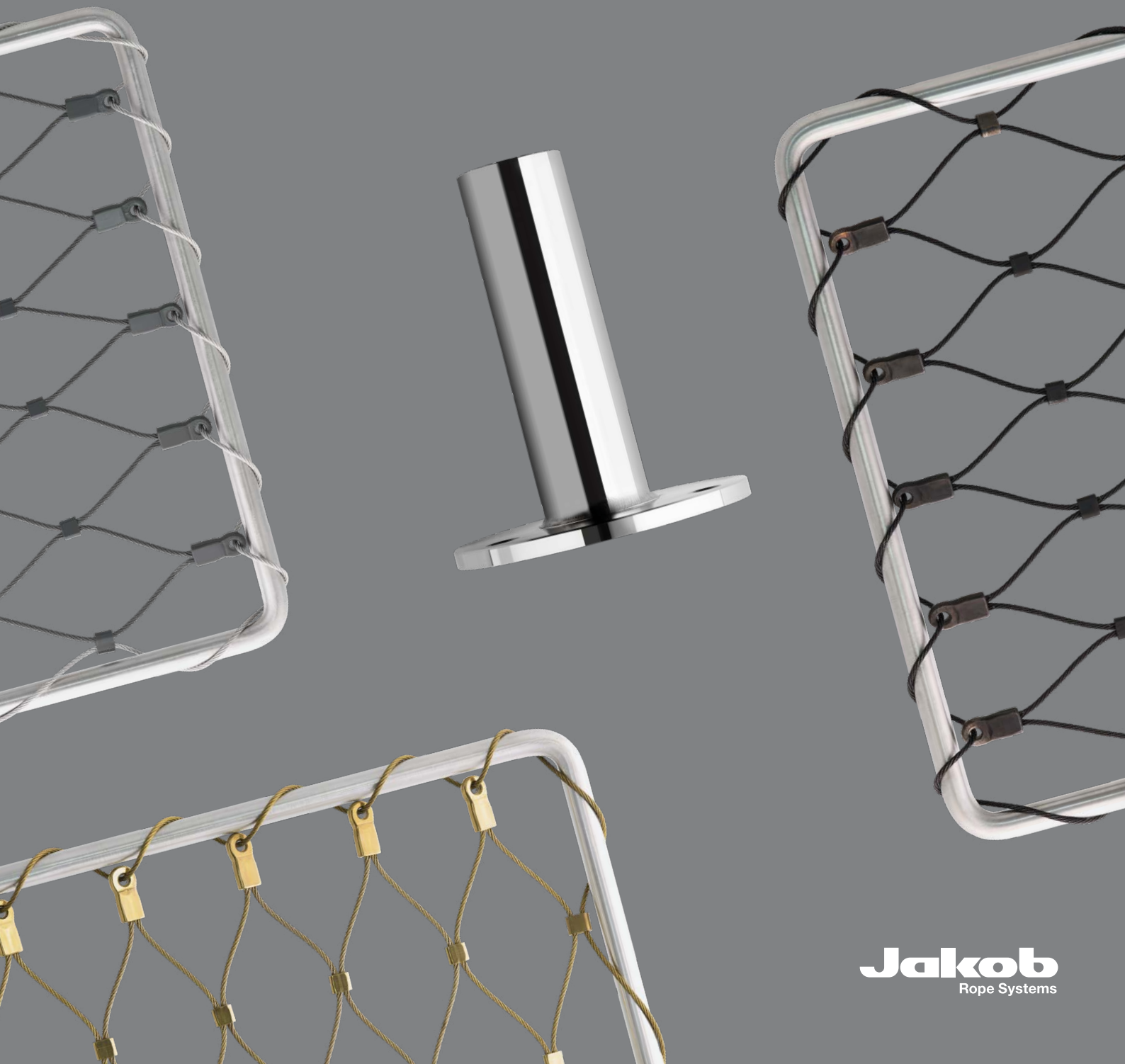


# Surface finishing of stainless steel wire ropes and components



## Surface finishing of stainless steel wire ropes and components

Jakob Rope Systems provides various surface finishing processes for stainless steel components, wire ropes and wire rope nets, all of which can be chosen depending on the specific requirements and field of application.

