1. Use

This specification applies to all surfaces and surface treatments of sheet metal and profiles. This includes, among other things, painting, powder coating, chemical coatings (anodizing, passivation), other coatings and printing processes, etc. Only **the maximum acceptable deviations** are recorded. Any deviations that go beyond this or are not recorded will not be accepted.

For raw materials, the corresponding standard applies.
e.g.: «Alu-Plate EN AW-5005 (AlMg1)» (Art. No. 7412-12-01, Index A)

- EN 485: Aluminium and aluminium alloys - Strips, sheets and plates
- EN 573: Chemical composition
- DIN EN ISO 7599: Anodizing of aluminium and aluminium alloys - Method for specifying decorative and protective anodic oxide layers on aluminium.
- DIN EN 12020-2: Aluminium and aluminium alloys - Extruded precision profiles made of alloys EN AW-6060 and EN AW-6063
- QIB: Powder and wet paint or own surface specification
- EN 10346 / EN 10143 / EN 10130 / EN 10152: Steel steels and sheets and strip (DC01, SVZ, EVZ)

1.1 Scope/ Resource:

- Elma CH, Elma RO

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2. Surface Categories

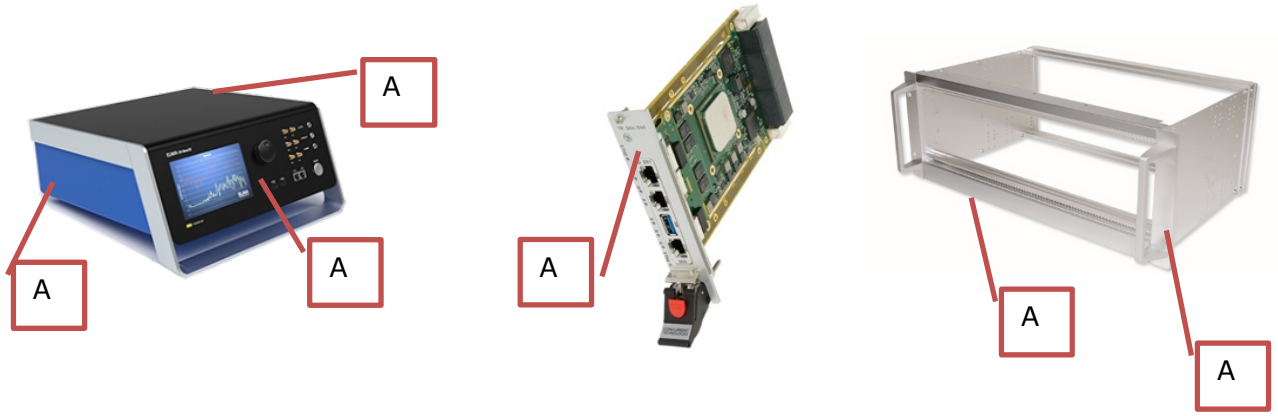
2.1 Class A – External, permanent visible area

Components of the final product whose surface is on the outside and **is visible** without disassembly or rotation **of the product**. This surface is classified as critical and includes the **top and front as** well as the **side wall** (left and right) of the product.

Examples include:

- All types of front panels
- Instrument Housing
- Desktop Chassis

For parts made from raw material or pre-coated raw material without additional surface treatment, class C applies.

