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1. Scope and purpose

This standard applies to Bühler Alzenau and all suppliers.

The standard defines powder coatings that are applied to surfaces outside the vacuum chamber as corrosion protection and as a means of product design for creating an appealing device and system design for Bühler Alzenau products.

For new developments of devices and systems, consult with the Design & Development department about colour design. The colour codes defined by Bühler Alzenau are arranged in [4.4 Colour code palette](#).

Only “**Coarse structure - glossy**” is permitted as a powder coating.

2. Applicable standards and guidelines

- Adhere to the manufacturer’s specifications
- ISO 2762 mK
- DIN EN ISO 2813
- DIN 67530
- DIN EN ISO 2409
- DIN EN ISO 2811
- DIN EN ISO 2808
- DIN EN ISO 1519
- DIN 2360

3. Description of the procedure

3.1 Powder coating


Powder coating is a coating procedure, in which an electrically conductive material is coated with a powder coating. A typical coating process consists of:

- Surface pretreatment (cleaning, blasting, adhesive primer)
- Drying in oven
- Coating process
- Burning in
- Cooling down
- Inspection

The usual materials for a powder coating are steel, galvanised steel and aluminium. The powder coating layers generated typically have a layer thickness between 60 and 120 µm.

However, the coating thickness can be above or below this range, depending on the area of application and the surface characteristics.

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4. Application

4.1 Pretreatment and preparation (on the basis of [UAB-24004](#))

The surfaces of the components to be coated must be free of fat, oil, rust and scale. There must not be any kind of marking applied to them.

Soldered and glued parts are unsuitable for powder coating (burn-in temperature approximately 200 °C).

To prevent the build-up of carbon deposits through welding, non-welded details must be degreased. From quality class 2 this is a mandatory requirement.

Threaded holes, fittings and sealing surfaces must be covered before starting work. Adhere to the specifications on the drawing. The main visible areas must not show any signs of unevenness, scratches or other types of damage. Parts must be protected from damage during transport for delivery for the surface treatment and especially for dispatch afterwards.

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Material	Pretreatment	Procedure
Steel	<ul style="list-style-type: none"> Degreasing Zinc / iron phosphating 	<ul style="list-style-type: none"> Powder coatings can be applied to the pretreated parts without an adhesive primer. A primer is always required if the material is to be used outdoors. If the material is to be smoothed, a primer with a powder coating base is required.
Stainless steel	<ul style="list-style-type: none"> Degreasing Sanding Sand / glass bead blasting 	<ul style="list-style-type: none"> Do not process powder coatings without the corresponding pretreatment to improve microgrip, such as glass bead blasting or sandblasting. ETL / KTL dip-coat primers are recommended as an alternative for improving the adhesion of powder coatings. Filler must not be applied without thorough roughening first. Organic coatings without the appropriate pretreatment are considered to be a risk for stainless steel. In general, the manufacturer should be consulted about the suitability of coating products for stainless steel in advance.
Aluminium and aluminium alloys	<ul style="list-style-type: none"> Pickling / chromating Degreasing 	<ul style="list-style-type: none"> If the parts are not pickled, the surface must be roughened or sanded for use indoors. A powder coating can be used without a primer. It is necessary to use a primer when using filler.
Non-ferrous metals and alloys (e.g. die-cast zinc)	<ul style="list-style-type: none"> Pickling / chromating Degreasing 	<ul style="list-style-type: none"> A powder coating can be used without a primer. It is necessary to use a primer when using filler.

4.2 Coating specification

Organic coatings manufactured according to this standard are burned in or structured coatings. When ordering the surface treatment, this standard specification sheet must be shown and the type of coating, among other matters, must be agreed as part of the initial order.


4.3 Burning in conditions

Adhere to the specifications from the powder coating manufacturer.

Reference values

Epoxy resin:	10 mins at 140-200°C surface temperature
Polyester resin:	15 mins at 160°C surface temperature or 8 mins at 210°C surface temperature


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4.4 Colour code palette

Code	RAL/ NCS	Colour	Preferred area
Bühler colour code palette (preferred usage!)			
4.4.1	NCS S2060-B70G	Bühler turquoise	<ul style="list-style-type: none"> Logo, accents, enclosing elements
4.4.2	NCS S0502-B	White	<ul style="list-style-type: none"> Panels in hygienic areas
4.4.3	NCS S2502-B	Light grey	<ul style="list-style-type: none"> Panels in dirty areas
4.4.4	NCS S6502-B	Dark grey	<ul style="list-style-type: none"> System racks and base frames
4.4.5	RAL 1003 (NCS 0580-Y30R)	Signal yellow	<ul style="list-style-type: none"> Lifting devices (LHH-N-090.206)
BU Leybold Optics colour code palette			
4.5.1	RAL 1001 (NCS 2020-Y40R)	Beige	<ul style="list-style-type: none"> Only applicable for primers
4.5.2	RAL 7035 (NCS 2502-Y)	Light grey	<ul style="list-style-type: none"> Panelling Electrical cabinets, consoles, terminal boxes Small products in special cases
4.5.3	RAL 9005	Jet black	<ul style="list-style-type: none"> Base frames and racks Front panels of plugin and partial plugin systems of table and floor units Fixed base plates with control devices for system operation Switchboard base plates, desk panels and control panels As an accent colour mainly in combination with blood orange
4.5.4	RAL 2002 (NCS 1080-Y80R)	Blood orange	<ul style="list-style-type: none"> As an accent colour mainly in combination with black

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5. Surface quality

The surface must exhibit the following quality characteristics of the applicable quality class after the coating has been performed.

