

**PAINT COATINGS  
RUBBERS AND PLASTICS  
MEASUREMENT OF GLOSS**

Page 1/8

**NO USE RESTRICTION***This is a translation, the French original shall be used in all cases of litigation**Date of translation : 14/04/1997***FOREWORD***This document is equivalent to the RENAULT document D25 1413.**It must not be modified without prior consultation with the Normalisation Services of this Group.**It is in conformity with the agreement reached between this Group and PSA PEUGEOT CITROEN in FEBRUARY 1995.***1. OBJECT AND FIELD OF APPLICATION**

The object of this méthode is to measure the specular gloss under angles of incidence of 20°, 60° or 85° using a gloss meter (or reflectometer).

It applies to paint coatings (deposited on sheet metal, rubber or plastic) and to self coloured rubber parts, plastic parts, etc.

**2. PRINCIPLE**

The measurement of gloss is based on the comparison of the specular reflection factor of the test specimen with that of a reference standard for a defined angle of incidence.

**3. DEFINITION OF TERMS**

**Gloss :** Directional reflecting property of a surface with the effect of showing luminous reflections to a more or lesser degree. Gloss is expressed in UB \*[Unité de Brillant (Unit of gloss)]. The gloss value of the black polished glass with a refraction index of 1,567 is set to 100 UB irrespective of the angle of incidence.

**Reflection factor :**

Ratio of reflected luminous flux to incident flux.

**Specular reflection factor :**

Regular reflection factor corresponding to the fraction of incident luminous flux which is reflected on the macroscopic scale according to DESCARTES' law.

\* **UB = Unité de Brillant (Unit of Gloss)**

## 4. EQUIPMENT AND REAGENTS

### 4.1. GLOSS METER

Recommended equipment :

- Manufacturer BYK : MICROGLOSS 20° type, reference 4512,  
MICROGLOSS 60° type, reference 4501,  
MICROTRIGLOSS type, reference 4520.
- Manufacturer LABOMAT ESSOR : REFO 3 type (3 measurement geometries),  
REFO 60 type (60°).
- Manufacturer MINOLTA : MULTIGLOSS 268 type.

The gloss meter consists of a housing comprising for a given angle of :

- a luminous source,
- an optical system,
- a receiver which is photosensitive exclusively to visible radiations giving information proportional to the luminous flux.

The angles and diaphragms of the measuring system meet the geometrical conditions carried in appendix 1. The base of the equipment includes a measuring window of dimensions less than 20 mm x 60 mm (for 20° and 60° angles).

The smallest dimension of the incident luminous beam, read off the measuring plane, must be greater than or equal to 5 mm.

A manual or automatic adjusting device must provide the setting of value 0 UB and the value of the reference standard.

### 4.2. SHAMMY LEATHER OR SOFT CLOTH OR SOFT BRISTLE BRUSH

### 4.3. JOSEPH PAPER

### 4.4. PURE SOAP

(for example : household soap).

### 4.5. DEMINERALISED WATER

## 5. REFERENCE STANDARDS

### 5.1. CALIBRATION STANDARD

The calibration standard is an opaque black glass plate with one flat and polished surface which must be a minimum of 5 mm thick to prevent deformations due to bending.

This standard has its own gloss values for 20°, 60° and 85° angles which are certified by the following organisations such as the National Research Council (NRC Canada) and the Bundesanstalt für Materialforschung und-prüfung (BAM Germany).

**Note :** *Its use is limited to the annual verification of secondary standards and equipment.*

### 5.2. SECONDARY STANDARDS

Secondary standards consist of opaque black glass plates with gloss values assessed in relation to the calibration standard under various reflection angles.

**Note :** *The calibration standard (5.1) and secondary standards (5.2) must be free from visible score marks in their area of use. They may be wiped with a cloth (4.2) and, if necessary, cleaned with a small quantity of soapy water (4.4 and 4.5); they must then be carefully dried by dabbing with Joseph paper (4.3).*

### 5.3. LIGHT TRAP (standard 0 UB)

The dimensions of the light trap meet the geometric dimensions carried in appendix 2.

