

PAINT COATINGS RESISTANCE TO CHIPPING

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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 to chipping of a paint coating, single or multi-coats applied to a metal or plastic substrate.

2.PRINCIPLE

The chipping test consists of projecting a determined mass of specified metal granules, at an angle of incidence, with a well defined output and energy, on the paint coating applied to a test specimen.

The same test specimen is subjected to a second chipping test identical to the previous one after it has been submerged in water at 40 °C for a duration of 24 hours.

The resistance to chipping is then evaluated, after application of adhesive tape, by the dimension of flakes their density and optionally by the number of impacts reaching the substrate.

3.EQUIPMENT AND REAGENT

3.1.CONDITIONED ENCLOSURE

At 23 °C \pm 2 °C and with no hygrometry requirements.

3.2.METAL GRANULE BLASTING EQUIPMENT,

According to the schematic diagram of the equipment shown in Appendix 1, marketed by the ERICHSEN company, reference VDA 508.

This equipment must be modified in such a way that the test specimens to be chipped are at a right angle to the axis of projection of the metal granules.

Detailed drawings of this modification can be obtained by simple request to the "PEINTURES" (Paints) department of DPTA/DMOV/MXP at VELIZY.

Note : *The precision of the manometer, with which it is equipped, must be of $\pm 0,1$ bar.*

3.3.GRANULES,

Quenched cast iron of "diamond" shape, to a ROCKWELL hardness of between 61 and 65 angular in form and with a mean diameter of 4 mm to 5 mm, marketed by the ERICHSEN company.

3.4."FORD" TANK,

Conforms to that used in test method D27 1327.

3.5.PLATES,

In sheet steel or aluminium or in plastic, defined in standards documents relating to paints applied on these substrates, with minimal dimensions of 85 mm x 85 mm.

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3.6.ADHESIVE TAPE,

Conforms to that used in test method D25 1075.

3.7.BALANCE,

With a range of 2 kg, accurate to within one gram.

3.8.CHRONOMETER

3.9.DE-IONISED WATER,

Available in the laboratory, with resistivity > 200 000 Ω /cm when the tank is assembled.

This is to be renewed weekly.

4.PREPARATION OF TEST SPECIMENS

4.1.LABORATORY TEST SPECIMENS

Use the sheet steel or aluminium or plastic plates (3.5.).

These plates receive the range of paints for which resistance to chipping is being assessed.

Record all the parameters linked with the complete range of paints: surface treatment, thickness of each coat, stoving temperature etc...

4.2.SAMPLING OF TEST SPECIMENS FROM PARTS

When the resistance to chipping of painted parts has to be assessed for example: doors, bonnets, plastic parts, cut out test specimens of at least 50 mm x 50 mm in the flattest area of the part, radius of curvature exceeding 1 metre, while taking care to not generate stresses outside the edges of the specimen.

If the dimensions of this test specimen are less than 85 mm x 85 mm, bond the test specimen to a steel plate with minimum dimensions of 85 mm x 85 mm.

In the case where no relatively flat test specimen can be cut out from the part, for example anti roll bar, torsion bar, wiper brush, rim ..., expose the part, or a portion of the part directly in front of the projection window (3.2.).

A cover adapted to the geometry of each part must be applied behind the part and on the window of the equipment (3.2.) to prevent granules from being projected outside the equipment

Or equally, 2 or more parts, placed side by side, may be used to blank the window; and avoid using a cover if this is a more practical method.

4.3.CONDITIONING OF TEST SPECIMENS

Painted test specimens must be conditioned in the enclosure (3.1.) for at least 16 hours.

Note : *In the case of paints curable at a temperature below 120 °C, the 16 hour conditioning must only be carried out 7 days after the paint has been applied to the test specimens.*

5.METHOD OF OPERATION

- Connect the blasting equipment (3.2) to the compressed air network with a minimum pressure of 6 bar and maximum pressure 10 bar.
- Apply the voltage and ensure that the air reservoir is adequately filled.

