ISO 12945-3 Textiles — Determination of Fabric Propensity to Surface Pilling, Fuzzing, or Matting- Testing Equipment

Description

5 Apparatus and auxiliary materials
5.1 Apparatus
The apparatus shall include:
5.1.1 Device, consisting of one or several cylindrical test chambers, horizontally positioned, with the inside dimensions of (152,4 ± 1,0) mm in depth and (146,0 ± 1,0) mm in diameter. In the centre of each chamber is a horizontal shaft with cross rods (impellers) which rotate at 1 200 min?1 (see Figure 1 – The tolerance on all dimensions is ± 0,5 mm unless otherwise stated). This device shall have a mean capable of sustaining a steady movement of the test specimens (thus, avoiding jamming during the test); this functionality can be set by either an air jet (which can blow onto the cylinder wall) or plastic blades (placed on the shaft, see Figure 1, which can move physically jammed test specimens from the cylinder wall). The use of either air jet device or plastic blades shall be reported.
5.1.2 Lining material, polychloroprene liner. The polychloroprene liner shall conform to the following criteria as described in Table 1. Length and width of the polychloroprene liner shall be such that it fits securely in the test chamber without gaps or bulging.

Table 1 — Criteria for polychloroprene liner

Criteria	Units	Polychloroprene liner
Thickness	mm	3,2 ± 0,4
Hardness	IRHD[a]	60 to 70

[a] IRHD is an abbreviation for international rubber hardness degree and shall be checked according to ISO 48-2 (method N, i.e. normal test).

5.2 Auxiliary materials

5.2.1 Glue, a white waterbased allpurpose glue, for sealing the edges of the test specimens.

NOTE Generally, this kind of glue is an emulsion of polyvinyl acetate.

5.2.2 Device for cutting, test specimens square or round to provide a test area (100 ± 2) cm2.

NOTE Studies have shown that the shape of the test specimens does not influence the test results.

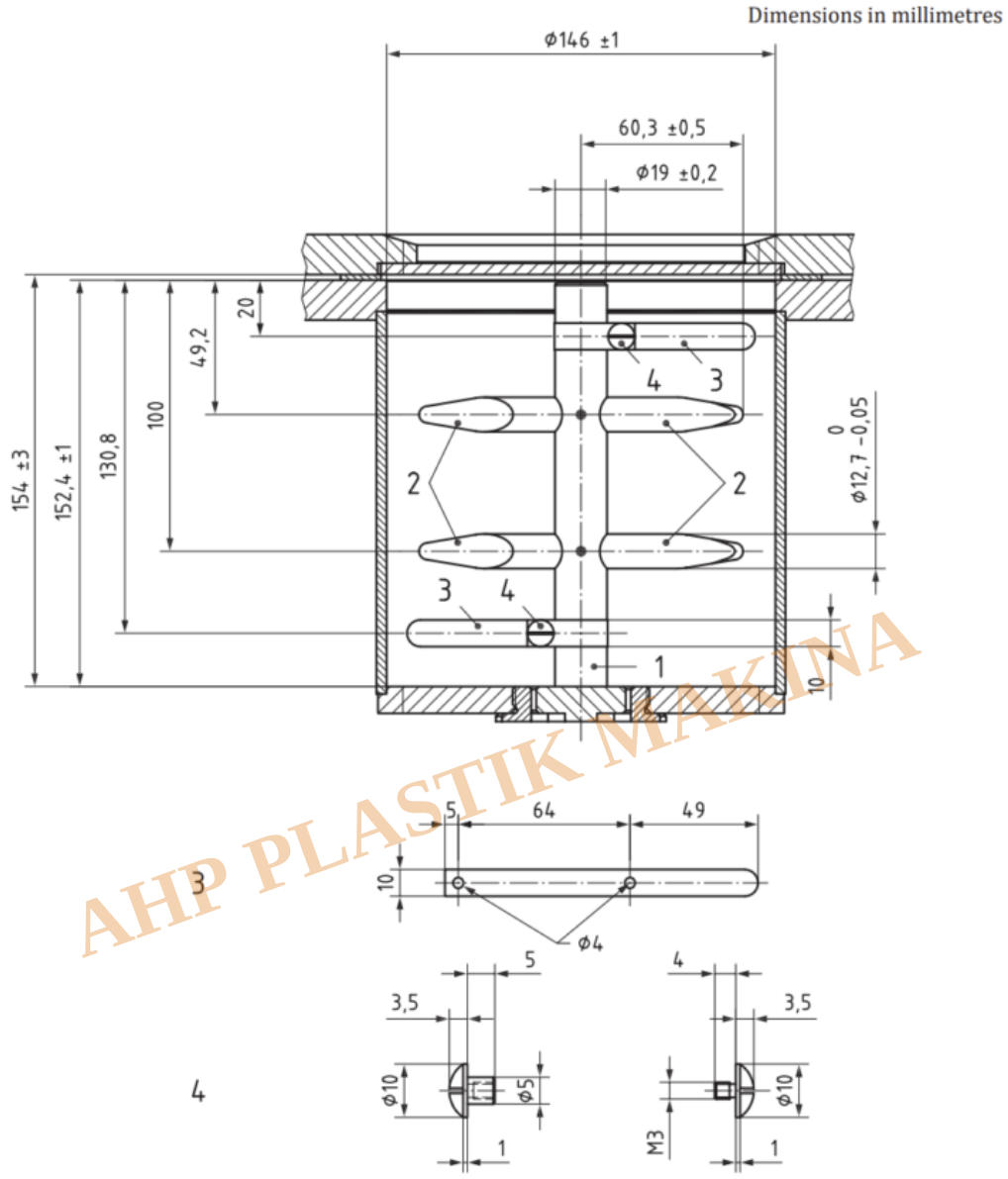
5.2.3 Rating standards (optional), a set of five photographs numbered 1 to 5 illustrating varying degrees of pilling. The photographs shall be the same size as the test specimens.

