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Protective equipment for martial arts —

Part 5: Additional requirements and test methods for genital protectors and abdominal protectors

Équipement de protection pour les arts martiaux —

Partie 5: Exigences et méthodes d'essai complémentaires relatives aux coquilles et aux protections abdominales

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Contents

Page

Foreword

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

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

Protective equipment for martial arts —

Part 5:
Additional requirements and test methods for genital protectors and abdominal protectors

1 Scope

This document specifies additional requirements and test methods for genital protectors and abdominal protectors used in unarmed martial arts such as taekwondo, karate, kick-boxing and similar disciplines.

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 21924-1:2017, *Protective equipment for martial arts — Part 1: General requirements and test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21924 and the following apply.

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

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

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

3.1
genital protector
device worn to protect genitalia from impacts

3.2
abdominal protector
device worn to protect the abdomen below the waist from impacts

4 Requirements

4.1 General

The general requirements for genital protectors and abdominal protectors shall be the same as those given in ISO 21924-1.

Edges of hard materials shall be covered with soft padding materials.

Genital protectors for females shall be so designed that they adapt to the body shape of the wearer.

Abdominal protectors and genital protectors may be used as a single piece or in combination (see 4.4).

4.2 Sizing

4.2.1 Genital protectors for females and males

A sizing system shall be used to define genital protectors as small (S), medium (M), large (L) or extra large (XL). If additional sizes are available, their size declaration shall be related to this sizing system.

4.2.2 Abdominal protectors for females and males

Abdominal protectors shall be sized in relation of the size of the users in accordance with Table 1.

Table 1 — Sizing of abdominal protectors in relation to the size of the user

Dimensions in centimetres

Size	Body height	
	Females	Males
S	<152	<164
M	152 to 164	164 to 176
L	164 to 176	176 to 188
XL	>176	>188

Dimensions shall be graded linearly in case of additional sizes.

4.3 Zone of protection

4.3.1 Genital protectors

4.3.1.1 Genital protectors for females

The dimensions of the zone of protection of genital protectors for females shall be as given in Figure 1 and Table 2. Dimensions shall be graded linearly in case of additional sizes.