The selection of the most suitable process influences appearance, but also the functionality, colorfastness, and corrosion resistance.

This technical information presents the most important surface finishing processes, describes their properties, and recommends typical applications. You will find important information about each surface condition and process to help you choose what is best for your application.

An essential distinguishing feature is whether a separate layer is applied for coloring or whether the color effect is achieved without an additional layer. We distinguish between:

### Surface treatment

The surface is modified through physical or chemical processes without adding any additives to the surface. The original look is retained.

### Coating

In these processes, an additive is applied to the surface and usually fixed by heat treatment. External influences can cause the coloring layer to dissolve locally.

### General corrosion resistance

In this document, we also consider general corrosion resistance, which has been validated as a standardized test method by a salt spray test in compliance with DIN EN ISO 9227. We also provide practical tips and care instructions for our products.

### Limitations of use

Components with surface treatments and coatings require careful protection during transport, storage, and assembly.

In processes involving color coatings such as powder coating and wet painting, increased wear and possible paint flaking can be expected, especially on moving components (such as wire ropes). Minor color touch-ups may be necessary after installation.

Paints and varnishes may look different even though they have the same name. This is due to gloss level, ambient light, material, surface structure, and metamerism (color change depending on light).

Variations in RAL colors occur due to tolerances in color mixing and manufacturing processes. Manufacturers often only supply similar tones within the scale. The differences are most noticeable on large surfaces, even with products from the same manufacturer. Colors on surfaces also change over time: Fading, abrasion, weathering, and UV radiation all affect appearance.

### Standardization and quality requirements

There are no consistent international standards for surface treatments and coatings for the stainless steel products mentioned here.

The set of standards for powder coating refers to conventional steel construction and is therefore only partially applicable to rope and net products.

This technical information is intended to explain the various processes as transparently as possible, highlight the technical and design options, and describe the achievable results and their reliability.

Jakob Rope Systems takes great care to ensure that our suppliers apply the procedures responsibly and comply with the quality and environmental standards set out in ISO 9001 and ISO 14001.

### Stainless steel materials 1.4401 and 1.4404 (without surface finishing)

Most components in the Jakob Rope Systems range are manufactured from stainless steel of material group 1.4404 / AISI 316L. Wire ropes are usually made from 1.4401 / AISI 316.

Both materials feature high corrosion resistance and are easy to process. They are regarded as high-quality alloys that are suitable for a wide range of technical and design applications.

### Stainless steel in duplex material 1.4462 (without surface finishing)

Stainless steel 1.4462, also known as duplex steel, is a combination of ferritic and austenitic steel. This structure gives the components high strength and good corrosion resistance.

Duplex steel components are particularly resistant to pitting, stress corrosion cracking, and intergranular corrosion, even in chemical environments and seawater. The tensile and yield strengths are significantly higher than those of comparable austenitic steels. The material has good welding properties.

### Factor rain water

No matter how resistant they may be, even high-quality stainless steels can show discoloration or signs of surface corrosion when exposed to adverse environmental influences. The lower areas, where rainwater flows and accumulates, are particularly affected.

### Factor additives

The rainwater carries along additives that make these effects even worse. Crevice corrosion can occur in pressed eyelets, especially in combination with salts or chemicals. It then rises to the surface and drips down the adjacent components.

### Environmental factors

Various environmental factors may contribute to early signs of corrosion in stainless steels:

- Dust from neighboring construction sites, especially when using angle grinders on steel structures
- Brake dust from nearby highways or rail lines with heavy traffic
- Deicing salt on roads
- Saline moisture in maritime environments
- Rust water from adjoining components or during the construction phase
- Chemical pollution from industrial processes in the environment
- Tannic acids from wooden objects, such as handrails and facade cladding, especially oak, robinia, chestnut, or walnut
- Less commonly, flower dust, pollen, and, near the sea, algae blooms

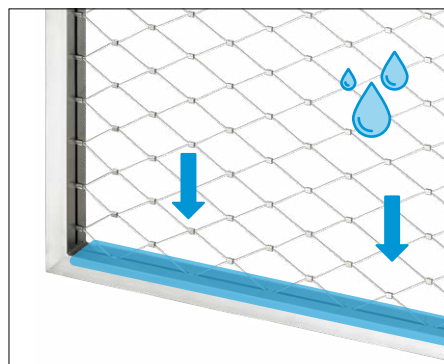


Figure 1: Accumulation of rainfall and splash water with dissolved additives at the bottom edge of the net.