5.2.4 Cork liner (optional), if agreed upon between the interested parties, cork liner can be used instead of the polychloroprene liner (see 5.1.2).

NOTE The replacement of the polychloroprene liner by the cork liner leads to increase the testing time to

two times as specified in 9.4.

5.2.5 Cotton linters (optional), if agreed upon between the interested parties, cotton linters can be used to highlight the possible occurrence of pills.



Key

1 axis of the impeller
2 cross rods
3 plastic blades (optional) and as component in the middle view
4 cap screws and as component in the bottom view

Figure 1 — View of the testing chamber and its components

6 Preparation of test specimens

6.1 Pretreatment of the laboratory sample

Laboratory samples may be pretreated by washing or drycleaning before cutting the test specimens, using conditions appropriate for the fabric end use or conditions agreed upon between the interested parties. When pretreated, the evaluation of the tested specimen from the pretreated laboratory sample is done in comparison with that laboratory sample.

If there is no specific pretreatment agreed upon between the interested parties, the test specimen is

tested as received.
Regardless of the pretreatment, samples shall be conditioned according to Clause 8 prior to testing.
NOTE The procedures of the pretreatment described in ISO 6330 or in the respective part of ISO 3175 can be suitable (see Bibliography).
Test specimens should be laundered or drycleaned in order to protect the friction surfaces of the polychloroprene liner and cross rods from lubricants or finishes which might cause inconsistent results.

6.2 Sampling of test specimens

Take specimens from areas evenly spaced across the width of the fabric or from three different panels of a garment. Stagger specimens in such a manner that no two specimens contain the same yarns. Avoid
areas with wrinkles and other distortions. Unless otherwise specified, do not cut specimens nearer to the selvedge than onetenth the width of the fabric.
Handle the specimen by applying minimal tension to avoid stretching.
Cut test specimens in squares (105 ± 1) mm × (105 ± 1) mm on the bias at an approximate 0,78 rad (45°)
angle to the warp (wale) and weft (course) directions. Circles 100 cm2 can be used as an alternative if agreed upon between the interested parties.

6.3 Fixation of test specimen edges

In order to prevent fraying or deknitting, apply a strip of glue (5.2.1) to the edge of the test specimen not exceeding 3 mm in width when dried. Hang the test specimens in order to allow the glue to dry completely before testing (at least for 2 h).
6.4 Number of test specimens and marking
Prepare four test specimens: three test specimens for testing (and mark each of them with a number, from 1 to 3) and a fourth to serve as an untreated reference test specimen for assessment. This fourth need not have the edges secured.
For the alternative method as described in Annex B, six test specimens shall be prepared: five for testing and one for the assessment.

7 Preparation of polychloroprene liners

Both side of a polychloroprene liner can be used to carry out a test. After completion of the two testing, the polychloroprene liner shall be removed, and then cleaned and dried according to the procedure described in A.2.1.
A new polychloroprene liner shall be runin according to the procedure described in A.2.2.
The polychloroprene liner shall be discarded as soon as its use leads to significant differences in results (one or more than one grade) when testing an inhouse standard reference fabric of known pilling, fuzzing, or matting resistance.

8 Conditioning and testing atmosphere
The standard atmosphere for conditioning and testing textiles as defined in ISO 139 shall be used.
The test specimens should be conditioned for at least 16 h prior to testing.

9 Procedure

9.1 Condition the test specimens and polychloroprene liners as specified in Clause 8. Conduct all tests in the standard atmosphere for testing. Check the apparatus according to A.1.

