
**Textiles — Tests for colour fastness —
Part X19:
Colour fastness to rubbing (Gakushin
test method)**

Textiles — Essais de solidité des coloris —

*Partie X19: Solidité des coloris au frottement (Méthode d'essai
Gakushin)*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 1, *Tests for coloured textiles and colorants*.

A list of all parts in the ISO 105 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Textiles — Tests for colour fastness —

Part X19:

Colour fastness to rubbing (Gakushin test method)

1 Scope

This document specifies the test method for determining the resistance of the colour of textiles of all kinds to rubbing off and staining other materials using convex specimen stage (Gakushin test method). Two test methods are specified, one with a dry rubbing cloth and one with a wet rubbing cloth.

This document is applicable to textiles made from all kinds of fibres in the form of yarn or fabric, including textile floor coverings and other pile fabrics, whether dyed or printed.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 105-A01, *Textiles — Tests for colour fastness — Part A01: General principles of testing*

ISO 105-A03, *Textiles — Tests for colour fastness — Part A03: Grey scale for assessing staining*

ISO 105-A04, *Textiles — Tests for colour fastness — Part A04: Method for the instrumental assessment of the degree of staining of adjacent fabrics*

ISO 105-F09, *Textiles — Tests for colour fastness — Part F09: Specification for cotton rubbing cloth*

ISO 139, *Textiles — Standard atmospheres for conditioning and testing*

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 Principles

The test specimen on the convex specimen stage is rubbed by the cotton rubbing cloth fastened to the rubbing finger with a reciprocating motion. After the test is carried out, the cotton rubbing cloth is assessed by comparing with the grey scale for assessing staining or instrumentally.

5 Apparatus

5.1 Rubbing meter

Suitable testing device for determining the colour fastness to rubbing (Gakushin test method) is shown in [Figure 1](#) and [Annex A](#), consisting of convex specimen stage, rubbing finger, arm and a cycle counter with automatic stop which are specified as follows.

5.1.1 Convex specimen stage, shall be (200 ± 1) mm radius of curvature (ρ_1) and reciprocates (120 ± 3) mm with 30 reciprocations per minute. The test specimen fastened by clamps on the convex specimen stage is rubbed with the cotton rubbing cloth fastened to rubbing finger by moving to and fro in a straight line along (100 ± 3) mm track.

5.1.2 Rubbing finger, shall be a rounded surface of $(20 \pm 0,5)$ mm squares with (45 ± 1) mm radius of curvature (ρ_2) capable of being fastened the cotton rubbing cloth ([5.2](#)).

5.1.3 Arm, one end is connected to the fulcrum shaft and the other end is connected to rubbing finger. The rubbing finger shall exert a downward force of $(2 \pm 0,1)$ N and is capable of being moved along with the convex specimen stage.

