EJOT®

Overview of hexavalent chromium free (Cr (VI)-free) platings

Ban of chromium (VI) (hexavalent chromium):
The European directive on end-of-life vehicles bans the use of hazardous substances such as hexavalent chromium Cr (VI) from July 1st, 2007.
Besides another European directive "WEEE" (waste electrical and electronic equipment) bans hexavalent chromium from July 1st, 2006 as hazardous substances in the RoHS as well.

It is expected that other industries will consent to the ban of hexavalent chromium Cr(VI). The demand for surfaces containing Cr(VI) has already decreased significantly, so the availability for the future cannot be assured.

That is why EJOT will no longer offer, respectively produce new parts with platings containing hexavalent chromium.

The following corrosion protection platings contain hexavalent chromium and are subject to the above mentioned ban:

- zinc or zinc alloy + yellow chromated
- zinc or zinc alloy + black chromated
- DACROMET® (zinc flake coating produced by DACRAL company)
- **Attention:** In Europe nearly all clear or bluish passivations are Cr(VI)-free since years, whereas in Asia, even today many clear or bluish chromated surfaces contain Cr(VI).

Conclusions:

- **New applications should not be coated with Cr(VI) platings.**
- **Current series parts with Cr(VI) platings that are to be used also in future should be changed to Cr(VI)-free platings as soon as possible.**

The changeover to Cr(VI)-free alternatives:

The following points must be observed:

Layer thickness:
The changeover to Cr(VI)-free surfaces often requires a higher layer thickness. The smaller the dimensions the greater is the effect of the layer thickness on the thread geometry. The maximum layer thickness is limited by the conformity of the internal recess (e.g. TORX®) or conformity of metric threads.

In particular, black top coats are hardly possible to apply on micro fasteners with very small dimensions, since the parts can stick together and the conformity of internal recesses can no longer be guaranteed.

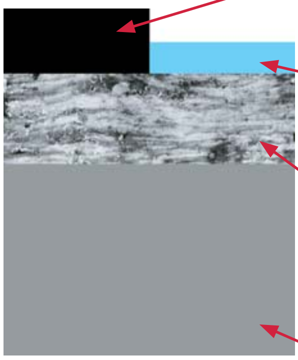
Friction ratings:
State of the art sealer and top coats often are only available with integrated lubrication additives (GZ). These have been developed to fullfill the friction ratings demanded by the automotive industry for metric screws.
However such integrated lubrication additives are not especially developed for direct assemblies and thus are often inadvisable.
For direct screw assemblies into plastic, in general, no kind of lubrication additive is recommended.

For direct screw assemblies into metal, usually a treatment with lubrication is necessary. But in such cases the integrated lubrication additives often cause a higher thread forming torque than additionally applied lubrications.

Generally, if a changeover from a hexavalent chromium plating to Cr(VI)-free plating is planed, a modification or adjustment of the installation planned has to be expected.

Overview of chrome VI-free platings

General structure of a galvanic coating



General structure of a zinc flake coating

Corrosion protection of galvanic systems:

Min. layer composition for galvanic systems	Resistance against white rust [h]	Minimum resistance against red rust depending on the layer thickness [h]		
		5 µm	8 µm	12 µm
Zn blue / transparent passivated	6	48	72	120
Zn thick-film passivated	72	--	144	168
Zn thick film passivated + sealer	168	--	288	360
Zn-Fe black passivated + sealer	120	240	360	--
Zn-Ni transparent passivated	120	480	720	--
Zn-Ni black passivated	48	480	720	--
Zn-Ni transparent passivated + sealer	168	480	720	--
Zn-Ni black passivated + sealer	168	480	720	--

Corrosion protection of zinc flake coatings:

Layer composition approx.	Resistance against white rust [h]	Minimum resistance against red rust depending on the layer thickness [h]		
		7 µm	14 µm	17 µm
Delta Protekt KL 100 + VH 300 (without GZ), silver	--	240	720	840*
Delta Protekt KL 100 + VH 301 GZ, silver	--	240	720	840*
Delta Protekt KL 100 + Delta Seal (without GZ), black	240	--	480	720
Delta Protekt KL 100 + Delta Seal GZ, black	240	--	480	720
Magni B 46 + B 37 (without GZ), black	240	--	480	720
Geomet 321 + Plus VL (GZ), silver	--	480	720	840*

* achievable depending on the part design

Important information:
The resistance values given in the chart refer to the salt spray test, respectively the NSS test according to ISO 9227, and screws after having finished the coating. They can be agreed with the plater as quality requirements that have to be met.
The evaluation does not give any information about the expected corrosion resistance of the screw joint in a precise construction. Preloads on the screws resulting from filling and transport movements (also during the assembly) as well as adhesive strength, abrasion resistance and surface damages are not taken into consideration. Considering the definition of corrosion according to DIN EN ISO 8044, the operating forces and the ambient medium have a huge impact when the screws are installed. So we have to talk about a "corrosion system screw joint" which should not corrode for a certain usage period with its different materials at different and changing operating conditions under the impact by an ambient medium that varies within known limits (see also EJOT FORUM 1, picture 4). For zinc-flake coatings, the DIN EN ISO 10683 also prescribes a corrosion test after several preloads.
The chart only serves as a contribution to the decision.
Since the selection of surfaces is linked with many variables, it should be made in close cooperation with EJOT.

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07.2009 All technical data may be subject to technical improvements.