General Information

STAINLESS STEEL in colour

– coloured according to the INOX-SPECTRAL®-process

Stainless steels can be easily formed (rolled, bent, drawn, etc.) and joined (welded, soldered, glued, etc.), so they are suitable for applications in a wide variety of areas and industries.

► Stainless steel in colour is characterized by:

- Sustainability (100% recyclable)
- Temperature resistance (highest fire protection class A1)
- Versatility
- Aesthetic appearance
- Corrosion resistance
- Longevity; in any weather, without losing its elegant shine
- Special hygienic properties
- Economy, as it requires little maintenance
- Conductivity
- Food safety

► Stainless steels for colouring

Austenitic, ferritic and in some degree also martensitic stainless steels can be coloured by the INOX-SPECTRAL®-process. To get good colouring results the alloy has to have a minimum content of 50% iron and 17% of chromium. In the case of stainless steel with a chromium content between13% and 17% only a reduced range of colours can be achieved, predominantly brown and grey. There are limitations in maximum content of other alloy components. Best results are obtained on austenitic stainless steels. Relatively high standards are set with regard to homogeneity of structure and alloy concerning the surface quality of the material to be coloured. Only first quality material provides uniformly coloured surfaces.

► Colours

Using the INOX-SPECTRAL® process, the following colours can be achieved on austenitic and ferritic stainless steels with a chromium content of more than 17%:
champagne, bronze, cobalt blue, steel blue, gold, red, green, black

Depending on the mechanism of the colour formation, the coloured stainless steel surfaces show a relationship to viewing angle (interference effect) which has to be considered by the purpose of use.

INOX-COLOR GmbH
Dreisteinheumatte 6 • DE-74731 Walldürn
Tel. +49 (0) 62 82/92 38-0 • Fax +49 (0) 62 82/92 38-99
www.inox-color.com • info@inox-color.com

► Range of delivery

Sheets, coloured on one side (if necessary also on both sides) with max. dimensions of 2000 x 6000 mm with a thickness of 0.5 to 4.0 mm. All colours can be achieved on bright annealed, patterned, shaped, grounded, electropolished and pickled surfaces. Tubes, profiles and steel bars up to max. 6000 mm length and 50 mm diameter on request. Likewise screws, fasteners and other small parts. The INOX-SPECTRAL®-process can also be used for colouring stainless steel expanded metals, wire mesh or other stainless steel products.

Resistance

► Corrosion resistance

The corrosion resistance of coloured stainless steel surfaces basically depends on the corrosion resistance of the base material used. The chromium oxide layer build up by using the INOX-SPECTRAL®-process represents a chemical reinforcement of the passive layer of stainless steel in terms of corrosion technology.
Coloured stainless steel surfaces therefore usually have a higher corrosion resistance than the pure base material. If the base material is not inherently resistant to corrosion, a corrosion attack occurs with a time delay and in a weakened form, even on coloured surfaces. Basically, the material quality should therefore be selected according to the expected corrosion stress.

► Temperature resistance

The temperature resistance of the coloured surfaces depends on the quality of the material used. The coloured surface is resistant to temperatures of up to 200 ° C in continuous use. Temporary excess temperatures of up to approx. 100 ° C are usually tolerated, but perma-nent discoloration occurs in the event of permanent exposure in the higher temperature range due to increased oxidation and the associated increase in the thickness of the oxide film. More recent tests with a 13% chromium steel (material no. 1.4512) result in a temperature resistance of the colour black up to 350° C, at 400° C the first slight discoloration was observed. High temperatures, such as those occurring during welding or brazing, lead to discoloration of the surface.

► Resistance of light, weather and ageing

The surface of coloured stainless steel does not contain pigments or colouring substances which could be bleached or changed by ageing or influences of light and weather. Longtime exhibition to different atmospheric conditions during more than 25 years have shown no visible changes on coloured stainless steel. The surface of coloured stainless steel does not crack or peel and is resistance to ageing.