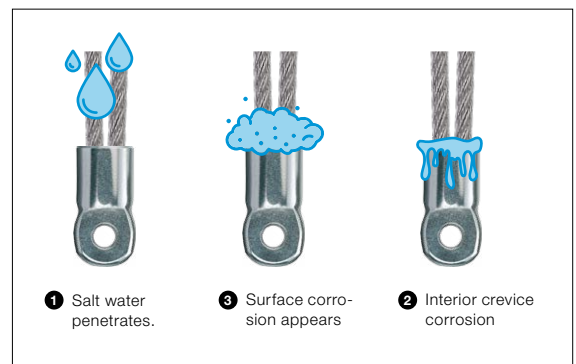


Figure 2: Stages of crevice corrosion formation when reacting with salt and chemicals.

### Inspection, cleaning, preventive maintenance

Surface corrosion does not affect the stability of the materials initially if it is detected during inspection and cleaned professionally following our specifications.

See also > [Technical information: Wire rope and tensile structures Maintenance and upkeep \(PDF\)](#) at [jakob.com](#) > Downloads

The material quality can be confirmed by 3.1 certificates. If a potentially corrosive environmental influence cannot be completely avoided, it is advisable to treat the affected areas with a special protective wax for aluminum rims used in the automotive industry. It forms a transparent, durable protective film that reliably shields the material from moisture for a long period.

For applications in Europe, we recommend ELASKON Aero 46 Spezial or comparable products.



ELASKON Aero 46 Spezial

### Corrosion resistance test following EN ISO 9227

Jakob Rope Systems or our suppliers have performed a salt spray test according to DIN EN ISO 9227 for the processes described here. This procedure is considered a standardized method for evaluating the corrosion resistance of materials and surfaces.

The test samples were exposed to a constant humidity atmosphere with 5% salt content at 35°C for 720 hours. An inspection for signs of corrosion followed. All results were documented. The tests were performed in the certified K-laboratory at DEKRA GmbH in Bretten (Germany).

### Types of corrosion found on Jakob Rope Systems stainless steel products

The salt spray test showed that all tested products and coating processes offer high resistance to saline atmospheres.

Even after 720 hours of testing, only superficial signs of corrosion could be detected, if at all, which are physically explainable and unavoidable regardless of the material.

This refers to crevice corrosion or surface corrosion on the lower wire mesh areas where salt water could accumulate. This type of corrosion can usually be easily wiped off and does not affect the mechanical properties of the materials.

The results of the salt spray test according to EN ISO 9227 after 720 hours show differences in the corrosion progression for the various surface treatments.

- Electropolished surfaces of stainless steel 1.4404 and untreated duplex stainless steels of grade 1.4462 demonstrate the highest corrosion resistance.
- PVD- and powder-coated surfaces as well as spectrally black-finished components show comparable or slightly increased corrosion resistance compared to untreated stainless steel materials of grades 1.4404 and 1.4401.
- Oxide coated and wet-painted elements show comparable or slightly reduced corrosion resistance compared to untreated stainless steel materials of grades 1.4404 and 1.4401. Tests revealed isolated fine cracks in the paint layer, flaking, and localized surface corrosion.

