

**PAINT COATINGS  
RUBBERS AND PLASTICS  
ARTIFICIAL AGEING BY WEATHER-OMETER**

Page 1/18

**No use restriction***This is a translation, the French original shall be used in all cases of litigation**Date of translation : 02/01/2008***PREFACE**

*This document is equivalent to the document from the Group Renault SAS of reference D27 1911.*

*It should not be modified without prior consultation with the Standards Department of this Group.*

*It is in conformity with the agreement reached between this Group and PSA PEUGEOT CITROËN in **JUNE 2007**.*

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MATERIALS – ARTIFICIAL AGEING BY WEATHER-OMETER	D27 1389	2/18
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## HISTORY

Index	Date	Nature of the modifications
OR	01/05/1980	CREATION OF THE NORM.
A	01/01/1985	COMPLETE REWRITING OF THE NORM.
B	01/06/1993	COMPLETE REWRITING OF THE NORM.
C	01/04/1995	COMPLETE REWRITING OF THE NORM WITH ADDITION OF THE PREFACE - THIS NORM CANCELS AND REPLACES THE NORM <a href="#">D47 5160</a> .
D	30/09/1997	IMPROVED UNDER IDEM.
E	15/09/1999	MODIFICATIONS OF THE VALUES IN § 3.1.2., 4.2.. 6.2. AND IN APPENDIX 3.
F	17/06/2003	EVOLUTION OF THE TEST PROCEDURE FOR THE ADAPTATION OF THE RUBBERS FOR THE PREPARATION PART OF THE TEST SPECIMENS.
G	03/07/2007	UPDATE TO THE NEW PROCEDURES OF THE STANDARDS D. UPDATE OF THE § DISCUSSING THE EXPOSURE AND THE EVALUATION OF THE TEP AND RUBBERS UPDATE OF § 5., 6., 9., 10., 11., 12. AND OF APPENDIXES.

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<b>MATERIALS – ARTIFICIAL AGEING BY WEATHER-OMETER</b>	<b>D27 1389</b>	<b>3/18</b>
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## CONTENTS

<b>1. OBJECT AND FIELD OF APPLICATION</b>	<b>4</b>
<b>2. REFERENCE DOCUMENTS</b>	<b>4</b>
2.1. STANDARDS	4
2.2. REGULATIONS	4
2.3. OTHER DOCUMENTS	4
<b>3. TERMINOLOGY AND DEFINITION</b>	<b>5</b>
3.1. DEFINITIONS	5
3.2. ABBREVIATIONS	5
<b>4. PRINCIPLE OF THE TEST METHOD</b>	<b>5</b>
<b>5. EQUIPMENT</b>	<b>5</b>
5.1. WEATHER-OMETER (WOM) TYPE CI 4000 OR CI 35A FROM THE ATLAS COMPANY	5
5.1.1. 3500 Watt Xenon Lamp	5
5.1.2. Thermometer	5
5.1.3. Spraying ramp,	5
5.1.4. Rotating specimen holder drum	5
5.1.5. Lamp cooling system	5
5.2. GLOSS METER	6
5.3. SPECTROCOLORIMETER	6
5.4. BLUE INDICATOR RANGES	6
5.5. GRAYS SCALE	6
5.6. DAYLIGHT DEVICE (LIGHT BOOTH)	6
5.7. WIPING PAPER	6
5.8. WHITE CLOTH	6
<b>6. REAGENTS</b>	<b>6</b>
6.1. WATER TO GLOSS	6
6.2. DEIONIZED WATER	6
6.3. WATER / ALCOHOL MIX	6
<b>7. PREPARING THE SOLUTIONS</b>	<b>7</b>
<b>8. SAMPLE REPRESENTATIVENESS</b>	<b>7</b>
<b>9. PREPARING THE TEST SPECIMENS</b>	<b>7</b>
9.1. GENERAL CASE	7
9.2. CASE OF RUBBERS AND THERMOPLASTICS ELASTOMERS	7
9.3. CASE OF PAINTED SUPPORTS	8
<b>10. TEST PROCEDURE</b>	<b>8</b>
10.1. TEST CONDITIONS	8
10.2. TEST PROCESS	8
10.3. CHARACTERIZATION AFTER THE TEST	9
10.3.1. General case	9
10.3.2. Case of rubbers and thermoplastics elastomers	9
10.3.3. Case of painted parts	9
<b>11. NOTES</b>	<b>10</b>
<b>12. EXPRESSION OF RESULTS</b>	<b>10</b>
<b>13. TEST REPORT</b>	<b>10</b>
<b>APPENDIX 1 SPECTRAL CHARACTERISTICS OF THE FILTERS IN BOROSILICATE S ACCORDING TO THE PERIOD OF EXPOSURE</b>	<b>11</b>
<b>APPENDIX 2 SPECTRAL CHARACTERISTICS OF AN ARC BURNER WITH BOROSILICATE S INSIDE AND OUTSIDE FILTERS</b>	<b>12</b>
<b>APPENDIX 3 MAINTENANCE AND HISTORY OF THE WEATHER-OMETER (5.1.)</b>	<b>13</b>
<b>APPENDIX 4 (1/2) PROCEDURES FOR CHARACTERIZATION PSA PEUGEOT CITROËN</b>	<b>14</b>
<b>APPENDIX 4 (2/2) PROCEDURES FOR CHARACTERIZATION PSA PEUGEOT CITROËN</b>	<b>15</b>
<b>APPENDIX 5 PROCEDURES FOR CHARACTERIZATION OF THE PAINTED PARTS RENAULT</b>	<b>16</b>
<b>APPENDIX 6 PREPARING THE TEST SPECIMENS– SPECIFIC CASE OF ELASTOMER TEST SPECIMENS</b>	<b>17</b>

