

Application News

No. **i288**

Material Testing Machines

Tensile Test of Fabrics (JIS L1096 Grab 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 daily life; these include test methods to measure not just breaking strength and tearing strength, but also air permeability and warmth retention. JIS L1096 (2020) specifies six different methods for breaking tests conforming to JIS and ISO. Four JIS methods includes method A (strip method), method B (grab method), method C (wet strip method), and method D (wet grab method). Two ISO methods includes method E (strip method) and method F (grab method).

This article describes an example case in which a tensile test of fabrics was performed by method B (grab 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 pneumatic flat grips. Method B specifies that the front grip face dimensions shall be at least 25 mm × 25 mm and the rear grip face at least 51 mm × 25 mm. When using grip faces with a file pattern, breakage of the specimen at the vicinity or inside the grips may occur. To prevent this, flat grip faces and wave grip faces (R1) with no file pattern were used. The test conditions are shown in Table 2. The test setup is shown in Fig. 2. Strength was evaluated for three different specimen fabrics. Two types of specimens were prepared; one with its length parallel to the machine direction and the other with its length parallel to the cross-machine direction.

Table 1 Equipment Configuration

| | |
|---------------------------|--|
| Universal testing machine | AGS-X |
| Load cell | 5 kN |
| Grips | 5 kN pneumatic flat grips |
| Grip faces | Grip faces for grab tests (flat, wave R1) |
| Software | TRAPEZIUM™ X (Single) |

Table 2 Test Conditions

| | |
|------------------------|--|
| Test speed | 300 mm/min |
| Distance between grips | 76 mm |
| Initial load | 0.1 N |
| Specimen dimensions | Width 100 mm × length 150 mm |
| Specimen fabrics | (1) Gingham cloth (2) Cotton cloth (3) Satin cloth |
| No. of tests | n=3 |

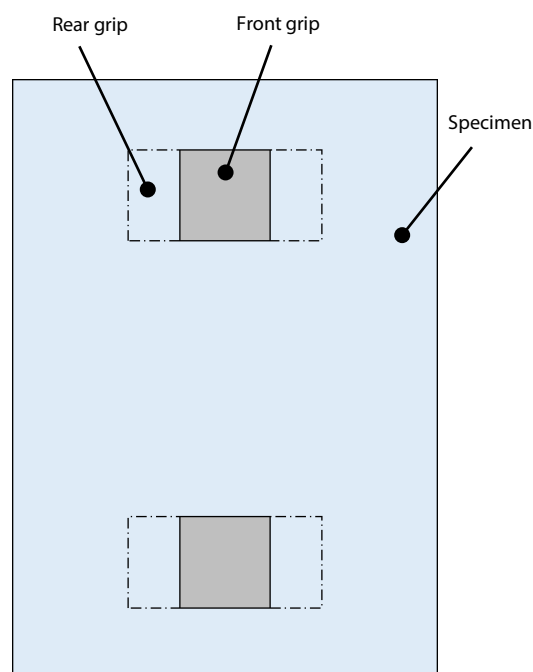


Fig. 1 Test Specimen

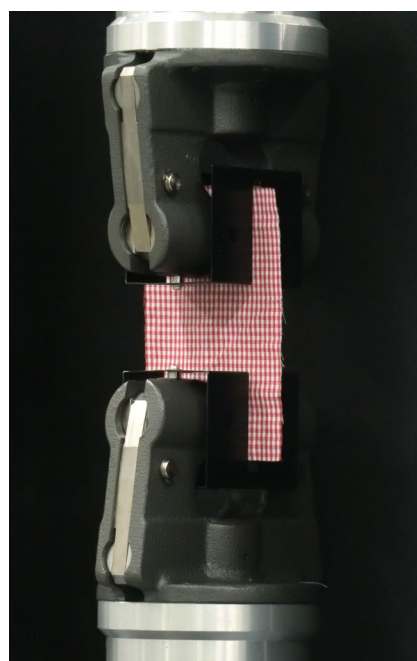


Fig. 2 Test Setup

■ Test Results

Example test results are shown in Fig. 3. JIS L1096 states: “when a specimen breaks within 10 mm of the grips or breaks in an abnormal manner, exclude it from the results.” (1) Gingham cloth was tested on flat grip faces and (2) cotton cloth and (3) satin cloth were tested on wave grip faces with cushioning material that allowed tests to conduct without the specimens breaking near the grips. A summary of the test results is shown in Fig. 4. The results showed a difference in percentage elongation between the machine direction and the cross-machine direction for all specimen fabrics. Furthermore, the results showed that compared to other specimens, the breaking strength of (3) satin cloth machine direction and cross-machine direction specimens was almost the same.