Quality class 1: Flawless, even surface (in visible area)

Quality class 2: Even surface (not in visible area)

Quality class 3: Uneven surface (no surface requirements)

5.1 Quality characteristics for visual inspection

Characteristics	Quality class		
	1	2	3
Viewing distance	approx. 0.5 m	approx. 0.8 m	approx. 1.0 m
Spot-welding marks	not permitted	permitted, with clean execution & symmetrical fit.	permitted, with clean execution
Structural deviation	not permitted visual assessment (samples can be requested)	not permitted visual assessment (samples can be requested)	permitted, with limitations. visual assessment (samples can be requested)
Colour deviation	not permitted Comparison with colour palette, visual assessment (colour samples can be requested)	not permitted Comparison with colour palette, visual assessment (colour samples can be requested)	permitted, if not conspicuous Comparison with colour palette, visual assessment (colour samples can be requested)
Orange skin (for gloss coating)	not permitted	permitted only in certain cases	permitted
Coating errors (impurities, bubbles, inclusions)	max. 5 items $\leq 0.5\text{mm}^2$ pro m^2	max. 15 items $\leq 1.0\text{mm}^2$ pro m^2	max. 30 items $\leq 1.0\text{mm}^2$ pro m^2

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5.2 Gloss level

Only “Coarse structure - glossy” is permitted as a powder coating.

Gloss levels in accordance with DIN 67530 or ISO 2813			
Surface structure	Gloss assessment using the reflectometer		Gloss description
	Measuring angle	Gloss level	
smooth (not permitted)	20°	70-100%	gloss
	20°	50-80%	satin-gloss
	60°	25-40%	semi-matte
	60°	15-30%	matte
Fine structure (not permitted)	60°	70-90%	glossy
	60°	40-70%	satin-gloss
	60°	35-45%	semi-matte
	60°	10-30%	matte
coarse	60°	70-90%	gloss
	85°	45-60%	satin-gloss
	85°	25-45%	semi-matte
	85°	10-30%	matte

5.3 Measuring set-up

20° measuring angle for primarily **high-gloss** test specimens

60° measuring angle for primarily **medium-gloss** test specimens

85° measuring angle for primarily **matte** test specimens

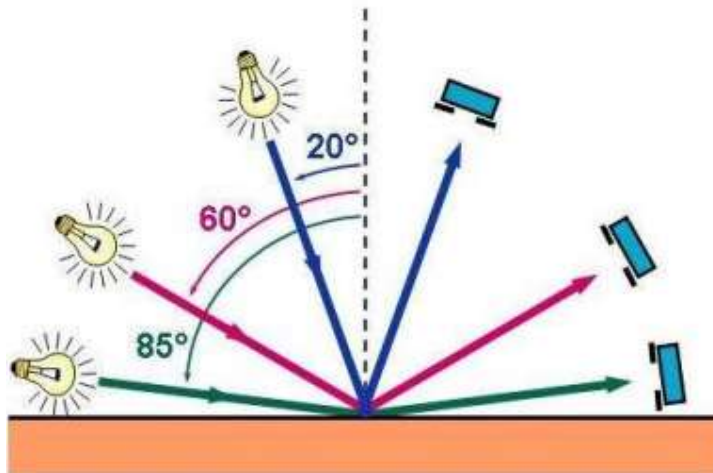



Figure 1 - Schematic drawing of the three-angle gloss measuring device

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5.4. Adhesive strength / density

General requirements GT 0-1 in accordance with DIN EN ISO 2409
 Approx. 1.4 g/cm³ at 20°C in accordance with DIN EN ISO 2811

5.5 Coating thickness

The following values should not be exceeded or undershot:

1. **Level viewing surfaces:** 70 - 90 µm
 2. **Radii:** 80 - 130 µm
 3. **Undercut:** The undercoat may show through if no corrosion protection is required.
- The total thickness increases by the primer surface, by approx. 50 µm. The layer thickness measurement is performed in accordance with DIN 2360.

6. Information in design documents

In the drawings, the part surfaces to be powdered must be designated in accordance with the surface symbols.


Specification: **Powder-coated in accordance with LHH-N 120.014**
 Select colour code in accordance with [4.4 Colour code palette](#)
 Quality class according to definition in [5.1 Quality characteristics for visual inspection](#)
 Gloss level specification according to the definition in [5.2 Gloss level](#)

✓ pulverbeschichtet
 powder coated according to LHH-N 120.014 Code X.X.X
 grade X - gloss level
 Güteklasse x - Glanzgrad

Example (White NCS S0502-B, grade 1, coarse structure, glossy):

✓ pulverbeschichtet nach
 powder coated according to LHH-N 120.014 Code 4.4.2
 grade 1 - coarse glossy
 Güteklasse 1 - grob glänzend

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7. Inspection

7.1 Order instructions:

Conformity with the specifications in the manufacturing documents and order instructions.

7.2 Visual inspection:

[see 5 - Surface quality](#)

- Visual inspection
- A well-illuminated, well-defined inspection place with an illumination of 800 to 1400 lux must be chosen.

7.3 Gloss level:

[see 5.2 - Gloss level](#)

Reflectometer values according to requirements

7.4 Adhesion test:

[see 5.4 - Adhesion](#)

- Cross-cutting adhesion test in accordance with DIN EN ISO 2409
- Mandrel bend test in accordance with DIN EN ISO 1519
- Similar tests on request

7.5 Layer thickness test:

[see 5.5 - Layer thickness](#)

The layer thickness test is performed by arrangement. On even surfaces, it is measured at least 20 mm from the edge and at three spatially staggered points. Greater thicknesses can result at radii and circumferential edges; in case of doubt these must be agreed upon.

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