5.1.CALIBRATION OF EQUIPMENT

- Protect the test specimen fixing system by fitting a metal plate.
- With the solenoid valve open, set the compressed air pressure to $1 \text{ bar} \pm 0,1 \text{ bar}$ (unless otherwise specified).
- Raise the window by 10 mm, used as a partition between the hopper and the acceleration tube, to allow the flow of metal granules.
- Pour $500 \text{ g} \pm 1 \text{ g}$ of metal granules (3.3.) into the hopper.
- Switch on the equipment.
- Start the chronometer (3.8.) as soon as the first metal granules fall into the acceleration tube.
- Stop the chronometer as soon as the last metal granules have disappeared and record the time elapsed.
- If the flow time is different from $10 \text{ s} \pm 1 \text{ s}$, increase or decrease the speed of flow by means of the knob provided.
- Repeat the operation until the flow time of the metal granules is equal to $10 \text{ s} \pm 1 \text{ s}$.

5.2.TEST

5.2.1. Fix the test specimen previously conditioned, according to § 4.3., on to the equipment support (3.2.). Due to the noise made as a result of the test, the equipment is often located outside of the conditioned enclosure. In this case, ensure that less than 5 minutes elapses between the part being removed from the conditioned enclosure and the beginning of the test.

5.2.2. Pour 500 g of metal granules (3.3.) into the hopper and fix to the equipment (3.2.) the tray for collecting the metal granules.

5.2.3. Switch on the equipment until the metal granules have completely passed through.

5.2.4. Stop the equipment, then remove the test specimen from the support.

5.2.5. Submerge for $24 \text{ hours} \pm 1 \text{ hour}$, the test specimen in the tank (3.4.), fill with de-ionised water (3.9.) and thermostatically controlled to $40 \text{ }^{\circ}\text{C} \pm 1 \text{ }^{\circ}\text{C}$.

5.2.6. Proceed to a second chipping operation, between 1 and $1\frac{1}{2}$ hour after the specimen has been removed from the tank (3.4.), following the procedure described in § 5.2.1. to 5.2.4. inclusive.

5.2.7. When the equipment (3.2.) is not to be used for the next 24 hours, it must be switched off and the air reservoir emptied.

5.2.8. Apply adhesive tape (3.6.) over the whole chipped surface and peel it off following the procedure as indicated in § METHOD OF OPERATION of test method D25 1075.

5.3.QUALITY AND SAFETY CONTROL

5.3.1.Quality Control

- The projection tube for the metal granules must be inspected yearly.
- The edges of the shot frame window, PSA PEUGEOT CITROËN modification of the original equipment, must show no defects.
- The metal granules must be replaced every 200 projections. Use the test counter fitted to the blasting equipment.
- The pressure, weight of granules, and time taken for the granules to pass through are to be checked daily, prior to beginning the test.

5.3.2.Safety

- It is recommended to switch off the blasting equipment (3.2.) and empty the air reservoir when the testing is stopped for longer than 24 hours.
- The operator must wear noise protection equipment during testing.

6.EXPRESSION OF RESULTS

After testing, the resistance to chipping of the test specimen is to be estimated according to three criteria, one of which is optional.

6.1.GRADING OF THE SIZE OF FLAKING

This grading corresponds to numbers 1 to 6 of the representative photographs shown in Appendix 2, with the surface area of the largest flakes identical to those on the largest flakes on the test specimen.

If the surface of the largest flakes on the test specimen is between two of the grades shown, then an intermediate grade may be used.

Example : *Surface of the largest flakes on the test specimen is between grades 3 and 4 → grading 3/4.*

Note :

- Eliminate systematically the largest flake on the test specimen and do not take into account flakes situated less than 5 mm from an edge.
- When a large flake is caused by the grouping of many smaller flakes (many impacts close to one another), do not take into account, for the grading, the large flaking area but assess which grading would have been allocated to the flakes if the impacts had been more apart from one another.

Remark : Concerns only gradings 1, 2 and 3.

- *Markings with no flaking on the paint coating due to the permanent deformation of a plastic substrate must not be considered to be flaking.*
- *The plates which show no flaking, but only markings, correspond to grade 1.*

6.2.DENSITY OF FLAKING

Count the flakes present on the test specimen, the surface area of which is between that of the largest flakes on the grading obtained according to § 6.1 GRADING OF THE SIZE OF FLAKING, and that of the largest flakes on the immediately lower grading, do not take into account flakes on a smaller area; let n be this number.