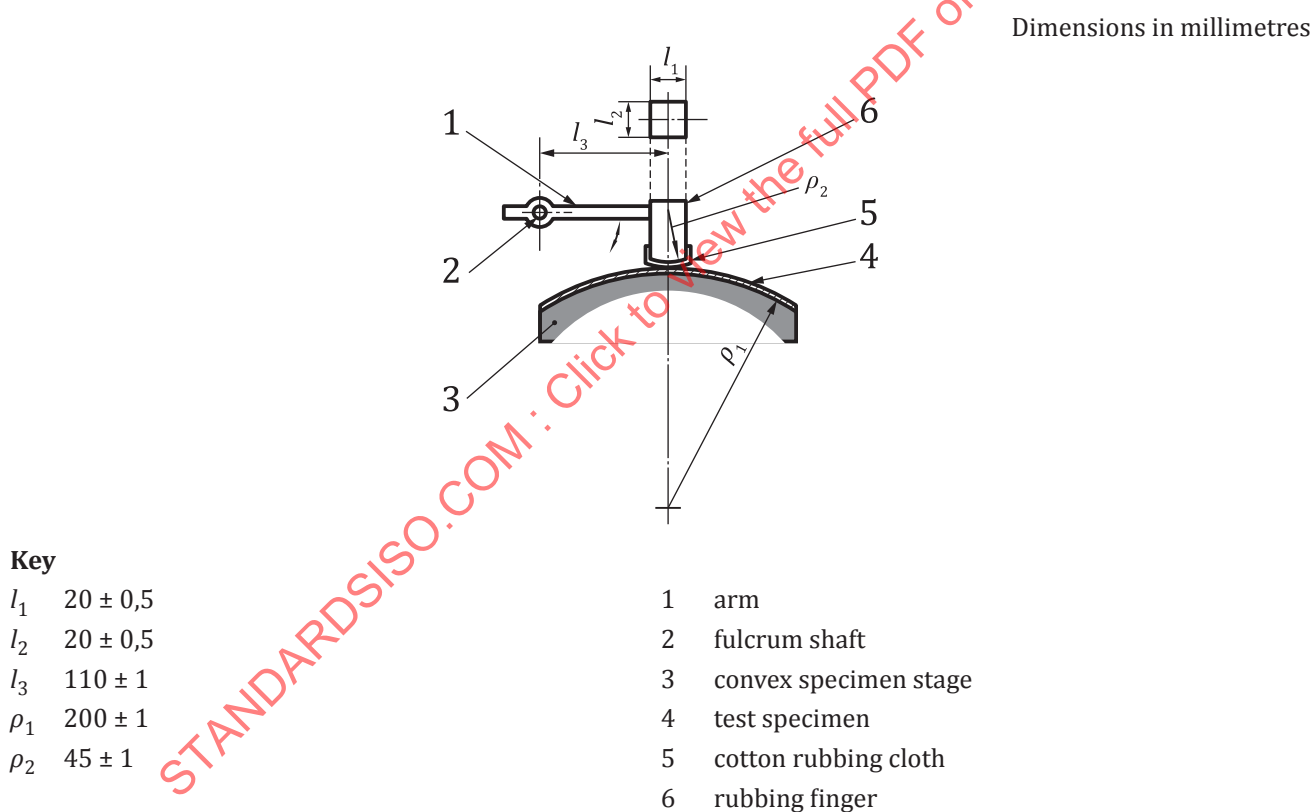


Figure 1 — Typical diagram of rubbing meter (Gakushin test method)

5.2 Cotton rubbing cloth, in accordance with ISO 105-F09, is at least 50 mm squares.

5.3 Grey scale for assessing staining, in accordance with ISO 105-A03.

5.4 Spectrophotometer or colorimeter for assessing staining, in accordance with ISO 105-A04.

5.5 Soft-back water resistant abrasive paper, recommended grain size is P320 specified in ISO 6344-1. Alternative grain size may be used by agreement between the interested parties. In this case, it shall be reported in the test report.

5.6 Double-sided tape, with the thickness not more than 0,5 mm.

6 Test specimens

6.1 If the textile to be tested is a fabric or textile floor covering, two pieces not less than 220 mm × 30 mm are required for dry rubbing and wet rubbing.

Additional test specimens may be used when higher precision is needed. One test specimen of each pair shall have the long direction parallel to the warp yarns (or in the direction of manufacture), the other parallel to the weft (or filling yarns or at right angles to the direction of manufacture). An alternate method of cutting test specimens is to cut the long dimension diagonally to warp and weft. If the pile lay of a carpet specimen is distinguishable, cut the test specimen with the pile lay pointing in the long direction.

6.2 If the textile to be tested is yarn or thread, two pieces knit it into fabric to provide test specimens of at least 220 mm × 30 mm or form a layer of parallel strands by wrapping it lengthways on a cardboard rectangle of suitable dimensions for dry rubbing and wet rubbing. Wrapped cardboard shall be adhered to the convex specimen stage.

6.3 When testing multi-coloured textiles, care should be taken to position the specimens in such a way that all colours of design are rubbed. Alternatively, if the areas of colour are sufficiently large, more test specimens may be taken, and the individual colours assessed separately.

7 Procedure

7.1 Dry rubbing test

7.1.1 Before testing, condition the test specimen and cotton rubbing cloth for at least 4 h in the temperature of $(20 \pm 2) ^\circ\text{C}$ and the relative humidity of $(65 \pm 4) \%$ in accordance with ISO 139. Any deviation from this procedure shall be reported. Conditioning is done by laying each test specimen and each piece of cotton rubbing cloth separately on a screen or perforated shelf. Some fabrics such as cotton or wool can require longer periods of conditioning.

Carry out the test at the temperature of $(20 \pm 2) ^\circ\text{C}$ and the relative humidity of $(65 \pm 4) \%$ in accordance with ISO 139.

7.1.2 Fasten each test specimen by means of clamps to the convex specimen stage so that the long direction of the test specimen follows the track of the convex specimen stage. Some specimens (for example, elastic textile, thin textile, etc.) may be wrinkled and/or moved during the test. In that case, set soft-back water resistant abrasive paper or double-sided tape between the test specimen and the convex specimen stage, it shall be reported.

Attention should be paid to the characteristics of the soft-back water resistant abrasive paper or the double-sided tape used to hold the test specimen, as they can leave an imprint through the textile which can cause a false rating to be made.

7.1.3 Fasten the cotton rubbing cloth to the rubbing finger.

7.1.4 Rub 100 times at rate of 30 reciprocations per minute. Remove the tested cotton rubbing cloth and condition as in [7.1.1](#). Remove any fibrous material that might interfere with the rating.

