Cooperation Centre for Scientific Research Relative to Tobacco

Physical Test Methods Sub-Group

CORESTA Recommended Method No. 90

DETERMINATION OF DRY AND WET SEALING STRENGTH OF POUCHES FOR SMOKELESS TOBACCO AND DERIVATIVE PRODUCTS – DEFINITIONS AND MEASUREMENT PRINCIPLES

June 2019

CORESTA RECOMMENDED METHOD Nº 90

Title:

DETERMINATION OF WET AND DRY SEALING STRENGTH OF POUCHES FOR TOBACCO AND DERIVATIVE PRODUCTS – DEFINITIONS AND MEASUREMENT PRINCIPLES

Status: Valid

Note:

Document history:

Date of review	**Information**
March 2019	Version 1
June 2019	Version 2 – Update of r&R data

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DETERMINATION OF DRY AND WET SEALING STRENGTH OF POUCHES FOR TOBACCO AND DERIVATIVE PRODUCTS - DEFINITIONS AND MEASUREMENT PRINCIPLES

(June 2019)

1. SCOPE

This CORESTA Recommended Method specifies a physical test method for the determination of dry and wet sealing strength of pouches for smokeless tobacco and derivative products (SADP).

2. NORMATIVE REFERENCES

All CORESTA Recommended Methods are subject to revision and parties to agreements based on these Recommended Methods are encouraged to investigate the possibility of applying the most recent editions of the methods indicated below.

CORESTA Recommended Method N° 21
Atmosphere for conditioning and testing tobacco and tobacco products.

ISO 3402
Tobacco and tobacco products – Atmosphere for conditioning and testing.

ISO 7500-1
Metallic materials – Calibration and verification of static uniaxial testing machines Part 1: Tension/compression testing machines – Calibration and verification of the force measuring system.

ISO 376
Metallic materials – Calibration of force-proving instruments used for the verification of uniaxial testing machines.

ISO 9073-3
Textiles – Test methods for nonwovens – Part 3: Determination of tensile strength and elongation.

3. DEFINITIONS

3.1 SADP Pouch
A small, porous sealed bag containing smokeless tobacco or derivative products.

3.2 Seam
Where two or more layers of the material used for SADP pouch are sealed together.

3.3 Sealing Strength
The strength of the seam holding together the layers of material used for SADP pouch.

3.4 Longitudinal Seam Sample
The middle seam which holds together two layers of material and which is cut out directly from a pouch, see, for example, Figure 1a.

3.5 Cross Seam Sample
The cross seam converges on the horizontal and vertical seam which is cut out directly from the pouch after removal of the SADP, see, for example, Figure 1b.

3.6 Maximum Force
The highest measured force at which the seam fails through breaking or peeling during the performance of one test.

3.7 Average Tensile Force
The average value of the tensile force used to break the seam over the distance travelled whilst under shear or peel during the performance of one test.

3.8 Clamping Jaws
The clamping arms of a device that pulls the longitudinal seam sample or the cross seam sample apart without slipping.

