the minimum breaking strength.
- 2 The higher factor for nylon fibres is to allow for a 15 percent reduction of strength when wet by water.

**6.2 End fittings** Clause 5.10 requires any end fittings to comply with AS 3585 or AS 3776, each of which includes requirements for mechanical properties.

**6.3 Stitching** The stitching shall be capable of withstanding the load that will cause failure of the sling under the conditions specified in Appendix B.

## 7 MARKING

### 7.1 Information

**7.1.1 Mandatory** Each sling shall be permanently and legibly marked with the following information:

- (a) Working load limit.
- (b) SWL for various lifting configurations.  
The SWL of multileg slings shall be stated on the tag attached to the master link.  
NOTE: Where multileg sling assemblies are configured, ensure that there is no confusion between the working load limit of each leg with the SWL of the whole assembly. Also, refer to AS 1353.2.
- (c) Fibre material (e.g. nylon, polyester, polypropylene or aramid polyamide, as applicable).
- (d) Month and year of manufacture of the sling.
- (e) Identification marking to correlate the sling to a test certificate or batch number.
- (f) Manufacturer's identification.

NOTE: In any lifting or handling system that consists of components of different capacities, it is dangerous for each of these components to be tagged with its different capacity. A tag specifically marked for a higher capacity component could inadvertently be understood to refer to the complete lifting system.

**7.1.2 Optional** The following list of precautionary warnings should also be provided:

- (a) Consult sling manufacturer or supplier for configurations not shown on the sling tag or a relevant load chart.
- (b) Do not use sling if tag is removed.
- (c) Inspect sling for damage before each use.
- (d) Do not use sling if there is any sign of cut cover, snagging, heat or chemical damage, excessive wear, damaged seams, any other defects, or presence of grit, abrasive materials or other deleterious matter.
- (e) Do not tie knots in sling.
- (f) Protect sling from sharp edges of load.
- (g) Do not expose sling to temperatures above . . .

NOTE: Insert a safe maximum temperature. Information on safe temperatures is given under selection of material in AS 1353.2.

- (h) Do not allow abrasive or other damaging grit to penetrate the fibres.
- (i) Consult with manufacturer's recommendations before immersing a sling in a chemical solution.
- (j) Keep away from . . .

NOTE: Insert 'acids', 'alkalis', or 'phenolic compounds', as applicable.

#### NOTES:

- 1 A typical label is shown in Figure 3.
- 2 Manufacturers making a statement of compliance with this Standard on a product, packaging or promotional material related to that product are advised to ensure that such compliance is capable of being verified.

**7.2 Means** The marking required by Clause 7.1 shall be given—

- (a) for single-leg slings, on a label of a suitable material that is permanently attached to the webbing of the sling by sewing; and
- (b) for multileg slings, on a durable and corrosion-resistant tag that is permanently affixed to the master link.

**7.3 Colour** The colour of the label on the sling leg shall be used to identify the fibre material, using the following colour code:

Webbing material	Colour
Nylon	Green
Polyester	Blue
Polypropylene	Brown
Aramid polyamide	Yellow

Where the colour of the sling leg is used to identify its WLL, the following colour code shall be used:

Working load limit, t	Colour
1	Violet
2	Green
3	Yellow
4	Grey
5	Red
6	Brown
8	Blue
≥ 10	Orange

**8 TESTING OF MECHANICAL PROPERTIES** Compliance of each design with the requirements of Clause 6 shall be demonstrated.

**NOTES:**

- 1 The test of each design is known as the type test, which determines the adequacy of the design for achieving the required performance.
- 2 Each change in manufacturing process, grade of material, design, end fittings and size other than length necessitates separate type testing, to demonstrate compliance with the requirements of Clause 6.
- 3 Where sewing is manually controlled, the production from each sewing machinist should be tested.
- 4 In addition to type testing, effective quality control necessitates systematic testing of each lot or batch to ensure continuing compliance with the requirements of Clause 6. Such a lot may include slings that vary only in length, but similar slings produced by different machinists may be considered to be in different lots.
- 5 Methods for demonstrating compliance with this Standard are given in Appendix C.

