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Martial arts — Protective equipment for martial arts —

Part 9: Additional requirements and test methods for Wushu Sanda head protectors

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 83, *Sports and other recreational facilities and equipment*, Subcommittee SC 6, *Martial arts*.

A list of all parts in the ISO 21924 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Wushu Sanda, an important component of Chinese Wushu (martial arts), is a sport of one-on-one combat involving kicking, striking, wrestling, etc. As attacks to the head and main body are allowed in combat, head protectors are adopted to protect the head and to reduce injuries.

Though Wushu Sanda head protectors are sold and used all over the world, they vary considerably in quality. As no standard has been established to prescribe relevant requirements, the inconsistency in production processes and quality inspections have become the main constraint on the development of this product.

The establishment of this document provides a technical guideline for manufacturers and consumers, and will help to standardize the production and quality control of Wushu Sanda head protectors to further promote international trade and Wushu Sanda and to safeguard the interests of consumers.

Martial arts — Protective equipment for martial arts —

Part 9:
Additional requirements and test methods for Wushu Sanda head protectors

1 Scope

This document specifies the terms and definitions, product structure, classification, requirements and test methods of head protectors for Wushu Sanda.

This document is applicable to Wushu Sanda head protectors sewn with polyurethane (PU) synthetic leather, polyvinyl chloride (PVC) artificial leather, foamed plastic products and other materials.

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. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 105-E04, *Textiles — Tests for colour fastness — Part E04: Colour fastness to perspiration*

ISO 105-X12, *Textiles — Tests for colour fastness — Part X12: Colour fastness to rubbing*

ISO 1856, *Flexible cellular polymeric materials — Determination of compression set*

ISO 2439, *Flexible cellular polymeric materials — Determination of hardness (indentation technique)*

ISO 3071, *Textiles — Determination of pH of aqueous extract*

ISO 3377-1, *Leather — Physical and mechanical tests — Determination of tear load — Part 1: Single edge tear*

ISO 4045, *Leather — Chemical tests — Determination of pH and difference figure*

ISO 8307, *Flexible cellular polymeric materials — Determination of resilience by ball rebound*

ISO 11640, *Leather — Tests for colour fastness — Colour fastness to cycles of to-and-fro rubbing*

ISO 11641, *Leather — Tests for colour fastness — Colour fastness to perspiration*

ISO 13937-2, *Textiles — Tear properties of fabrics — Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method)*

ISO 14184-1, *Textiles — Determination of formaldehyde — Part 1: Free and hydrolysed formaldehyde (water extraction method)*

ISO 14362-1, *Textiles — Methods for determination of certain aromatic amines derived from azo colorants — Part 1: Detection of the use of certain azo colorants accessible with and without extracting the fibres*

ISO 14362-3, *Textiles — Methods for determination of certain aromatic amines derived from azo colorants — Part 3: Detection of the use of certain azo colorants, which may release 4-aminoazobenzene*

ISO 17226-1, *Leather — Chemical determination of formaldehyde content — Part 1: Method using high performance liquid chromatography*

ISO 17234-1, *Leather — Chemical tests for the determination of certain azo colorants in dyed leathers — Part 1: Determination of certain aromatic amines derived from azo colorants*

ISO 17234-2, *Leather — Chemical tests for the determination of certain azo colorants in dyed leathers — Part 2: Determination of 4-aminoazobenzene*

ISO 17076-1, *Leather — Determination of abrasion resistance — Part 1: Taber method*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
Wushu Sanda head protector
protective gear to protect the head when practicing, performing or demonstrating Wushu Sanda

Note 1 to entry: See Figure 1.

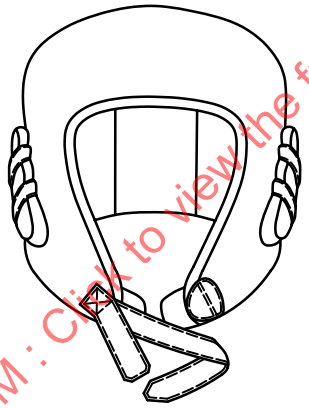


Figure 1 — Wushu Sanda head protector

3.2
main body
part to protect the forehead and both sides of the head

Note 1 to entry: See Figure 2.