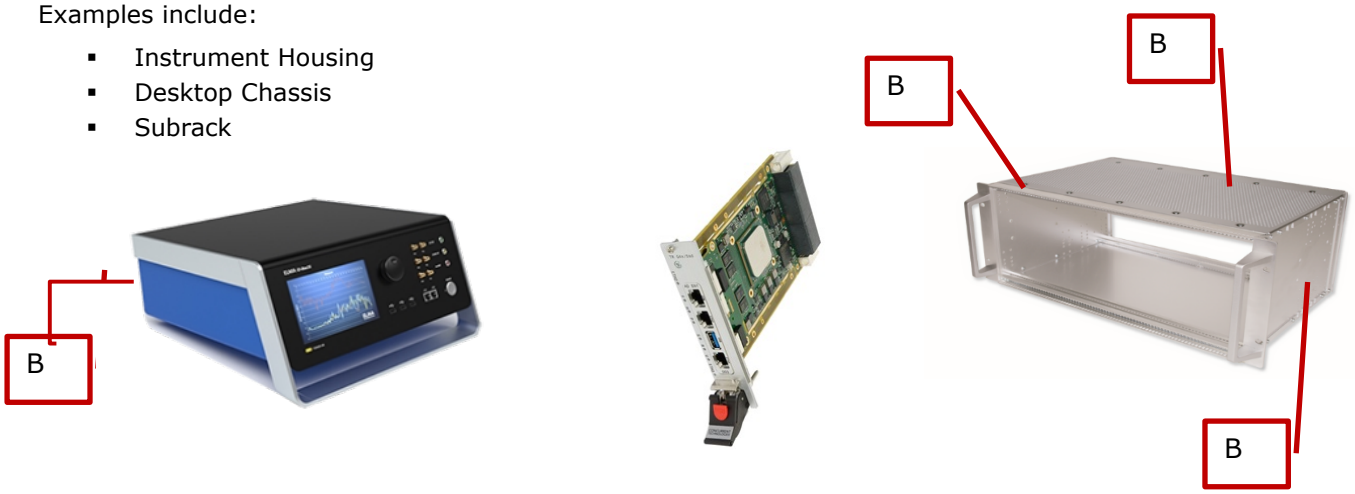


2.2 Class B – External, not permanent visible area

Components of the final product whose surface is invisible on the outside, i.e. is **not in the viewer's direct field** of vision, and only becomes **visible after the** product **has been turned**. This surface is classified as **less critical** and includes the **bottom (underside)** and **back of** the product.

Examples include:

- Instrument Housing
- Desktop Chassis
- Subrack

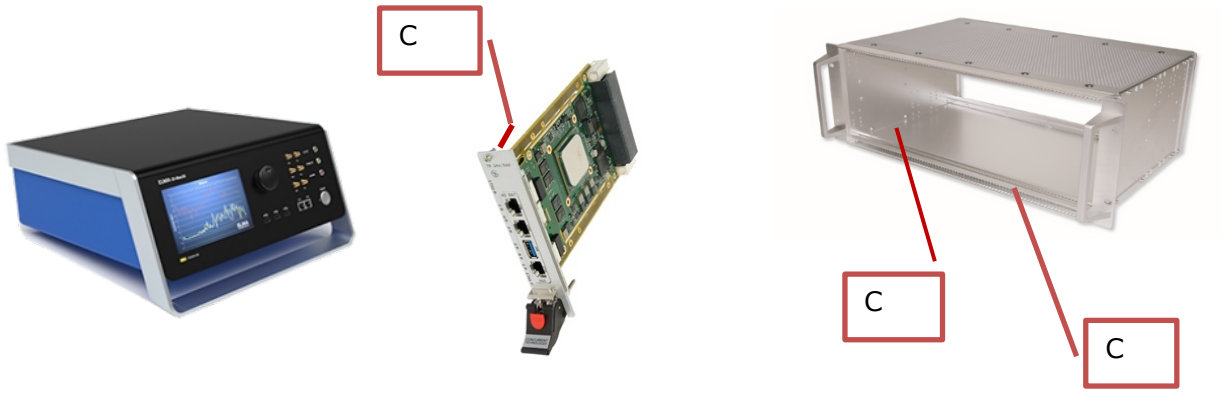


2.3 Class C – Inner Area

Components of the end product whose surface is **hidden inside** and only becomes **visible after dismantling the outer components**. This surface is classified as non-critical and includes all internal components and the inside of covers.

Examples include:

- Card
- Rack / Card Holder



3. Requirements for the test stations

3.1 Surface of the test station

The surface of the test station must not be reflective.

Preferred: Black rubber mat (min. anthracite)

Unacceptable: Light surfaces, e.g. white, grey, yellow, metallic, etc.

3.2 Light source

3.2.1 Specification of light

Neutral, white & artificial light (LED). Direct sunlight is unacceptable.

3.2.2 Intensity

Uniform intensity from 1000 – 1500 LUX.

3.2.3 Arrangement of the light source

Reflection-free, non-directional light from above.

No direct light above the test station.

