

Electroplated coatings of chrome and nickel

Technical information

Chrome plating is a surface treatment process for the application of a nickel deposit followed by a thin deposit of chromium on a variety of components. The coatings are electro-deposited from aqueous solutions (electrolytes) consisting of nickel or chrome salts, as metal ions. These ions are reduced to a metallic coating at the surface of the components by means of an external power source. MidtjydsK Fornikling carries out chrome plating on components suspended from plating racks.

Chrome plating or decorative chrome as it is also called, is a coating system in which nickel coating account for the major part of the layer thickness. The chrome plating is precipitated in a very modest layer (normally 0,3-1 µm) but in such a way that the surface of the nickel plating is coated. This ensures a surface that is smooth, reflective, and tarnish resistant.

Nickel plating (without a chromium topcoat) can also be applied to small components (barrel plating) and it is mainly used for functional usage. The surfaces appear yellowish compared to chrome plating. Nickel plating is at times applied as the sole surface treatment, but nickel surfaces have poor resistance to tarnishing, resulting in a loss of reflectivity and a darkening of the surface. This can be avoided by applying a chrome plating (not in barrel applications) because chrome coatings have a highly corrosion-resistant surface which preserves a bright and decorative appearance for a

lengthy time period even when exposed to more corrosive environments.

Other chrome types

An alternative to the known chrome/nickel plating which also has a bright and shiny surface is satin chrome / satin nickel. The characteristics and durability of these surfaces are equivalent to chrome plating and nickel plating respectively. Before production of these surface treatments it is recommended to obtain a sample from MidtjydsK Fornikling because visual differences can occur if using several surface coating suppliers.

The information indicated below states the characteristics and application of the coatings and offers guidance to ordering of chrome plating.

Application data for coatings

Nickel (Ni):

Melting point 1453° C
Molar weight 58,7 g/molar
Volume weight 8,9 g/cm³

Maximum application temperature for nickel: 400° C

Chrome (Cr):

Melting point 1890° C
Molar weight 52,0 g/molar
Volume weight 6,9 – 7,2 g/cm³

Maximum application temperature for chrome: 450° C
Loss of brightness at temperatures above 260° C in air

Specification of chrome plating

Orders of chrome plating are placed according to the standards

DS/EN ISO 1456 or DIN 50967. The standards comprise the basic metals iron/steel, copper, copper alloy, zinc and aluminium and state a variety of coating combinations according to usage environment which is specified by the environmental classes 0-4. Examples of recommended coatings and coating thicknesses as related to the environmental classes are illustrated in figure 1. We refer to the standards for a more detailed description hereof.

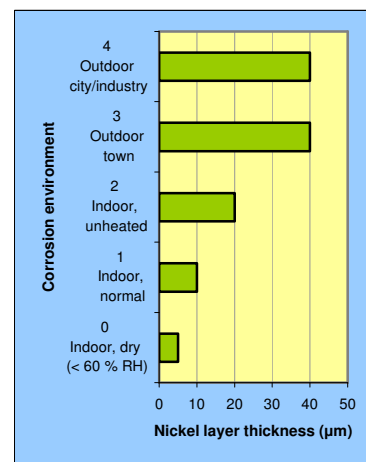


Figure 1: Recommended nickel layer thickness in chrome plating on steel cf. DS/EN ISO 1456, environmental class 0-4. In the environmental classes 0-3 full-bright (b) is applied and in class 4 semi-bright (p) is applied. Chrome plating is done regular (r).

By way of example the specification of an ordinarily applied chrome plating on steel in environmental class 2 with minimum 20 µm full-bright (b) and minimum 0,3 µm regular chrome (r) is; DS/EN ISO 1456 – Fe/Ni20b/Cr r.

The requirements for nickel layer thickness and chrome layer thickness must be complied with

in so far as the significant surfaces of the components. That is, unless agreed otherwise, the areas of the components that can come into contact with a ball which has a diameter of 20 mm. The requirements only encompass the outer surfaces of the components, and not the inner surfaces and voids of e.g. pipes that are electrically shielded during precipitation and, therefore, cannot be coated.

Chrome baths generally have poor coverage, that is difficulty in coating internal corners, recessed sections etc. where the current density is low. Components to be chrome plated should, therefore, be shaped in such a way that visually important surfaces are open and without electric shielding. Otherwise yellowish or matt spots can occur where the chrome coating is not able to overcoat the nickel coating, which has better covering power.

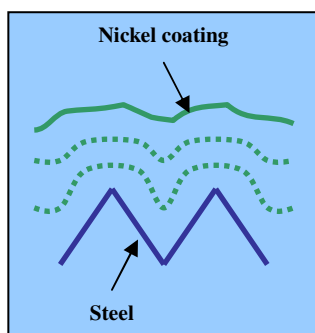


Figure 2: Schematic presentation of the levelling ability of nickel coatings. The coating balances out the roughness of the steel surface.

Nickel has a good levelling ability which means an ability to cover minor surface roughness from grinding or manufacturing processes, and the coating will form a very smooth and even surface as depicted in figure 2. The best results are however, obtained if the untreated components have a surface roughness equivalent to fine grinding or better.

When ordering chrome plating from Midtjysk Fornikling a specification of the basic metal should be provided so we can assess the optimum pre-treatment (before the actual chrome coating process) to ensure the optimum coating performance.

Corrosion behaviour of chrome coatings

The functionality of nickel coatings as part of a chrome plating is to reduce/balance out the roughness of the components so that the surface will be completely levelled. Subjected to damp conditions the surface must, also be free from porosity in order to protect the base material against corrosion. Nickel and chrome are precious metals

compared to steel which is why any steel surface exposed to conditions of dampness will be subject to galvanic corrosion and, therefore, forms rust stains at pores and flaws in the coatings. The thicker the nickel coating and the smoother the base material surfaces, the lower the possibility of voids and porosity. In practice chrome plating cannot be totally free of voids. Frequent none abrasive cleaning and the use of wax containing polishes will increase the durability. If subjected to corrosive environments the components must, however, be manufactured in more corrosion-resistant materials such as brass to achieve optimum performance.

The extent of porosity in the chrome plating surface on steel can be tested by means of salt fog exposure (ISO 9227, DIN 50021 - SS) or Kesternich-test (DIN 50018 - SF 0,2 S).

We offer:

Rack plating:

1 rack plating line, max length of components:
3000 x 1450 x 600 mm

Barrel plating (nickel):

1 barrel plating line

Contact us for a no-obligation consultant visit or obtain more information.