If the surface of the test specimen exposed to chipping is different from 0,64 dm², surface of the window of the equipment (3.2.).

Calculate the number of flakes N relating to a surface area of 0,64 dm², according to the following relationship:

$$N = \frac{n \cdot 0,64}{S}$$

In which : n = Number of flakes present over the whole test specimen,

S = Surface of the test specimen exposed to chipping expressed in square decimetres.

Grade the density of flakes, letters A to E, according to the following table:

Grading	n (or N if S ≠ 0,64 dm ²)
A	1 to 9
B	10 to 24
C	25 to 74
D	75 to 150
E	> 150

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6.3.NUMBER OF IMPACTS TO REACH THE METALLIC SUBSTRATE

(optional)

The grading of the number of impacts reaching the metal substrate must be expressed in conformity with test method D29 5342.

6.4.EXAMPLE OF GRADING

The grading of the resistance to chipping must be expressed by the three gradings together, the third being optional, defined in § 6.1., 6.2. and 6.3., in that order.

Example : 3 C 2

7.MEASUREMENT UNCERTAINTY

The evaluation of the resistance to chipping is a grading method: the measurement uncertainty cannot be defined.

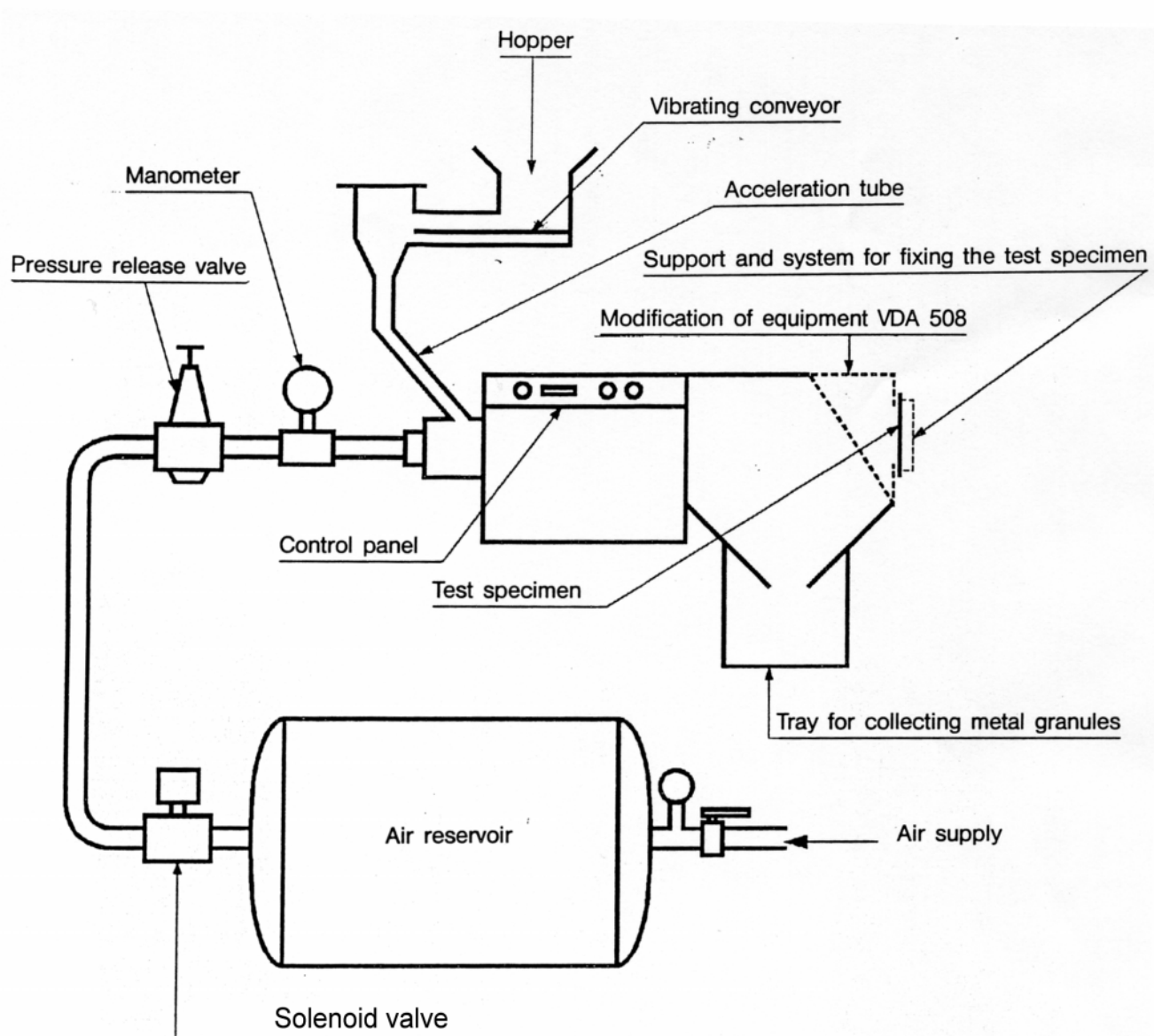
8. TEST REPORT

As well as the results, the test report must include:

- the reference to this method,
- the reference to the part, in the case of a test specimen being sampled from a part,
- the type of substrate,
- the detailed range of paint applied to the test specimen, reference of the products, name of suppliers, thickness applied, etc...,
- the stoving conditions for the laboratory test specimens, as well as for specimens taken from parts, if the data is available.
- The operational details not specified in the method as well as any incidents likely to affect the results.