## 1.OBJECT AND FIELD OF APPLICATION

The object of this method is to define the conditions to observe to determine the resistance of a material to the action of an artificial light source in defined wetting and temperature conditions.

It aims to reproduce the ageing of the materials exposed to light and to stress of weather.

It applies to paint coatings as well as to all external rubber and plastic parts artificially colored in the mass, paint coated or not.

It applies also to mastics, to canvases and to windows.

## 2.REFERENCE DOCUMENTS

Specific chapter for the tests for PSA Peugeot Citroën.

### 2.1.STANDARDS

<a href="#">A10 0156</a>	TEST REPORT - DRAFTING
<a href="#">D15 1343</a>	COLORED MATERIALS - VISUAL COMPARISON OF COLORS IN A LIGHT BOOTH
<a href="#">D15 5083</a>	OPAQUE COLORED ITEMS - COLOR SPOT (SPECTROCOLORIMETRY)
<a href="#">D15 5084</a>	OPAQUE OR TRANSPARENT COLORED ARTIFACTS - CALCULATION OF THE OFFSHADES (CIE LAB 1976 SYSTEM)
<a href="#">D15 5362</a>	PLASTICS AND PAINT COATINGS - CRACKING AND CHIPPING PHENOMENA - REFERENCE STANDARD
<a href="#">D25 1413</a>	PAINT COATINGS - RUBBERS AND PLASTICS - MEASUREMENT OF THE GLOSS
NF EN ISO 105-B02	TEXTILES - COLORFASTNESS TEST - PART B02: COLORFASTNESS TO ARTIFICIAL LIGHT: XENON ARC LAMP
NF EN 20105-A02	TEXTILES - COLORFASTNESS TEST - PART A02: GRAYSCALE FOR EVALUATING THE DEGRADATIONS

### 2.2.REGULATIONS

Not applicable.

### 2.3.OTHER DOCUMENTS

MXP_EMR06_1496	VALIDATION PROTOCOL - APPEARANCE CONSISTENCY APPROACH OF SEALING GASKETS - BODY AND WINDOWS FINISHES
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### 3. TERMINOLOGY AND DEFINITION

#### Specific chapter for the tests for PSA Peugeot Citroën

A dictionary (glossary) containing the main terms and their definitions used in the activities of the Technico-Industrial Upstream can be consulted internally through the glossary [Nectar](http://nectar.inetpsa.com) (<http://nectar.inetpsa.com>). This glossary is constantly updated.

#### 3.1. DEFINITIONS

Not applicable.

#### 3.2. ABBREVIATIONS

Not applicable.

### 4. PRINCIPLE OF THE TEST METHOD

The test consists in subjecting one or several test material specimens to a cycle of simulation to solar light, by using a filtered Xenon lamp, in combination with a periodic spraying that simulates rain.

The degradation is then evaluated, either visually, or through colorimetric or other measurements, in comparison with a non exposed indicator.

### 5. EQUIPMENT

#### 5.1. WEATHER-OMETER (WOM) TYPE CI 4000 OR CI 35A FROM THE ATLAS COMPANY

The device should be installed in a clean air-conditioned room, with a temperature of  $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and a relative humidity  $< 80\%$ , and having an effective outward exhaust.

##### 5.1.1. 3500 WATT XENON LAMP

Generally, the lamp has internal and external filters in borosilicate S, general case (irradiance curve according to Appendixes 1 and 2).

- Note:**
- *For the varnish cracks tests, use quartz filters.*
  - *Use lamps already aged by the Supplier or carry out the 24 h pre-ageing in the WOM in the conditions described in this method.*
  - *The filters are pre-aged by the Supplier.*

##### 5.1.2. THERMOMETER

A black panel BPT (Black Panel Temperature), installed instead of a test specimen at the central drum level.

##### 5.1.3. SPRAYING RAMP,

Made of stainless steel, consisting of three nozzles, oriented on the exposed side of the test specimens. Ensure the nozzle holes are neither fouled nor clogged.