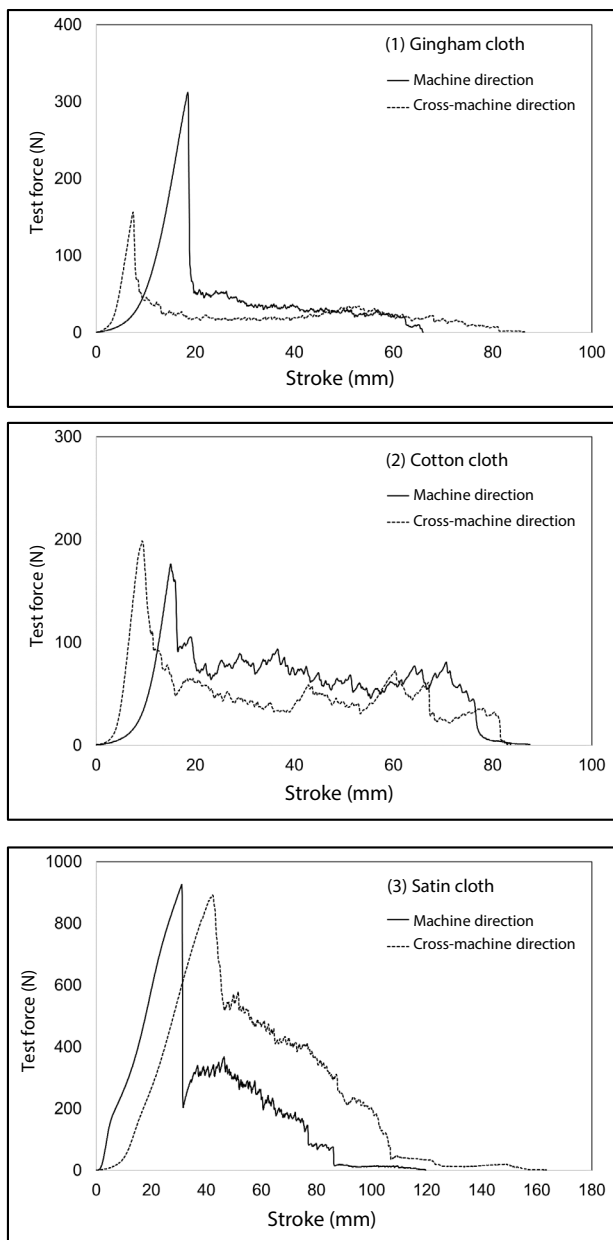


Fig. 3 Test Results

■ Summary

A table-top type universal testing instrument was used to perform a tensile test of fabrics (grab method) that conformed to JIS L1096. A correct evaluation of fabric strength requires the use of appropriate grips and grip faces during strength testing. In addition to the flat grip face and wave grip face (R1) with cushioning material described in this article, Shimadzu offers a variety of other grip faces suitable for different qualities of fabric.

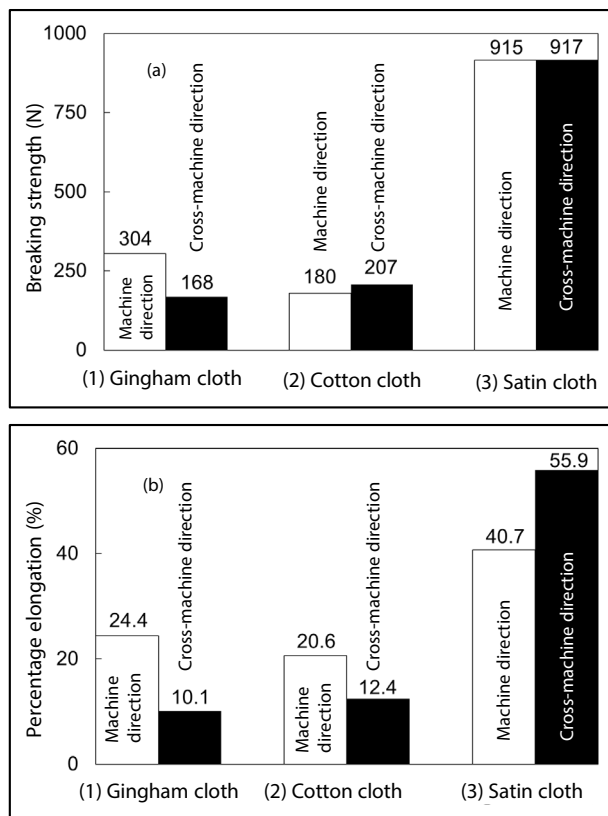


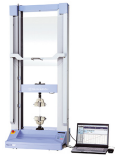
Fig. 4 Summary of Test Results (Mean Values, n = 3)
(a) Breaking Strength (b) Percentage Elongation

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