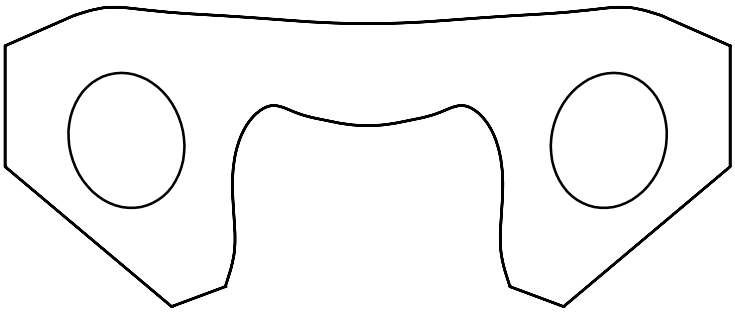


Figure 2 — Main body

3.3
protector of the back of the head
part to protect the back of the head

Note 1 to entry: See Figure 3.

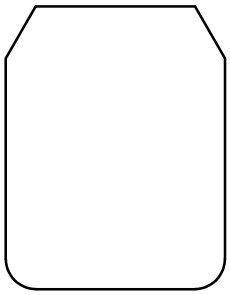


Figure 3 — Protector of the back of the head

3.4
ear protector
part to protect the ears

Note 1 to entry: See Figure 4.

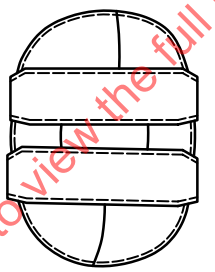


Figure 4 — Ear protector

3.5
locking strap
part at the bottom of the head protector as a component of the restraint system

Note 1 to entry: See Figure 5.

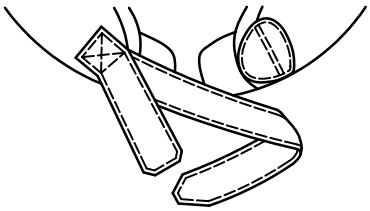


Figure 5 — Locking strap

3.6
hook and loop fastener
part at the back of the head protector as a component of the restraint system

Note 1 to entry: See Figure 6.

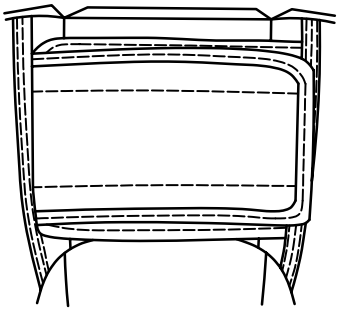


Figure 6 — Hook and loop fastener

3.7
top cover
part at the top of the head protector as a component of the restraint system

Note 1 to entry: See Figure 7.

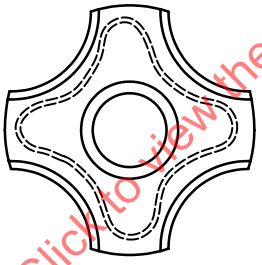
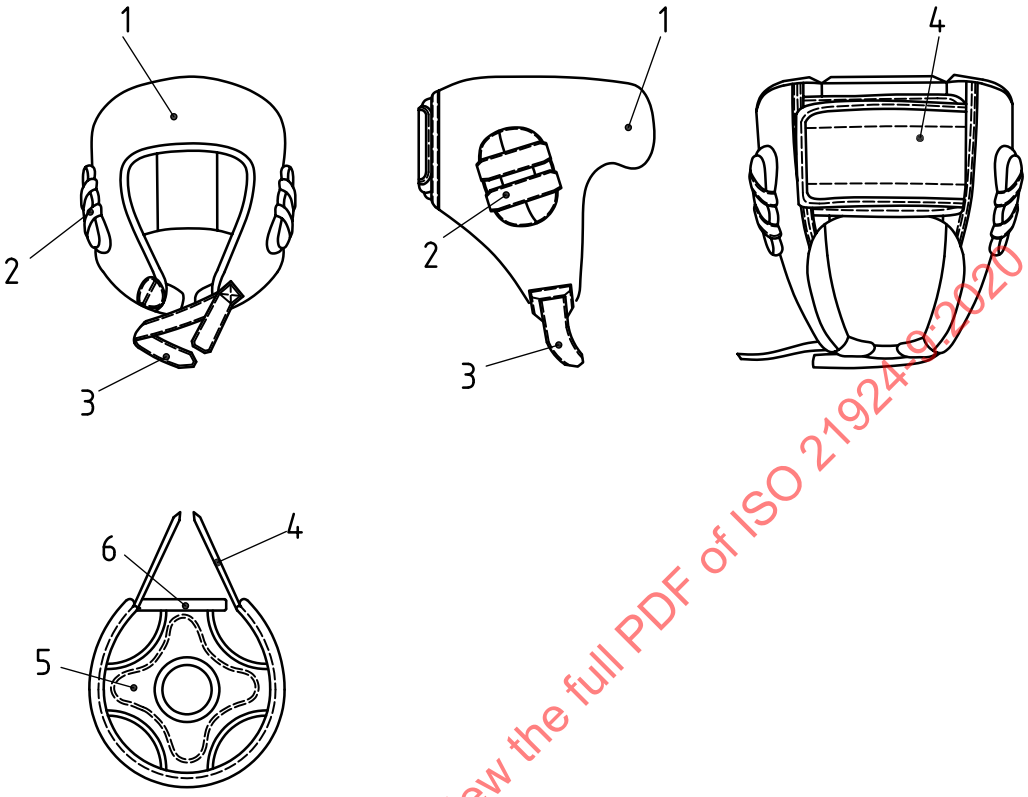