3.9 Jaw Separation
The distance between the upper and lower jaws prior to testing.

3.10 Separation Speed
The speed at which the longitudinal seam sample or the cross seam sample is pulled apart.

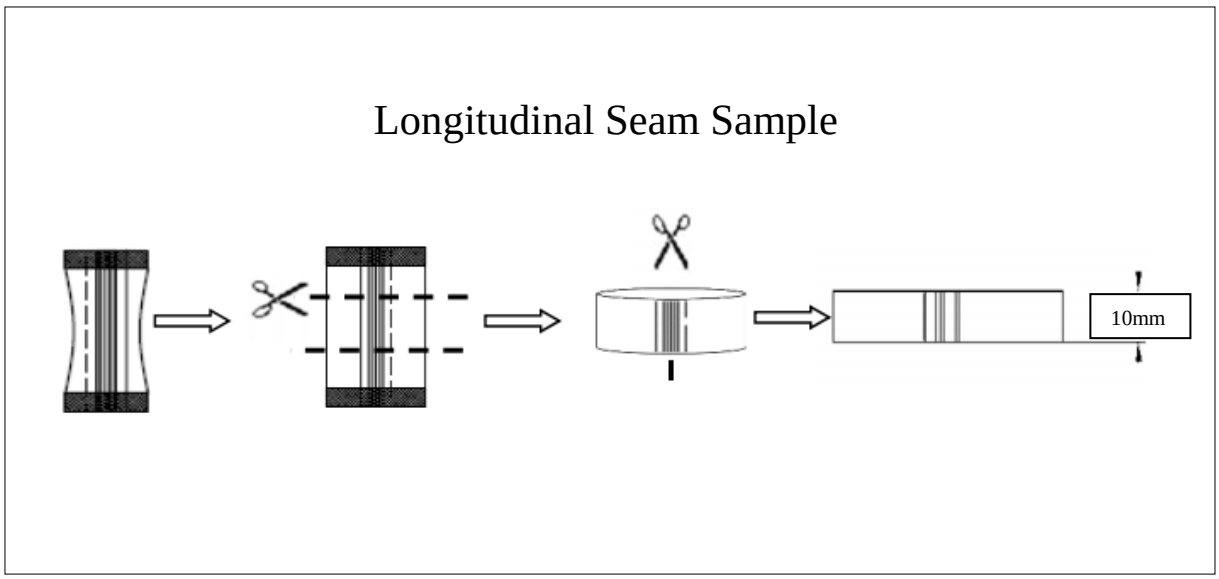

Figure 1a

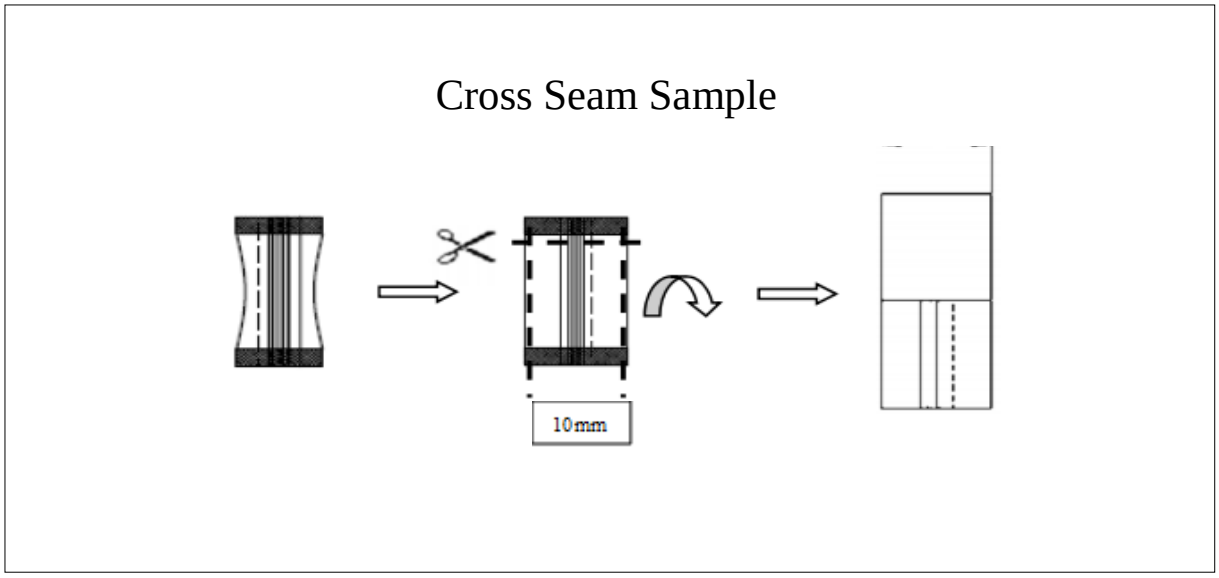

Figure 1b

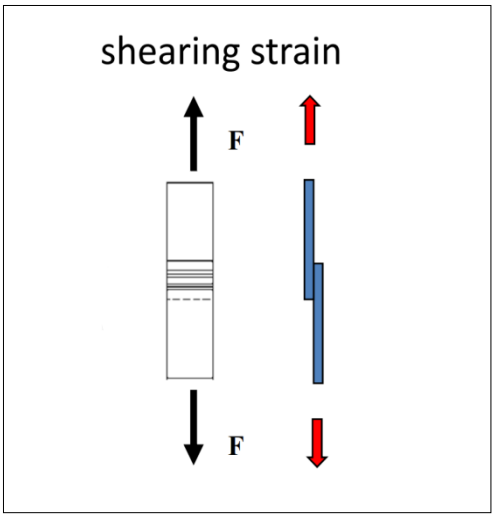

Figure 1c

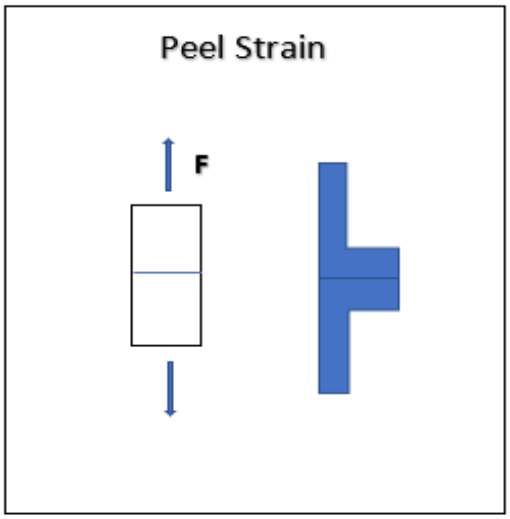

Figure 1d

4. PRINCIPLE

4.1 Dry Measurement

A conditioned longitudinal seam sample or cross seam sample is clamped between vertically aligned clamping jaws, with the seam of each sample being placed in the middle of the jaws. The sample is pulled apart in the vertical direction. During the process the maximum force and the average force are measured.

4.2 Wet Measurement

A conditioned longitudinal seam sample or cross seam sample is dipped into demineralized water for a time period of 60 minutes and excess water is removed by blotting with a paper towel in accordance with ISO 9073-3. The sample is clamped between vertically aligned clamping jaws, with the seam of each sample being placed in the middle of the jaws. The sample is pulled apart in the vertical direction. During the process the maximum force and the average force are measured.

5. SAMPLE PREPARATION AND CONDITIONING

5.1 A longitudinal seam sample shall be cut out of a SADP pouch after removal of the SADP according to Figure 1a. The width of the cut-out sample shall be 10 mm ± 1 mm. Alternatively, pouches can be cut to their maximum possible width by cutting off the sealed edges of the pouch on both sides. Record the width.

Prior to measurement the cut-out samples shall be conditioned in an atmosphere as specified in ISO 3402 or CRM 21 (temperature 22 °C ± 1 °C, relative humidity (60 % ± 3 %)).