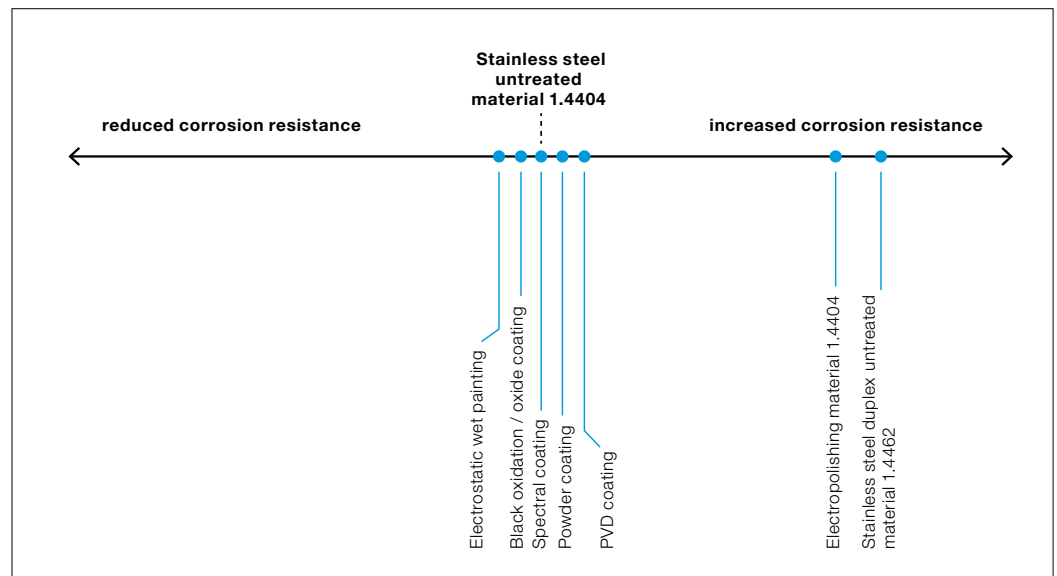


Figure 3: Resistance until corrosion occurs under test conditions.



Spectral coating is an electrochemical process that produces a rather matte black shade due to spectral effects in a microscopically thin oxide layer.

It does not alter the material properties, has permanent abrasion resistance, and is particularly suitable for large nets and rope constructions in outdoor areas. The ease of machining large components is also an advantage. The process is not standardized for use with stainless steel.

**Possibilities and advantages:**

- Excellent UV and weather resistance
- No application of paint, no risk of flaking, can be reshaped later
- High abrasion resistance, colorfast
- Large elements and components can be treated
- Semi-matte surface minimizes light reflections

**Limitations and restrictions:**

- Only black tones available, no RAL colors
- Color varies depending on batch, material cross-section, and lighting conditions
- The color tone cannot be reproduced exactly
- Color touch-ups are tricky
- Unsuitable for structural, welded components

**Fields of application:**

- Outdoor rope and mesh structures, technical solutions
- Large-scale mesh structures
- Animal enclosures, protective nets, applications with limited light reflection

**Technical data:**

- For stainless steel materials 1.4401, 1.4404
- Wire rope meshes up to 100 m<sup>2</sup> or a maximum of 150 kg, wire ropes up to 50 m long
- Layer thickness: no additional layer, oxide structure in the nanometer range

**Corrosion resistance:**

- Comparable to untreated stainless steel surfaces.

**Maintenance and care:**

- Clean like untreated stainless steel: Wash with water, a fiber brush, or a soft metal brush

**Notes:**

- The process involves chemicals, but they are not present in the final product
- Protection required during transport and assembly
- Extended delivery time of up to five weeks
- Order number: 20800-6002



Oxide coating is a chemical process that produces a matte black oxide layer. The surface remains metallic and is evenly darkened. Ideal for smaller outdoor components that require a matte black appearance.

**Possibilities and advantages:**

- Uniform, matte black effect
- Excellent UV and weather resistance
- No application of paint, no risk of flaking, can be reshaped later
- For wire ropes, meshes, and loose components

**Limitations and restrictions:**

- Only smaller elements can be treated (limited bath size)
- Color: Matte black, no RAL color
- Abrasion may cause color transfer
- The paint layer may peel off locally under increased mechanical stress
- Color touch-ups are only possible with alternative materials like paint

**Fields of application:**

- Wire ropes, rope nets, and loose components
- Outdoor applications preferred

**Technical data:**

- For stainless steel materials 1.4401, 1.4404
- Component length: up to 1.2 m
- Unit weight up to 30 kg
- Bath temperature approx. 400°C