Figure 7 — Top cover

4 Structure

The structure of a Wushu Sanda head protector is shown in Figure 8.



Key

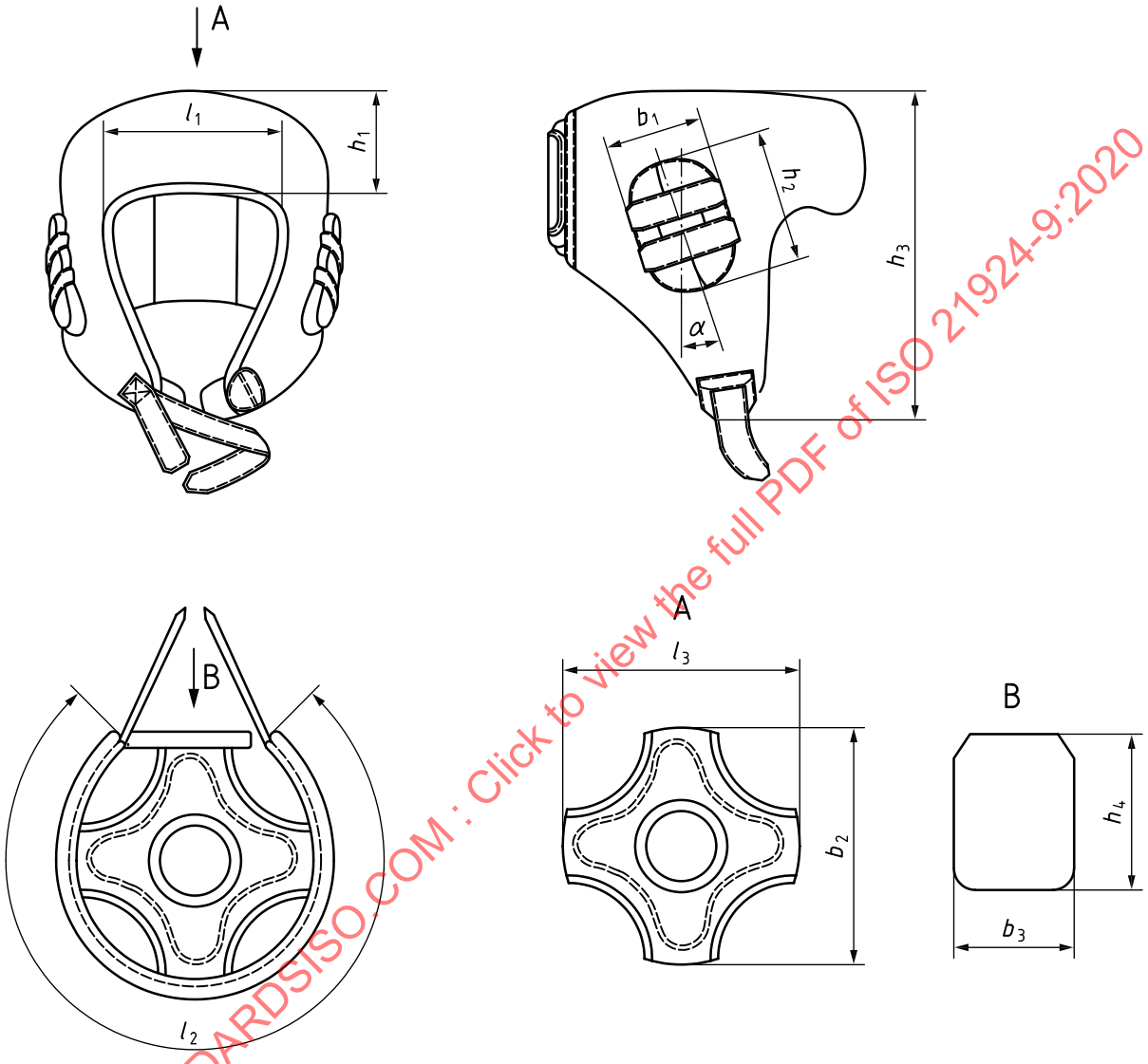
1	main body	4	hook and loop fastener
2	ear protector	5	top cover
3	locking strap	6	protector of the back of the head