5.2 A cross seam sample shall be cut at the edges of the pouch after removal of the SADP according to Figure 1b. The width of each sample is limited by the dimensions of the accordant sample. Record the width.

Prior to measurement the cut-out samples shall be conditioned in an atmosphere as specified in ISO 3402 or CRM 21 (temperature 22 °C ± 1 °C, relative humidity (60 % ± 3 %)).

6. APPARATUS

6.1 The apparatus used shall allow the vertical separation of the sample with a constant but adjustable separation speed to determine the maximum force and the average tensile force. The pulling direction shall be vertical with both separation jaws and sample, being aligned on the same vertical axis.

6.2 The SADP Pouch sample shall be held in between the clamping jaws with the seam being positioned approximately in the middle between the upper and lower jaws as shown in Figure 2.

6.3 The clamping jaws used to grip the samples shall be sized and positioned appropriately to the dimensions of the sample. Each jaw shall exceed the sample in width by a minimum of 5 mm. The clamping jaws shall be capable to grip and pinch the sample at top and bottom using mechanical, pneumatic or electrical pinching.

6.4 The jaw separation shall be 15 mm ± 0,1 mm. For the case of a total cut pouch length being less than 15 mm, a jaw separation of 10 mm ± 0,1 mm can be used. To place the sample into the clamping jaws, the operator may use his/her hands or tweezers.

6.5 The jaw separation speed shall be adjustable over a range of 0,001 mm/min to 2000 mm/min with an accuracy of the set speed not exceeding 1 % of the nominal speed.
For the test a separation speed of 20 mm/min shall be used.