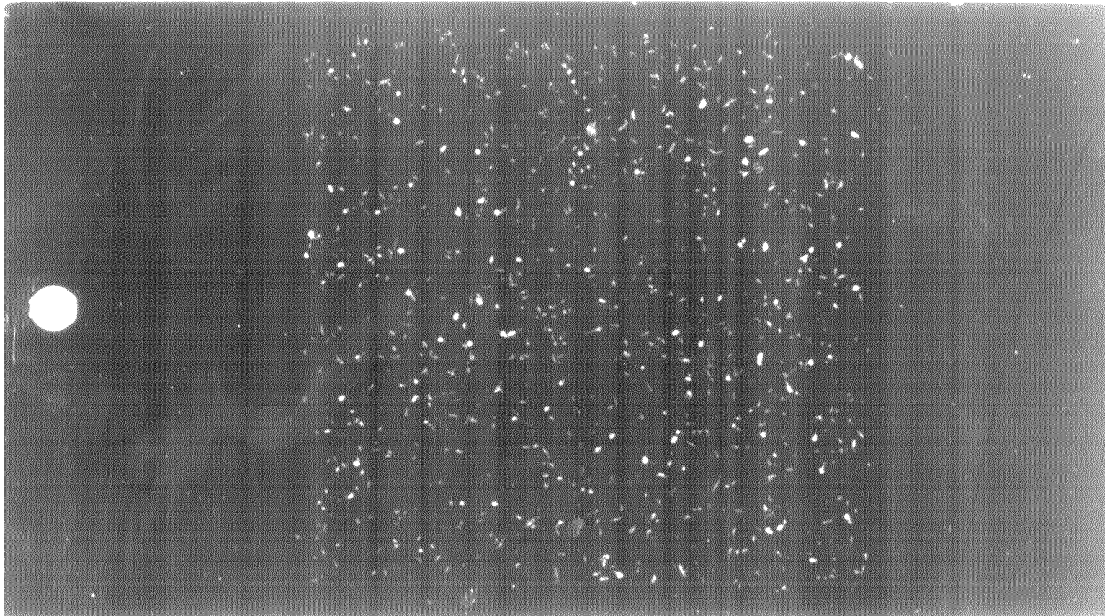
APPENDIX 1

SCHEMATIC DIAGRAM OF THE EQUIPMENT

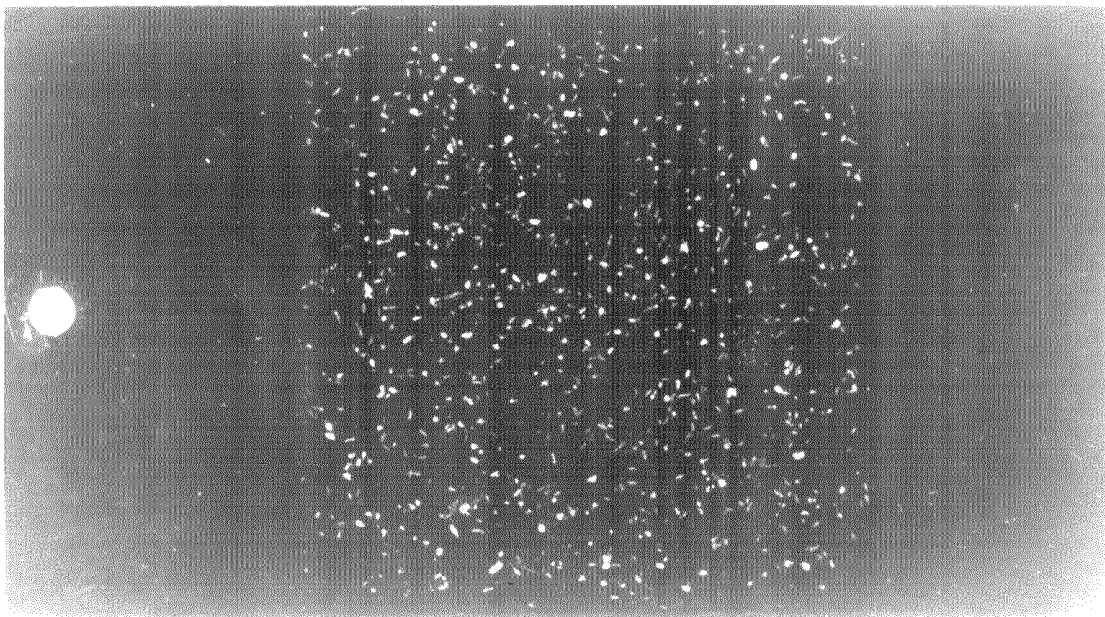


APPENDIX 2 (1/3)