Figure 8 — Structure of Wushu Sanda head protector

5 Requirements

5.1 Size and dimensions

The size and dimensions shall conform to the specifications given in Figure 9 and the dimensions given in Table 1.



Key

l_1	length of the forehead of the head protector	l_2	length of the main body of the head protector
h_1	height of the forehead of the head protector	l_3	length measured horizontally of the top cover
b_1	width of the ear protector	b_2	width measured vertically of the top cover
h_2	height of the ear protector	b_3	width of the protector of the back of the head
h_3	height from the top to the bottom of the head protector	h_4	height of the protector of the back of the head
		α	tilt angle of the ear protector

Figure 9 — Dimensions of the Wushu Sanda head protector

Table 1 — Size and dimensions of the Wushu Sanda head protector

Size	Head circumference	l_1 mm	h_1 mm	b_1 mm	h_2 mm	h_3 mm	l_2 mm	l_3 mm	b_2 mm	b_3 mm	h_4 mm	α
S	520 to 540	172 to 176	80 to 82	74 to 76	98 to 102	220 to 224	524 to 530	190 to 194	190 to 194	99 to 101	114 to 116	16° to 17°
M	541 to 560	183 to 187	80 to 82	74 to 76	98 to 102	226 to 230	546 to 552	197 to 201	197 to 201	99 to 101	114 to 116	16° to 17°
L	561 to 580	195 to 199	80 to 82	74 to 76	98 to 102	232 to 236	568 to 574	204 to 208	204 to 208	99 to 101	114 to 116	16° to 17°
XL	581 to 600	206 to 210	80 to 82	74 to 76	98 to 102	238 to 242	590 to 596	211 to 215	211 to 215	99 to 101	114 to 116	16° to 17°

5.2 Materials

5.2.1 Fabric

PU synthetic leather or PVC artificial leather shall be used.

5.2.2 Lining

PU synthetic leather, PVC artificial leather or textiles shall be used.

5.2.3 Padding

Polyurethane foam shall be used.

5.3 Sewing

Stitches shall be done in a line without breaks with a density of 8 stitches to 10 stitches per 30 mm. There shall be no defects resulting from wrong needle positions, missing stitches or skipping stitches.

5.4 Appearance

5.4.1 The Wushu Sanda head protector shall be in good shape with a continuous and smooth arc. The symmetrical parts shall be consistent in appearance.

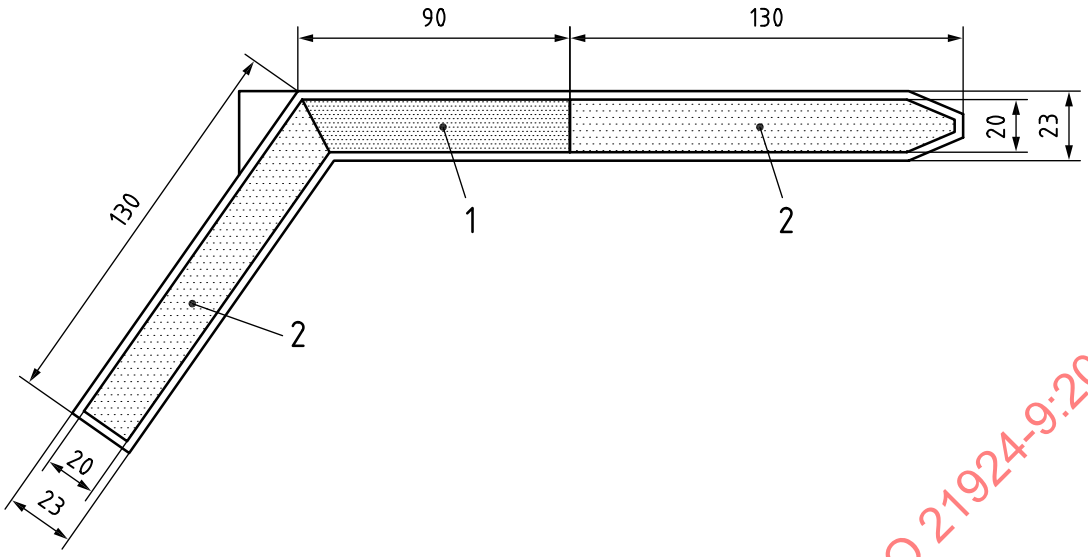
5.4.2 There shall be no block defects, oil stain, broken defects, etc. on the surface.