The internal faces of the light trap are matt black (for example : paint or baize).

## 6. PREPARATION OF TEST SPECIMENS

### 6.1. DIMENSIONS

The measuring areas of the coating or the surface of the part must be able to come into contact with the gloss meter measuring window and meet the following conditions :

- the gloss meter window must fully cover the measuring area,
- the curvature radius must be greater than 10 times the smallest dimension of the measuring window.

### 6.2. PREPARATION OF THE SURFACE

The measurement of gloss is very sensitive to any surface pollution or damage.  
Inspect visually the aspect of the surface to be measured and record :

- traces of dust,
- fingerprints,
- presence of deposits,
- etc.

#### 6.2.1. LIGHTLY POLLUTED SURFACES (DUST)

Dust the surface with a soft bristle brush (4.2.).

#### 6.2.2 POLLUTED SURFACES (FINGERPRINTS, DEPOSITS)

Apply a cleaning method of operation which includes :

- washing (soapy water or suitable product which does not affect the surface),
- rinsing,
- wiping, if applicable,
- drying.

Mention these operations in the test report.

After these various operations, check and note whether some defects are still present (score marks, scale deposits, etc.).

## 7. METHOD OF OPERATION

Place the gloss meter (4.1) in a location outside the range of direct lighting (solar rays, projector, etc.). The gloss meter must be used according to the manufacturer's instructions.

### 7.1. CALIBRATION

- Select the measuring angle :
  - the 60° angle is used for comparing the gloss from most surfaces,
  - the 20° angle is used for measuring surfaces with a gloss under 60° higher than 70 UB,
  - the 85° angle may be used exceptionally for comparing matt non grained surfaces.
- Calibrate the gloss meter using the standard (5.2) at the beginning of each period of use : at fairly frequent time intervals, ensure that the setting has not changed.
- Check the zero by using the light trap (5.3); the gloss measured must be between 0 UB and 0,2 UB. If this value has not been reached, modify the zero on the equipment or contact the manufacturer.

### 7.2. MEASUREMENT

the measurement of gloss, in the initial condition and after ageing, is carried out while maintaining the same angle.

#### 7.2.1. FLAT SURFACES

- Place the gloss meter (4.1) on the surface to be examined.
- Record the gloss value (see paragraphs 6.1 and 6.2)
- Repeat this measurement in 4 points of the surface and in various directions; the furthest measuring points must not be at a distance of more than 100 mm.

#### 7.2.2. CURVED SURFACES

- Place the gloss meter (4.1) on the surface to be examined (see paragraphs 6.1 and 6.2).
- Slightly rotate the gloss meter so as to obtain the maximum value of the point considered, record this value.
- Repeat the above operation in 4 points of the surface; the furthest measuring points must not be at a distance of more than 100 mm.

## 8. EXPRESSION OF RESULTS

Determine the gloss characteristics on the surface examined by :

- the mean  $\bar{x}$  of  $n$  measurements,
- the value of the typical calculated variation  $S$  (scatter) is obtained by means of the following formula :

$$S = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}}$$

in which :  $x_i$  = value of the  $i^{\text{th}}$  measurement,  
 $i$  = measurement index varying from 1 to  $n$ ,  
 $\bar{x}$  = mean of  $n$  measurements on the test specimen,  
 $n$  = number of measurements ( $n \geq 5$ ).

Express the gloss in unit of gloss (UB) by using the indices  $B_{20}$ ,  $B_{60}$  or  $B_{85}$ .

Example : Gloss measured under a  $20^\circ$  angle :

$$B_{20} = 82,5 \text{ UB} \pm 2,1 \text{ UB}$$

## 9. RELIABILITY

### 9.1. REPEATABILITY

The difference in absolute value between 2 individual results obtained in repeatability conditions (International Norme ISO 5725) and with a probability defined at 95%, must not exceed 2 UB under a  $20^\circ$  angle and 0,5 UB under a  $60^\circ$  angle.