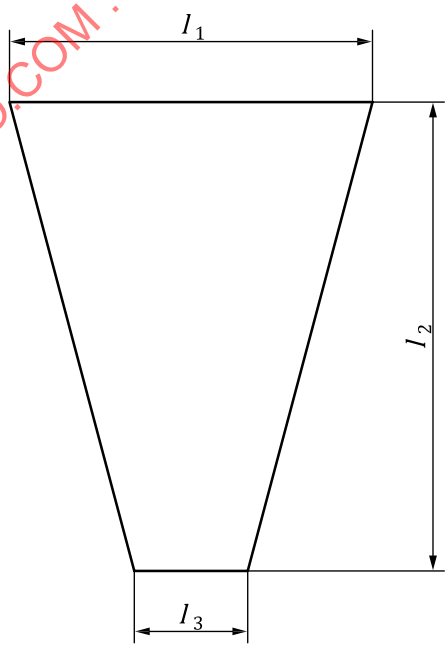


Figure 1 — Zone of protection of genital protectors for females

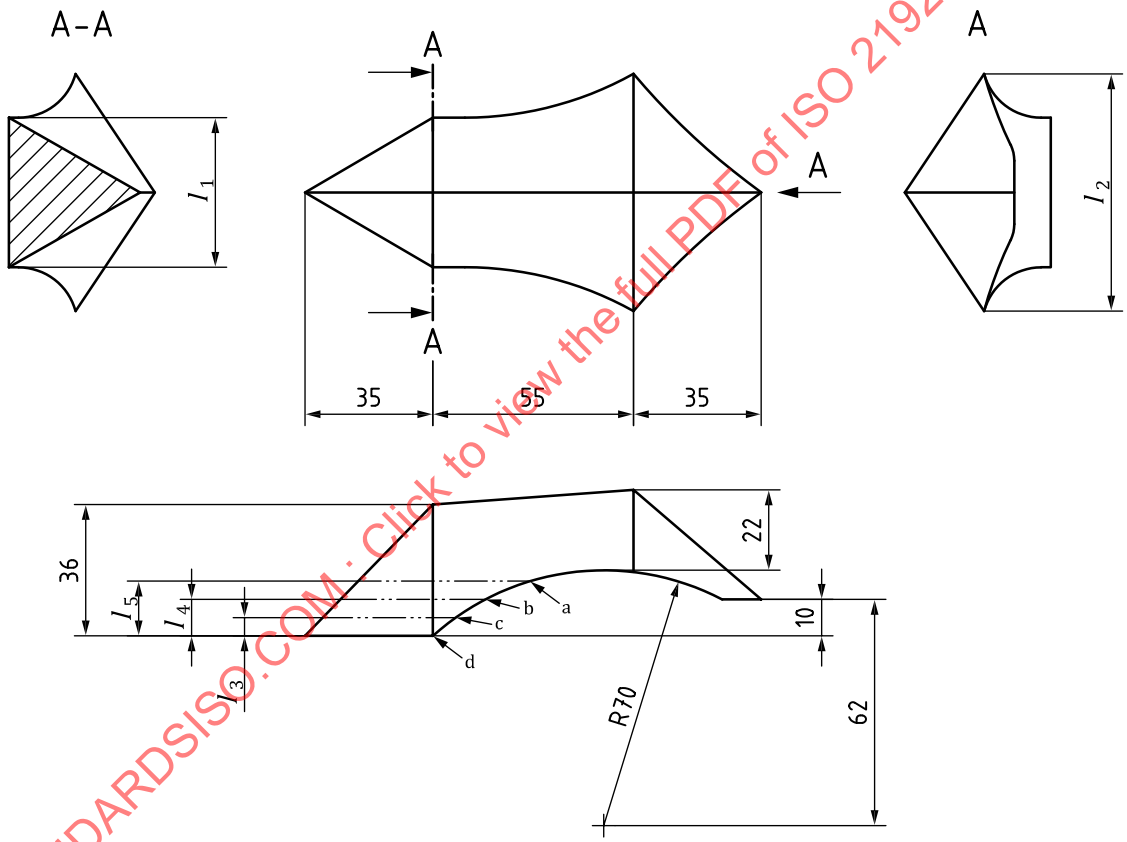
Table 2 — Dimensions of the zone of protection of genital protectors for females

Dimensions in millimetres

Size	l_1 min.	l_2 min.	l_3 min.
S	25	150	15
M	35	170	19
L	45	190	23
XL	55	210	27

4.3.1.2 Genital protectors for males

The minimum volume protected by the genital protector shall be as given in Figure 2 and Table 3. Dimensions shall be graded linearly in case of additional sizes.



a Size S.

b Size M.

c Size L.

d Size XL.

Figure 2 — Minimum volume protected by the genital protectors for males

Table 3 — Dimensions of the minimum volume protected by of genital protectors for males

Dimensions in millimetres

Size	l_1	l_2	l_3	l_4	l_5
S	30	52	—	—	15
M	34	55	—	10	—
L	38	61	5	—	—
XL	41	65	—	—	—

4.3.2 Abdominal protectors

4.3.2.1 General

Abdominal protectors shall have a zone of protection covering the abdominal surface.

If an abdominal protector is continuous with a compatible genital protector, no gap shall exist between the zone of protection of both protectors.

4.3.2.2 Dimensions

The dimensions for the zone of protection of abdominal protectors shall be as given in Figure 3 and Table 4. Dimensions shall be graded linearly in case of additional sizes.

Figure 3 — Zone of protection of abdominal protectors

Table 4 — Dimensions for abdominal protectors

Dimensions in millimetres

Size	l_1 **minimum**	l_2 **minimum**
S	230	55
M	250	60
L	270	65
XL	290	70

4.4 Combinations

If combined use is allowed, the requirements specified for the individual protectors shall also apply.