**Corrosion resistance:**

- Slightly inferior properties compared to untreated stainless steel surfaces
- Corrosion particles and impurities may adhere to rough surfaces

**Maintenance and care:**

- Clean like untreated stainless steel: Wash with water, no high-pressure cleaner, fiber brush, or soft metal brush

**Notes:**

- The process involves chemicals, but they are not present in the final product
- Protection required during transport and assembly
- Extended delivery time of up to three weeks
- Order number: 20800-6003



Wet painting with electrostatically applied 2K paint is well suited for decorative applications. The paint meets the requirements for outdoor use, but is only partially recommended due to its limited UV and weather resistance. The surface has a satin finish and is available in RAL Classic colors.

**Possibilities and advantages:**

- Color based on RAL Classic color chart
- Gloss level: Satin
- Mesh or rope surfaces are also treatable

**Limitations and restrictions:**

- Not scratch-resistant, affected by movement and stretching
- Limited UV and weather resistance
- Color variations possible despite identical color tone
- Different shades possible depending on the manufacturer
- Less suitable for moving parts like joints and threads
- Webnet frames (frame size max. 1.2 × 2.9 m)
- Maximum mesh area: 25 m<sup>2</sup>, maximum weight: 50 kg

**Fields of application:**

- Interior design, decorative applications

**Technical data:**

- For stainless steel materials 1.4401, 1.4404
- Two coats of paint (primer + top coat, 15–25 µm each)

**Corrosion resistance:**

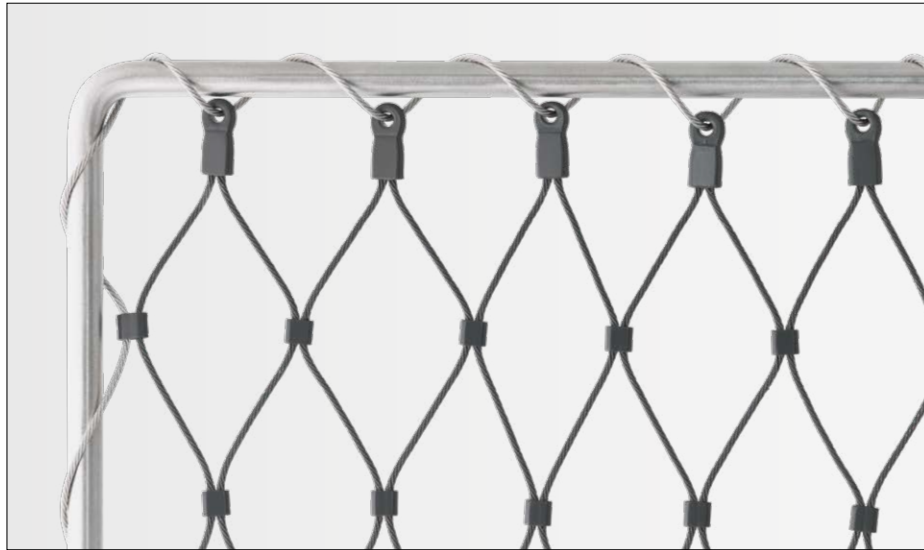
- Slightly inferior properties compared to untreated stainless steel surfaces

**Maintenance and care:**

- Clean with a soft cloth, no aggressive or abrasive cleaning agents
- Repair possible with suitable 2K paint

**Notes:**

- Storage: Do not use plastic packaging; store in a dry place
- Protection required during transport and assembly
- Surface vulnerable when moved: Coating can crack when stretched or bent
- Extended delivery time of up to four weeks
- Order number: 20800-6001

**Powder coating**

Powder coating is an electrostatic process using thermal curing. It provides a robust layer of paint with good durability for solid components. RAL Classic Color selection in matte or satin finish.

