

## PAINT COATINGS CROSS HATCH TEST

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NO USE RESTRICTION

*This is a translation, the French original shall be used in all cases of litigation**Date of translation : 25/11/2003*

### 1. OBJECT AND FIELD OF APPLICATION

The object of this method is to assess the resistance of a paint coating to separation from its substrate when incisions are made as far as the substrate.

In general, this test must be carried out on the complete system constituting the paint film.

However, the test may be carried out independently on each layer with a view to determining the characteristics specific to each of them.

The method is not suitable for coatings with a total thickness exceeding 250 µm, for textured coatings and when it is applied to coatings with a rough surface, as this will give scattered results.

### 2. PRINCIPLE

The test consists of making an incision in the paint film as far as the substrate using a cutting instrument to form a cross hatch, then assessing the adhesion of the squares on the network formed.

This test is completed by a tear test carried out using adhesive tape on the cross hatched part of the film, the results of which are compared with a reference film.

The method is implemented with the view to producing a six degree classification.

### 3. EQUIPMENT AND REAGENT

#### 3.1 CUTTING TOOLS

##### 3.1.1 WITH A SINGLE BLADE

with a 20° to 30° edge according to figure 1 of appendix 1. The use of such a tool is only permitted on parts with a radius of curvature too large to use the multi-blade tool correctly.

##### 3.1.2 WITH MULTI-BLADES

with six cutting edges 1mm, 2 mm and 3 mm apart according to figure 2 of appendix 1.

**Note :** *The state of the blades must be inspected regularly, with a magnifying glass. If in doubt a dimensional inspection must be made. If the blades no longer correspond with the specifications of Appendix 1, it is necessary to either sharpen or change the blades.*

#### 3.2 BLADE GUIDES AND SPACERS FOR SINGLE BLADE

used for spacing incisions correctly according to appendix 2. To be used if necessary

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### 3.3 SOFT BRUSH

### 3.4 ADHESIVE TAPE

with an adhesion between 600 and 750 g/cm when it is measured in conformity with norme NF EN 1939.

### 3.5 CONDITIONED ROOM

at 23°C ± 2°C with no hygrometry requirements.

### 3.6 ETHANOL

## 4. TEST SPECIMENS

The dimensions of test specimens must be such that they allow the test to be carried out in three different places on each test specimen with a distance between these and the edges of at least 5 mm.

The test may also be completed on test specimens taken from parts or directly from the vehicle. In the latter case, the test protocol may be adapted, by prioritising the use of the multi-blade tool.

### 4.1 PREPARATION OF TEST SPECIMENS

The type of substrate, its surface preparation, the conditions for applying and drying the films must be those appropriate to the use of the products to be examined and must be indicated in the test report.

The surface of the substrate must be clean, if necessary, proceed with a cleaning operation with ethanol (3.6), then wipe with a clean cloth.

The thickness of the paint film must be known with an accuracy equal to ± 10% or ± 5 µm whichever is the lowest of these values.

### 4.2 AGEING AND CONDITIONING

The test specimens may, if applicable, be subjected to any type of ageing specified in the documents before this test.

Condition the test specimens for at least 16 hours, prior to the test, at 23°C ± 2°C with no hygrometry requirements.

**Remark:** In the case where the cross-hatch test takes place in addition to another test which requires specific conditioning of the test specimens (according to test method D27 1571 or D27 5438, for example) the indication of the latter will be adhered to.

## 5. METHOD OF OPERATION

### 5.1 TEST CONDITIONS AND NUMBER OF TESTS

- Carry out the test in the conditioned room (3.5).
- Carry out the test in three different places on the test specimen. If the results do not agree, the differences being more than one unit of classification, repeat the test in three other places, using, if necessary, other test specimens and record all the results.

### 5.2 NUMBER OF INCISIONS

The number of incisions in each direction of the cross hatch must be six.