3.3 Viewing Conditions

The employee checks the surface in one step. Each assessment must be carried out and verified with the specified light source, with the correct viewing distance and time, the correct viewing angle and according to the classification. (DIN EN 13018-2016)

Surfaces-Category	Distance to article	Angle	Testing time
Class A	750mm	45°	5 sec.
Class B	1000mm	45°	5 sec.
Class C	1000mm	45°	5 sec.

3.4 References for assessment

References include:

- Test template (e.g. BM00001773)
- Boundary pattern (target state with customer approval)
- Reference pattern (1 bad pattern, 1 good pattern)

Important: The item must not be moved under a light source to make a defect more visible. Defects are detected, not searched for.

4. Acceptable deviations

4.1 Uncoated and pre-coated metal parts (raw material)

According to the manufacturer's specifications for all surface categories:

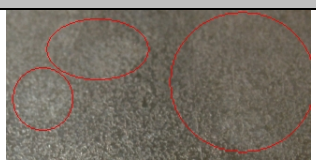
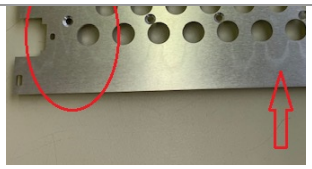
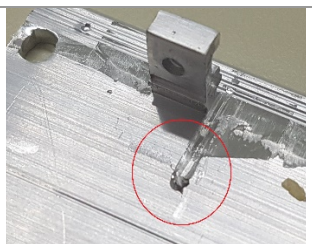
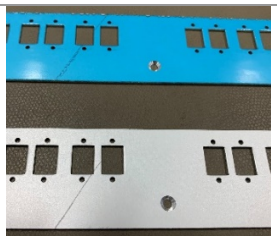
- EN 485: aluminium and aluminium alloys - Strips, sheets and plates
- EN 10346 / EN 10143 / EN 10130 / EN 10152: Steel steels and sheets and strip (DC01, SVZ, ECC)

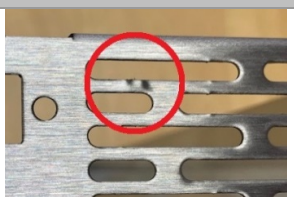
4.2 Mechanical processing

Examples include: punching, drilling, milling, grinding, laser marking, brushing, welding, bending

Parameter	Class A (Top and front, Sidewall)	Class B (Page bottom, back)	Class C (Inside)
Stains	None	Acceptable	Acceptable
Fingerprints **Burns**	None	None	One error per page
Scratches, Cracks, Hick	None	1 error, length = 5mm at 100cm2	Acceptable
Pores, brow	None	None	None
Process Marks	None	Acceptable	Acceptable
Welding marks / spatter	None	None	Acceptable

4.2.1 Definitions of errors (= deviations)

Parameter	Definition	Example
Fingerprints	Marks caused by the moisture and grease on the palms and fingers.	
Stains	Impurities that can be traced back to cleaning the surface, application of grease, oil, glue. E.g. from washing, lubricants, etc., residues of a protective film.	
Brew	Sharp edges, fraying or splintering of a usually metallic workpiece created during a machining or manufacturing process.	
Scratches, cracks	Linear damage to the surface or surface treatment that goes through to the workpiece surface. E.g. damage caused by external influences (other articles, knives, sharp edges, etc.) or material defects that only become apparent during surface treatment.	
Pores	In the surface structure of the workpiece or there are small holes in the structure of the surface treatment.	

Parameter	Definition	Example
Process Marks	Damage and deviations that can be attributed to a systematic process error and/or its devices. E.g. of punching or bending tools of spot welding.	
Burns	Surface areas and edges that are dark, burnt or discoloured by the heat winding.	
Welding marks / Weld spatter	Visible process marks, in the example of point, which remain visible during further processing steps. In the example, the welding spots are still visible after UV printing.	