**Possibilities and advantages:**

- Color based on RAL Classic color chart
- Gloss level: Satin or matte
- Good UV and weather resistance for static components
- Rugged surface, ideal for frames, anchor plates

**Limitations and restrictions:**

- Partially suitable for moving components
- Paint may chip off during movement or contact
- Color variations possible depending on powder manufacturer, material, and gloss level
- Visual differences despite identical color tones due to surface structure, pigments, or lighting conditions
- Limited size: Maximum size 1.2 × 2.9 m

**Fields of application:**

- Indoor and outdoor applications
- Webnet frame including Webnet
- Fittings, railing sections, anchor plates

**Technical data:**

- For stainless steel materials 1.4401, 1.4404
- Coating thickness approx. 80–120 µm
- The powder coating is cross-linked or “baked” in the dryer at temperatures between around 150 and 250°C

**Corrosion resistance:**

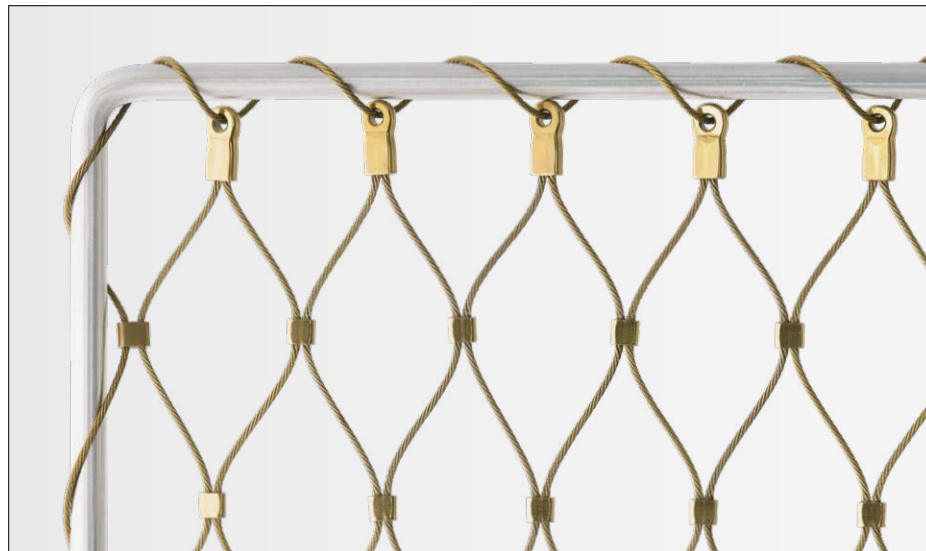
- Slightly superior properties compared to untreated stainless steel surfaces

**Maintenance and care:**

- Clean with a soft cloth, no aggressive or abrasive cleaning agents
- Repair possible with suitable 2K paint

**Notes:**

- In most cases, a minimum quantity of components for coating is required
- Protection required during transport and assembly
- Slight wear may occur in contact with other parts
- The coating may peel off under mechanical stress
- Storage: Remove packaging immediately upon receipt, store in a dry place
- Extended delivery time of up to four weeks
- Order number: 20800-6005



PVD is a high vacuum process that produces extremely hard, decorative color coatings. Ideal for sophisticated, visually appealing individual parts with limited component size. Wire ropes can be coated and assembled in advance in limited sizes and lengths.

**Possibilities and advantages:**

- High colorfastness and scratch resistance
- Elegant, durable surface
- Environmentally friendly, as coating is applied virtually lossless

**Limitations and restrictions:**

- Webnet coating in advance as individual components (wire ropes, sleeves, or eyelets)
- Limited color options: Black, gold, copper, bronze
- Significant manufacturing costs
- The feasibility of larger elements must be confirmed in advance

**Fields of application:**

- Indoor and outdoor applications
- Mechanical components and fittings
- Design components, decorative applications

**Technical data:**

- For stainless steel materials 1.4401, 1.4404 (polishing recommended)
- Coating thickness approx. 1–2  $\mu\text{m}$

**Corrosion resistance:**

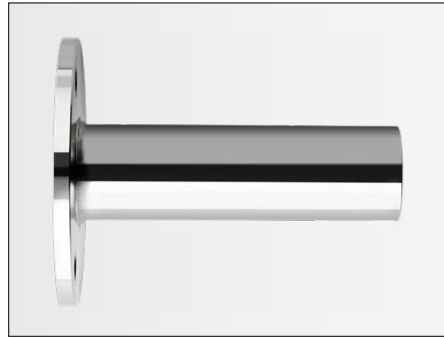
- Slightly superior properties compared to untreated stainless steel surfaces