### 5.3 SPACING OF INCISIONS

The spacing of incisions in each direction must be the same and must depend on the thickness of the coating and of the type of substrate as follows :

- On a metallic substrate:
  - Cataphoresis or cataphoreses + primer: 1 mm spacing
  - Complete film: 2 mm spacing
  - Recycling, or touch-up: 3 mm spacing
- On a plastic substrate:
  - Painted plastic parts (initial fitting), delivered finished by the Supplier in partially finished condition (primer): 1 mm spacing
  - Painted plastic parts (initial fitting), delivered finished by the Supplier in fully finished condition: 2 mm spacing
  - Plastic parts, delivered with a primer by the Supplier and a final coating i.e. applied by PSA Peugeot Citroën (initial fitting): 2 mm spacing

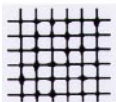


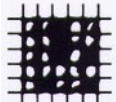
### 5.4 INCISION AND REMOVAL OF THE COATING

- Place the test specimen on a flat rigid surface in order to avoid any distortion of the panel during the test.
- Maintain the tool in a perpendicular plane to the surface of the test specimen. By applying an even pressure on the tool and using a suitable spacing guide (3.2), if the single blade tool is used, produce the agreed number of incisions in the coating at a constant speed. All incisions must penetrate as far as the substrate.
- Repeat this operation by carrying out new parallel incisions, in equal number, overlapping the initial incisions at 90° so as to form a cross hatched area.
- Lightly brush the test specimen with the brush (3.3).
- Place the centre of the adhesive tape (3.4) on the cross hatched area, in parallel with one of the direction of incision as shown in appendix 3 and firm the tape with the finger on the cross hatched area and around it over a length of at least 20 mm, smooth with a wooden rounded ridge tool. The handle of the comb or the edge of the brush supplied with the comb, if made of wood, is suitable. Allow at least 1 minute for adhesion.
- Within five minutes following the application of the adhesive tape, remove the tape by holding the free extremity and rapidly tearing it in 0,5 second to 1 second, at an angle as close as possible to 60° according to appendix 3.

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## 6. EXPRESSION OF RESULTS

- Examine the paint film and classify according to the size of the detached area by comparing it with the examples mentioned below.

Classification	Description	Surface of the cross hatched area for which flaking has occurred (For six parallel incisions)
a	The edges of the incisions are perfectly smooth : none of the squares on the cross hatched area has become detached.	-
b	Detachment of small flakes from the coating at the incision intersections affecting approximately 5% of the cross hatched area.	
c	The coating has become detached along the edges and/or at the incision intersections affecting clearly over 5% up to approximately 15% of the cross hatched area.	
d	The coating has become detached along the edges of the incisions partially or totally, in large strips, and/or has become detached partially or totally in various points of the cross hatched area A cross hatched area representing clearly over 15% up to 35% is affected..	
e	The coating has become detached along the edges of the incisions in large strips and/or a few squares have become detached partially or totally. An area representing clearly over 35% up to 65% is affected.	
> e	All degrees of flaking which cannot be classified under classification e.	-

- In the case of a multi-layer system, record at which interface the flaking appears.
- Results may possibly be compared with those obtained with a reference film.

## 7. MEASUREMENT UNCERTAINTY

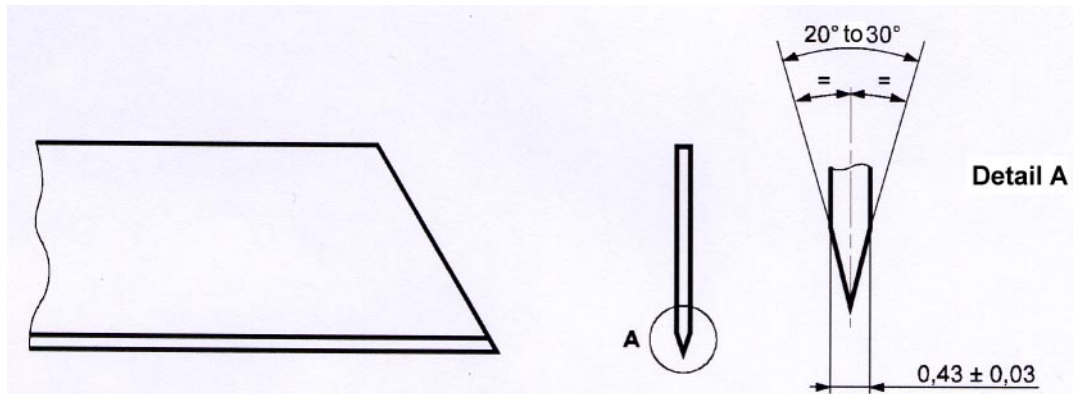
The evaluation of the cross hatch strength is a grading method: the measurement uncertainty cannot be defined.