If combined use is not intended by the manufacturer, this restriction shall be clearly indicated in the information supplied by the manufacturer.

Possible combinations shall be indicated in the information supplied by the manufacturer.

4.5 Restraint

A restraint system shall be supplied by the manufacturer which enables the user to attach genital protectors and abdominal protectors without any assistance.

The restraint system shall meet the requirements defined in ISO 21924-1:2017, 4.3.

For genital protectors for males, the third paragraph of ISO 21924-1:2017, 4.3 does not apply. After each individual test, the displacement of genital protectors for males from their original position shall be less than 20 mm.

4.6 Impact performance

4.6.1 Genital protectors for females and abdominal protectors for females and males

Genital protectors for females and abdominal protectors for females and males conform to this document if the maximum peak force is below 3 kN when tested in accordance with 5.6.1.

4.6.2 Genital protectors for males

Genital protectors for males conform to this document if they meet the following requirements when tested in accordance with 5.6.2.

a) No part of the genital protector shall break or split.

b) The plasticine cylinder used for testing shall not be deformed more than 2 mm after contacting the genital protector.

c) The maximum peak force is below 3 kN.

5 Test methods

5.1 General

If no special test methods are specified, the requirements of this document are to be tested by measurement, visual inspection, tactile examination, etc.

For the tests, new, unused protector shall be used.

5.2 Sampling

Sampling shall be carried out in accordance with ISO 21924-1:2017, 5.1.

5.3 Conditioning

Conditioning is carried out in accordance with ISO 21924-1:2017, 5.2.

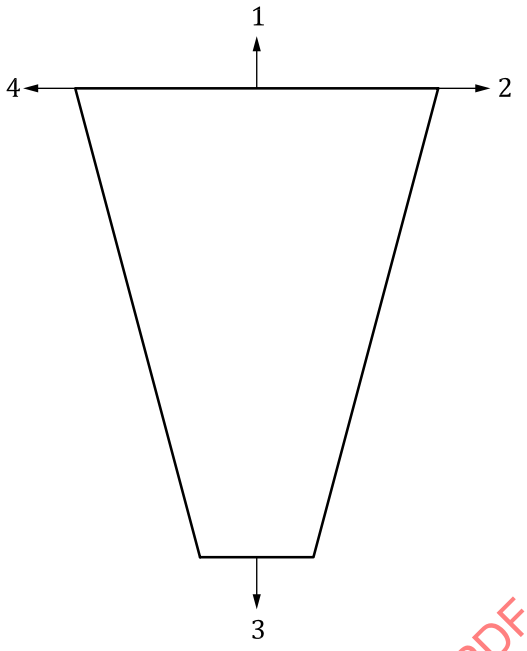
5.4 Restraint

Restraint testing of genital protectors and abdominal protectors for females and males shall be carried out as defined in ISO 21924-1:2017, 5.4. When testing the restraint, the protector(s) shall be attached to the body of a test person or a dummy.

The test force to be applied in any test position and test direction shall be 20 N.

Test positions shall always be as close as possible on the limits of the zone of protection. They are defined in Figures 4, 5 and 6.