6.6 It is recommended to use a pre-load of 0,1 N.

6.7 The apparatus used for the determination of the seam strength shall operate and be calibrated in a vertical orientation as shown in Figure 2.

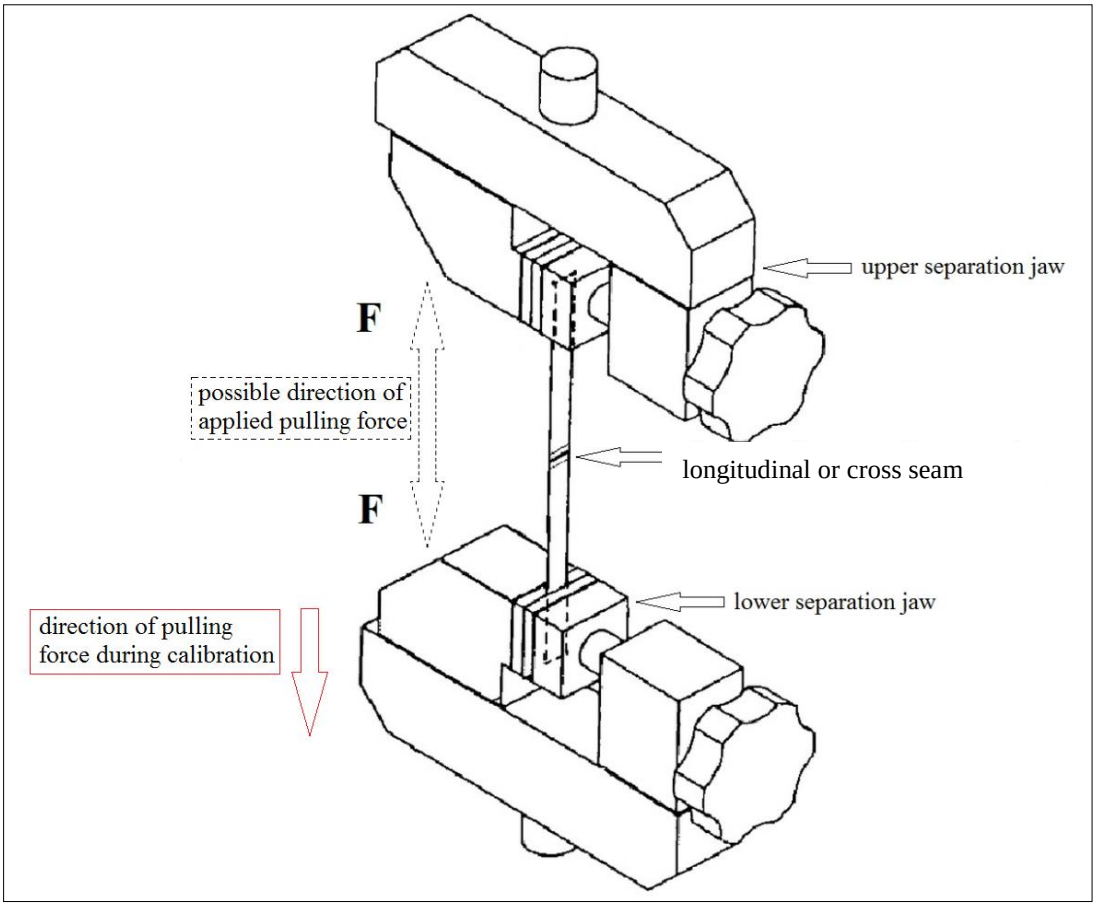

Figure 2 – Schematic for SADP pouch seam strength determination

7. SAMPLING

A sample shall be taken which is representative, on a statistical basis, of the population to be characterised.

Ten (10) replicate measurements are recommended for each determination of sealing strength.

Samples shall be free of visible defects and additional creases. Defective samples are not to be tested.

8. CALIBRATION OF APPARATUS

The measurement device shall be calibrated in accordance with the manufacturer's recommendations, ensuring the calibration procedure is carried out in accordance with ISO 7500-1 and ISO 376.

9. PROCEDURE

9.1 Conditioning of SADP Pouch Samples

Condition the pouch samples selected for the test as specified in 5.1 or 5.2.

9.2 Calibration

Calibrate the measurement device using calibration standards and calibration procedure in accordance with section 8.