GRADING SCALE



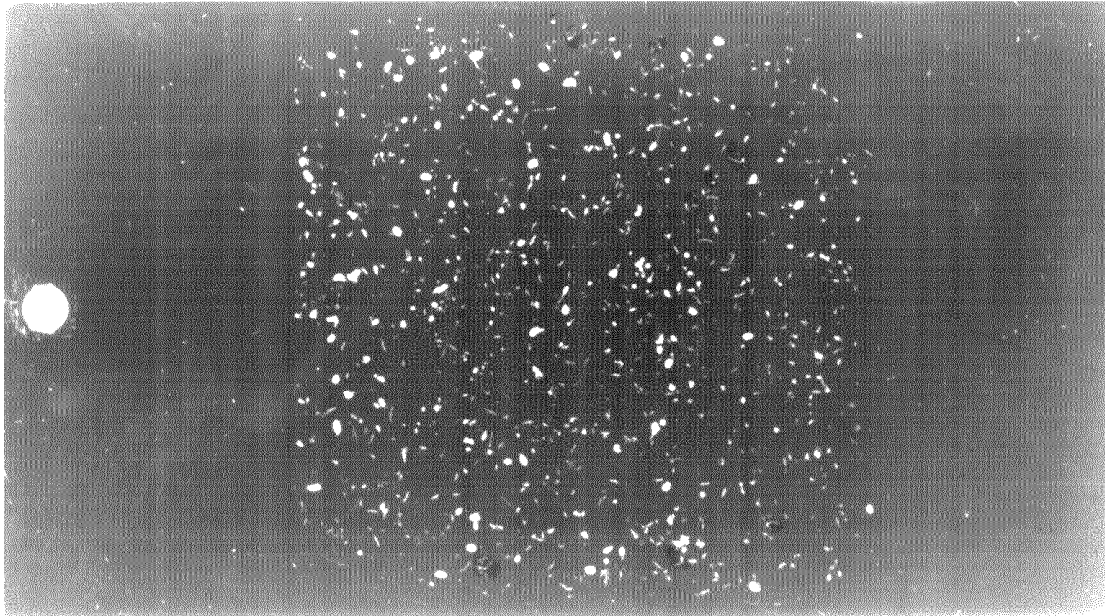
NUMBER 1



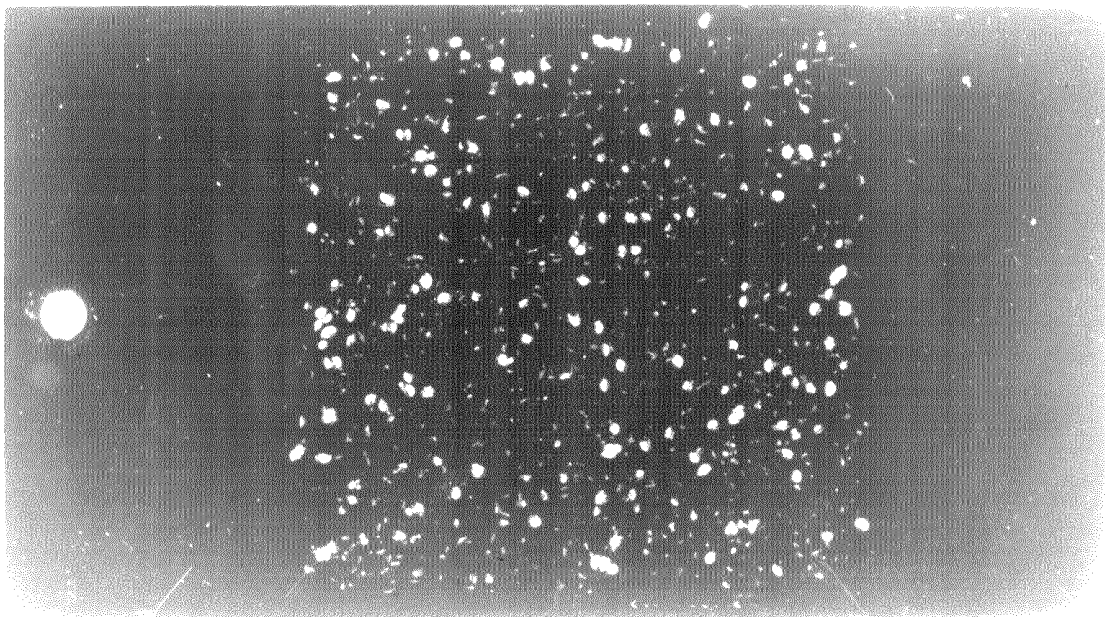
NUMBER 2

APPENDIX 2 (2/3)

GRADING SCALE (continued)