► Mechanical resistance

The film of chromium which creates the colours is very ductile and homogeneously connected with the stainless steel. Deformations which do not affect the basic material also will not impair the coloured surface. Bending, tilting, pressing and even deep-drawing are possible without impairing the colour effect and without cracking or peeling off the coloured surface. The resistance to abrasive stress is limited due to the extremely low thickness of the interference layer (between 0.05 µm and 0.8 µm). The hardness of the interference film is slightly higher than that of the uncoloured stainless steel surface, but abrasive attack that attacks the uncoloured stainless steel surface also leads to the destruction of the coloured surface.

However, certain surface structures are suitable for the use of coloured stainless steel in areas with high abrasive loads. In this case patterned surfaces are finished by grinding after colouring, so that the abrasive load is absorbed by the bare, raised surface areas and the deeper-lying coloured areas are protected against mechanical attack.

Processing

► Mechanical treatment

With suitable surface protection (protective film), coloured stainless steel can largely be mechanically deformed and processed like stainless steel with a untreated surface.

► Machining, Shaping, Cutting

For machining, such as drilling, sawing and milling, the same rules apply as for machining the respective uncoloured material. When separating by cutting, punching or nibbling, it can be observed, especially in the case of thinner sheets, that the coloured surface is partially pulled over the cutting edge, so that the bare cutting edge is less noticeable than would be expected.

► Forming

Provided that there is a suitable surface protection (protective film), coloured stainless steel can be deformed like the bare material by bending, edging, pressing, embossing, rolling and deep drawing. The colour effect is generally not impaired if the protective film is not damaged in the process.
Strong local deformation can lead to changes in the gloss level of the surface, corresponding to the deformation of the microstructure of the steel.

Bonding

► Mechanical Bonding

Mechanical connection methods such as screwing, riveting and clamping can be used for coloured stainless steel without any problems. The rules that also apply to bare surfaces apply here. The connecting means can also be coloured and thus largely adapted to the sheet metal surface. This also applies to stainless steel screws that are used to fasten aluminum sheets.

► Welding

When welding coloured stainless steel generally the recommendations for welding of stain less steel must be followed. In the area of the weld seam, discoloration occurs in the zone of very high temperatures. Subsequent colouring of these decolored areas is not possible. Weld seams should therefore be avoided if possible or placed in areas that are not visible. If this is not possible, the weld seams can be used as decorative seams. For this purpose, the weld seams are arranged symmetrically and subsequently grinded in a uniformly wide strip with a clean border (cover). This creates a decorative contrast between the colou-red and the grinded, bare surface areas. Swimming pool construction is a typical area of application for this technology. The attachment of fastening elements by means of stud welding to the rear of coloured stainless steel sheets is possible with sheet thicknesses of 1.0 mm and above without impairing the coloured visible surface. Attention is to be paid to the short-term energy input (tip ignition).

► Brazing and soldering

The same restrictions apply to connections by brazing as to welding. Special solders with at least 40% tin are used for soft soldering. Special pastes or 50% phosphoric acid are used as flux, since fluxes containing hydrochloric acid leave traces that cannot be removed. Solder residues should be thoroughly removed with soda or P3 solutions.

► Adhesive Bonding

Adhesive processes can be used for coloured stainless steel without restrictions. Both cold-curing and warm-curing adhesives can be used here, provided the temperatures required for curing do not exceed 200 ° C.

Special note

► Pickling, Etching, Electropolishing

Chemical and electrochemical surface treatment processes associated with an attack on the stainless steel surface, such as pickling, etching and electropolishing, destroy the

coloured stainless steel surface.

Chemical and electrochemical removal processes are
therefore used in a targeted manner to apply labels and patterns to coloured stainless steel. For this purpose, the areas in which the coloured surface is to be retained are covered with acid-resistant resist (photoresist, screen printing or offset printing) and then the areas that remain free are decoloured.

► Cleaning

Colored stainless steel surfaces are water and dirt repellent. They can be easily cleaned with suitable, non-abrasive cleaning agents. In many cases, vigorous rubbing with a soft, clean cloth or washing with water, possibly with the addition of a commercially available dishwashing detergent, is sufficient. All types of abrasives (they scratch the surface), chrome, silver and brass care products, furniture polishes and other „glossers“ are not suitable.

We will be happy to answer any individual questions you may have.

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