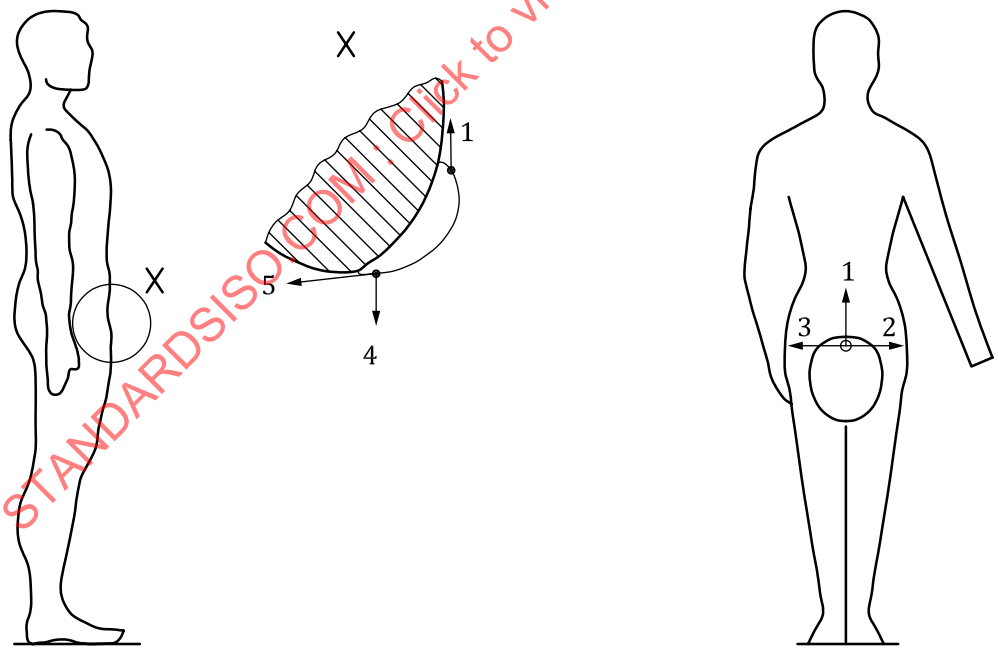
Test directions shall be as shown by arrows in Figures 4, 5 and 6. They shall be tangential to the surface of the body of the test person.



Key

1 to 4 order of the test directions

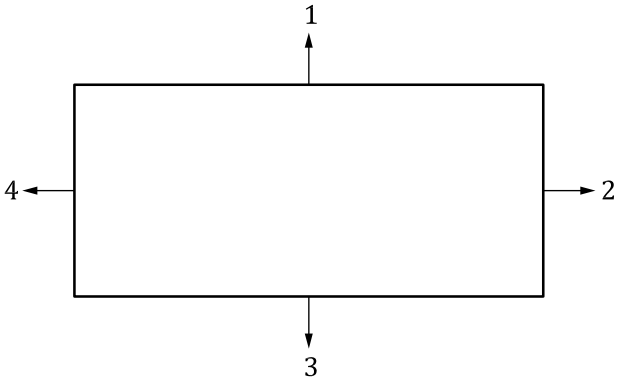
Figure 4 — Test positions and test directions at genital protectors for females



Key

1 to 5 order of the test directions

Figure 5 — Test positions and directions at genital protectors for males



Key

1 to 4 order of the test directions

Figure 6 — Test positions and test directions at abdominal protectors for females and males

If a genital protector and an abdominal protector are inseparably connected, both shall be attached in accordance with the information supplied by the manufacturer.

5.5 Zone of protection

5.5.1 Genital protectors for females and abdominal protectors for females and males

To measure the zone of protection, the protector shall be placed flat.

When tested according to ISO 21924-1:2017, 5.5, the template shall be placed on the inside of the protector within the zone of protection.

5.5.2 Genital protectors for males

The minimum volume protected by the genital protector (see 4.3.2) shall be tested using a gauge. The shape and the dimensions of the gauge shall be identical with the values specified in Figure 2 and Table 3.

The gauge shall be placed into the inside of the genital protector within the zone of protection.

It shall be inspected if all parts of the gauge are completely within the zone of protection.

5.6 Impact performance

5.6.1 Genital protectors for females and abdominal protectors for females and males

5.6.1.1 Apparatus

The principle of impact testing is shown in Figure 7.

5.6.1.1.1 Flat horizontal steel plate, with a width of at least 300 mm, a length of at least 350 mm and a thickness of at least 20 mm shall be used as a support of the sample. In the centre of the flat plate, there shall be a cylindrical hole with a diameter of (106 ± 2) mm.

5.6.1.1.2 Cylindrical anvil, with a diameter of (100 ± 2) mm, a thickness of at least 20 mm with a flat upper surface shall be mounted on a load cell.

The surface of the anvil facing the striker shall be in level with the surface of the flat plate with a tolerance of ±1 mm.

