

SURFACE DEFECTS RATING
AND
ACCEPTABILITY CRITERIA CLAIMS

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1 PURPOSE

This procedure provide the criteria necessary for classification of anomalies encountered on plated products and at the same time establishes the STANDARD of acceptability for the ASO H&P product line.

The concepts expressed do not reduce the performance of the product.

2 FIELD OF APPLICATION

The present procedure is applicable to all PRODUCTS supplied by ASO H&P.

3 LIABILITY

Quality control staff should to inspect the material in accordance with the criteria and procedures provided in this standard.

4 RESOURCES

In order to detect all the visual defects and avoid the generation of the new ones, the areas dedicated to control operations must have:

- adequate lighting,
- adequate support,
- proper handling equipment.

Inspection team must be properly trained and have a correct understanding of the requirements stated in this document.

5 CONTROL EQUIPMENT

- Loupe 25x29 - 5Xwith LED light.
- Lens with measuring slide 10X type.
- Cotton gloves;
- Cloth;
- Solvent / degreaser



6 QUALITY CONTROL METHODS

- **Visual inspections:** the method is useful to detect the defects but it doesn't define if the imperfection get to the base material.
- **Ferroxyl test or chemical controls:** the method could be useful to identify the defect but it doesn't accurated as like metallographic analysis.
- **Metallographic analysis:** the method is the most accurate to detect a defect but it's a distructive test.

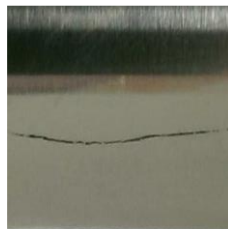
7 SURFACE DEFECTS

7.1 Definition

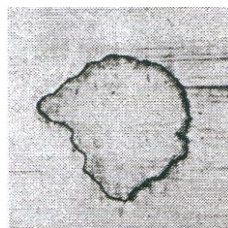
Any discontinuity or imperfection on the chromed surface visible with the naked eye or by a low magnifying lens. This chapter list kind of defects on the chromed surface:

7.1.1 Imperfections due to chroming plating process/raw material:

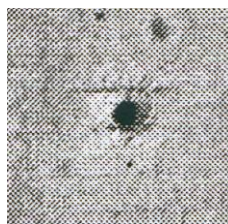
- **Cracks:** a fracture/discontinuity



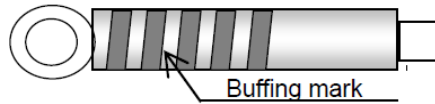
- **Flaking / exfoliation:** Chrome material lack



- **Pitting:** "black-hole" on the chromed surface:



- **Visual buffing marks:** spiral on chrome surface generated during the polishing operation.

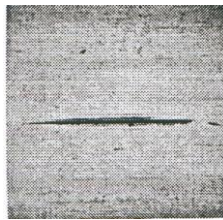


- **Nodules (bumps)/bubbles**



7.1.2 Imperfections due to handling operations:

- **Scratch (longitudinal, radial):**



- **Dents, engravings from handlings and chipping marks:** bulge of the edges of the defect



- **Pressure marks:** a dent generated before final grinding.



7.2 Defect Morphology

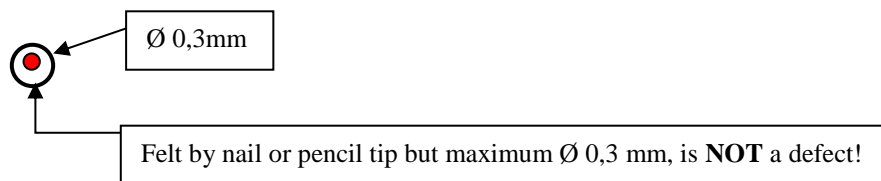
The following list defines the specific terms used to describe different surface defects:

- **Skin-deep:** defect visible to the naked eye but doesn't perceptible by nail or pencil tip;
- **Single:** isolated defect or more defects distant from each other more than 100 mm or when the distance between the defects is less than 5mm;
- **Line-up:** when the distance between the defects is more than 5mm;
- **Cluster:** Min. 3 defects contained in a section of 15×15 mm or 225 mm².

8 ACCEPTABILITY CRITERIA

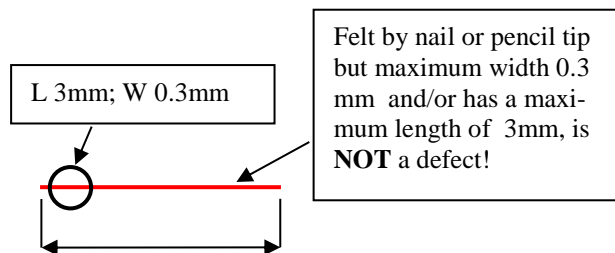
It is **NOT ALLOWED** to supply products affect with the following imperfections:

- Cracks;
- Exfoliations;
- Pits only when these conditions are satisfied:
 - $0.3 \text{ mm} < \varnothing < 0.6 \text{ mm}$ and more than 1pit/300 mm or 10 / 6000 mm single or line-up
 - $\varnothing > 0,6 \text{ mm}$ even it is a single defect

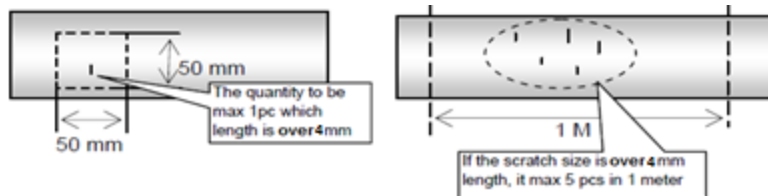


- Bubbles;
- Dents;

- Longitudinal scratches only when the three conditions mentioned below are satisfied at the same time:
 - perceptible with the nail or the pencil's tip;
 - width > 0,3 mm;
 - length > 3 mm.



- Radial Scratches only when the three conditions mentioned below are satisfied at the same time:
 - more than 1 mark / 2500mm² and / or 5 marks / 1000mm;
 - roughness Rt > 3 μm;
 - length > 4 mm.



- Pressure marks only when this three conditions are satisfied at the same time:
 - $\varnothing > 1\text{mm}$;
 - roughness Rt > 3 μm;
 - more than 1 mark/2500mm² and / or 5 marks/1000mm

The claim should be rejected when:

- products supplied with visual buffing marks because aren't a functionality defects;
- products with imperfections due to handling operations (see § 7.2.2) if the warranty conditions are not satisfied (see § 10);
- the warranty is expired.

9 EXTREMITY OF THE BARS/TUBES

- Chromed products, chrome layer and dimensional tolerance aren't guarantee for the following lengths:

Type of chrome line	Length not guarantee	Total length for both ends
Traditional horizontal	150 mm ca. (for each end of the bar).	300 mm ca.
Continuous line	50 mm ca. (for each end of the bar).	100 mm ca.

- Linear shafts, tolerance and induction hardness depth (Shd) aren't guarantee for 100mm on both sides.

10 WARRANTY CONDITIONS

It is forbidden to unload the material with forklift



It is forbidden to store the material in un-adequate conditions (outside, rain, etc).



Don't store the material on supports without protections.



Don't unload at the same time different bundles with different length in the same time, the short length could damage the longest material.