5.4.3 The connecting part of the hook and loop fastener, locking strap and the main body of the head protector shall be skewed in a way so that no injuries or scratches can be caused to the wearer.

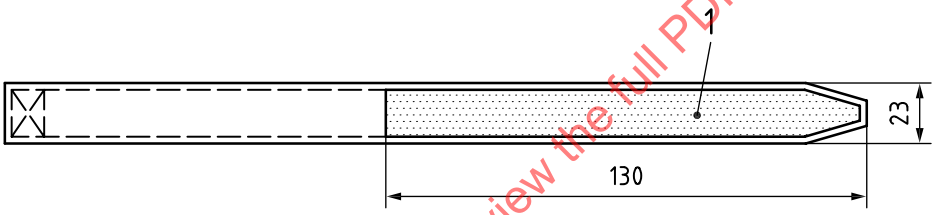
The skews of the hook and loop part on the locking strap shall be skewed in a span of 1,5 mm to 2,5 mm from the outer borders to make sure that it can be properly locked and to prevent injuries during an impact because of an improper lock (see Figure 10).

The position of the hook and loop fasteners on the locking strap shall be positioned as shown in Figure 10.

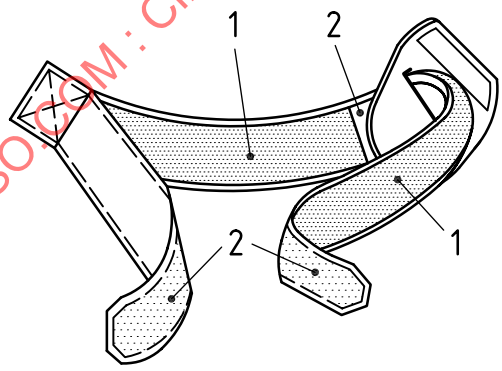
Dimensions in millimetres



a) outside view of the locking strap



b) inside view of the locking strap



c) combined view of the helmet with locking strap

Key

1 soft loop fastener

2 hook fastener

Figure 10 — Positioning of soft loop fastener and hook fastener

5.5 Quality requirements

5.5.1 Safety requirements

Safety requirements shall conform to the values given in Table 2.

Table 2 — Safety requirements

Item		Value
Formaldehyde (mg/kg)	fabric	≤ 300
	lining	≤ 75
Aromatic amines derived from azo colorants (mg/kg)	fabric	≤ 20
	lining	≤ 20
PH value	PU synthetic leather/PVC artificial leather	3,5 to 9,5
	textile	4,0 to 8,5

5.5.2 Physical and mechanical properties

Physical and mechanical properties shall conform to the values of Table 3.

Table 3 — Physical and mechanical properties

Item		Values
Tear strength (N)	PU synthetic leather/PVC artificial leather	> 40
	textiles	> 10
Abrasion resistance (grade)	PU synthetic leather/PVC artificial leather	> 4
Hydrolysis resistance (N/mm)	PU synthetic leather	> 3,5
Colour fastness to rubbing (grade)	dry	> 4
	wet	> 3
Colour fastness to perspiration (grade)	change in colour	> 4
	staining	> 3
Seam strength (N/cm)	locking strap and fabric	> 140
Shear strength (N/cm)	hooks and loops fastener	> 7,5
Peel strength (N/cm)		> 1,6
Hardness (HA/°)	padding (polyurethane foam)	8 to 10
Resilience (%)		> 30
Compression set (%)		≤ 15
Impact resistance (kN)	finished product	≤ 1,8 No break, tear or permanent deformation

6 Test methods

6.1 Measurements and dimensions

Press lightly to make the outer layer of the head protector flat to the padding inside. Measure the length of the forehead of the head protector (l_1) with a length measuring tool. The division value shall be less than 1 mm. Take the measurement of the widest position as the result. The accuracy of the measurement result shall be 1 mm.

6.2 Inspection of sewing and appearance

A subjective inspection together with measuring tools shall be used.

6.3 Inherent quality test

6.3.1 The determination of the formaldehyde content of the PU synthetic leather and PVC artificial leather shall be in accordance with ISO 17226-1. The determination of the formaldehyde content of textiles shall be in accordance with ISO 14184-1.

