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Test methods for seam strength of textiles

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Textile Evaluation Technology Council (JTETC)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS L 1093** : 1995 is replaced with this Standard.

This revision has been made based on **ISO 13935-2** : 1999 *Textiles—Seam tensile properties of fabrics and made-up textile articles—Part 2 : Determination of maximum force to seam rupture using the grab method* for the purpose of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

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In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

Contents

Test methods for seam strength of textiles

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **ISO 13935-2** *Textiles—Seam tensile properties of fabrics and made-up textile articles—Part 2 : Determination of maximum force to seam rupture using the grab method* published in 1999 with some modifications of the technical contents.

The portions underlined with dots are the matters modified from the original International Standard. A list of modifications with the explanations is given in Annex (informative).

1 Scope This Japanese Industrial Standard specifies the test methods for seam strength of textiles.

Remarks : The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

ISO 13935-2 : 1999 *Textiles—Seam tensile properties of fabrics and made-up textile articles—Part 2 : Determination of maximum force to seam rupture using the grab method* (MOD)

2 Normative references The following standards contain provision which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 7721 *Verification and calibration of the force measuring system of the tension/compression testing machines*

JIS B 9003 *Glossary of terms used in household sewing machines*

JIS L 0105 *General principles of physical testing methods for textiles*

JIS L 0208 *Glossary of terms used in textile industry—Testing*

JIS L 1096 *Testing methods for woven fabrics*

JIS P 8112 *Paper and board—Determination of bursting strength by Müllen low-pressure tester*

JIS Z 8401 *Guide to the rounding of numbers*

3 Definitions For the purposes of this Standard, the definitions given in **JIS B 9003**, **JIS L 0105** and **JIS L 0208** apply.

4 Classification The classification shall be two classes such as grab method and bursting method.

Remarks : Usually, grab method shall be used when the specimen is woven fabrics and bursting method shall be used when the specimen is knitted fabrics.

5 Test condition The test shall be carried out at the test place specified in **4.1** of **JIS L 0105**. And, the initial load shall be load (mN) equivalent to the mass per 10 m of test specimen in the case of the sample of woven fabrics, and be 30 mN in the case of knitted fabrics.

6 Sampling and preparation of test specimen The test specimen shall be taken from the part where the kind of sewing thread and the shape of seam are same and the uniform (1) seam in sewing is obtained as follows and be made constant weight according to **4.3 (1)** of **JIS L 0105**.

a) **Grab test** The five pieces of test specimen, of which the dimensions are 10 cm in parallel direction to the seam so that the seam is positioned at the centre and not less than 15 cm in perpendicular direction to the seam, shall be taken from the sample.

Moreover, on each test specimen, a straight line shall be drawn at distance of 3.8 cm from one side of test specimen being perpendicular to the seam running the full length of test specimen so as to be perpendicular to the seam line.

b) **Bursting method** The five pieces of test specimen, of which the dimension is approximately 15 cm × 15 cm so that the seam is positioned at the centre, shall be taken from the sample.

Note (1) The sewing up direction, sewing direction, margin to seam and the number of seam per unit length are uniform.

7 Testing method

7.1 Grab method

7.1.1 Standard seam tensile strength and elongation The test of standard seam tensile strength and elongation shall be as follows.

a) The test specimen shall be mounted to the tensile tester having the precision specified in **JIS B 7721** under the following conditions as adding initial load (see figure 1).

1) The dimensional clamping area for use shall be 2.5 cm × 2.5 cm in the front side and not less than 5.1 cm × 2.5 cm in the back side similarly at the upper and lower sides.

2) The clamping interval shall be 7.6 cm or 10 cm (2) and the seam shall be positioned at the center between clamps.

b) Pull the test specimen at 30 cm/min ± 2 cm/min or 5 cm/min (3) in tensile speed, measure the tensile strength at break of seam up to three places of significant figure, measure simultaneously the elongation at break of seam up to 0.1 cm, calculate the elongation ratio from this elongation and round off to three places of significant figure according to **JIS Z 8401**.

Notes (2) In the case of testing at 10 cm in clamping interval, that shall be additionally mentioned.

(3) In the case of testing at 5 cm/min in tensile speed, that shall be additionally mentioned.

Remarks : The verification of tensile tester shall be in accordance with **JIS B 7721**.

c) Calculate the mean value of five times, and round off to three places of significant figure according to **JIS Z 8401**. Provided that remove the one when cut near the clamp.

