

**CELLULAR MATERIALS MADE OF RUBBER
OR PLASTIC - COMPRESSION
SET AFTER COMPRESSION AT CONSTANT DEFORMATION**

NO USE RESTRICTION

FOREWORD

This document conforms technically to the test method RENAULT no. 1540.

It must not be modified without prior consultation with RENAULT.

It is in conformity with the agreement reached between the Standardization Departments of PEUGEOT Company and RENAULT in APRIL 1983.

1.OBJECT AND FIELD OF APPLICATION

The object of this method is to measure the compression set after compression at constant deformation of the cellular materials made of rubber or plastic. It does not concern the flexible cellular materials for trimming and the parts made of cellular material with skins, for which the test method D45 1046 is applied.

2.PRINCIPLE

The test consists to exposing a test specimen, at a given temperature and for a given time, to a constant deformation, then measuring the set in given time and temperature conditions.

3.EQUIPMENT

3.1.COMPRESSION DEVICE

It is composed of two flat and parallel polished plates made of chromium or stainless steel, between which the test specimens can be compressed. These plates must be enough rigid not to be deformed during the test. The plates must have sufficient dimensions so that the test specimen does not protrude from the plate edges.

3.2.SET OF SHIMS OR DEVICE

that allows adjusting the required compression ratio.

3.3.MEASURING EQUIPMENT

(in compliance with the test method D45 1394) with 10 mm diameter jaw.

The measuring pressure chosen is defined in the table below, depending on the bearing capacity of the material P_{50} .

BEARING CAPACITY OF THE MATERIAL in compliance with the test method D41 1541 P_{50} in kPa	MEASURING PRESSURE	
	mbar	kPa
< 30	$1 \pm 0,1$	approximately 0.1
$30 \leq P_{50} \leq 300$	10 ± 1	approximately 1
> 300	measuring with a micrometer in 4 points	

3.4.THERMOSTATIC STOVE

adjusted at the test temperature.

3.5.CONTROLLED ENVIRONMENT CHAMBER

at 23 °C ± 2 °C and 50 % ± 5 % relative humidity.

4.TEST SPECIMENS

The test specimens consist of rectangle parallelepipeds cut out from the plate or the part, with the sides having dimensions between 20 to 25 mm, and with a thickness of at least 6 mm.

The thickness of the test specimens must correspond to the direction along which the part is compressed in operation.

The test is performed on at least two test specimens.

The skins of the plate or of the part must be kept.

Note: *If only plates or parts thinner than 6 mm are available, it is possible to operate by stacking tests specimens with the same dimensions, until obtaining a thickness near to 6 mm.*

If the width of the test specimen is smaller than 20 mm, the test is performed on a test specimen with the width of the part.

5.PROCEDURE

5.1.CONDITIONING

In the case of rubber materials, the period between the end of the vulcanization and the beginning of the test must be of at least 24 hours.

The test specimens are conditioned for 24 hours in the climatic chamber (3.5).

5.2.TEST CONDITIONS

5.2.1 The measurements must be made inside the chamber (3.5).

5.2.2 The period and the temperature of the test must be chosen among the following ones:

22 h (0 / + 2 h) at 40 °C ± 1 °C,

22 h (0 / + 2 h) at 70 °C ± 1 °C,

70 h (0 / + 2 h) at 100 °C ± 1 °C,

70 h (0 / + 2 h) at 150 °C ± 2 °C.

5.3.THE TEST PROPER

1. Measure the initial thickness of the test specimen "H₀" using the equipment described in the test method D45 1394, using the pressure defined there in the table of paragraph 3.3.
2. Choose the appropriate shims or the device (3.2) to obtain the required compression ratio, generally 50 %. Place the test specimen between the plates of the compression device (3.1) with the shims placed on both sides of the test specimen.
3. Tighten the bolts so as to hold together the plates against the shims.
4. Place the assembly in the thermoplastic stove (3.4) adjusted at the test temperature.
5. After the given time, take the assembly out of the stove, release the test specimen within 2 minutes, and allow it to cool for 24 h ± 2 h on a non-metal surface inside the chamber (3.5).
6. Then measure the thickness of the test specimen after recovery (H₁) proceeding in compliance with the test method D45 1394.

6.EXPRESSION OF RESULTS

The compression set (CS) is expressed in percents of the imposed deformation, using the formula:

$$\text{DRC (en \%)} = \frac{H_0 - H_1}{H_0 - H_2} \cdot 100$$

where: H_0 = initial thickness of the test specimen, in millimeters,
 H_1 = thickness of the test specimen after recovery, in millimeters,
 H_2 = thickness of the compressed test specimen, in millimeters,

Take as result the mean of the two values obtained; the maximum distance between them can be of 15%. In the case of a greater difference, another test should be performed.

7. TEST REPORT

Besides the obtained results, the test report must indicate:

7. the reference to this method,
8. the reference of the material employed,
9. the place of sampling the test specimen from the plate or from the part,
10. the imposed deformation, if different from 50%,
11. the test temperature and length,
12. possibly, the pressure when measuring the thickness,
13. the type of test specimen employed (one or several thicknesses),
14. the type of set of the test specimen at the end of the test (uniform, bobbin shape, barrel shape, etc.),
15. the procedure details that are not specified in the method, as well as the possible incidents that might have influenced the results.

8.RECORDS AND REFERENCE DOCUMENTS

8.1.RECORDS

8.1.1.CREATION

16.OR: 01/11/1983 - CREATION OF NORM.

8.1.2.OBJECT OF MODIFICATION

17.**Error! Bookmark not defined.**

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8.2.REFERENCE DOCUMENTS

8.2.1.PSA DOCUMENTS

8.2.1.1.Norms

D411541, D451046, D451394.

8.2.1.2.Other

8.2.2.EXTERNAL DOCUMENTS

8.3.EQUIVALENT TO:

REN1540

8.4.CONFORMS TO:

8.5.KEYWORDS