### 9.2. REPRODUCIBILITY

The difference in absolute value between 2 individual results obtained in reproducibility conditions (International Norme ISO 5725) and with a probability defined at 95%, must not exceed 3,3 UB under a  $20^\circ$  angle and 0,7 UB under a  $60^\circ$  angle.

## 10. TEST REPORT

As well as the results obtained, the test results must indicate :

- the reference to this méthode,
- the complete identification of the coating or part,
- the type of gloss meter used for the measurement (name of the manufacturer and model reference),
- the references of the standard used,
- the possible treatments to which the test specimens have been subjected before the test (conditioning, cleaning, polishing, etc.),

- the operating details not specified in the method as well as any possible incidents likely to have affected the results.

## APPENDIX 1

**TABLE 1 - ANGLES AND RELATIVE DIMENSIONS  
OF THE IMAGE FROM THE SOURCE AND RECEIVERS FOR 60°**

	In the measuring plane			Perpendicular to the measuring plane		
	$\sigma$ degrees	$2 \operatorname{tg} \sigma/2$	Relative dimension	$\sigma$ degrees	$2 \operatorname{tg} \sigma/2$	Relative dimension
Angular dimension of the image from the source	$0,75 \pm 0,25$	$0,0131 \pm 0,0044$	$0,171 \pm 0,057$	3,0 (*)	0,0524	0,682
Receiver aperture	$4,4 \pm 0,1$	$0,0768 \pm 0,0018$	$1,000 \pm 0,023$	$11,7 \pm 0,2$	$0,2049 \pm 0,0035$	$2,668 \pm 0,0466$

(\*) Maximum; no minimum specification

**TABLE 2 - ANGLES AND RELATIVE DIMENSIONS  
OF THE IMAGE FROM THE SOURCE AND RECEIVERS FOR 20°**

	In the measuring plane			Perpendicular to the measuring plane		
	$\sigma$ degrees	$2 \operatorname{tg} \sigma/2$	Relative dimension	$\sigma$ degrees	$2 \operatorname{tg} \sigma/2$	Relative dimension
Angular dimension of the image from the source	$0,75 \pm 0,25$	$0,0131 \pm 0,0044$	$0,171 \pm 0,057$	3,0 (*)	0,0524	0,682
Receiver aperture	$1,8 \pm 0,05$	$0,0314 \pm 0,0009$	$0,409 \pm 0,012$	$3,6 \pm 0,1$	$0,0629 \pm 0,0018$	$0,819 \pm 0,023$

(\*) Maximum; no minimum specification

**TABLE 3 - ANGLES AND RELATIVE DIMENSIONS  
OF THE IMAGE FROM THE SOURCE AND RECEIVERS FOR 85°**

	In the measuring plane			Perpendicular to the measuring plane		
	$\sigma$ degrees	$2 \operatorname{tg} \sigma/2$	Relative dimension	$\sigma$ degrees	$2 \operatorname{tg} \sigma/2$	Relative dimension
Angular dimension of the image from the source	$0,75 \pm 0,25$	$0,0131 \pm 0,0044$	$0,171 \pm 0,057$	3,0 (*)	0,0524	0,682
Receiver aperture	$4,0 \pm 0,3$	$0,0698 \pm 0,0052$	$0,909 \pm 0,068$	$6,0 \pm 0,3$	$0,1048 \pm 0,0052$	$1,365 \pm 0,068$