##### 5.1.4. ROTATING SPECIMEN HOLDER DRUM

Made of stainless steel, three thirds type

##### 5.1.5. LAMP COOLING SYSTEM

With demineralized water (6.2.).

**Note:** *The periodic maintenance of the device is carried out according to the indications in Appendix 3.*

## 5.2.GLOSS METER

In conformity with the one described in the test method [D25 1413](#).

## 5.3.SPECTROCOLORIMETER

For the measurement of the tristimulus values, according to the test method [D15 5083](#).

- Note:**
- The use of a colorimeter, type MINOLTA CR300 for example, can also be projected to measure the hue change compared with the indicator.
  - For PSA PEUGEOT CITROËN, refer to the specific procedure (ref. MXP\_EMR06\_1496) for the colorimetric and gloss characterization of the rubbers and thermoplastics elastomers (TPE) when the specifications require it.

## 5.4.BLUE INDICATOR RANGES

Indicators are wool fabrics dyed blue, which meet the specifications of the standard NF EN ISO 105-B02.

They are ranked from no. 1 - very low resistance to light to no. 8 - very high resistance to light.

## 5.5.GRAYS SCALE

For assessing the degradation, in conformity with standard NF EN 20105-A02.

Use the scale at nine degrees with a black border.

**Note:** *Gray scales can be obtained from l'ADSOL, 37-39, rue de Neuilly - 92110 CLICHY or from the company ATLAS, Z.A. La Barogne - 3, rue des Longues Raies - 77230 Moussy-le-Neuf.*

## 5.6.DAYLIGHT DEVICE (LIGHT BOOTH)

In conformity with the test method [D15 1343](#).

## 5.7.WIPING PAPER

Made of white, absorbent, lint-free cotton.

## 5.8.WHITE CLOTH

Made of lint-free cotton for cleaning the elastomer test specimens of the type KO-TON KO-TON from CHICOPEE®.

# 6.REAGENTS

## 6.1.WATER TO GLOSS

For example type FINESSE IT from 3M, only used by RENAULT, according to Appendix 5.

## 6.2.DEIONIZED WATER

For cleaning the sprinkling test specimens.

- Spraying pressure :  $2.5 \text{ bar} \pm 0.5 \text{ bar}$ .
- Resistivity :  $\geq 10 \text{ M}\Omega \cdot \text{cm}$ .
- Silica content :  $\leq 0.02 \text{ ppm}$ .
- Dry extract :  $< 10 \text{ ppm}$ .
- Water temperature :  $18 \text{ }^{\circ}\text{C} \pm 4 \text{ }^{\circ}\text{C}$ .
- pH :  $7 \pm 0.5$ .

## 6.3.WATER / ALCOHOL MIX

For cleaning rubber and TPE test specimens (§ 10.3.2.). The mix is made of 50/50 in volume, from demineralized water, the characteristics of which are specified above, and from laboratory quality ethanol.

## 7.PREPARING THE SOLUTIONS

Not applicable.

## 8.SAMPLE REPRESENTATIVENESS

**Specific chapter for the tests for PSA Peugeot Citroën.**

The samples should be representative of the variable to be characterized. To ensure this representativeness, one should know the main characteristics of the studied population. The criteria of selection of samples should be specified in the Test Report (TR), according to the standard [A10 0156](#).

In case of any doubt about sampling, contact the PSA service *DTI/DITV/PMXP/MXP/EMR/VSDA* in order to find out the directives to apply.

## 9.PREPARING THE TEST SPECIMENS

### 9.1.GENERAL CASE

The sizes of the test specimens should, in all case or when possible, be at least 68 mm x 46 mm and at most 68 mm x 145 mm, according to the type of specimen holder used. The exposed side of the test specimens should be directed towards the lamp, and the black side towards the BPT.

Prepare two test specimens, one intended to be exposed and the other preserved as indicator away from light and humidity, and protected by a non abrasive packaging.

No material likely to decompose to light, to heat or to humidity, or that releases products detrimental to the proper operation of the test should be exposed in the device.

Each test specimen is identified in an indelible manner in an area that does not impede the test.

**Note:** *When the dimensions quoted above cannot be observed (size of the part too little), the tested test specimens should have the largest and the flattest possible surface exposed.*

### 9.2.CASE OF RUBBERS AND THERMOPLASTICS ELASTOMERS

**Note:** *In this category belong the materials EPDM, TPE, TPV, TPO, SEBS, etc.*

**Note:** • *The sample and the indicator part should be preserved in darkness at a temperature of  $4\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$  enveloped individually in an aluminum sheet or in filter paper.*

Clean the parts or the samples with the mix (6.3), applied on white, lint-free cotton (5.8).

When cleaning, the cloth must be well dampened, but without excess, and the samples or the parts should not undergo particular strains (rubbing).

The purpose of this cleaning is to standardize the samples or the parts and to remove any trace of pollution.

The parts thus cleaned can be dried by a short passage of compressed air.