9.2 Place the polychloroprene liner securely and smoothly inside the chamber, so that the polychloroprene liner shall not rotate against the drum when in use.
9.3 Conduct individual test runs using three test specimens from the same laboratory sample together in one test chamber.
9.4 Place the three prepared test specimens into the test chamber. Close the chamber door. Start the apparatus and run for the following total testing time (continue test time after each interval so that the total testing time is reached at each interval):
— step 1: total testing time: 5 min;
— step 2: total testing time: 15 min (10 min to be set up after the step 1);
— step 3: total testing time: 30 min (15 min to be set up after the step 2).
If total testing time of 45 min or 60 min is required, this should be mentioned in the test report.
Ensure that no hang ups occur around the impeller during a test run.
9.5 At each inspection interval, remove each test specimen from the chamber, firmly grasp the test specimen and clean off any excess fibre that is not actually entangled in pills using an air jet blowing tangentially onto the surface.
9.6 Evaluate the test specimens subjectively as described in Clause 10.
9.7 Repeat 9.4 to 9.6 until the predetermined total testing time is completed.
9.8 Clean and dry the polychloroprene liners according to A.2.1.

10 Assessment of pilling, fuzzing and matting
The visual assessment of pilling, fuzzing and matting, respectively, shall be carried out according to ISO 12945?4.
If agreed between interested parties, the assessment may be additionally carried out according to instrumental assessment.

11 Results
For each surface appearance (i.e. pilling, fuzzing, and matting), record the grade for each test specimen.
Calculate the mean result for all tested specimens for each surface appearance separately: for pilling, for fuzzing and for matting as described in Clause 10. If the mean result is not a whole number, round the
result to the nearest half-grade. The variation in the result based on the mean of three test specimens should be no more than half a grade. If this variation is more than half a grade, the grading of each test specimen shall be reported.
Table 1 shows an example of presentation of the results.

Table 1 — Example of a table with results at each assessment stage

	Pilling				Fuzzing				Matting			
testing time	result 1	result 2	result 3	**average**	result 1	result 2	result 3	**Average**	result 1	result 2	result 3	**aver-age**
5 min	Grade	Grade	Grade	**Grade**	Grade	Grade	Grade	**Grade**	Grade	Grade	Grade	**Grade**
15 min	Grade	Grade	Grade	**Grade**	Grade	Grade	Grade	**Grade**	Grade	Grade	Grade	**Grade**
30 min	Grade	Grade	Grade	**Grade**	Grade	Grade	Grade	**Grade**	Grade	Grade	Grade	**Grade**

Checking of apparatus and preparation of liners

A.1 Checking of apparatus
A.1.1 Checking of test apparatus can be done inhouse or by the service department of the equipment supplier. Check timer, tension of belt transmission, rotor revolutions. In case of the chamber with air injection, check the air pressure.
A.1.2 For checking of the function of the apparatus, use an inhouse standard reference fabric of known pilling resistance. Apply test requirements to be used for this test.
A.1.3 The frequency of checking the apparatus depends on the frequency of use. If used daily, check monthly. If used infrequently, check before the start of a new test series.

A.2 Preparation of liners
A.2.1 Cleaning and drying of polychloroprene liners
Prepare the cleaning paste, by mixing IEC reference detergent A (nonphosphate detergent with optical brightener and with enzymes, described as “reference detergent 2” in ISO 6330) with lukewarm water at 70:100 to 80:100 by weight (ratio: water/detergent).
Brush polychloroprene liners carefully with a polyamide hairbrush and with the cleaning paste and lukewarm water.
Rinse thoroughly with water.
Repeat this procedure three times for new polychloroprene liners before the runningin procedure according to A.2.2.
After runningin or after use for testing of each side of the polychloroprene liner, perform this operation of cleaning and drying once before reusing the polychloroprene liner.
Let polychloroprene liners dry in ambient atmosphere and condition in the standard atmosphere for testing.
A.2.2 Runningin of new polychloroprene liners
Perform a blank test with three test specimens of the standard reference inhouse fabric, preferably a desized and scoured or bleached cotton twill fabric (a mass per unit area of 150 g/m2 has been found suitable). The test should be run for 3 h without interruption. At the end of the test, clean and dry the polychloroprene liners once according to A.2.1.

Alternative procedure
B.1 Principle
The procedure described in Clause 9 leads to run the testing always with the same three test specimens
and leads to take out the three test specimens to assess them and place them again in the testing chamber and run again. In order to optimize the testing time, the alternative procedure is intended to replace one tested test specimen by a new one at each stage.
B.2 Number of test specimens and marking
Prepare six test specimens, five test specimens for testing (and mark each of them with numbers, from 1 to 5) and a sixth to serve as an untreated reference test specimen for assessment. This sixth does not
need having the edges secured.
B.3 Alternative procedure
Proceed as described in Clause 9 but placing the following test specimens according to the Table B.1.