9.3 Measurement of Cross or Longitudinal Seam Samples

Ensure that the measurement apparatus has been adjusted to suit the dimensions of the pouch samples to be measured as stated under 6.4.

Insert the pouch samples to be tested between the clamping jaws with the seam being positioned approximately in the middle between the upper and lower jaws and operate the apparatus in accordance with the manufacturer's instructions.

The reported value of sealing strength can be assessed in two ways:

1. The average value of the force to break the seam can be determined by taking an average of the peaks and troughs present in the stress/strain diagram over 10 equidistant points and expressed as an average tensile force in N/mm or;
2. If a stress-strain diagram is not available, the maximum force recorded by the apparatus and expressed in N/mm can be taken as the sealing strength.

Record the testing parameters used.

10. EXPRESSION OF RESULTS

The sealing strength shall be expressed in N/mm showing each individual result as well as the mean value, minimum, maximum and standard deviation for each set of trials. Recording a stress-strain diagram is optional but not required.

The environmental conditions of the test shall be mentioned in the test report.

The results shall be expressed as follows:

a) Individual values and mean value of the results taken from the measurement of the sealing strength shall be shown to four decimal places.

b) The standard deviation shall be expressed to four decimal places.

c) Comments as to the mode of failure shall be classified into breaking or peeling, an additional remark is required if the seal remains intact and the material has torn.

The test report shall include the number of SADP pouch samples and all necessary information for complete identification of the samples and shall specify the method used and the results obtained. It shall also mention any operating details not specified in this CRM or regarded as optional, together with details of any deviations from the standard. The report must also include the environmental conditions measured at time of testing.

11. PRECISION

An international inter-laboratory study involving 7 laboratories has been carried out in 2018 to determine repeatability and reproducibility statistics of this test method. A pouch sample was distributed to the participating laboratories and each laboratory made ten measurements of dry and wet sealing strength in cross direction and in longitudinal direction. Table 1 shows the mean value (MV), and for repeatability and reproducibility the standard deviation (StD), the limit and the coefficient of variation (CoV) for a single measurement of sealing strength.

Table 1 – Mean value (MV), repeatability and reproducibility statistics of a single measurement

	Sealing Strength						
		Repeatability			**Reproducibility**		
	MV	**StD**	**Limit**	**CoV**	**StD**	**Limit**	**CoV**
	N/mm	**N/mm**	**N/mm**	**%**	**N/mm**	**N/mm**	**%**
Dry, Cross Direction	0,1219	0,0174	0,0493	14,33	0,0319	0,0903	26,22
Dry, Longitudinal Direction	0,2280	0,0274	0,0776	12,04	0,0444	0,1256	19,48
Wet, Cross Direction	0,0516	0,0083	0,0234	16,03	0,0127	0,0360	24,69
Wet, Longitudinal Direction	0,0888	0,0092	0,0260	10,96	0,0191	0,0541	22,83

For a determination of sealing strength calculated from ten individual measurements, the repeatability and reproducibility standard deviation (StD), the limit and the coefficient of variation (CoV) can be estimated from the values of Table 1 and are provided in Table 2.

Table 2 – Mean value (MV), repeatability and reproducibility statistics of an average of 10 individual measurements

	Sealing Strength						
		Repeatability			**Reproducibility**		
	MV	**StD**	**Limit**	**CoV**	**StD**	**Limit**	**CoV**
	N/mm	**N/mm**	**N/mm**	**%**	**N/mm**	**N/mm**	**%**
Dry, Cross Direction	0,1219	0,0055	0,0156	4,53	0,0101	0,0286	8,29
Dry, Longitudinal Direction	0,2280	0,0087	0,0245	3,81	0,0140	0,0397	6,16
Wet, Cross Direction	0,0516	0,0026	0,0074	5,07	0,0040	0,0114	7,81
Wet, Longitudinal Direction	0,0888	0,0029	0,0082	3,47	0,0060	0,0171	7,22

It has to be noted that this test method is destructive and therefore the repeatability and reproducibility statistics contain the sample-to-sample variability, which may be a substantial contribution to overall variability. The values thus apply only to the specific sample material tested in this study and may be different for other sample materials.