

ads-tec GmbH

# Quality Benchmark for Surfaces

## Energy Storage



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Version	Date	Prepared by	Changes
1	15.06.2018	DdKv	Draft / introduction

# 1 Foreword

The primary goal of ads-tec GmbH is to process and deal with incoming complaints to the complete satisfaction of the business partner concerned.

ads-tec GmbH shall reserve the right to change this quality specification in response to emerging requirements.

The purpose of these inspection instructions is to define appearance requirements and quality criteria for visible surfaces.

The scope of application of these quality directives shall extend to visible external coated metallic surfaces.

In order to guarantee a consistently high standard for the Energy Storage products, ads-tec GmbH complies with the following specifications for its product range.

# 2 Assessment of visible surfaces

The classification of surfaces must be clearly defined by a drawing or another implementation provision from ads-tec GmbH.

If necessary, standardised or otherwise defined structure details and colour must be specified in the drawing, e.g. *RAL 7035 fine textured, matt*.

If more than one finish layer or coating is applied, all must be listed if they are not part of a standard process. Any deviations from these details and specifications must be agreed upon.

The gloss level of surfaces is specified by ADS-TEC where necessary; a permissible gloss range is additionally defined.

If coating thickness restrictions need to be put in place in order to ensure proper functioning in certain zones (e.g. contact points), then these zones must be identified in the drawing and the limit values specified.

If information is missing, the supplier must request the surface classification.

Property	Meaning
Paint-free	No paint residue / no spray mist
Paint allowed	Paint residue allowed, closed surface OK
Spray mist allowed	Paint residue allowed, not a closed surface
Free of coating / finish layer	No coating or finish layer residue allowed
Not coated / no finish layer applied	Partial coating / finish layer residue allowed

The areas must be marked in the drawing and labelled as above.

## 2.1 Classification of visible surfaces

The visible surfaces are generally classified as

- A surfaces: Directly visible surfaces, e.g. housing fronts
- B surfaces: Indirectly visible surfaces, e.g. housing sides
- C surfaces: Surfaces outside the field of vision (surfaces inside the housing which do not have a function that requires classification)

	<b>A surface</b>	<b>B surface</b>	<b>C surface</b>
<b>Quality level</b>	Highest requirement	High requirement: The overall visual impression must not be impaired at any point on the surface	Limited requirements
<b>Permissibility of flaws</b>	Minimal flaws permitted*	Minor flaws permitted to a limited extent*	Flaws permitted*

\*See 2.2 / "Permissible surface defects"

<b>Specification</b>	<b>A surface</b>	<b>B surface</b>	<b>C surface</b>
<b>Inspection method</b>	Detailed examination: Uniform "visual scanning" of every surface to be inspected; conscious "search for flaws".	Brief examination: Every surface to be inspected is briefly and carefully checked to make sure that minor flaws (if present) do not impair the overall impression.	Cursory examination: Every surface to be inspected is very quickly checked to establish whether it meets the defined limited requirements.
<b>Guide value for inspection duration per surface</b>	Approx. 8 s	Approx. 5 s	Approx. 3 s
<b>Guide value for inspection spacing</b>	450 mm	1000 mm	1000 mm

## 2.2 Permissible surface defects

Surface flaw	A surface	B surface	C surface
<b>Discolouration, gloss and inclusions</b>	Max. three Max. dimension: Ø1.0mm	Max. four Max. dimension: Ø1.5mm	Max. six Max. dimension: Ø4.0mm
<b>Scratches / notches</b>	Max. three Max. dimension: 0.2mm x 10mm	Max. four Max. dimension: 0.4mm x 20mm	Max. four Max. dimension: 0.5mm x 45mm
<b>Scoring and paint tears</b>	None	None	Max. four Max. dimension: 0.5mm x 45 mm
<b>Structural damage</b>	Max. three Max. dimension: Ø1.0mm	Max. four Max. dimension: Ø2.0mm	Max. five Max. dimension: Ø5.0mm
<b>Indentation</b>	None	Max. two Max. dimension: Ø6.0mm x approx. 0.2mm	Max. five Max. dimension: Ø15.0mm x approx. 0.4mm

1. Technology-induced burr must not exceed 10% of the material thickness in the case of material thicknesses up to 2.0 mm; a burr height of max. 0.2 mm is permitted in the case of material thicknesses greater than 2.0 mm. Burr sharpness in the context of potential cutting injury is rated in accordance with the American UL standard 1439.
2. Corrosion-protected surfaces must not be interrupted in a way that will impair the protective effect. No damage down to the bare metal to be protected!
3. Technology-induced inclusions under the film with a diameter of up to 2mm are tolerated as long as they do not exceed 3 per part. Film damage caused by cutters must be avoided.

## 2.3 C surfaces – general

For surfaces that are not visible in their installed state and therefore classified as C surfaces, the following applies irrespective of the material:

- The surfaces must be dry, clean and free of grease.