7.1.2 Wet seam tensile strength and elongation The test of wet seam tensile strength and elongation shall be as follows.

a) Place the test specimens in a container provided separately, leave them as they are till they sink in water at 20°C ± 2°C by their own weight respectively or let them sink in water for 1 h or longer. When the woven fabrics difficult to wet are required to wet completely, an aqueous solution containing not more than 0.1 % of non-ionic surface active agent may be used. Provided that the test specimen shall be sufficiently washed prior to test.

b) Take out the test specimen from the water, carry out the test within one minute according to the same method as in **7.1.1** and obtain the tensile strength and elongation at break of seam.

Unit : cm

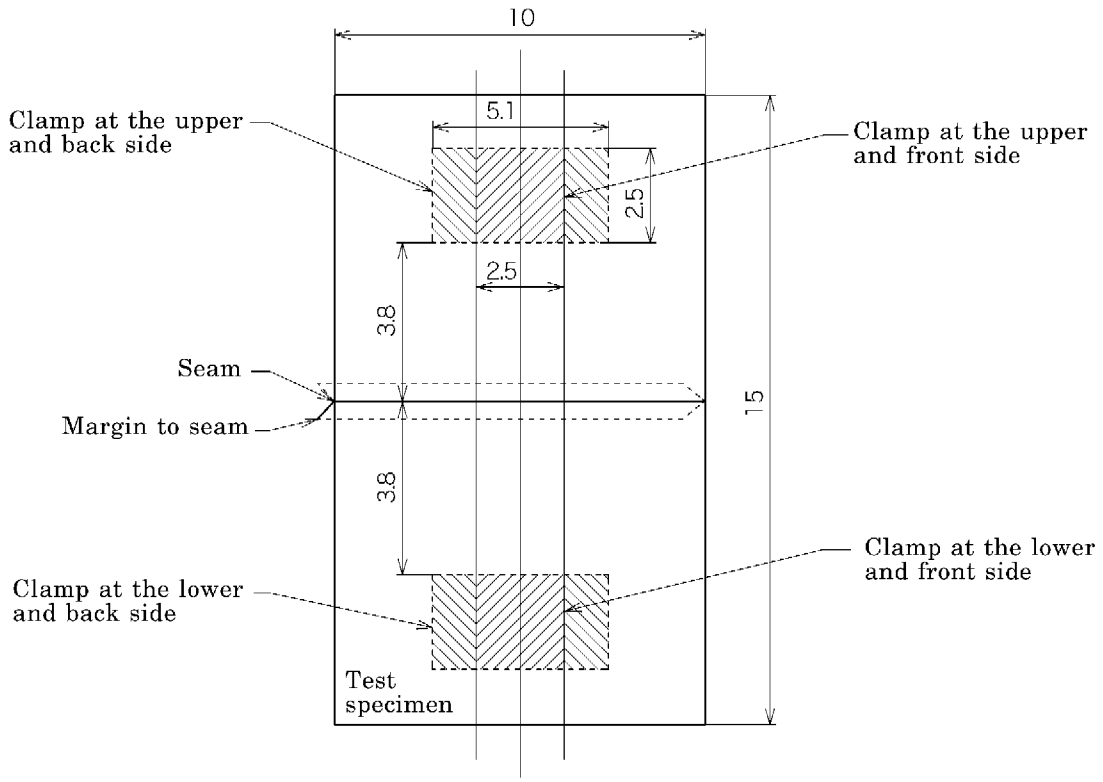

Figure 1

7.2 Bursting method

7.2.1 Standard seam bursting strength (4) The test of standard seam bursting strength shall be carried out as follows.

a) Mount the test specimen on Müllen type bursting strength tester so that the margin to seam is placed downward and the seam is positioned at the center of clamp.

Note (4) That shall be the apparatus specified in **JIS P 8112** or that having the precision equivalent or superior to this.

b) Measure the strength by which rubber membrane breaks through the seam of test specimen by adding pressure, and calculate the strength at break of seam according to the following formula.

Moreover, the diameter of clamp shall be 3.05 cm ± 0.03 cm and the increase rate of oil for adding pressure shall be 98 ml/min ± 4 ml/min. The rubber membrane of tester shall be the pure rubber material of 0.84 mm to 0.89 mm without containing mineral filler.

$$F = a - b$$

where, F : bursting strength (kPa)

a : strength of rubber membrane to break through test specimen (kPa)

b : strength of rubber membrane at removal of clamp (kPa)

Remarks : For the verification of tester, the adjustment shall be carried out by using standard aluminium. The standard aluminium specified in **8.16.1** of **JIS L 1096** [Method A (method of Müllen type)] shall be used.

c) Calculate the mean value five times and round off to three places of significant figure according to **JIS Z 8401**. Provided that remove the one when cut near the clamp.