Assess the five test specimens according to Clause 10, but no mean calculation is required.
The subsequent assessments represent the evolution of the pilling/fuzzing/matting in relation to the

duration of the testing time, as summarized in Table B.2.

Table B.1 — Alternative procedure

Stages	Total testing time (min)	Number of the test specimens
1st step	5	1, 2, and 3
2nd step	15	2, 3, and 4 (1 is out and 4 is in)
3rd step	30	3, 4, and 5 (2 is out and 5 is in)

Table B.2 — Duration of the testing time

Number of the test specimen	Duration of the testing time (min)
1	5
2	15
3	30
4	25
5	15

Rationale

The methods based on respectively the use of “pilling box” (see ISO 12945?1) and “RTPT” (this document) are more appropriate for testing knitted fabrics. In these cases, the change of the surface appearance is obtained by random checks of the test specimens against mild abrasive surfaces (cork liner or polychloroprene liner).

Especially, the “RTPT” method is more appropriate for heavy gauge knitwear like pullovers, as well as napped fabric, as it better reflects what can occur during the wear than the pilling box (see ISO 12945?1).

Moreover, napped fabric (fleece) products cannot be graded according to the grading table related to pilling because the surface appearance after testing is something different from pilling (sometimes called “sheep like” or matting) and therefore requires a specific scale of grading (see Figures C.1 to C.2),

as described in ISO 12945?4.

In comparison with ISO 12945?1 and ISO 12945?2, the method, as described in this document, gives the possibility to show the evolution of the surface appearance in relation to the duration (after 5 min, 15 min, and 30 min).

On another hand, the method based on “modified Martindale” (see ISO 12945?2) is more appropriate for testing woven fabrics. In this case, the change of the surface appearance is obtained by systematic rubbing of the test specimens against another fabric surface (made of the same fabric of the test specimens or made of reference abrasive fabric).

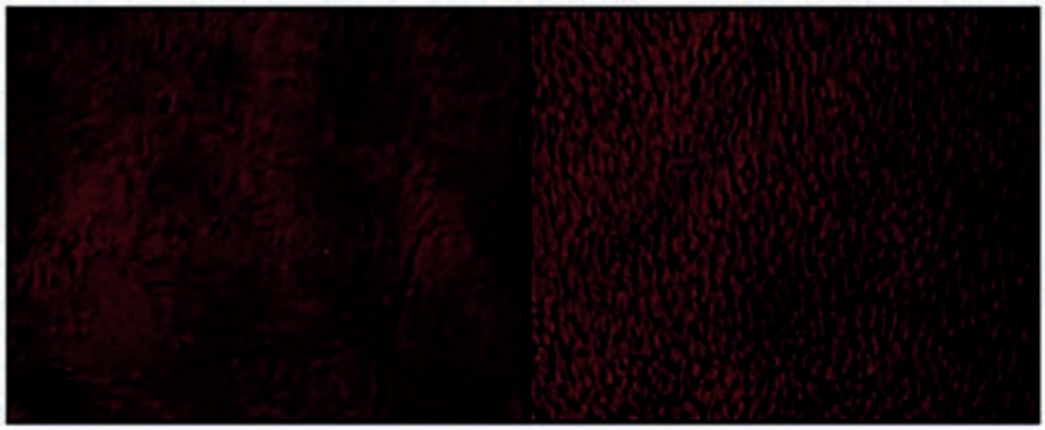


Figure C.1 — Example of matting appearance of napped fabric (front side): original (left) versus matting appearance (right)

Figure C.2 — Example of matting appearance of napped fabric (back side): original (left) versus matting appearance(right)

Random Tumble Pilling Tester

Product Details

- The longstanding standard instrument for the **ASTM D3512, ISO 12945-3** Test Methods
- **Lights** inside each sample chamber allow clear viewing of the test in progress

- **Compressed air** is injected into the test chambers to assist the tumbling action
- Cork liners are cut to size to fit **securely** inside sample chambers
- Available with either **2** or **4** testing chambers to best meet your required testing needs (Basic model is 2 station)
- Controls are easily **accessible** for testing and illuminating the sample chambers
- Four-digit timer display indicates minutes: seconds and has a maximum setting of **99.59** (mm:ss)
- **Air pressure** display
- Tumble diameter 146mm
- Tumble length 152mm
- Cork liner dimension 452*146*1.5 mm
- Rotational speed 1200 rpm
- Stirring rod length 121mm
- Specimen size 105*105mm
- Aire pressure 0.014 MPa

Category

1. Equipment for Standards
2. Standards