6.3.2 The determination of the decomposable aromatic ammonia of the PU synthetic leather and PVC artificial leather shall be in accordance with ISO 17234-1 and ISO 17234-2. The determination of the decomposable aromatic ammonia of textiles shall be in accordance with ISO 14362-1 and ISO 14362-3.

6.3.3 The determination of the PH value of the PU synthetic leather and PVC artificial leather shall be in accordance with ISO 4045. The determination of the PH value of textiles shall be in accordance with ISO 3071.

6.3.4 The determination of the tear force of the PU synthetic leather and PVC artificial leather shall be in accordance with ISO 3377-1. The tearing properties of textiles shall be in accordance with ISO 13937-2.

6.3.5 The abrasion resistance of the PU synthetic leather and PVC artificial leather shall be in accordance with ISO 17076-1.

6.3.6 The hydrolysis resistance of the PU synthetic leather shall be tested as follows.

a) Cut two specimens from the samples or from the same material as the samples. The length and width of the specimens shall be (150 ± 2) mm and (30 ± 2) mm, respectively.

b) Immerse the cut specimens in 10 % NaOH solution at normal temperature for 24 h.

c) Clean the specimens with water.

d) Dry them in a drying oven at the temperature of (100 ± 2) °C.

6.3.7 The colour fastness to rubbing of the PU synthetic leather and PVC artificial leather shall be in accordance with ISO 11640. The colour fastness to rubbing of textiles shall be in accordance with ISO 105-X12.

6.3.8 The colour fastness to perspiration of the PU synthetic leather and PVC artificial leather shall be in accordance with ISO 11641. The colour fastness to perspiration of textiles shall be in accordance with ISO 105-E04.

6.3.9 The seam strength shall be measured as follows.

a) Cut the specimens with a width of 30 mm and a length of 150 mm outside the seams from the fabric layer and the hook and loop fastener of the sample, respectively. The length direction of the specimens shall be vertical to the seam stitches.

b) Carry out a test of the seam strength of the locking strap on a tensile tester with an appropriate measurement range and accuracy at a speed of (100 ± 10) mm/min.

The average of the results of the two specimens shall be the test result, with an accuracy of 1 N.

6.3.10 The shear strength shall be measured as follows.

a) Cut two specimens with a length of (100 ± 5) mm and a width of 20 mm from the samples. Each specimen shall consist of two components, a hook strip and a loop strip.

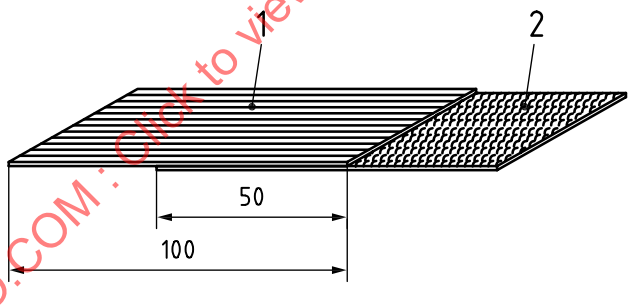
b) Press together the hook strip and the loop strip for an effective bond length of 50 mm in the length direction, with the hook strip facing up and the loop strip facing down, and the ends of the two strips attached together as shown by Figure 11.

c) Roll uniformly 10 times on both sides of the specimens with a special roller for a tensile test of 3 kg.

d) Carry out a test of the shear strength of the hook and loop fastener on a tensile tester with an appropriate measurement range and accuracy at a speed of (100 ± 10) mm/min.

The measured maximum force shall be the shear force. Divide the value of the shear force by the width of the specimen to get the result of the shear strength. The test result shall be the average of the results of the shear strength of the two specimens and rounded to one decimal place.

Dimensions in millimetres



Key

1 hook strip

2 loop strip

Figure 11 — Specimen for the shear strength test

6.3.11 The peel strength shall be measured as follows.

a) Cut two specimens with a length of (100 ± 5) mm and a width of 20 mm (if the width is less than 20 mm, use the effective width) from the samples. Each specimen shall consist of two components: a hook strip and a loop strip.

b) Press together the hook strip and the loop strip for an effective bond length of 50 mm, with the hook surface facing up and the loop facing down, and the ends of the two strips attached together as shown by Figure 12.

c) Carry out a test of the shear strength of the hook and loop fastener on a tensile tester with appropriate am measurement range and accuracy at a speed of (50 ± 10) mm/min.