7.2.2 Wet seam bursting strength For the wet seam bursting strength, the test specimen shall be moistened according to the similar method to **7.1.2**, then the test be carried out according to the similar method to **7.2.1** and the bursting strength be obtained.

8 Record For the record, the following information shall be mentioned.

a) Class and method of test

b) Conforming with **JIS L 1093** and date of test executed

c) Discrimination of test sample and sample preparation method (if necessary)

d) Cause of seam breakage according to the observation of test

Information : For the cause of seam breakage, the followings are included.

— breakage of sewing thread

— breakage of texture thread

— slippage of texture thread

— two or more combination of the above mentioned

e) Test results [mean value of tensile strength and elongation or bursting strength and number of testing times. As occasion demands, coefficient of variation and wet and dry strength ratio (5) are calculated and additionally mentioned.]

Note (5) The wet and dry strength ratio shall be calculated according to the following formula.

$$F_r = \frac{S_w}{S_d} \times 100$$

where, F_r : wet and dry strength ratio (%)

S_d : standard tensile strength (N)

S_w : wet tensile strength (N)

f) Name of position when the seam sample is taken from product

g) Where the seam sample is prepared from texture, sewing-up method of test specimen, margin to seam, shape of seam, number of stitches per unit length and seam direction to texture thread direction

h) As occasion demands, the kind of sewing thread, sewing machine needle

i) Used cooling device and silicone oil, etc.

j) In the case of breakage of texture part or breakage at clamping position of texture part, the individual results

k) Matter executed according to the agreement between the parties concerned with delivery

Annex (informative)

Comparison table between JIS and corresponding International Standard

JIS L 1093 : 2005 *Test methods for seam strength of textiles*		**ISO 13935-2** : 1999 *Textiles—Seam tensile properties of fabrics and made-up textiles articles —Part 2 : Determination of maximum force to seam rupture using the grab method*					
(I) Requirements in **JIS**		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between **JIS** and the International Standard by clause Location of deviation: text Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
1 Scope	Specifies the test for seam strength of textiles.	**ISO 13935 -2**	1	Specifies methods for the determination of seam maximum force of sewn seams.	MOD/addition	**JIS** specifies, also, the testing method for knitted fabrics.	The necessary clauses for **JIS** are added. It is examined to propose at next time of **ISO** standard revision.
2 Normative references	**JIS B 7721**, **JIS B 9003**, **JIS L 0105**, **JIS L 0208**, **JIS L 1096**, **JIS P 8112**, **JIS Z 8401**		2	—	MOD/addition		The necessary normative references for **JIS** are added.
	—			**EN 20139**, **EN 10002-2**, **EN 30012-1**	MOD/deletion		The unnecessary normative references for **JIS** are deleted.
3 Definitions	It shall be in accordance with **JIS B 9003**, **JIS L 0105** and **JIS L 0208**.		3	It is accordance with **EN 10935** and in addition the four clauses of term are defined.	MOD/alteration		The necessary terms for **JIS** are defined.
4 Classification	Grab method and bursting method. Usually, grab method is used for the sample of woven fabrics and bursting method is used for the sample of knitted fabrics.		1	Grab method	MOD/addition	**JIS** adds the bursting method not included in **ISO**.	Because knitted fabrics are added in the scope.

(I) Requirements in **JIS**		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between **JIS** and the International Standard by clause Location of deviation: text Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
5 Test condition	The test shall be carried out at the test place specified in **4.1** of **JIS L 0105**.		7	It shall be in accordance with **EN 20139**.	MOD/alteration	The expression method is different, however, it is same as **JIS**.	—
	Initial load to test specimen; For knitted fabrics, the load equivalent to the mass for 10 m.		7	The initial load is not applied.	MOD/alteration		It will be proposed at the next time of revision for **ISO** standard.
	30 mN for knitted fabrics.			—	MOD/addition		Because knitted fabrics are added to the scope.
6 Sampling of test specimen and preparation	The test specimen is taken from the part in which the kind of sewing thread and the shape of seam are same and the uniform seam in sewing is obtained, and made constant weight according to **4.3 (1)** of **JIS L 0105**.		5	It is approximately identical with **JIS**.	MOD/alteration	The expression is different, however, these are substantially identical.	

(I) Requirements in **JIS**		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between **JIS** and the International Standard by clause Location of deviation: text Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
6 Sampling of test specimen and preparation (continued)	a) Grab method For the test specimen, five pieces, of which the size of 10 cm in parallel direction to the seam so that the seam is positioned at the centre and of not less than 15 cm in perpendicular direction to the seam, shall be taken from the sample. On each test specimen, a straight line shall be drawn at distance of 3.8 cm from one edge running the full length of the test specimen so as to be perpendicular to the seamline.		8.2 8.3	Grab method Five or more test specimens, which have the size of 10 cm in parallel direction to the seam so that the seam is positioned at the centre and of not less than 35 cm in perpendicular direction to the seam, shall be taken from the sample. On each test specimen, a straight line shall be drawn at distance of 3.8 cm from one edge (long side) running the full length.	MOD/alteration	**JIS** specifies "five pieces of test specimen of not less than 15 cm".	There are some samples from which the test specimen cannot be taken for the dimensions of **ISO** standard. It is examined to propose at the next time of revision for **ISO** standard.
	b) Bursting method		—	—	MOD/addition		Because knitted fabrics are added to the scope.
7 Testing methods 7.1 Grab method	Specifies the testing methods. **7.1.1** Standard seam tensile strength and elongation **a) 1)** The dimensional clamping area shall be 2.5 cm × 2.5 cm in the front side and not less than 5.1 cm × 2.5 cm in the back side similarly at the upper and lower sides.		6.1.6	b) One clamp of 25 mm × 40 mm (preferably 50 mm) is positioned with the wider direction of clamp perpendicular to the line of application of the force, and the second clamp is made 25 mm × 25 mm.	MOD/alteration	The one side of clamp dimensions is 51 mm in **JIS** and 50 mm in **ISO**. The others are same.	Grab method is that which is specified in **8.12** of **JIS L1096**, therefore it is examined in accordance with the time of revision for **JIS L 1096**.

(I) Requirements in **JIS**		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between **JIS** and the International Standard by clause Location of deviation: text Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
7.1 Grab method (continued)	**a) 2)** The clamp interval is made 7.6 cm or 10 cm and made so that the seam is positioned at the centre between the clamps.		9.1	The clamp interval is 100 mm ± 1 mm.	MOD/selection		The data are taken based on the both standards and the measures are examined at the time of next revision.
	b) Tensile speed 30 cm/min ± 2 cm/min or 5 cm/min		9.2	The clamp interval is 100 mm ± 1 mm.	MOD/selection		
	c) The mean value of five times is calculated and rounded off to the three places of significant figure. The one when cut near the clamp is removed.		10	Calculation and expression of results It is made the mean value of five times and the significant figure is specified depending on the numerical value of tensile strength.	MOD/alteration	The rounding method for numerical value is different.	The method of **ISO** standard has not been adopted up to now. The data of both standards are collected and examined by the next time of revision.
	7.1.2 Wet seam tensile strength and elongation		—	—	MOD/addition		It is adopted in the test for the tent used outside, industrial materials. It is examined to propose at the time of next revision for **ISO** standard.
7.2 Bursting method	Specifies the testing method for bursting method. **7.2.1** Standard seam bursting strength **7.2.2** Wet seam bursting strength		—	—	MOD/addition		Because knitted fabrics are added to the scope.

(I) Requirements in **JIS**		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between **JIS** and the International Standard by clause Location of deviation: text Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
8 Record	Specifies the matters to be recorded.		11	Specifies the clauses to be mentioned in test report. It is approximately identical with **JIS**.	MOD/addition	**JIS** adds the clause in text such as **a)**, **h)**, **i)**.	In addition to the class of test according to the addition of knitted fabrics to the scope, the clauses necessary for **JIS** are added.

Designated degree of correspondence between **JIS** and International Standard: MOD

Remarks 1 Symbols in sub-columns of classification by clause in the above table indicate as follows:

– MOD/deletion : Deletes the specification item(s) and content(s) of International Standard.

– MOD/addition : Adds the specification item(s) and content(s) which are not included in International Standard.

– MOD/alteration : Alters the specification content(s) which are included in International Standard.

– MOD/selection : Parallel requirement(s) for specification content(s).

Remarks 2 Symbol in column of designated degree of correspondence between **JIS** and International Standard in the above table indicates as follows:

– MOD : Modifies International Standard.

Errata for JIS (English edition) are printed in *Standardization Journal*, published monthly by the Japanese Standards Association, and also provided to subscribers of JIS (English edition) in *Monthly Information*.

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