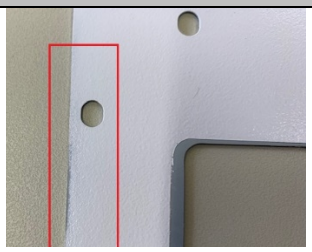
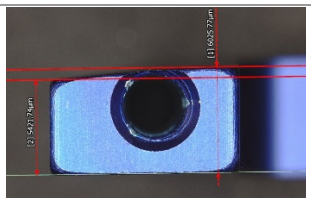
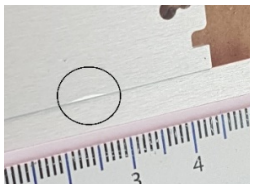
4.3 Surface treatment

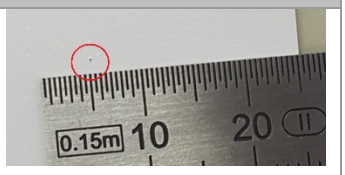
Anodizing (anodizing), passivation (chromating), trovalize (vibratory finishing) or surface treatments with chrome, copper, tin, etc.

Parameter	Class A (Top and front, Sidewall)	Class B (Page bottom, back)	Class C (Inside)
Inclusions	1 error Ø 0.2mm at 100cm2	3 errors with Ø 0.5mm each at 100cm2	Acceptable
Scratches, cracks	None	1 error, length = 5mm at 100cm2	Acceptable
Plating thickness	+/- 10% of the setpoint	+/- 20% of the setpoint	+/- 50% of the setpoint
Colour structure, pores	None	Acceptable	Acceptable
Colour printing, process marks	None	None	Acceptable
Fingerprints	None	None	None

Due to process-related influences, an exact reproduction of the colour is not possible with colour anodizing. Colour deviations may occur and do not constitute grounds for complaint.

4.3.1 Definitions of errors (= deviations)

Parameter	Definition	Example
Colour	The workpiece surface is visible through the surface treatment.	
Pores	There are small holes in the surface structure of the workpiece or in the structure of the surface treatment.	
Process Marks	Damage and deviations that can be attributed to a systematic process error and/or its devices. E.g.: of punching or bending tools of the spot welding systems or foil not completely glued to the workpiece - > anodized layer has run under the foil	 

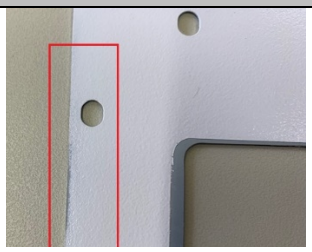
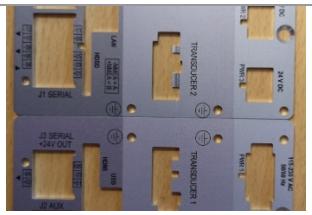
Parameter	Definition	Example
Inclusions	Impurities are under the surface treatment or are trapped in the surface treatment. E.g. dust inclusions, chips from mechanical processing.	
Plating thickness	The thickness of the surface treatment is outside the applicable specification.	

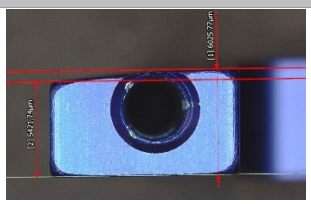
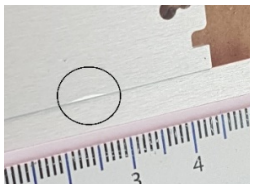
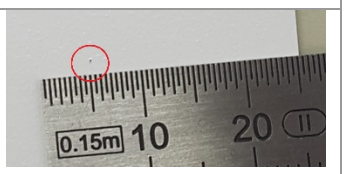
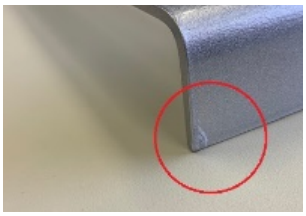
4.4 Paint coatings / varnishes

Examples include: powder coating, wet painting

Parameter	Class A (Top and front, Sidewall)	Class B (Page bottom, back)	Class C (Inside)
Inclusions	1 error Ø 0.2mm at 100cm2	3 errors with Ø 0.5mm each at 100cm2	Acceptable
Scratches, cracks	None	1 error, length = 5mm at 100cm2	Acceptable
Plating thickness	+/- 10% of the setpoint	+/- 20% of the setpoint	+/- 50% of the setpoint
Colour structure, pores	None	Acceptable	Acceptable
Colour printing, hue, colour breakage, process marks	None	None	Acceptable
Delta E colour deviations	ΔE≤2.0 if pattern is present	ΔE≤3.5 if pattern is present	ΔE>3.5 if pattern is present