## 8. TEST REPORT

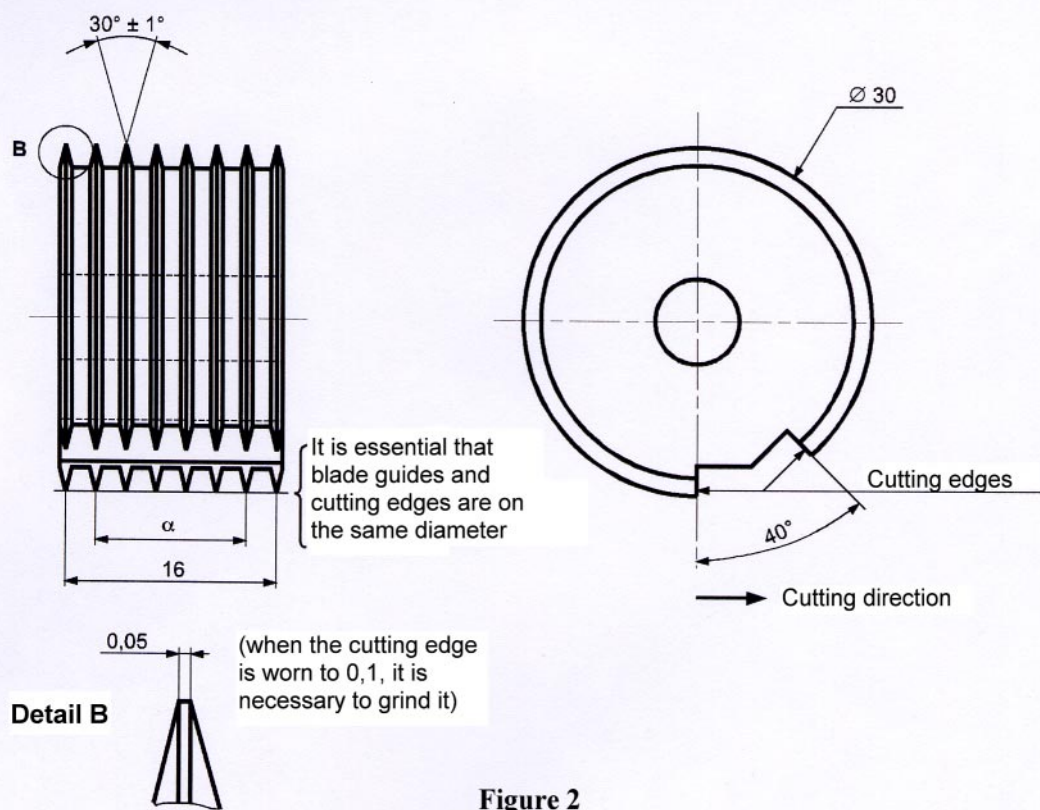
As well as the results obtained, the test report must indicate :

- the reference to this method,
- the tool used,
- the family and description of each of the paint film layers assessed, as well as those of the substrate,
- the thickness of the paint film in micrometres with a precision equal to the lowest of the following values :  $\pm 10\%$  or  $\pm 5 \mu\text{m}$  and the number of layers; the thickness of the tested layer if the test is carried out on a single layer,
- the pitch of the cross hatching if it differs from that set by the method,
- the test conditions temperature and relative humidity should they differ from those set in the method,
- the operating details not specified in the method as well as any possible incidents likely to have affected the results.