7.2 Wet rubbing test

7.2.1 Condition and test in the atmosphere specified in [7.1.1](#).

Weighing a conditioned cotton rubbing cloth then thoroughly soak in grade 3 water in accordance with ISO 3696. In case of other water used, it shall be reported in the test report. Reweigh to ensure take-up of 95 % to 100 %.

NOTE As the level of soak of the cotton rubbing cloth can dramatically affect ratings, other levels can be used. An example of a very commonly used level of soak is $(65 \pm 5) \%$.

7.2.2 Carry out the procedure described in [7.1.2](#) to [7.1.4](#), then air dry the cotton rubbing cloth. Remove any fibrous material that might interfere with the rating.

8 Evaluation

8.1 Back each tested cotton rubbing cloth with two or more layers of white rubbing cotton cloth while evaluating.

8.2 Assess the staining of the cotton rubbing cloth with the grey scale for assessing staining ([5.3](#)) under suitable illumination in accordance with ISO 105-A01 or instrumentally ([5.4](#)).

NOTE Precision data are shown in [Annex B](#).

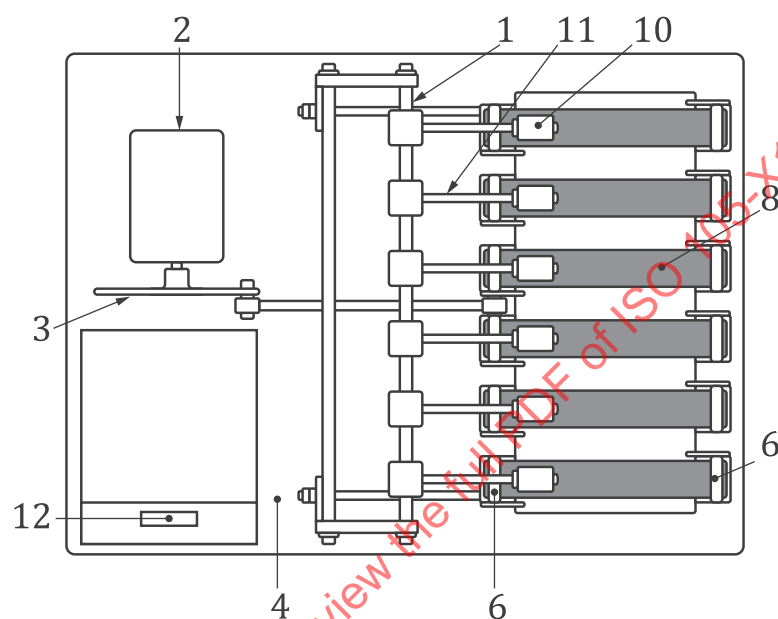
9 Test report

The test report shall contain the following information:

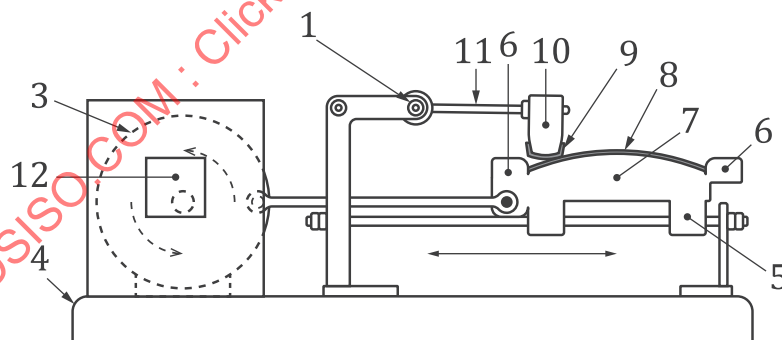
- a) a reference to this document, i.e. ISO 105-X19:2020;
- b) identification of the test specimen;
- c) whether dry or wet rubbing is performed along with the percentage of soak;
- d) the time of conditioning of the test specimens and cotton rubbing cloth as well as the atmospheric conditions during testing;
- e) identification of the long direction of the test specimen mounting, i.e. warp or weft;
- f) whether the soft-back water resistant abrasive paper (with grain size) or the double-sided tape is used;
- g) the numerical rating for staining for each test specimen;
- h) any deviation from the procedure;
- i) any unusual features observed;
- j) the date of the test.

Annex A (informative)

Typical figure of rubbing meter with six rubbing fingers (Gakushin test method)



a) Top view of rubbing meter with six rubbing fingers



b) Side view of rubbing meter with six rubbing fingers

Key

- | | | | |
|---|--------------------------|----|-----------------------|
| 1 | fulcrum shaft | 7 | convex specimen stage |
| 2 | motor | 8 | test specimen |
| 3 | crank wheel | 9 | cotton rubbing cloth |
| 4 | base | 10 | rubbing finger |
| 5 | horizontal moving device | 11 | arm |
| 6 | clamp for test specimen | 12 | cycle counter |

Figure A.1 — Typical figure of rubbing meter (Gakushin test method)

Annex B (informative)

Precision data

B.1 General

This annex describes the precision data of the interlaboratory study. The data gathered from three different rubbing meter manufacturers (Gakushin test method), six different laboratories, six different operators, four test specimens, three test methods, on different days.