### 9.3.CASE OF PAINTED SUPPORTS

The painted sheet plates should be entirely protected on the edges and on the upper and back sides, for example by a primer paint.

The nature of the support material, its surface texture as well as the nature of the sub-layers and the conditions of application of the substrate should be those corresponding to the use of the products to be examined.

- Note:**
- For PSA PEUGEOT CITROËN, the test tubes to test, as well as the reference test tubes are measured before exposure with the spectrophotometer (5.3.), according to the test method [D15 5083](#). The color distance between the test specimen and the reference is called  $\Delta E_{new}$ . The distance is calculated according to the test method [D15 5084](#). If  $\Delta E_{new}$  is greater than 0.5, choose another test specimen, according to Appendix 4 - § 1.1 MEASUREMENT OF THE COLOR CHANGE.
  - The measurements should be carried out using a cover so that they are always made at the same location before and after ageing.
  - Measure the test specimen sheen to be tested according to the test method [D25 1413](#), observing Appendix 4 - § 1.2. MEASUREMENT OF THE VARIATION OF THE GLOSS.

## 10.TEST PROCEDURE

### 10.1.TEST CONDITIONS

- Exposure to continuous light, obtained by using a Xenon lamp (5.1.1.) and adapted filters.
- Irradiance of 0.55 W/m<sup>2</sup> at 340 nm.
- Thermometer temperature setting (5.1.2.) : 70 °C ± 2 °C
- Dry bulb temperature setting: 50 °C ± 2 °C.

**Note:** Thermometer and dry bulb temperatures (5.1.2.) are adjusted continuously (automatic mode).

- Sprinkling frequency (only on the exposed side of the test specimens): 18 minutes of sprinkling followed by 102 minutes without sprinkling.
- Relative humidity: 50 % ± 5 % without sprinkling period ( $\Delta T = 10.5 \text{ °C}$ ) – ( $\Delta T = T^{\circ}\text{C}_{\text{dry bulb}} - T^{\circ}\text{C}_{\text{humid}}$ ).

### 10.2.TEST PROCESS

- Place the test specimens on the appropriate specimen holders.

**Note:** For the test specimens originating from the vehicle part, favor the exposure of the part visible by the customer. If needed, stainless supports can be used to maintain the position of the sample on the specimen holders.

**Note:** For PSA PEUGEOT CITROËN, for rubber materials, see appendix 6.

- Place the specimen holders and the thermometer (5.1.2.) in the Weather-Ometer (5.1.) while making sure the thermometer is in the middle row, in vertical position.
- Fill all the specimen holders, and if needed, put fictitious test specimens, reflecting surfaces, such as mirrors, excluded.
- Record the number of hours in the totalizer and put the device in operation.
- The test duration is defined in the documents:
  - For RENAULT: using the number of hours.
  - For PSA PEUGEOT - CITROËN: using the number of cycles.

A cycle corresponding to the time required to deteriorate the blue wool indicator no. 7 has a  $\Delta E = 2.5 \pm 0.15$ . This time corresponds to 168 hours of test in the Weather-Ometer (5.1.), adjusted as shown in § 10.1., but without sprinkling.



MATERIALS – ARTIFICIAL AGEING BY WEATHER-OMETER	D27 1389	9/18
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- Remove the test specimens from the Weather Ometer at the end of the test.

**Note:**

- *During the exposure cycle, the device should not be stopped more than once per day (for example: door opening). If such a stop occurs, it should preferably take place at the end of the dry period.*
- *During an exposure cycle, on the test specimens of the material colored in the mass, there should be no operational halt with a duration greater than 3 consecutive days (72 hours). If such a halt takes place, the cycle is restarted with new test specimens.*

### 10.3.CHARACTERIZATION AFTER THE TEST

#### 10.3.1.GENERAL CASE

Examine the test specimen surface in light booth, according to the test method [D15 1343](#), by comparing it with the one of the indicator test specimen.

Grade de average variation of the grayscale (§ 5.5.). Record the appearance modifications such as whitening, matting, erosion, micro-cracking, etc.

Determine if required the evolution of the tristimulus values between the aged test specimen and the indicator following the methods of the test procedures [D15 5083](#) or D17 1736 (RSA), as well as the gloss according to the test procedure [D25 1413](#).

Other characteristics: On aged test specimens, it is possible to determine the evolution of certain characteristics, for example the mechanical characteristics such as shock resistance.

- Note:**
- For Renault SA, in the case of hygroscopic materials, these different measurements should be carried out, in final phase, on test specimens having been stored for at least 24 hours in an air-conditioned room.
  - For PSA, the accuracy of the characterization procedures are treated in Appendix 4.

#### 10.3.2.CASE OF RUBBERS AND THERMOPLASTICS ELASTOMERS

The test of the test specimen surface described in § 10.3.1 is carried out before and after the cleaning of the test specimen.

