REPORT 96-14

OBJECT: study on the importance of pretreatment for aluminum surfaces, previous to powder-coating.

REQUESTED BY: Decoral System

02/10/14

OBJECT: study on the importance of pretreatment for aluminum surfaces, previous to powder-coating.

1. Purpose:

Assessing the importance of a correct pretreatment to obtain a good adhesion of the layer of powder coating on the metal substrate.

2. Samples description:

The data of the samples are reported in the following table:

Lab ref.	Support material	Pretreatment	Powder coating	Notes
34207	Aluminum panel	No pretreatment	DS 739	/
34208	Aluminum panel	Chrome	DS 739	/
34209	Aluminum panel	Chrome-free	DS 739	/

Table 1: samples

3. Tests:

1. Thickness **EN ISO 2360**
2. Corrosion test (salt spray) **ISO 9227**
3. Adhesion (cross-cut test followed by impact test)

3.1 Thickness:

EQUIPMENT FOR THE TEST:

- Thickmeter Fischer Dualscope MP20 (registration number 01052042)
  Standard reference: **ISO 2360: 2003**

In the table below, the average values are displayed:

Lab reference	Thickness
34207	72µm
34208	81µm
34209	69µm

Table 2: thickness

3.3 Acetic acid salt spray:

The samples have been tested in terms of resistance to corrosion, according to standard **ISO 9227**:

Conditions	pH	Temperature	Collecting devices
Standard	6±0.5	35°C±0.5°C	1.0-1.5 ml/h
Operative	6.03	34.7°C	1.8 ml/h

Sample 34207:

Type of degradation	Density*	Dimensions**	NOTES
Blistering (ISO 4628-2)	2	5	clearly distinguishable defects

Sample 34208:

Type of degradation	Density *	Dimensions**	NOTES
Blistering (ISO 4628-2)	0	0	/

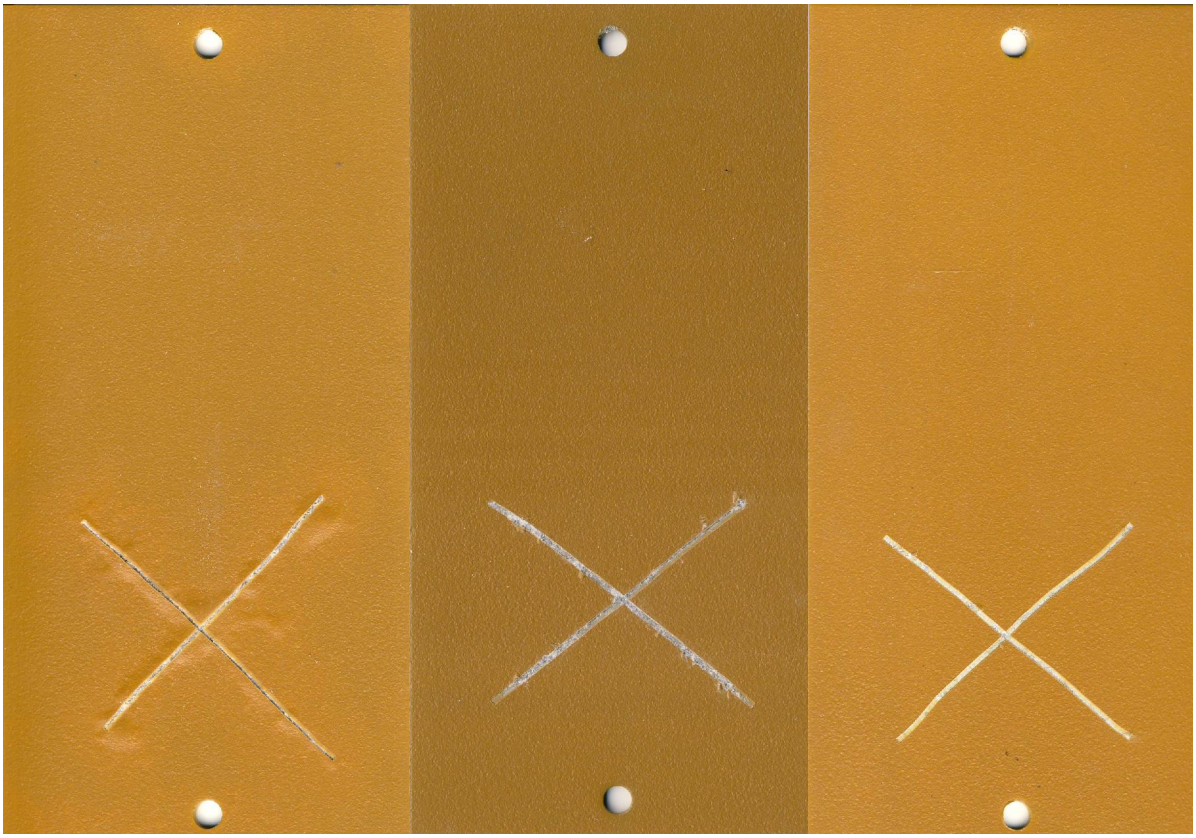
Sample 34209:

Type of degradation	Density *	Dimensions**	NOTES
Blistering (ISO 4628-2)	0	0	/

*** Assessed according to UNI EN ISO 4628/1 table 2**

0 = none
1 = very few
2 = few
3 = moderate
4 = considable
5 = dense

**** Assessment according to the respective tables: UNI EN ISO 4628**



Picture 1, left to right: sample 34207, 34208, 34209 after the acetic acid salt spray test

Picture 1 shows how the non-pretreated sample has lost the adhesion of the powder-coat layer all along the cut, due to the beginning of corrosion processes.
Pretreated samples, instead, keep a good adhesion everywhere on the surface, included the area in proximity of the cut.