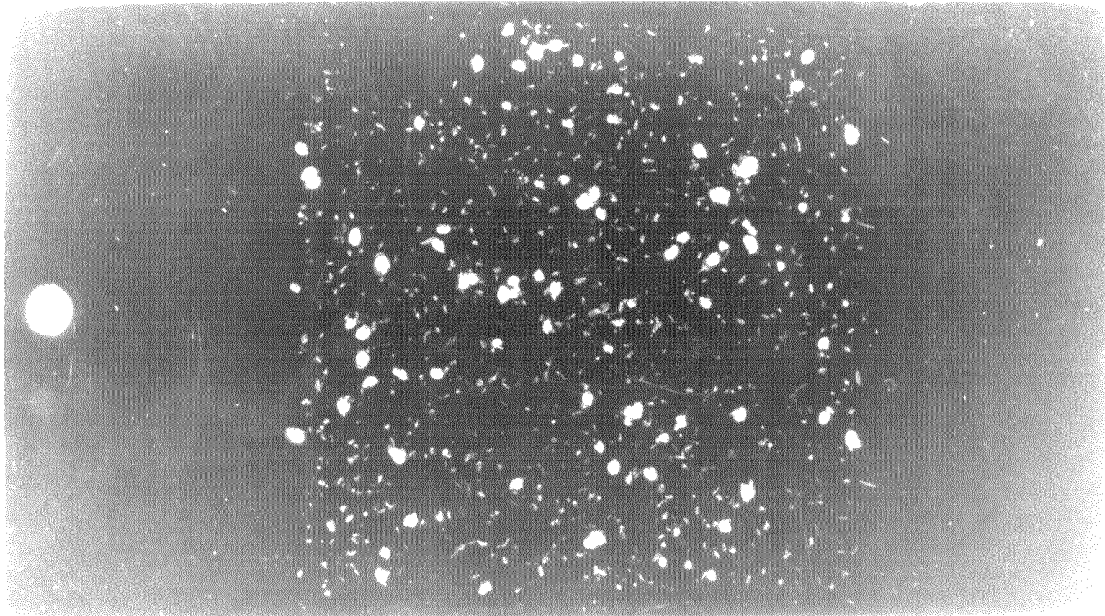
NUMBER 3



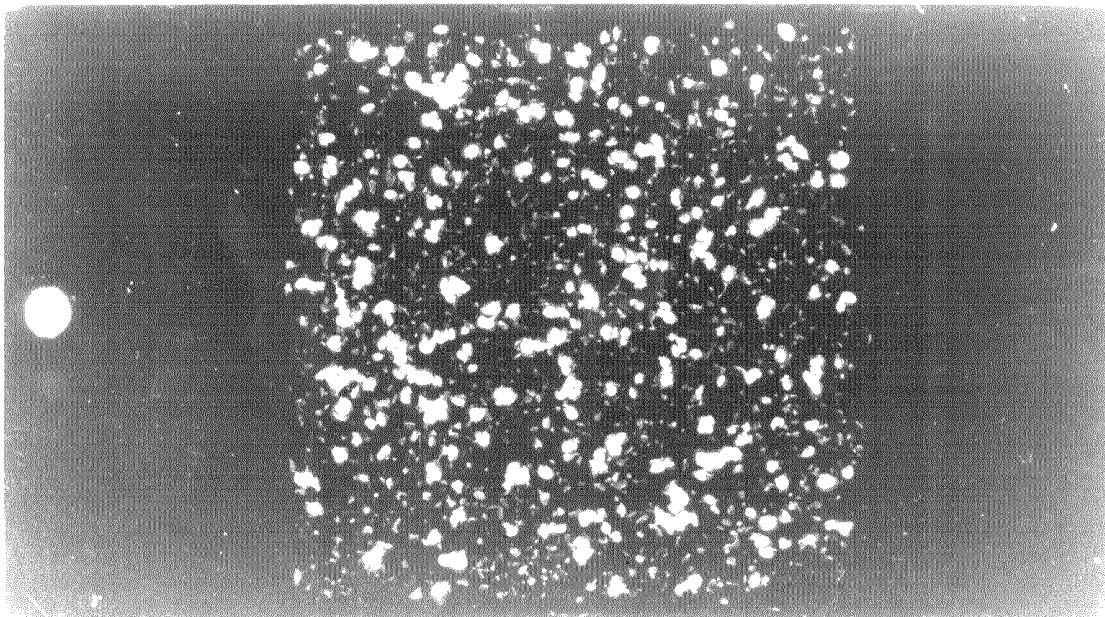
NUMBER 4

APPENDIX 2 (3/3)

GRADING SCALE (continued)



NUMBER 5



NUMBER 6

9. RECORDS AND REFERENCE DOCUMENTS

9.1. RECORDS

9.1.1. CREATION

- OR : 01/05/1980 – CREATION OF THE PSA NORME. REPLACES THE PEUGEOT NORME No. 1312

9.1.2. OBJECT OF THE MODIFICATION

- D : 20/05/2003 – UPDATE OF THE TEST METHOD.
- C : 28/03/1997 - INTRODUCED INTO IDEM (*French only*).

9.2. REFERENCES DOCUMENTS

9.2.1. PSA DOCUMENTS

9.2.1.1. Normes

D25 1075	PAINT COATINGS – CROSS HATCH TEST
D27 1327	PAINT COATINGS – RESISTANCE TO IMMERSION IN WATER (FORD TANK)
D29 5342	PAINT COATINGS ON METALLIC SUPPORTS - HIGHLIGHTING AND GRADING OF IMPACT REACHING THE SUPPORT

9.2.1.2 Others

9.2.2. EXTERNAL DOCUMENTS

9.3. EQUIVALENT TO :

9.4. CONFORMS TO:

9.5. KEY-WORDS