Two measurements are carried out:

**Gross measurement:** Do not clean the samples. Carry out the measurement in grayscale (5.5.).

**Grading after cleaning:** Cleaning of the samples or of the parts with the mix (6.3.) and the cloth (5.8.), then carry out the measurement in grayscale (5.5.).

The two measurements should be present in the test report.

Except if indicated otherwise in the specifications, the measurement accepted for the validation tests is the measurement after cleaning.

- Note:**
- *For PSA PEUGEOT CITROËN, when the prescriptive documents require it, the rubber and TPE test specimens should be characterized according to the procedure MXP\_EMR06\_1496, available on request.*

#### 10.3.3.CASE OF PAINTED PARTS

Refer to appendix 4 for PSA Peugeot Citroën and appendix 5 for Renault SA.

MATERIALS – ARTIFICIAL AGEING BY WEATHER-OMETER	D27 1389	10/18
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## 11.NOTES

Specific chapter for the tests for PSA Peugeot Citroën

Not applicable.

## 12.EXPRESSION OF RESULTS

- Express the shade variation:
  - by recording the measured colorimetric differences,
  - by assigning the contrast between the exposed material and the non exposed material, on the nearest grey scale degree,
- Record the loss of gloss, in %.
- Write down any other appearance variation.
- Write down the variations of the mechanical and/or physical characteristics retained as ageing criteria.

Write down these results before and after drumming and cleaning **when the operation is required**.

## 13.TEST REPORT

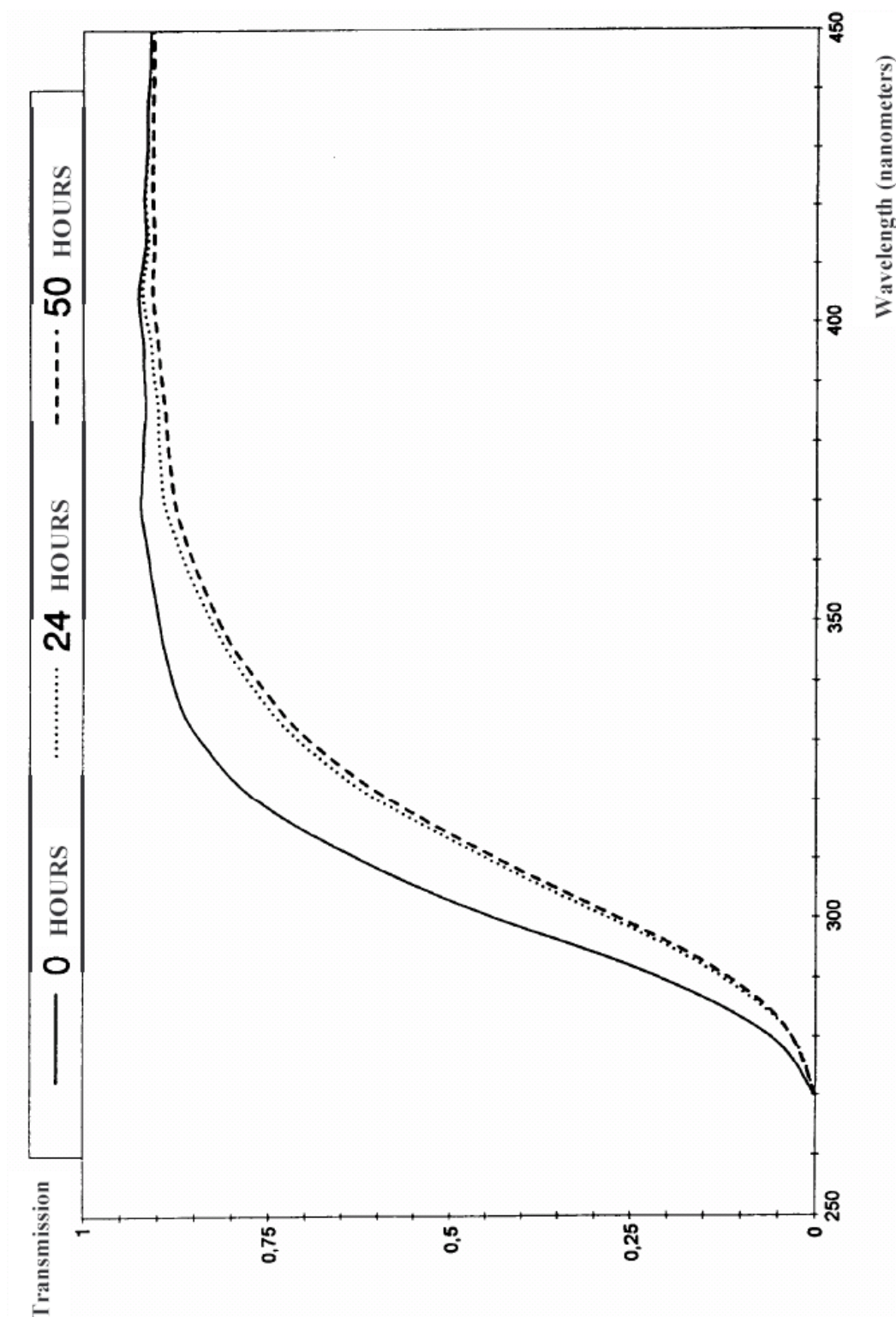
The form and the minimum contents of the test report, for the PSA Peugeot Citroën tests, are defined in the standard [A10 0156](#).