**Maintenance and care:**

- Clean only with soft cloths, no cleaning agents with abrasive particles
- Color touch-ups are impossible

**Notes:**

- Protection required during transport and assembly
- Order number: 20800-6006



Electropolishing is an electrochemical process for smoothing and cleaning stainless steel surfaces. The process removes microscopic roughness, producing a shiny, metallically pure surface.

The material properties remain unaltered, while the surface gains corrosion resistance and improved hygiene. The process is particularly suitable for applications with demanding cleanliness, appearance, and corrosion protection requirements.

**Possibilities and advantages:**

- Improved corrosion resistance through removal of micro-cracks and contamination
- A surface that captivates with its purity and metallic look
- Reduced dirt adhesion, easy to clean
- Deburring and passivation as a side effect

**Limitations and restrictions:**

- Complex designs and geometries are challenging
- No color change, purely functional finishing
- Maximum component size 1000 × 1500 mm

**Fields of application:**

- Architectural components with demanding requirements for appearance and hygiene
- Technical components requiring corrosion protection
- Design components with a glossy surface

**Technical data:**

- For stainless steel materials 1.4401, 1.4404
- Typical material removal: 20–40 µm
- Processable component sizes depending on geometry
- Surface roughness after finishing: Ra < 0.2 µm possible

**Corrosion resistance:**

- Superior properties compared to untreated stainless steel surfaces
- Removal of iron particles and micro-cracks
- Formation of a passive chromium oxide layer

**Maintenance and care:**

- Clean like untreated stainless steel
- Water, mild cleaning agents, no abrasive tools
- Less susceptible to biofilm and grime buildup

**Notes:**

- Environmental aspects: The electrolyte contains acids, but the product is free of chemicals
- Surface susceptible to scratches
- Protection required during transport and assembly
- Delivery time depends on component size and geometry, typically two to four weeks
- Order number: 20800-6007

## Summary

Salt spray tests according to EN ISO 9227 show that electropolished components and untreated duplex stainless steel (1.4462) demonstrate the highest corrosion resistance and are particularly suitable for projects with high durability and mechanical stress requirements.

Spectral coating, black oxidation, and PVD coating offer a level of corrosion resistance comparable to untreated stainless steel (material 1.4404) and are ideal for applications with demanding color requirements.

Powder coating is well suited for batches of rigid components or finished frames and provides robust coloring and uncompromised corrosion resistance.

Electrostatic wet painting offers a wide range of applications and color options, while compromising mechanical strength and weather resistance.

Often, a combination of different coloring techniques is required—especially when colored meshes, edge ropes, and brackets are combined.

---

### We will be happy to advise you

Jakob Rope Systems will assist you with selecting the appropriate method. We will work with you to review the technical and design requirements of your project. This ensures that function, appearance, and durability are perfectly coordinated.

[jakob.com](https://www.jakob.com) > [contact](#)

## Surface finishing properties

	Spectral coating	Black oxidation	Electrostatic wet painting	Powder coating	PVD coating	Electropolishing
<b>Color spectrum</b>	Shades of black Depending on material/batch	black	RAL Classic	RAL Classic	black gold bronze copper	transparent
<b>Color appearance</b>	semi-matte	matte	satin	satin or matte	gloss	gloss
<b>Material application</b>	no	no	Adhesive primer: 15–25 µm Top layer: 15–25 µm	80–120 µm	1–2 µm	no
<b>Mechanical strength</b>	••••	•••	••	•••	••••	
<b>Weather resistance</b>	•••••	••••	••	•••	•••••	•••••
<b>Suitability for interior use</b>	••	•••	•••••	•••••	•••••	•••••
<b>Suitability for exterior use</b>	•••••	•••••	••	••••	•••••	•••••