The following are not permissible:

- Large areas of discolouration as well as oil and detergent residue
- Interruptions in the metallic protective coatings
- Large areas of white rust

The following are permissible:

- Pixels, grains, stripes, pinholes, scratches, colour points and colour stains on the surface, provided that they comply with the specifications of the applicable requirements (e.g. DIN EN 10130, DIN EN 10346) defined for metallic coatings and surfaces
- Tool-specific and processing-induced pressure and scrape marks at bent edges, provided that these flaws do not interrupt the metallic protective coatings

## 2.4 Inspection methods for visible surfaces

ads-tec GmbH uses the following parameters when checking the surface quality:

- The illumination level is 600 to 700 lux
- During inspection, the surfaces to be assessed are not reflected against the light
- Normal or corrected visual acuity

Flaws that can be identified under these conditions are ignored, provided that the defects are of a purely optical nature and do not in any way impair functioning.

### **Area of application:**

The area of application describes the use for which a part or a product must be suitable owing to the intended deployment location and deployment environment.

These specifications must be defined beforehand and stated in the request/order text.

The inspection specifications required for verification of suitability are then determined based on this. If the corresponding inspection standards permit various options, details regarding the applied inspection conditions must be given.

### **Special use:**

Special uses are those which require increased robustness compared to normal use (e.g. scratch test, weather-resistant...).

### 3 Flaw definition

Irrespective of the other attributes of supplied parts/assemblies, ads-tec assesses these parts/assemblies according to surface defects.

Quality characteristic	Criterion to be assessed
<b>General</b>	
Scratches / notches	Damage to the surface → Paintwork or unpainted finished part caused by the subsequent effect of pointed or sharp-edged objects. The raw material must NOT be visible!
Indentation	Laminar lifting or lowering of the surface without damage to the first surface coating (usually casting defects) Or: Damage to the surface caused by the part coming into contact with other objects, or damage such as short, relatively wide scratches
Colour, gloss level	Consistency with the original colour/surface structure
Structural damage	Surfaces which have an insufficient or excessive coating
Inclusions	Particles entrapped in the paint or in the unpainted finished part; these flaws vary depending on optical contrast or perceptible lifting/lowering of the surface.
Scoring	Recesses, grinding marks or other marks in the material which are visible after surface treatment
Paint tears	Excessive paint application which causes paint drops to form
Roughness	Unevenness of the surface height / scoring, grooves, peaks and scaling or irregularities in the microstructure or lattice structure.
<b>Coated surface</b>	
Repair of top coating	If repair is possible, it must be performed in such a way that it is "invisible".
Scraper and grinding marks	The overall visual impression must NOT be impaired by these flaws.
Labelling defects (procedural defects in ongoing production process)	Procedural deficiencies with consequences such as: debonding, cracking, creasing, illegibility, etc. are not permissible.
Orange peel effect	Limit samples must be agreed upon in the case of process-related effects.

## 3.1 Contamination

On delivery, the components must be **free of loose and detached parts as well as contamination** in the form of

- grease, dirt
- detergent residue
- white rust deposits
- fingerprints
- shavings, burr needles, metallic flakes and other particles

## 3.2 Paint and powder coatings – general

- Printed images must be correctly positioned, uniformly and clearly printed and must not be broken or smeared.
- The adhesion of coatings / screen and pad prints is checked using the adhesive tape test. In this test, a 19mm wide strip of Scotch Transparent Tape 550 measuring 40mm in length is bonded to the area to be tested and pressed down firmly. The adhesive tape is then removed abruptly at a 90° angle. There must not be any paint particles on the removed adhesive tape.
- The coating thickness of paint or powder coatings ranges from 80 to 100µm. If, for technological reasons, it is not possible to keep within this range, then ads-tec GmbH must be asked whether a different coating thickness is permissible.
- Gloss level and colour values must correspond to the specifications in the drawings and/or the confirmed samples.
- Damage to the paint coating down to the material underneath is impermissible in all cases.
- The coating surface must withstand chemical influences (where required).



### 3.3 Matt paint

Glossy areas caused by abrasion (no deep damage → no scratches!) must be avoided in all cases and the affected parts must be fully protected against mechanical effects. If a defect of this type nevertheless occurs, the following limit values apply:

- If multiple glossy areas are present (two to three), then the component must also be examined under light reflection
- Minor abrasion on corners is acceptable, provided that it does not occur at all corners (max. 3 corners per part)

## 4 Approval sampling

When undergoing approval sampling for series production, the workmanship of the parts/assemblies must always be checked with respect to the following:

- conformity with drawings/model
- observance of tolerance ranges and inspection dimensions
- correct manufacturing processes and
- surface quality.

The resulting golden samples serve as benchmarks for the subsequent assessment of delivered parts and are used for comparison purposes in unclear cases.

## 5 Packaging/transport

The supplier is generally responsible for selecting suitable packaging. When selecting the type of packaging, the supplier must always assume that a combination of transport means (road/rail/air) with multiple cargo handling points will be used. The protective function of the packaging must also be effective if the products are separated.

The following minimum standard must be observed when packing products with A or B surfaces: Each part must be individually packed in a bubble-lined padded envelope. The products in the bubble-lined padded envelopes must then be individually stood or laid in containers and vertically and horizontally protected against contact, abrasion and pressure.

Details are defined in the latest version of ads-tec's packaging specifications.