Besides the obtained results, the test report should indicate:

- the reference to this method,
- the type of Weather-Ometer employed,
- the exact reference to the paint used and the name of the Supplier,
- the complete references to the tested materials and/or parts, as well as the Supplier's name,
- the exact references of the spectrophotometer and of the gloss meter used,
- type of the test carried out: normal or test crack cycle for PSA PEUGEOT CITROËN,
- the test length,
- the procedure details that are not specified in the method, as well as the possible incidents that might have influenced the results.

## Appendix 1

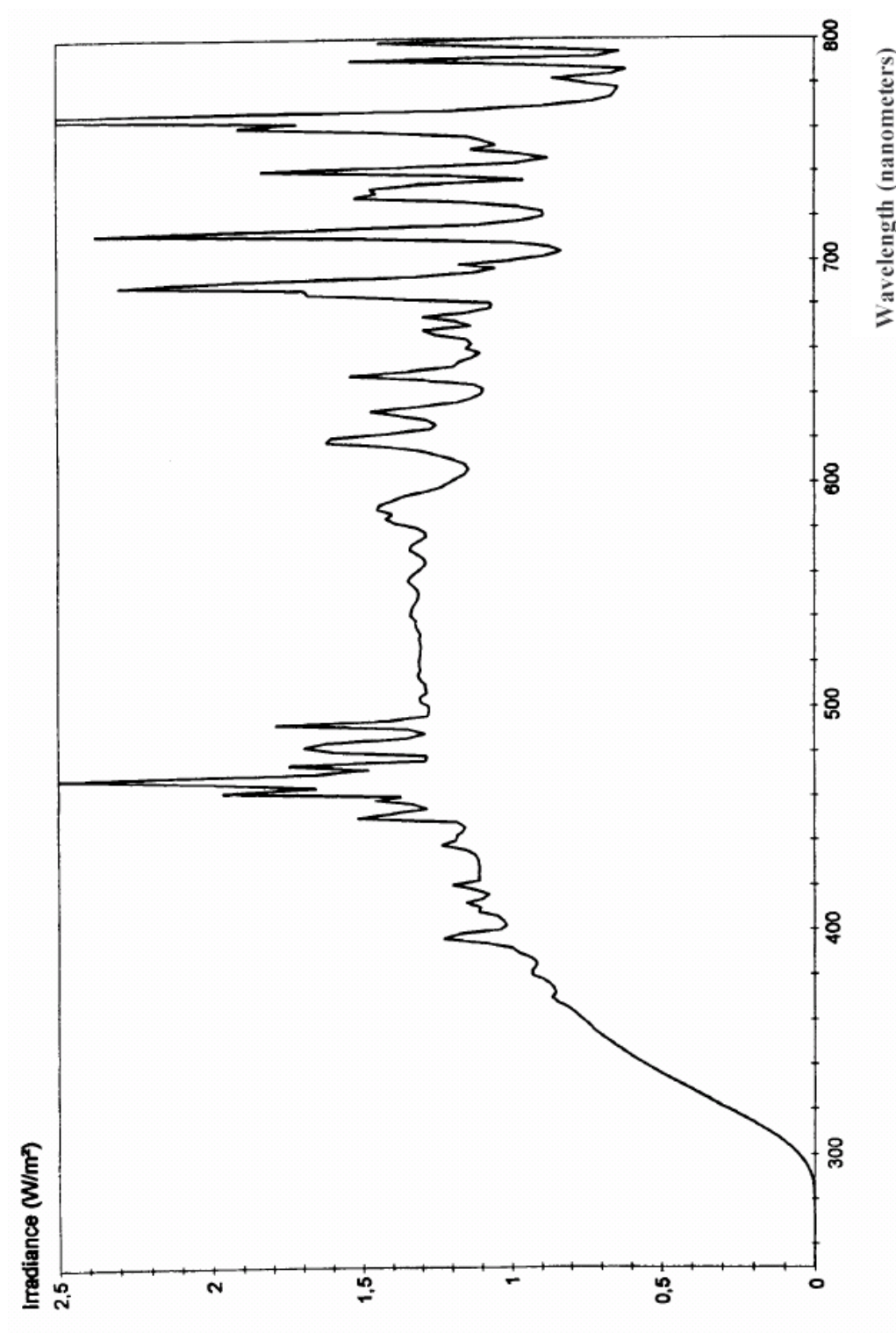
### Spectral characteristics of the filters in borosilicate S according to the period of exposure



## Appendix 2

### Spectral characteristics of an arc burner with borosilicate S inside and outside filters

0.55 W/m<sup>2</sup> to 340 nm



## Appendix 3

### Maintenance and history of the Weather-Ometer (5.1.)

The maintenance and calibration of the device are carried out according to the manufacturer recommendations.