## Application: Surface finishing on products

	Spectral coating	Black oxidation	Electrostatic wet painting	Powder coating	PVD coating	Electropolishing
<b>Webnet</b>	yes	yes	yes	only securely mounted in frame	yes	no
<b>Frames</b>	no	no	yes	yes	no	yes, limited
<b>Wire ropes</b>	yes	yes	yes, limited	yes, limited	yes, limited	no
<b>Rope terminals</b>	yes	yes	yes, limited	yes, limited	limited	yes
<b>Mechanical components</b>	yes	yes	yes, limited	yes	yes	yes
<b>Structural components</b>	yes, limited	yes, limited	yes, limited	yes	no	yes
<b>Wire rope links assembled</b>	yes	yes, limited	yes, limited	no	no	no
<b>Notes</b>	The process uses chromium-VI. Products are safe.	The process uses chemicals. Products are safe.	Not suitable for use on stressed or moving meshes and ropes.	Rugged Can only be applied to pre-stressed systems. Minimum quantity required.	Individual components only.	Solid mechanical components only. Maximum size 1000 x 1500 mm



DEKRA Automobil GmbH Unidekstraße 5 D-75015 Bretten

**Jakob GmbH**  
 Mr. Konstantin Kühner  
 Im Pfingstwasen 1  
 73035 Göppingen

**DEKRA Automobil GmbH (former k-labor)**  
 Laboratory for materials testing and failure analysis  
 Unidekstraße 5  
 75015 Bretten  
 Phone +49.7252.96552-0  
 Fax +49.7252.96552-29  
 DEKRA contact person:  
 Matthias Hoffmann  
 Phone +49.7252.96552-23  
 E-Mail matthias.m.hoffmann@dekra.com

### Test report No: K17452-Rev. 01

**Customer:** Jakob GmbH  
**Street:** Im Pfingstwasen 1  
**Postcode / City:** 73035 Göppingen  
**Reference Person / purchaser:** Mr. Konstantin Kühner  
**Phone / E-mail:** +49 7161 65 883 17 / konstantin.kuehner@jakob.eu  
**Order Date:** 16/10/2024  
**Customer order number:** -

**Scope of investigation:** Testing the corrosion resistance

**Sample / Artefact:** see table 1  
**Number of delivered parts:** 21  
**Receipt at laboratory:** 10/10/2024

**Approval of Test Report:**  
 This report contains 28 pages.

**Responsible project manager:** Matthias Hoffmann  
**Laboratory management:** Dr. Petra Bauer  
**Date:** Bretten, 08/01/2025  
**Remarks:** Revision 01: Editorial changes



Deutsche  
 Akkreditierungsstelle  
 D-PL-11060-05-00

The accreditation is only valid for the scope of accreditation listed in the certificate system D-PL-11060-05-00.

The test results refer exclusively to the forementioned test items. This report may only be reproduced completely. Without written permission of the test laboratory a partial duplication of the test report is not permitted. This report has been generated automatically and is valid without signature. Statements of conformity are only made according to customer requirements or specifications. Statements of conformity are made without taking the measurement uncertainty into account.

DEKRA Automobil GmbH  
 Handwerksstraße 15, D-70565 Stuttgart  
 Telefon (07 11) 78 61-0  
 Telefax (07 11) 78 61-22 40  
 www.dekra.com

Sitz Stuttgart, Amtsgericht Stuttgart, HRB-Nr. 21039  
 Ust.ID-Nr. DE 811 297 970 - Steuer-Nr. 99015/01322  
 Bankverbindung - Commerzbank AG  
 BIC: DRESEFF3300 IBAN: DE84 6008 0000 0901 0051 00  
 Landesbank Baden-Württemberg  
 BIC: SOLADEST3300 IBAN: DE74 6005 0101 0002 0195 25

Vorsitzender des Aufsichtsrates:  
 Stefan Kölbl  
 Geschäftsführer:  
 Guido Kutschera (Vorsitzender),  
 Friedemann Bausch, Jann Fehlauer

Date: 1/8/2025	Filename: K17452_Jakob GmbH_Salt spray test on 21 samples_TR_Rev.01.docx	Page 1 of 28
----------------	--	--------------