3.4 Adhesion test:

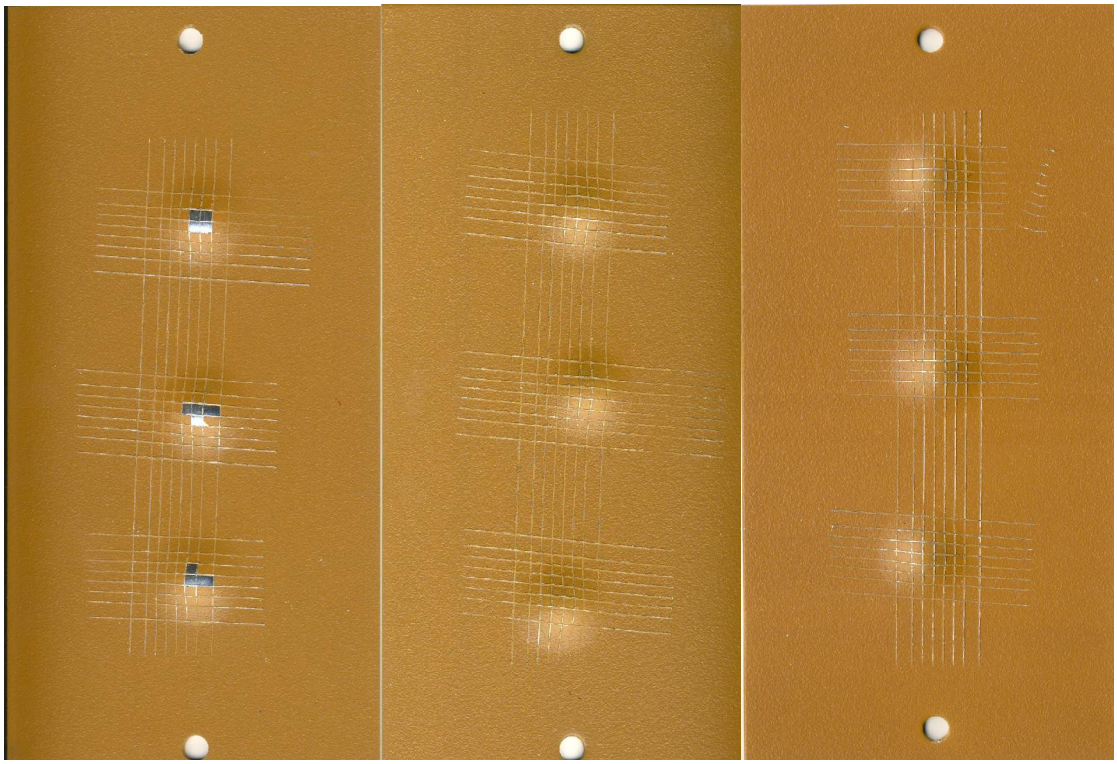
Cross-cut test (according to reference **EN ISO 2409**) has been made on the samples, followed by impact test (according to reference **ASTM D 2794**)

Lab reference	Results*
34207	GT 4
34208	GT 0
34209	GT 0

Table 3: adhesion test

*** Assessed according to UNI EN ISO 2409 table 1**

GT 0 = no loss of adhesion
GT 1 = loss of adhesion < 5% of the area
GT 2 = loss of adhesion between 5% and 15% of the area
GT 3 = loss of adhesion between 15% and 35% of the area
GT 4 = loss of adhesion between 35% and 65% of the area
GT 5 = other



Picture 2, left to right: sample 34207, 34208, 34209 after adhesion tests

Picture 2 shows how the non-pretreated sample has lost the adhesion of the powder-coat layer after the mechanical tests.
Pretreated samples, instead, maintain a good adhesion on the whole area, despite the severe mechanical stress.

4. Conclusions:

The results of the tests show how the chemical pretreatment is fundamental to obtain a good adhesion between the metal substrate and the layer of powder coating.

Therefore, it is important to consider that:

- An incorrect pretreatment, or no pretreatment at all, on aluminum surfaces would seriously compromise the adhesion of the powder coat, shortly leading to corrosion processes that in the long term may even structurally damage the aluminum object.

- Both the chrome pretreatment and the chrome-free pretreatment, if correctly carried out, ensure a perfect adhesion of the powder-coat layer on the metal substrate.

5. Some advices:

In order to avoid problems of adhesion:

- Always check that the pretreatment on the metal support is carried out in a correct and homogeneous way, and subsequently that it has been completely dried.
- Make sure that, after the pretreatment, the object to be coated isn't touched by anything that could dirty or soil it: this would compromise the adhesion of the powder coat.
- Possibly, apply a uniform thickness of powder coat in the range of 60-90 μm.

6. Attached samples:

- Aluminum panels 34207, 34208 and 34209.

7. Report given to:

- Laboratory archive (original samples).
- Dott. Pandolfi (via e-mail).

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