- SERVICE CALL of the device by the Atlas company, at least once a year.
- REPLACING OF THE BURNER every 2,500 hours maximum in the test conditions specified in this procedure.
- REPLACING OF THE INSIDE FILTER every 500 hours.
- REPLACING OF THE OUTSIDE FILTER every 2000 hours.
- CALIBRATION OF THE DEVICE (temperature and illuminance power) every 15 days.  
After stabilization, the frequency can be brought to 1 time/month at least.
- CALIBRATION CERTIFICATE to be established every 2 years.
- PARAMETERS OF USE
  - 3 times/week, monitor the various parameters of use of the device on the recorder.
  - The accepted tolerances are:
    - thermometer temperature (5.1.2.) :  $70\text{ °C} \pm 2\text{ °C}$
    - dry bulb temperature:  $50\text{ °C} \pm 2\text{ °C}$
  - Examine the test specimens, if necessary.
  - Supplement the water level of the quench tank of the burner.
- THERMOMETER with black panel (5.1.2)

Every 15 days, check its surface state and at least once a month, rinse it with distilled water, wipe it with a soft cloth and if necessary polish it with a polish (Johnson Restorer type).

The black panel should be replaced when its surface becomes metallic gray or has cracks, life duration between 6 and 12 months.

- CASE OF AN AQUADEM SYSTEM FOR DEMINERALIZED WATER (6.2.)

Changing frequency of the bottles given as information only:

- BOTTLES TYPE G (demineralization) every 2 months.
- BOTTLES TYPE C (anti-silica): every 3 months.
- DEMINERALIZATION CARTRIDGE: every 4 months.
- UPSTREAM FILTERS ON BOTTLES: monthly.
- DOWNSTREAM FILTERS ON BOTTLES: every 4 months.

Weekly water consumption: approximately  $1\text{ m}^3$ .

- OTHER SYSTEMS FOR PROCESSING WATER (6.2.)

Follow the recommendations for maintenance of the data device by the Supplier.

**Note:** Carry out a scheduled control of the characteristics of the demineralized water for sprinkling and check their compliance with the values in paragraph 6.2 (pH, silica rate and resistivity in particular). The control frequency depends on the quality of water upstream on the clean-up circuit. It is recommended to carry out this follow-up weekly.

## Appendix 4 (1/2)

### Procedures for characterization PSA PEUGEOT CITROËN

#### 1 CASE OF PAINT COATINGS

The test specimens should not be glossed, they can, if necessary, be washed with water (6.2.) with passage to the air gun without intervention.

##### 1.1. MEASUREMENT OF THE SHADE VARIATION

Measure the aged and the reference test specimens, at the same location as the one of the measurements carried out before exposure, as recommended in § 9. The deviation between the aged and reference test specimen is called  $\Delta E$ , the variation of color distance is given by the expression:

$$\Delta E_{\text{aged}} = \Delta E - \Delta E_{\text{new}}$$

When  $\Delta E_{\text{new}}$  is greater than  $\Delta E$ , we consider that  $\Delta E_{\text{aged}}$  is zero.

The variation of color distances is calculated according to the test method [D15 5084](#).

##### 1.2 MEASUREMENT OF THE VARIATION OF THE GLOSS

Measure the gloss on the aged test specimen, according to the test method [D25 1413](#).

The variation, in percentage, of the gloss is calculated by using the following formula:

$$\text{Loss of gloss (\%)} = \frac{B_i - B_v}{B_i} \cdot 100$$

where:

$B_i$  = initial gloss, expressed in gloss units,

$B_v$  = gloss of the test specimen having been subjected to ageing, expressed in gloss units.

##### 1.3. CRACK TEST (FOR VARNISHES)

Express the appearance variation of the test specimen according to the grading scale defined below:

- 0 - No change.
- 1 - Loss of gloss  $\leq 30$  %.
- 2 - Light chalking:  $30\% < \text{loss of gloss} \leq 60$  %.
- 3 - Important chalking: loss of gloss  $> 60$  %.
- 4 - Cracks or partial disappearance of the paint film.

##### 1.4. VISUAL OBSERVATION

Examine by using a microscope the surface of the test specimen. Record the presence or absence of cracks, the corresponding duration of appearance and the type of degradation according to the test method [D15 5362](#).

Write down any other particular appearance evolution.

## Appendix 4 (2/2)

### Procedures for characterization PSA PEUGEOT CITROËN

#### 2. CASE OF RUBBERS AND PLASTICS - GENERAL CASE

##### 2.1. GRADING ACCORDING TO GRAYSCALE

Examine the test specimens under several angles by using the light booth (5.6.), according to the test method [D15 1343](#), and find the angle which gives the most favorable contrast.