For information, the data include using the crockmeter specified in ISO 105-X12 with same conditions as above.

B.2 Test specimen

The test specimens for the interlaboratory study are as follows.

- TS 1: cotton dyed with direct black;
- TS 2: cotton dyed with indigo;
- TS 3: cotton dyed with direct black (untreated);
- TS 4: cotton dyed with reactive black.

B.3 Test method

The test methods of this interlaboratory study are as follows.

- Test method 1: rubbing meter with the soft-back water resistant abrasive paper;
- Test method 2: rubbing meter with the double-sided tape;
- Test method 3 (for information): crockmeter (see ISO 105-X12) with the soft-back water resistant abrasive paper.

NOTE The test specimens were wrinkled and moved, the soft-back water resistant abrasive paper and the double-sided tape were used in this interlaboratory study.

B.4 Evaluation

The results are assessed by the grey scale for assessing staining (5.3) under suitable illumination (ISO 105-A01).

B.5 Results

The results of six laboratories are shown in [Tables B.1](#) and [B.2](#).

Table B.1 — Results of dry rubbing test

Test method	Laboratory No.	n	Result of test specimen			
			TS 1	TS 2	TS 3	TS 4
Test method 1	1	1	4-5	3	4	4-5
		2	4-5	3	4	4-5
	2	1	4-5	3	4	4-5
		2	4-5	3	3-4	3-4
	3	1	4-5	3	4	4-5
		2	4-5	3	4	4-5
	4	1	4-5	2-3	4	4-5
		2	4-5	2-3	4	4-5
	5	1	4-5	3	4	4-5
		2	4-5	3	4	4-5
	6	1	4-5	2-3	4	4-5
		2	4-5	2-3	4	4-5
Test method 2	1	1	4-5	3	4	4-5
		2	4-5	3	4	4-5
	2	1	4-5	3	3	3-4
		2	4-5	3	3	3-4
	3	1	4-5	3	4	4-5
		2	4-5	3	4	4-5
	4	1	4-5	2-3	4	4-5
		2	4-5	2-3	4	4-5
	5	1	4-5	3	4	5
		2	4-5	3	4	4-5
	6	1	4-5	2-3	4	4-5
		2	4-5	2-3	4	4-5
Test method 3 (for information)	1	1	4-5	3	4-5	4-5
		2	4-5	3	4-5	4-5
	2	1	4-5	3-4	4	4-5
		2	4-5	3-4	4-5	4-5
	3	1	4-5	3	4	4-5
		2	4-5	3	4	4-5
	4	1	4-5	3	4	5
		2	4-5	3	4	5
	5	1	5	4	4	5
		2	5	4	4	5
	6	1	4-5	2-3	4	4-5
		2	4-5	2-3	4	4-5

Table B.2 — Results of wet rubbing test

Test method	Laboratory No.	n	Result of test specimen			
			TS 1	TS 2	TS 3	TS 4
Test method 1	1	1	2-3	1-2	1-2	3
		2	2-3	1-2	1-2	3
	2	1	2-3	1-2	2	2-3
		2	2-3	1-2	2	2-3
	3	1	2-3	2	2	3
		2	2-3	2	2	3
	4	1	2-3	1-2	1-2	2-3
		2	2-3	1-2	1-2	2-3
	5	1	2-3	1-2	1-2	3
		2	2-3	1-2	1-2	3
	6	1	2	1	1-2	2-3
		2	2	1	1	2-3
Test method 2	1	1	2-3	1-2	1-2	3
		2	2-3	1-2	1-2	3
	2	1	2-3	1-2	2	2-3
		2	2-3	1-2	2	2-3
	3	1	2-3	2	2	3
		2	2-3	2	2	3
	4	1	2-3	1-2	1-2	2-3
		2	2-3	1-2	1-2	2-3
	5	1	2-3	1-2	1-2	3
		2	2-3	1-2	1-2	3
	6	1	2	1	1-2	2-3
		2	2	1	1	2-3
Test method 3 (for information)	1	1	2-3	1-2	1-2	3-4
		2	2-3	1-2	1-2	3-4
	2	1	2-3	2	2	3-4
		2	2-3	2	2	3-4
	3	1	2-3	2	2	3
		2	2-3	2	2	3
	4	1	2-3	1-2	1-2	3
		2	2-3	1-2	1-2	3
	5	1	2-3	1-2	1-2	3-4
		2	2-3	1-2	1-2	3
	6	1	2-3	1	1-2	3
		2	2-3	1	1-2	3