5.6.1.1.3 **Compression ring**, made of steel with a mass of (10 ± 0,1) kg, (140 ± 4) mm internal and (260 ± 4) mm external diameter shall be used to fix the sample to the support.

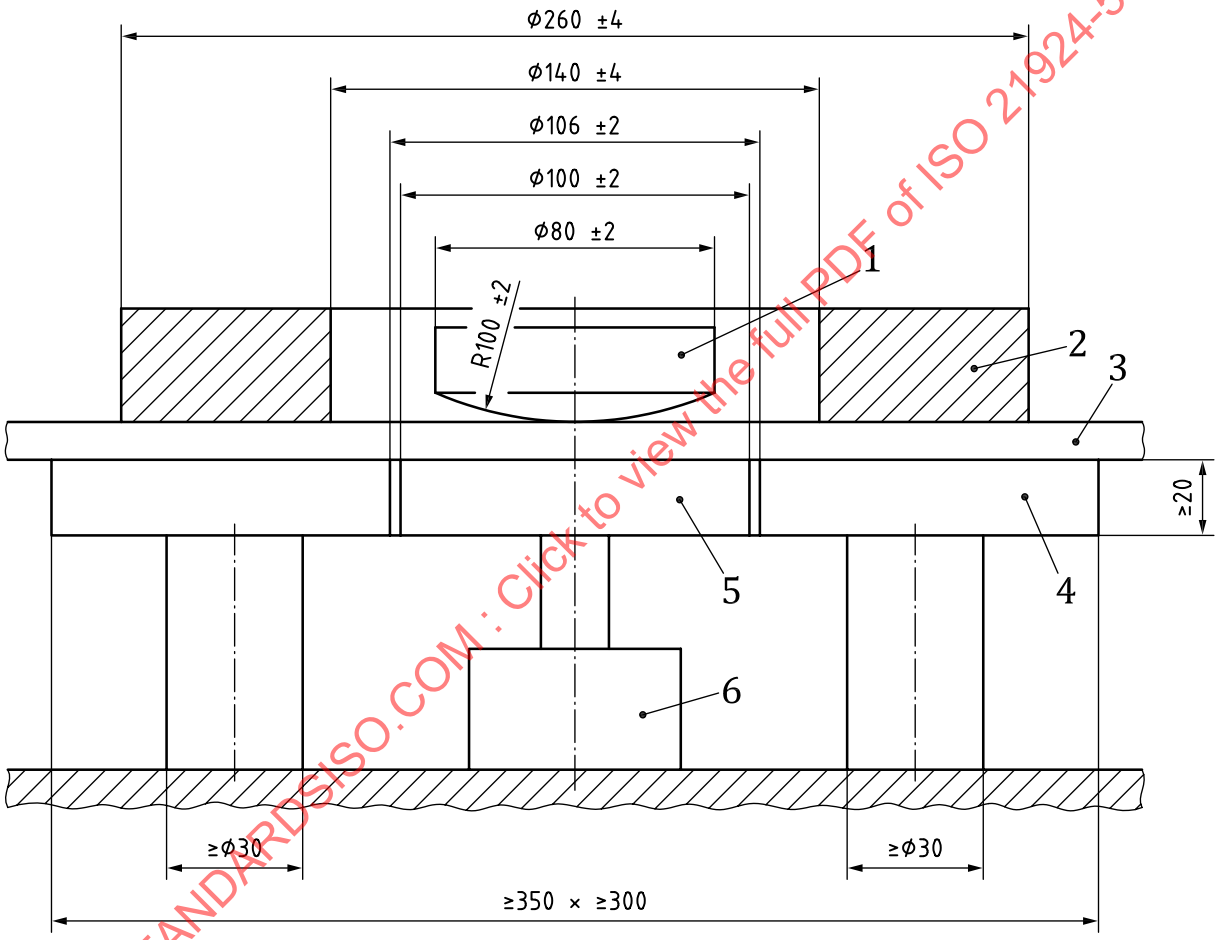
5.6.1.1.4 **Striker** shall be able to fall freely in the vertical axis of the anvil with a tolerance of ±2 mm. The striker shall be guided in such a way that it will always reach at least 95 % of the freefall velocity. A means of measuring the velocity of the striker at the point of impact shall be provided.