**9 PROOF TESTING**

**9.1 Proof loading** Each sling shall be subjected to a proof force that is not less than  $[2 \times 9.81 \times (\text{WLL, in tonnes})]$  kN applied under the conditions specified in Appendix B.

**9.2 Requirements** The sling shall—

- (a) withstand the application of the proof force, without sustaining damage that could affect its intended function or safety; and
- (b) after testing, be free from any deleterious permanent set or visible defects.

A competent person (see Clause 3.1) shall be satisfied that the sling complies with these requirements.

**9.3 Test certificate** The proof testing shall be recorded on a test certificate, which shall bear the following information:

- (a) Construction.
- (b) Type of terminations.
- (c) Sling material (including webbing, thread and any end fittings).
- (d) Width.
- (e) Effective length.
- (f) For single-leg slings or endless slings, working load limit.
- (g) For multileg slings, working load limit or safe working load.
- (h) Proof force.
- (i) Date of proof test.
- (j) Number tested.
- (k) Identification marking correlating with the slings.
- (l) A declaration that the slings comply with this Standard, i.e. AS 1353.1.
- (m) Name and address of the manufacturer or supplier.
- (n) Name and address of the testing establishment.
- (o) Name of the signatory.
- (p) Type of certificate (e.g. NATA, certifying authority, supplier).

NOTE: The manufacturer or supplier should retain the original test certificate for not less than 10 years.

Slings are made from 100% polyester. Each sling is clearly labelled with the W.L.L. and the Safety Factor is 8:1. All slings are colour coded for increased safety. For lifting rough or sharp cargoes we recommend the use of protective sleeves. Webbing slings are manufactured to AUSTRALIAN STANDARD AS 1353 1990 B.S. 3481 - D.I.N. 61360 I.S.O. 4578 - N.Z.S. 5227

Serial

How much may I lift with LIFTING MODES:

	M=10	M=04	M=20	M=19	M=14	M=10
VERTICAL	CHOKE	BARNET	30°	90°	90°	30°
W.L.L.	S.W.L.	S.W.L.	S.W.L.	S.W.L.	S.W.L.	S.W.L.

POLYESTER: MANUFACTURED IN AUSTRALIA

**Ten hints for safe lifting**

1. Consult sling load for conformations not shown.
2. Do not use sling if this tag is removed.
3. Inspect sling for damage between each use.
4. Do not use sling if there is any sign of cut webbing, snagging, heat or chemical damage, excessive wear, damaged seams, any other defects, or presence of grit, abrasive materials or other deleterious matter.
5. Do not tie knots in sling webbing.
6. Protect sling webbing from sharp edges of load. Use protective sleeves.

7. Do not expose sling to temperatures above 90°C.
8. Do not allow abrasive or other damaging grit to penetrate the fibres.
9. Consult with manufacturer's recommendations before immersing a sling in a chemical solution.
10. Keep away from strong alkalies and phenolic compounds.

FIGURE 3 TYPICAL LABEL FOR A FLAT SYNTHETIC-WEBBING SLING



APPENDIX A  
INFORMATION THAT SHOULD BE SUPPLIED WITH  
ENQUIRIES AND ORDERS  
(Informative)

The following information should be supplied with enquiries and orders for flat synthetic-webbing slings:

- (a) Working load limit.
- (b) Width.
- (c) Effective length (see Clause 3.3).
- (d) Inside length of any eyes (see also Clause 5.4.3).  
NOTE: The length of any eyes should be sufficient to ensure that the included angle between the legs of the eye during use does not exceed 20°.
- (e) Material.
- (f) Construction (see Clause 3.2).
- (g) Terminations, if any, which may be different on each end (see Clause 3.4).
- (h) Size of any terminations (i.e. length of eye or shape and dimensions of holes in terminal attachments).
- (i) Any protective sleeves or coatings.
- (j) Nature of loads to be handled.
- (k) Manner of use (e.g. direct loading, basket hitch, choke hitch).
- (l) Size of hook or details of other lifting devices with which the sling is to be used.
- (m) Significant environmental conditions (e.g. exposure to chemicals, heat, moisture, sunlight, abrasive substances including grit).
- (n) Any required means for demonstrating compliance with this Standard (see Appendix C).
- (o) Any required additional testing such as non-destructive testing.
- (p) Type of certificate (e.g. NATA, certifying authority, supplier).
- (q) Whether a copy of the test certificate is to be supplied.

