SHIMADZU
Excellence in Science

Application News

AGS-X Precision Universal Tester

Tensile Testing of Fabrics (ISO 13934-2 Grab Method)

Yuki Kamei

User Benefits

- The tensile strength of fabrics can be measured in accordance with ISO 13934-2.
- There are many kinds of grip faces, so the most suitable grip face can be selected.

■ Introduction

Every day, we change into various clothes according to the season, time of day, situation, and scene. For example, in the summer during the day we wear a T-shirt that breathes well, and in the cold winter a down jacket that keeps us warm. Also, if we work in the field, we should wear work clothes that are sturdy and easy to move in. Depending on what values are prioritized, such as comfort, functionality, and design, different performance is required for clothing, and new products are produced every day.

As clothing is a product, it requires strength evaluation to ensure a certain level of quality. ISO 13934 describes methods for measuring tensile strength of woven and knitted fabrics that are essential to our daily lives, ISO 13934-1 describes the strip method, and ISO 13934-2 describes the grab method. The advantages of the grab method are that it is easy to make the specimen and is close to the way in which force is applied during actual use. It is also said that even with the same grip size, the strength tends to be greater than that of the strip method.[1)] This article presents an example of tensile testing of fabrics in accordance with the ISO 13934-2 grab method.

■ Measurement System

Table 1 shows the test configuration. For this test, an AGS-X precision universal tester and a pneumatic type flat grip were used. Table 2 shows the test conditions.

Fig. 1 shows a schematic diagram of grab test specimen. Regarding grips, ISO 13934-2 describes the size of grip faces as “25 mm x 40 mm minimum, preferably 50 mm, on one side, 25 mm x 25 mm on the other side,” or “Positioned at right angles with 25 mm x 40 mm minimum, preferably 50mm, grip face on both sides.” In addition, “the faces of the jaws shall be smooth and flat, except that when, even with packing, the test specimen cannot be held satisfactorily with flat-faced jaws, engraved or corrugated jaws can be used to prevent slippage. Other auxiliary materials for use with either smooth or corrugated jaws to improve specimen gripping include paper, leather, plastics, or rubber.” In this test, a flat grip face was used, to prevent jaw breaks. “The width of each test specimen shall be 100mm and its length shall be long enough to secure the gauge length of 100 mm.” The specimen dimensions were 100 mm in width and long enough to secure the gauge length of 100 mm. In addition, a line parallel to either warp or weft threads was drawn at a distance 38 mm from one end of the specimen, and the specimen was mounted so that the drawn line coincides with one edge of the grips. Fig. 2 shows a photo of the test. In this case, the strength of four kinds of specimen was evaluated in the warp and weft directions.

Table 1 Test Configuration

Universal Testing Machine:	AGS-X
Load Cell:	5 kN
Grips:	Pneumatic type flat grip (5 kN)
Grip Face:	Grip Faces for Grab Tests (Flat)
Software:	TRAPEZIUM™ X (Single)

Table 2 Test Conditions

Test Speed:	50 mm/min
Gauge Length:	100 mm
Pretension:	None
Specimen Dimensions:	Width 50 mm × Length 300 mm
Kinds of Specimen:	(1) Red gingham fabric (2) Blue gingham fabric (3) Cotton hemp fabric
Number of Specimens:	n = 3

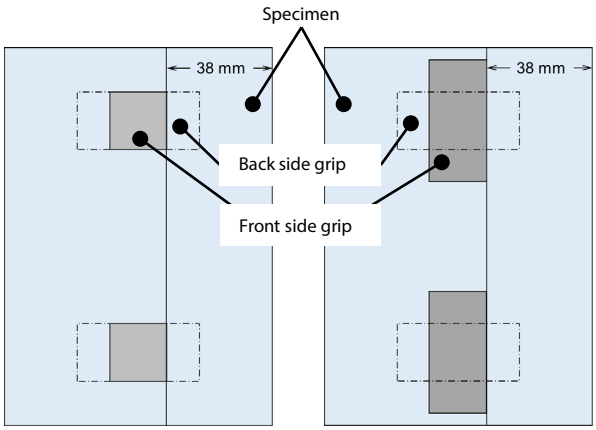

Fig. 1 Schematic Diagram of Grab Test Specimen

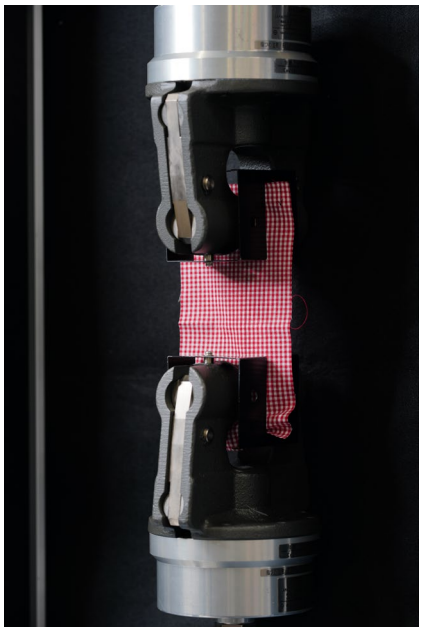

Fig. 2 Photo of the Test

■ Test Results

Fig. 3 shows the test results. ISO 13934-2 states the following criteria for determining whether a test result is included or excluded.

Jaw breaks

A break within 5 mm of the clamping line of the grips is a jaw break. If any jaw break result falls above the lowest "normal" break result, it can be included.

Using a flat grip face, it was possible to conduct the tests without a jaw break. Table 3 summarizes the test results. In these tests, it was found that there was a difference in tensile strength between warp and weft directions for specimens (1) and (2), and, on the other hand, the difference for specimen (3) was smaller than for specimens (1) and (2).

Table 3 Summary of the Test (Mean Strength of n=3)

Specimen	Direction	Strength (N)	Elongation (%)
(1) Red gingham fabric	Warp	241	24.1
	Weft	170	15.4
(2) Blue gingham fabric	Warp	229	17.1
	Weft	156	12.9
(3) Cotton hemp fabric	Warp	200	12.6
	Weft	177	22.0

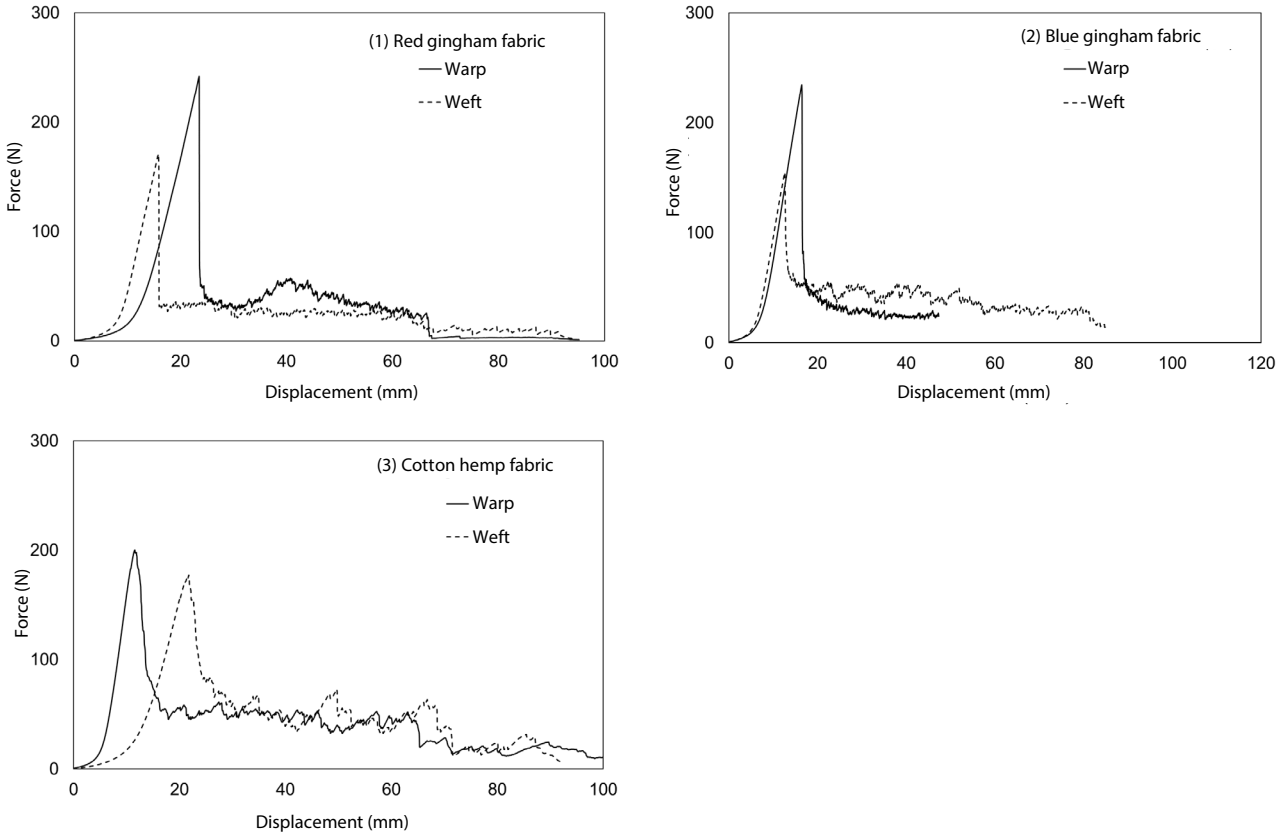

Fig. 3 Test Results

■ Conclusion

Tensile tests were conducted on fabrics in accordance with ISO 13934-2 using a precision universal testing machine. In strength tests on fabrics, it is necessary to use appropriate grips and grip face in order to evaluate the strength correctly. This article introduces an example using only flat type grip face, but in addition to this, our company can offer a variety of grip faces to suit the materials of the fabric.

References
1) Hanpei Kido and Makoto Nishizawa, Textile Products Test Introduction Edition 2, Sankyo Publishing Co., Ltd., 1983

01-00360-EN First Edition: Jun. 2022

SHIMADZU
Shimadzu Corporation
www.shimadzu.com/an/

› Please fill out the survey

Related Products Some products may be updated to newer models.

› Autograph AGS-X Series

AUTOGRAPH Table-TOP Precision Universal Tester

Related Solutions

› Textile

› Price Inquiry

› Product Inquiry

› Technical Service / Support Inquiry

› Other Inquiry