4.4.1 Definitions of errors (= deviations)

Parameter	Definition	Example
Colour	The workpiece surface is visible through the surface treatment.	
Colour breakage	The adhesion strength is outside the applicable specification. Note: Due to the insufficient adhesion between the surface and the surface treatment, the surface treatment will chip. Can also occur on the outside of a bend or occur due to burst bubbles in the surface.	
Tint	Uneven hue, hue deviates from the specified RAL value or the approved pattern (reference or boundary sample).	
Pores	There are small holes in the surface structure of the workpiece or in the structure of the surface treatment.	

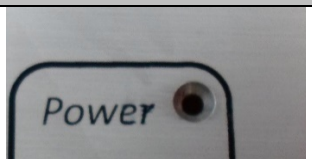
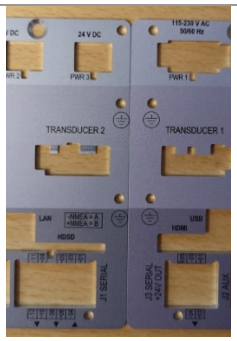
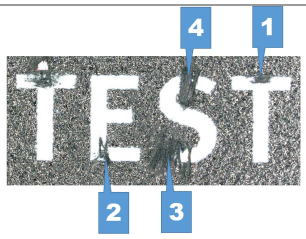
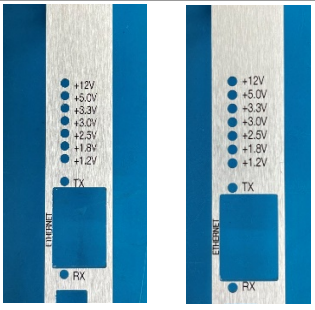
Parameter	Definition	Example
Process Marks	Damage and deviations that can be attributed to a systematic process error and/or its devices. E.g.: of punching or bending tools of the spot welding systems or foil not completely glued to the workpiece - > anodized layer has run under the foil	 
Inclusions	Impurities are under the surface treatment or are trapped in the surface treatment. E.g. dust inclusions, chips from mechanical processing.	
Plating thickness	The layer thickness should be within the applicable specification. At edges and chippings, the layer thicknesses can exceed the desired bandwidth.	 
Colour structure	The structure of the surface treatment is outside the applicable specification or differs from the approved pattern (reference or boundary sample).	

4.5 Print

Examples include: sub-anodizing printing, UV printing, screen printing, pad printing

Parameter	Class A (Top and front, Sidewall)	Class B (Page bottom, back)	Class C (Inside)
Inclusions	1 error Ø 0.2mm at 100cm2	3 errors with Ø 0.5mm each at 100cm2	Acceptable
Fill Rate	Ø 0.2mm	Ø 0.2mm	Ø 0.4mm
Broken font, printing errors	None	None	if readable
Position Deviation	+/- 0.3mm	+/- 0.5mm	+/- 0.5mm
Delta E color deviations	ΔE≤2.0 if pattern is present	ΔE 2.0 – 3.5 if pattern is present	ΔE>3.5 if pattern is present

4.5.1 Definitions of errors (= deviations)

Parameter	Definition	Example
Misprint	The print is unreadable, weak or blurry. The coverage is not even or incomplete.	
Tint	Uneven hue, hue deviates from the specified RAL/Pantone value for screen printing/pad printing and CMYK for under-anodized/UV printing or the approved pattern (reference or boundary pattern).	
Fill Rate [2]	The print is so incomplete that the workpiece surface becomes visible.	
Broken font	At the end (3) or in parts (4), the print is incomplete.	
Font thickness [1]	Uneven progression of the font thickness within a word or a sentence.	
Position error	The positioning differs in the horizontal or vertical direction, in relation to other areas of printing, article surface and processing.	

Parameter	Definition	Example
Inclusions	Impurities are under the surface treatment or are trapped in the surface treatment. E.g. dust inclusions, chips from mechanical processing.