**APPENDIX B**  
**CONDITIONS FOR APPLICATION OF TEST FORCES**  
(Normative)

The following conditions apply to the application of test forces to flat synthetic-webbing slings:

- (a) The testing machine shall be calibrated in accordance with AS 2193 and shall be capable of Class A results when testing mechanical properties (see Clause 6) and Class C results when proof testing (see Clause 9).
- (b) Manufacturing processes, other than any proof loading and any application of temporary protective coatings for storage purposes, shall be completed.
- (c) Where end fittings are part of the sling, either—
  - (i) test the complete sling; or
  - (ii) test the sling components separately, including—
    - (A) the end fittings in accordance with AS 3585 or AS 3776; and
    - (B) the components, incorporating an interface that is similar to that of the end fittings.
- (d) Each end of the sling shall be held as follows:
  - (i) For slings without end fittings—by means of an attachment with a contact radius and with the load-bearing seam of the sling in a loaded position away from the attachment.
  - (ii) For slings with end fittings—by means of an attachment with a contact radius.
- (e) The included angle between the legs of any eyes shall be not more than 20°.
- (f) The webbing shall not be twisted along its length during the test.
- (g) The test force shall be applied to the sling in tension.

APPENDIX C  
MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS STANDARD  
(Informative)

**C1 SCOPE** This Appendix sets out the following different means by which compliance with this Standard can be demonstrated by the manufacturer or supplier:

- (a) Evaluation by means of statistical sampling.
- (b) The use of a product certification scheme.
- (c) Assurance using the acceptability of the supplier's quality system.
- (d) Other such means proposed by the manufacturer or supplier and acceptable to the customer.

**C2 STATISTICAL SAMPLING** Statistical sampling is a procedure which enables decisions to be made about the quality of batches of items after inspecting or testing only a portion of those items. This procedure will only be valid if the sampling plan has been determined on a statistical basis and the following requirements are met:

- (a) The sample shall be drawn randomly from a population of product of known history. The history shall enable verification that the product was made from known materials at essentially the same time, by essentially the same processes and under essentially the same system of control.
- (b) For each different situation, a suitable sampling plan needs to be defined. A sampling plan for one manufacturer of given capability and product throughput may not be relevant to another manufacturer producing the same items.

In order for statistical sampling to be meaningful to the customer, the manufacturer or supplier needs to demonstrate how the above conditions have been satisfied. Sampling and the establishment of a sampling plan should be carried out in accordance with AS 1199, guidance to which is given in AS 1399.

**C3 PRODUCT CERTIFICATION** The purpose of product certification is to provide independent assurance of the claim by the manufacturer that products comply with the stated Standard.

The certification scheme should meet the criteria described in SAA HB18.28 in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective quality planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard.

**C4 SUPPLIER'S QUALITY SYSTEM** Where the manufacturer or supplier can demonstrate an audited and registered quality management system complying with the requirements of the appropriate or stipulated Australian or international Standard for a supplier's quality system or systems, this may provide the necessary confidence that the specified requirements will be met. The quality assurance requirements need to be agreed between the customer and supplier and should include a quality or inspection and test plan to ensure product conformity.

Guidance in determining the appropriate quality management system is given in AS/NZS ISO 9000.1 and AS/NZS ISO 9004.1.

**C5 OTHER MEANS OF ASSESSMENT** If the above methods are considered inappropriate, determination of compliance with the requirements of this Standard may be assessed from the results of testing coupled with the manufacturer's guarantee of product conformance.

Irrespective of acceptable quality levels (AQLs) or test frequencies, the responsibility remains with the manufacturer or supplier to supply products that conform with the full requirements of the Standard.

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