Measure the grading index, by using the grayscale (5.5.), and comparing it to the exposed and reference test specimen.

Also record any specific modification such as loss of gloss, appearance of cracks, pores, or scabs, change of coloring mode, etc.

##### 2.2. MEASUREMENT OF THE SHADE VARIATION

###### 2.2.1 MEASUREMENT OF THE SHADE VARIATION OF PLASTICS

Measure the tristimulus values of the aged and the reference test specimens, by using a spectrophotometer (5.3.) at the same location as the one of the measurements carried out before exposure, as recommended in § 9. The deviation between the aged and reference test specimen is called  $\Delta E$ , the variation of color distance is given by the expression:

$$\Delta E_{\text{aged}} = \Delta E - \Delta E_{\text{new}}$$

When  $\Delta E_{\text{new}}$  is greater than  $\Delta E$ , we consider that  $\Delta E_{\text{aged}}$  is zero.

The variation of color distances is calculated according to the test method [D15 5084](#).

#### 3. CASE OF RUBBERS AND PLASTICS - GENERAL CASE

When the specifications require it, the characterization before and after ageing of the rubber and thermoplastic elastomers should comply with the procedure MXP\_EMR06\_1496 (available on request).

## Appendix 5

### Procedures for characterization of the painted parts Renault

#### 1 GENERAL CASE

Examine the test specimen surface in light booth, according to the test method D15 1343, by comparing it with the one of the indicator test specimen.

Grade de average variation of the grayscale. Record the appearance modifications such as matting, chalking, erosion, micro-cracking, etc.

Determine if required the evolution of the tristimulus values between the aged test specimen and the indicator following the methods of the test procedures D15 5083 or D17 1736, as well as the gloss according to the test procedure D25 1413.

#### 2 CASE OF MATERIALS COATED WITH PAINT HAVING GLOSS FINISH BODY TONE

##### 2.1. Characterization before drumming

Examine the test specimen surface in light booth, according to the test method D15 1343, by comparing it with the one of the indicator test specimen.

Grade average variation of the grayscale. Record the appearance modifications such as matting, chalking, erosion, micro-cracking, etc.

Also determine the evolution of the gloss according to the test method D25 1413.

##### 2.2. Characterization after drumming

Carry out a drumming of the aged side of the test specimen according to the test method D29 1476.

Carry out again the measurements as described in § 1.



## Appendix 6

### Preparing the test specimens– Specific case of elastomer test specimens

Appendix specific to PSA Peugeot Citroën

This appendix gathers the recommendations intended to guide the user of the method in the preparation of the test specimens.

In all the cases where this is possible, the test specimens as vehicle parts or as material samples (extrudates, plates, etc.) are preferentially placed on the specimen holder as follows.

#### 1. CASE OF VEHICLE PARTS IN ELASTOMER MATERIALS

##### 1.1 LICK-ROLLER OR WINDOW SLIDING PART TYPES

Examples



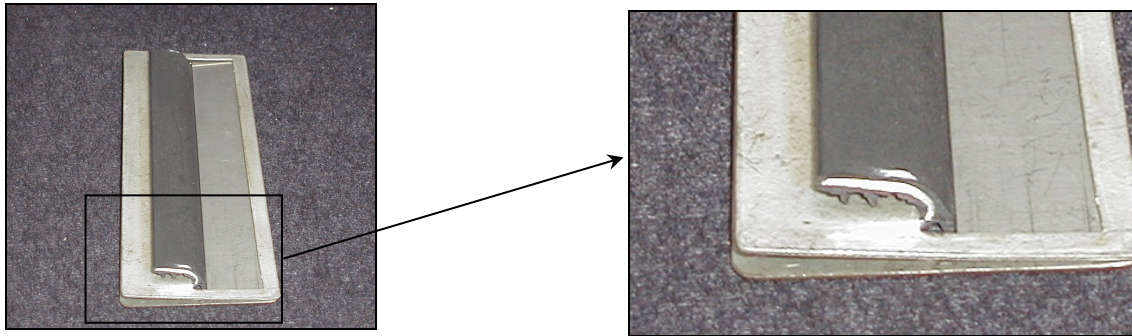
##### 1.2 USED SPECIMEN HOLDER

of the type 135 mm \* 45 mm as shown in the images below



### 1.3 PREPARING THE SAMPLE HOLDER

- Arrange successively the elements 1, 2, 3 to obtain the following assembly:



- Stamp the previous assembly on the support "5" by closing again with element "4", to obtain the final assembly shown below.



## 2 CASE OF MATERIAL SAMPLES (EXTRUDATES, PLATES, STRIPES)

### 2.1 USED SPECIMEN HOLDER

Of the type 135 mm \* 45 mm or 135 mm \* 68 mm following the dimensions of the test specimen.

### 2.2 PREPARING THE SAMPLE HOLDER

- Follow the protocol described at point 1, in order to obtain the following assembly:

