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Application News

AGS-X Precision Universal Tester

Tensile Testing of Fabrics (ISO 13934-1 Strip Method)

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User Benefits

- The tensile strength of fabrics can be measured in accordance with ISO 13934-1.
- 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 tensile strength of the strip method is proportional to the width of the fabric and the number of threads fixed by the grip, so it is suitable for considering the strength of the constituent thread.[1)]

This article presents an example of tensile testing of fabrics in accordance with the ISO 13934 -1 strip 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. For the grip, ISO 13934-1 recommends a smooth and flat grip face. However, to prevent slippage and jaw break, an engraved or corrugated grip face can be used, and other auxiliary materials can be used to improve specimen gripping including paper, leather, plastics, or rubber. In addition, if jaw breaks or slippage cannot be prevented with a flat grip, capstan grips have often been found suitable. A wave type grip face (R5) was used in this test.

Table 2 shows the test conditions. ISO 13934-1 specifies the speed for each elongation of the specimen as follows.

Elongation less than 8 %

20 mm/min (10 %/min of the gauge length 200 mm)

Elongation between 8 % and 75 %

100 mm/min (50 %/min of the gauge length 200 mm)

Elongation beyond 75 %

100 mm/min (100 %/min of the gauge length 100 mm)

As shown in Fig. 1, after the specimen was cut, approximately the same number of threads were removed from both sides of the width to obtain the predetermined width.

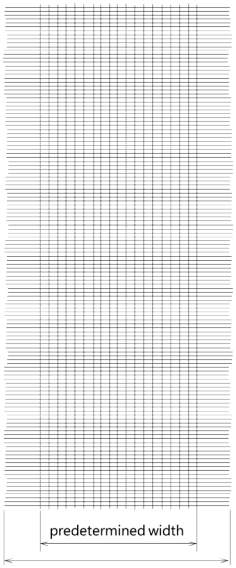
Fig. 2 shows a photo of the test. In this case, the strength of four kinds of specimen was evaluated in the warp and weft directions.

Table 1 Test Configuration

Universal Testing Machine	:	AGS-X
Load Cell	:	5 kN
Grips	:	Pneumatic type flat grip (5 kN)
Grip Face	:	Wave type grip face (R5)
Software	:	TRAPEZIUM™ X (Single)

Table 2 Test Conditions

Test Speed	:	100 mm/min
Gauge Length	:	200 mm
Pretension	:	None
Specimen Dimensions	:	Width 50 mm × Length 300 mm
Kinds of Specimen	:	(1) Red gingham fabric (2) Blue gingham fabric (3) Sheeting fabric (4) Japanese pattern fabric
Number of Specimens	:	n = 3



Width of the specimen at the time of sampling
(predetermined width + approximately 10 mm)

Fig. 1 Schematic Diagram of Strip Test Specimen

Fig. 2 Photo of the Test

■ Test Results

Fig. 3 shows the test results. ISO 13934-1 states the following criteria for determining whether a test result is included or excluded.

Slippage

If the specimen slips asymmetrically or by greater than 2 mm along the clamping line the test results should be excluded.

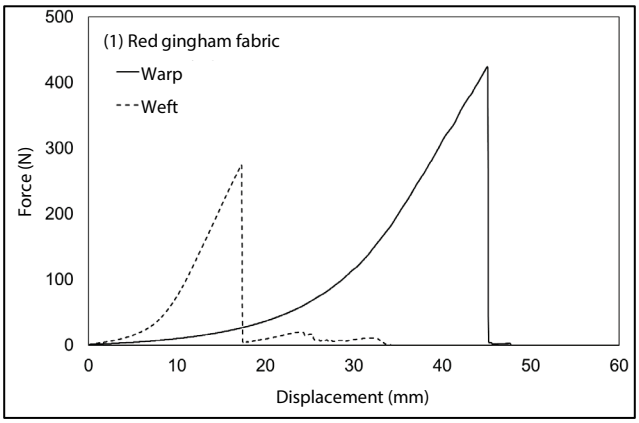
Jaw breaks

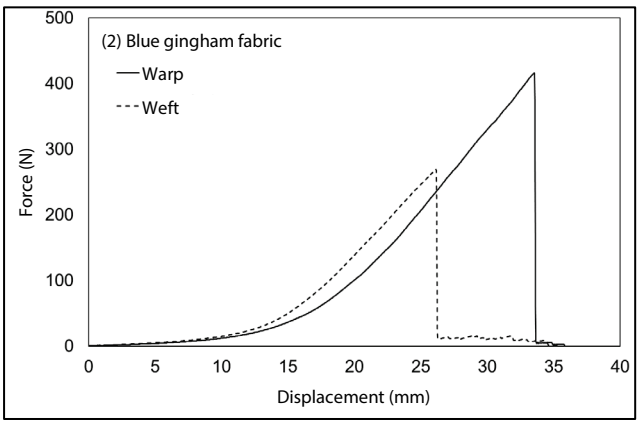
A break within 5 mm of the clamping line of the grips is a jaw break. If any jaw break result falls above the lowest "normal" break result, it can be included.

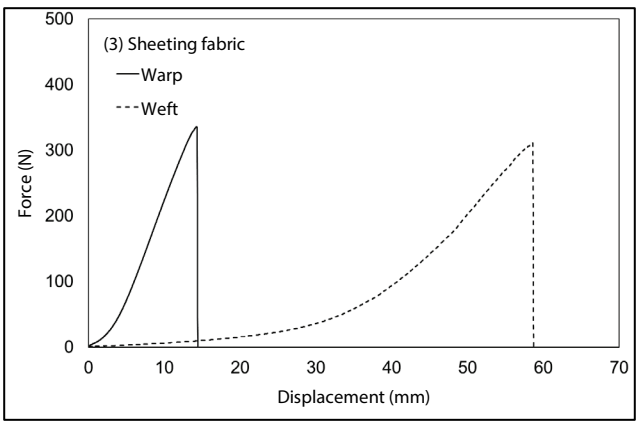
Using a wave type grip face (R5), it was possible to conduct the test without a jaw break. Table 3 summarizes the test results. In these tests, it was found that there was a difference in tensile strength between warp and weft directions for all specimens.

Table 3 Summary of the test (mean strength of n=3)

Specimen	Direction	Strength (N)	Elongation (%)
(1) Red gingham fabric	Warp	416	23.1
	Weft	268	8.91
(2) Blue gingham fabric	Warp	411	17.0
	Weft	280	13.4
(3) Sheeting fabric	Warp	333	6.99
	Weft	319	29.8
(4) Japanese pattern fabric	Warp	442	5.66
	Weft	323	34.6







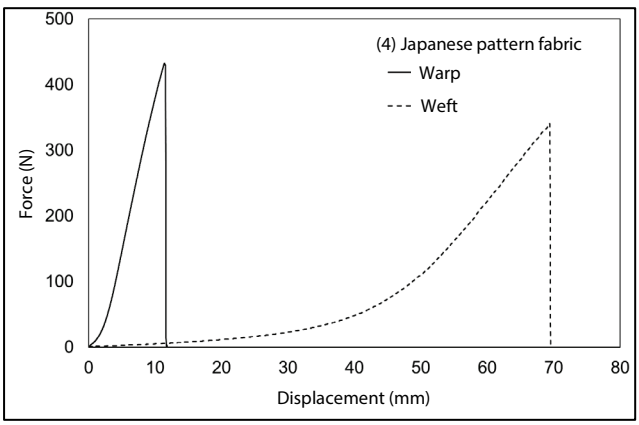


Fig. 3 Test Results

■ Conclusion

Tensile tests were conducted on fabrics in accordance with ISO 13934-1 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 wave type grip face (R5), 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

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