To measure the maximum peak force, an electric measurement device with the following characteristics shall be used:

— measurement frequency: minimum 2 000 Hz;

— accuracy class of the load cell: 0,2;

— maximum load: 10 kN.



Key

1 striker
2 compression ring
3 genital or abdominal protector
4 steel plate
5 anvil
6 load cell

Figure 7 — Principle of impact testing of genital protectors for females and abdominal protectors for females and males

5.6.1.2 Procedure

The genital or abdominal protector shall be placed on the flat support so that the test positions to be tested shall be above the centre of the anvil and shall be fixed with the compression ring.

The compressing ring shall be placed flat so that the anvil is situated in the centre of the ring with a tolerance of ±5 mm.

The genital or abdominal protector shall be moved on the support in order to reach every test position to be tested.

The gap between the genital or abdominal protector and the compression ring shall be filled with parts of the same type of the protector in such a way that the compression ring is placed horizontally.

The parts of the genital or abdominal protector used for filling shall be placed in such a way that they are not within a radius of 40 mm around the striker axis.

Three impacts with an energy of 3 J shall be carried out on each of two test positions with an interval of 2 min ± 15 s between impacts.

The test positions shall be so selected to include the positions on the genital or abdominal protector where the worst test results are assumed to be likely.

No other position previously tested shall be within a radius of 80 mm around the test position to be tested. If positions are selected to be impacted less than 80 mm distant from each other, at least two protectors of the same type shall be selected for impact testing.

5.6.2 Genital protectors for males

5.6.2.1 Apparatus

The principle of impact testing is shown in Figure 8.

The steel anvil shall be placed vertically on the top of a load cell. That anvil is also used as a support for the sample.

A plasticine cylinder with dimensions specified in Table 5 shall be positioned vertically and centred to the cylindric surface of the anvil as well as to the the striker axis with a tolerance of ±2 mm.

Table 5 — Dimensions of the plasticine cylinder

Dimensions in millimetres

Dimension	Size of the genital protector			
	S	M	L	XL
Height	15 ± 1	17 ± 1	19 ± 1	21 ± 1
Diameter	18 ± 2			

The sample shall be positioned on the top of the anvil and fixed by four connected straps with a space in the centre exposing the impact site. Each strap shall be loaded with a force of 25 N.

The striker shall fall free vertically. It shall be guided in such a way that it will always reach at least 95 % of the theoretical velocity at the point of impact to the sample. A means of measuring the velocity of the striker at the point of impact shall be provided.

To measure the maximum peak force, an electronic measurement device with the following characteristics shall be used:

— measurement frequency: minimum 2 000 Hz;

— exactness class of the load cell: 0,2;

— maximum load: 10 kN.

5.6.2.2 Procedure

Three impacts with an energy of 2 J shall be executed on each of the two test positions with an interval of 2 min ± 15 s between impacts. After each impact, the positioning of the sample shall be controlled and corrected, if necessary.

To find the test positions for impact testing, determine the area, where the protector bears in normal use when properly attached on the pubic bones. Mark the bearing area by two marks 50 mm distant from each other. The test position shall be selected between these two marks and within the vertical symmetrical plane of the protector with a tolerance of ±2 mm.

For each test, a plasticine cylinder shall be placed onto the anvil within the striker axis.

The genital protector shall be placed onto the anvil so that the symmetric axis of the protector is perpendicular to the long axis of the anvil and that the position to be tested is within the striker axis with a tolerance of ±2 mm.

The straps shall press the sample down onto the anvil.

After the third impact, the genital protector shall be removed from the apparatus. It shall be inspected for damages. The plasticine cylinder shall be inspected for deviations of more than 2 mm from its original shape.

For testing each of the test positions, new, unused genital protectors shall be taken.