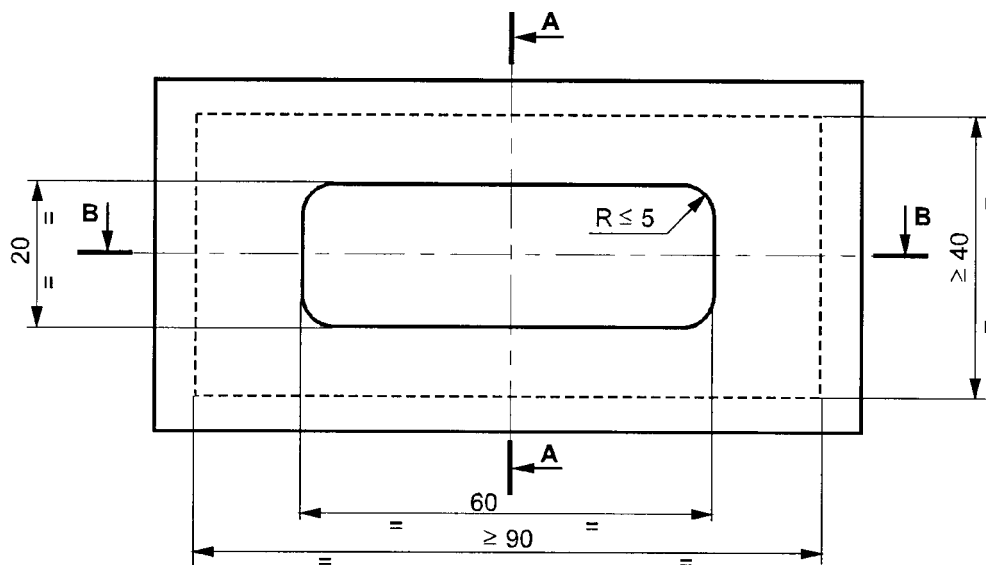
(\*) Maximum; no minimum specification

## Appendix 2

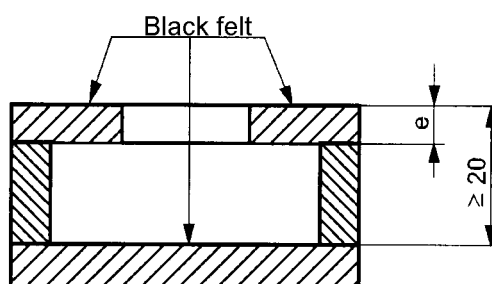
## LIGHT TRAP

Opaque material, thickness  $e$  between 1 mm and 5 mm, bonded assembly

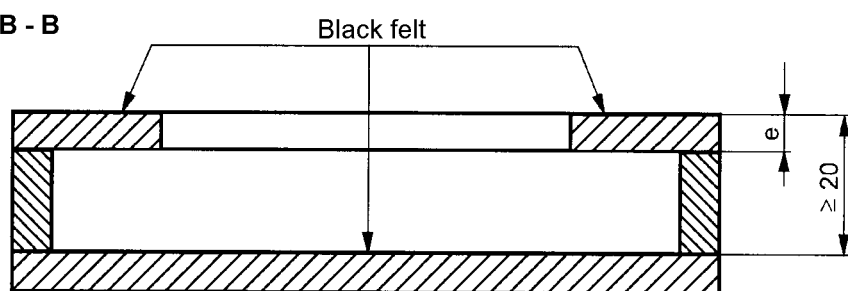
Plan view



## Section A - A



## Section B - B



## 11. RECORDS AND REFERENCE DOCUMENTS

### 11.1. RECORDS

#### 11.1.1. CREATION

- OR : 01/05/1981 – CREATION OF THE PSA NORME. REPLACES THE ASSOCIATION NORMES No. 1332 AND 1565.

#### 11.1.2. SUBJECT OF THE MODIFICATION

- B : 01/04/1995 – MODIFICATION TO PARAGRAPH 4.1.
- C : 03/04/1997 – INTRODUCED INTO IDEM (*French only*)

### 11.2. REFERENCE DOCUMENTS

#### 11.2.1. PSA DOCUMENTS

##### 11.2.1.1 Normes

##### 11.2.1.2. Others

#### 11.2.2. EXTERNAL DOCUMENTS

ISO 5725

### 11.3. EQUIVALENT TO :

REN D251413

### 11.4. CONFORMS TO :

### 11.5. KEY-WORDS