

Fabric Tearing Test (JIS L1096 Trapezoid Method)

People wear different types of clothing every day to match the season, time of day, and setting. Highly breathable T-shirts are worn on hot summer days and down jackets with excellent warmth retention properties are worn on cold winter days. People doing physical labor wear work clothes made of durable fabric that allows freedom of movement. Depending on the feature that takes priority, such as comfort, functionality, or design, different performances are needed and new clothes are being created every day according to such requirements.

Woven products must undergo strength evaluation to ensure they meet a certain level of quality. JIS L1096 (2020) describes various techniques for evaluating woven and knitted fabrics that are an essential part of our daily life; these include test methods to measure not only breaking strength and tearing strength, but also air permeability and warmth retention. JIS L1096 (2020) specifies five different tearing test methods: method A (single tongue method), method B (double tongue method), method C (trapezoid method), method D (pendulum method), and method E (ISO pendulum method).

This article describes an example case in which fabric tearing testing was performed by method C (trapezoid method).

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■ Measurement System

The test configuration is shown in Table 1. Measurements were taken on an AGS-X table-top type universal testing instrument using screw type flat grips and single file teeth grip faces to prevent slippage during the test. The test conditions are shown in Table 2. Specimens for method C were prepared by cutting out a sample of approx. 75 mm × 150 mm, and then marking an isosceles trapezoid shape as shown by the dashed lines in Fig. 1, then making a 10-mm slit on the short side of the trapezoid previously marked on the specimen. Two types of specimen were prepared; one with the longer dimension parallel to the machine direction and the other with the longer dimension parallel to the cross-machine direction.

The test setup is shown in Fig. 2. Testing was performed using grip faces that are at least 75 mm wide. The specimen was gripped so that long side of the grip face and the lateral sides of the trapezoid were matching. When first placed in the grips, the fabric on the longer side of the trapezoid was loose (Fig. 2-1) and the test was conducted until the specimen tore in two pieces from the 10-mm slit (Fig. 2-2, 2-3, and 2-4). The maximum test force measured during the test was taken as the tearing strength.

Table 2 Test Conditions

Test speed	200 mm/min
Distance between grips	25 mm
Specimen dimensions	Width 75 mm × length 150 mm 10-mm slit placed at a right angle to the specimen edge, in the center of the narrow side of the trapezoid
Specimen fabrics	(1) Gingham cloth (2) Cotton cloth (3) Sheeting cloth (4) Denim cloth
No. of tests	n=3

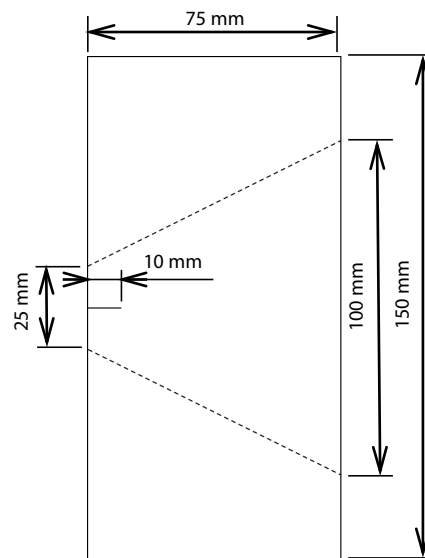


Fig. 1 Test Specimen

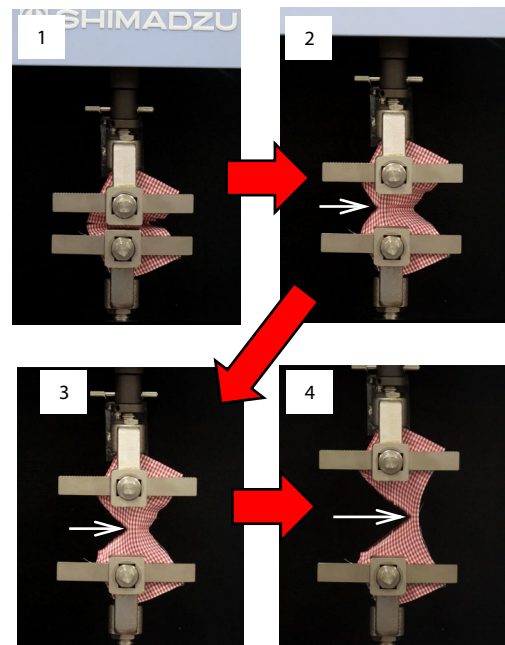


Fig. 2 Test Setup

Table 1 Equipment Configuration

Universal testing machine	AGS-X
Load cell	5 kN
Grips	5 kN screw type flat grips
Grip faces	Single file teeth grip faces (width 150 mm × length 20 mm)
Software	TRAPEZIUM™ X (Single)

■ Test Results

Examples of test results are shown in Fig. 3. Specimens longer in the machine direction were used to determine the weft tearing strength, and specimens longer in the cross-machine direction were used to determine the warp tearing strength. The test could be conducted smoothly without slippage of any specimen. A summary of the test results is shown in Fig. 4. The results showed a large difference between tearing strength in the machine direction and in the cross-machine direction for specimens (1), (3), and (4) and a small difference for specimen (2).

■ Summary

A table-top type universal testing instrument was used to perform a fabric tearing test (trapezoid method) that conformed to JIS L1096. This Shimadzu test system can be used to evaluate fabric strength.

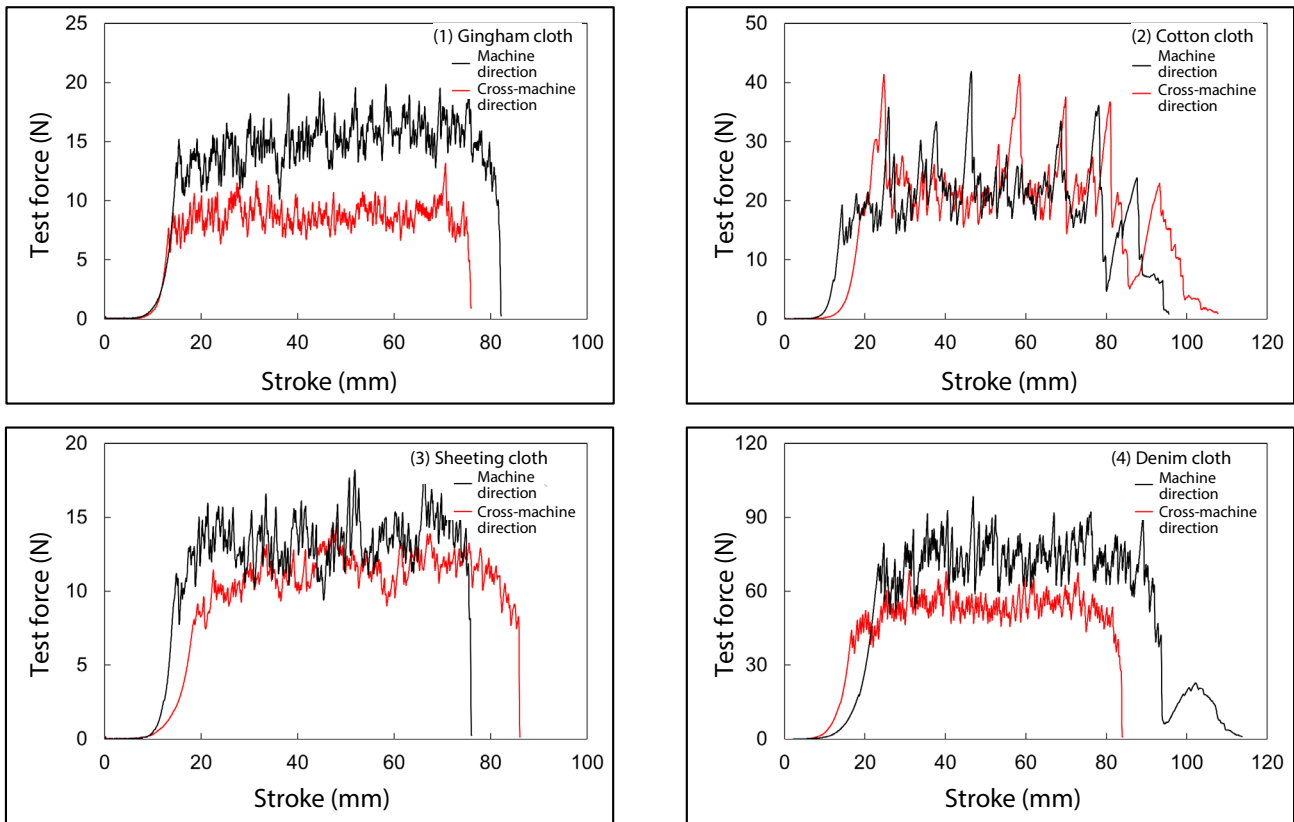


Fig. 3 Test Results

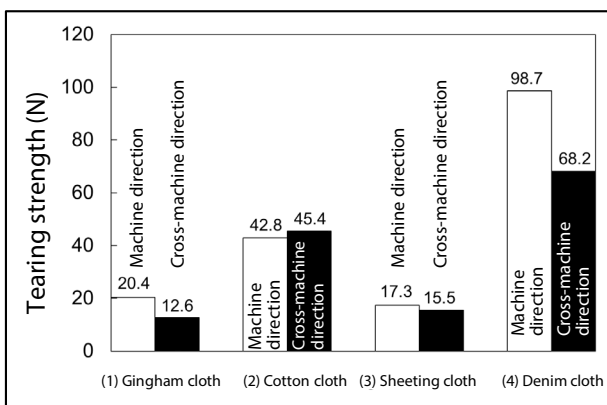


Fig. 4 Summary of Test Results (Mean Values, n = 3)

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