## APPENDIX 1

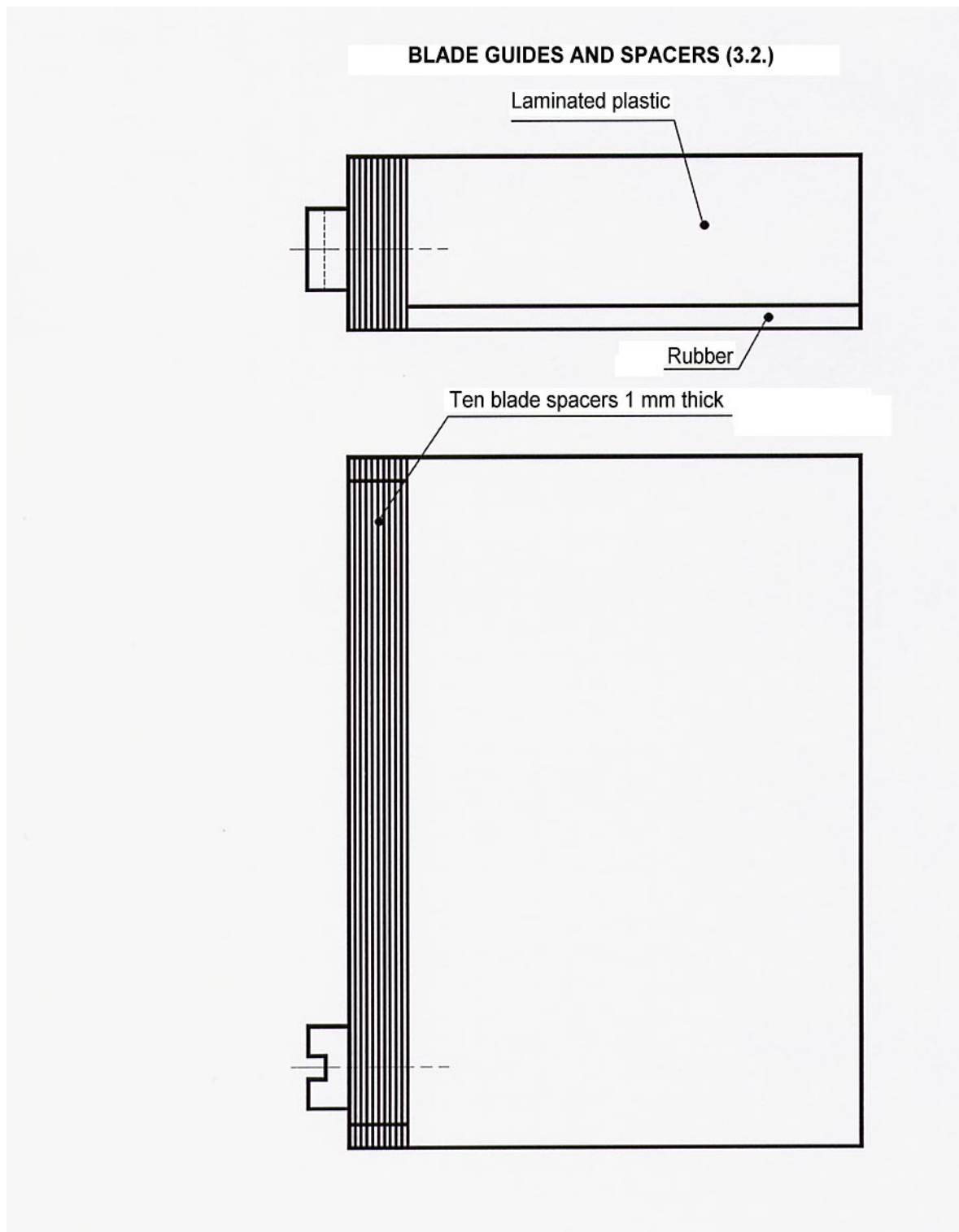


**Figure 1**  
**SINGLE BLADE CUTTING TOOL (3.1.1)**



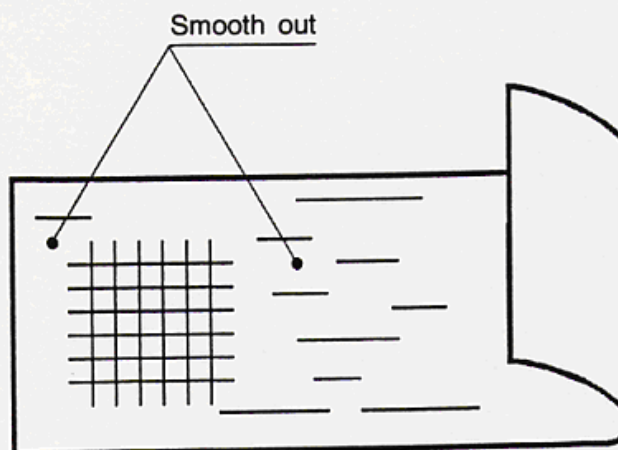
**Figure 2**  
**MULTI-BLADE CUTTING TOOL (3.1.2)**

## APPENDIX 2

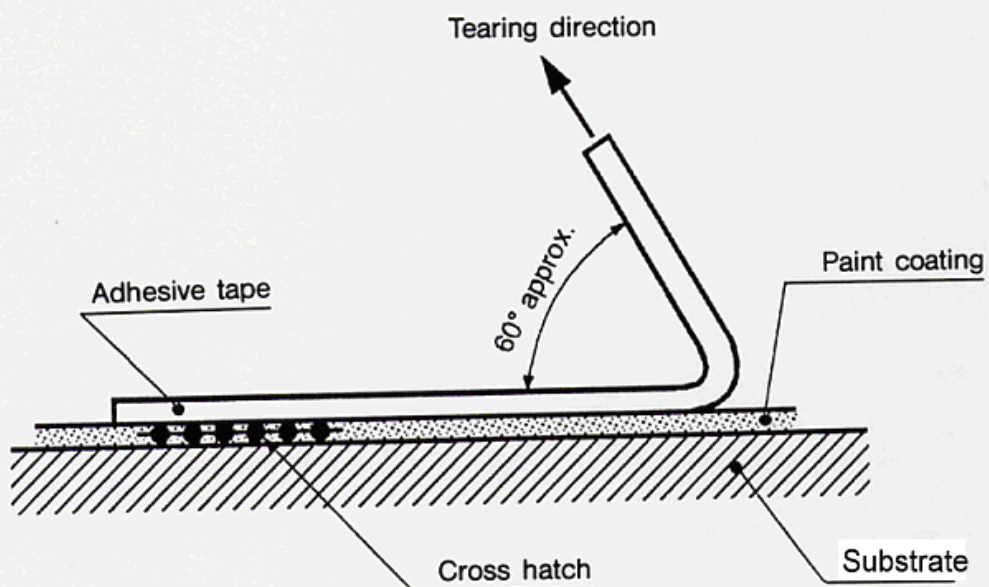


## APPENDIX 3

## POSITION OF ADHESIVE TAPE IN RELATION TO THE CROSS HATCH



## POSITION OF ADHESIVE TAPE UP TO TEARING



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## 9. RECORDS AND REFERENCE DOCUMENTS

### 9.1. RECORDS

#### 9.1.1. CREATION

- OR : 01/09/1982 – CREATION OF THE PSA NORME. REPLACES THE ASSOCIATION NORMES No. 1075 and 1254.

#### 9.1.2. OBJECT OF THE MODIFICATION

- C : 08/07/2003 – UPDATE OF THE TEST METHOD.
- B : 17/03/1997 - INTRODUCED INTO IDEM (*French only*).

### 9.2. REFERENCES DOCUMENTS

#### 9.2.1. PSA DOCUMENTS

##### 9.2.1.1. Normes

D27 1571	PAINT COATINGS – BLISTERING FROM HUMIDITY
D27 5438	REVÊTEMENTS DE PEINTURES - FEUIL FINI - RÉSISTANCE AU VIEILLISSEMENT EN AUTOCLAVE

##### 9.2.1.2. Others

#### 9.2.2. EXTERNAL DOCUMENTS

NF EN 1939	RUBANS AUTO-ADHÉSIFS – MESURE DU POUVOIR ADHÉSIF LINÉAIRE SUR ACIER INOXYDABLE OU SUR SON PROPRE SUPPORT
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### 9.3. EQUIVALENT TO :

### 9.4. CONFORMS TO:

### 9.5. KEY-WORDS