1 Scope

The specification refers to zinc coatings mechanically deposited on iron and steel metals with subsequent passivation of the zinc surface. This specification distinguishes several types according to the thickness of the zinc layer, the passivation and an additional sealing process. All coatings must be free from Hexavalent Chromium.

Types:

- **JED-731-0**: minimum thickness of layer 5 µm, with passivation, for threaded parts exposed to mild corrosive conditions;
- **JED-731-1**: minimum thickness of layer 8 µm, with passivation, for parts exposed to mild corrosive conditions or threaded parts exposed to moderate corrosive conditions;
- **JED-731-2**: minimum thickness of layer 12 µm, with passivation, for parts exposed to moderate corrosive conditions or threaded parts exposed to severe corrosive conditions;
- **JED-731-3**: minimum thickness of layer 25 µm, with passivation, for parts exposed to severe corrosive conditions;
- **JED-731-4**: minimum thickness of layer 40 µm, with passivation, for parts exposed to very severe corrosive conditions;
- **JED-731-5**: minimum thickness of layer 8 µm, with passivation and additional sealing of the passivation layer, for parts exposed to very severe corrosive conditions.
- **JED-731-6**: minimum thickness of layer 8 µm, with passivation, additional sealing of the passivation layer is allowed, for parts exposed to very severe corrosive conditions or threaded parts exposed to moderate corrosive conditions;
- **JED-731-7**: minimum thickness of layer 8 µm, with passivation which guaranteed electrical conductivity, for parts exposed to moderate corrosive conditions. A sealing must not be applied for this type.

Thermal range of application of the parts with surface protection:

-60 °C to +80 °C

2 Requirements

2.1 Requirements on the substrate

The parts to be coated shall be free from material or treatment defects and any other surface defects adversely affecting the corrosion protection or the adhesion of the coating to the substrate. These are for instance slag inclusions, laps, score marks with a depth of more than 0,2 mm, pore clusters, sink marks, weld marks, whirls and bubbles.

Parts with cracks or with material separations transversal to the force shall not be used.
2.2 Requirements on the coating

The significant surfaces of the parts shall have a dense and homogeneous coating with matt bright finish. The significant surfaces are those areas of the surface for which the specified coating is essential for serviceability and appearance, and that can be touched by a ball 20 mm in diameter.

The coatings shall not have any defects affecting corrosion protection, as for instance pores, cracks, roughness, stains or damages. The coatings shall firmly adhere to the substrate and shall not spall in case of slight deformation.

The process conditions shall be chosen such as to not affect the usability of the finished part. Parts having a strength of more than 1000 N/mm² (Corresponding hardness 30HRC, 295 HV, 280 HB) shall be heat-treated prior to passivation to avoid hydrogen embrittlement.

After coating, the parts shall be within the tolerances provided on the standard sheets or drawings, with special consideration given to the thread dimensions.

The coating thickness values specified on the following pages apply to the significant surfaces defined above.

Measuring areas for the coating thickness on screws and nuts

The significant surface on screws is the approximate center of the head surface or the approximate center of the end provided that the coating thickness in these areas approximates that in the first turn of the thread for screws with a length up to 5 d (figures 1 to 5).

If appropriate, special agreements shall be made with regard to the measuring areas for screws the length of which exceeds 5 d, and for special parts.

In case of screws with internal drive the coating thickness is measured in the center of the remaining head surface or in the approximate center of the end (figures 2 to 5).

The coating thickness on nuts is measured in the center of a wrench surface (figure 6).

Examples of measuring areas:

![Measuring areas for screws and nuts](image)

2.3 Coefficients of friction of threaded parts

On threaded parts to be used with preformed threads in the counterpart, plating shall be carried out in such a way that total coefficients of friction from 0,12 to 0,18, if measured according to ISO 16047, are met. This does not apply to thread-forming screws (see JED-836 and 837). In cases where a different coefficient range is defined in the drawing, that has to be used. Uneven, rough or too thick coatings shall be avoided in the threaded areas.

Coatings with a thickness of more than 8 µm usually peel when the screw is tightened. This leads to uncontrollable extreme coefficients of friction and to insufficient prestress within the screwed joint.

The coefficients of friction of screws and nuts shall be measured using screw testing equipment that permits uniform slow tightening and release of the screwed connection.
2.4 Corrosion protection requirements

2.4.1 Requirements until start of zinc corrosion

<table>
<thead>
<tr>
<th>Type</th>
<th>Requirement: no zinc corrosion up to</th>
<th>Test method</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>JED-731-0 to JED-731-4</td>
<td>≥ 72 h without zinc corrosion</td>
<td>NSS test</td>
<td>ISO 9227</td>
</tr>
<tr>
<td>JED-731-5</td>
<td>≥ 120 h without zinc corrosion</td>
<td>NSS test</td>
<td>ISO 9227</td>
</tr>
<tr>
<td>JED-731-6</td>
<td>≥ 48 h without zinc corrosion</td>
<td>NSS test</td>
<td>ISO 9227</td>
</tr>
<tr>
<td>JED-731-7</td>
<td>≥ 24 h without zinc corrosion</td>
<td>NSS test</td>
<td>ISO 9227</td>
</tr>
</tbody>
</table>

2.4.2 Overall requirement until start of basic metal corrosion (red rust), including testing times of section 2.4.1

<table>
<thead>
<tr>
<th>Type</th>
<th>Requirement: no basic metal corrosion up to</th>
<th>Test method</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>JED-731-0</td>
<td>≥ 72 h</td>
<td>NSS test</td>
<td>ISO 9227</td>
</tr>
<tr>
<td>JED-731-1</td>
<td>≥ 72 h</td>
<td>NSS test</td>
<td>ISO 9227</td>
</tr>
<tr>
<td>JED-731-2</td>
<td>≥ 96 h</td>
<td>NSS test</td>
<td>ISO 9227</td>
</tr>
<tr>
<td>JED-731-3</td>
<td>≥ 192 h</td>
<td>NSS test</td>
<td>ISO 9227</td>
</tr>
<tr>
<td>JED-731-4</td>
<td>≥ 240 h</td>
<td>NSS test</td>
<td>ISO 9227</td>
</tr>
<tr>
<td>JED-731-5</td>
<td>≥ 500 h</td>
<td>NSS test</td>
<td>ISO 9227</td>
</tr>
<tr>
<td>JED-731-6</td>
<td>≥ 240 h</td>
<td>NSS test</td>
<td>ISO 9227</td>
</tr>
<tr>
<td>JED-731-7</td>
<td>≥ 120 h</td>
<td>NSS test</td>
<td>ISO 9227</td>
</tr>
</tbody>
</table>

2.5 Test for hexavalent chromium

Hexavalent Chromium must not be present in the coating.
The test to prove that no hexavalent chromium is present has to be done according to EN 15205 “Determination of hexavalent chromium in corrosion protection layers”. If the concentration of hexavalent chromium is below 0,1 µg/cm² according to this test, the parts are regarded as being free from hexavalent chromium.

2.6 Test of brittle fracture tendency

The parts are subjected to a mechanical load approximating or exactly corresponding to the type of load intended. In this condition, the parts are exposed to -40 °C for 24 hours. No fracture is allowed to occur.
2.7 Measurement of coating thickness
The measurement of the thickness of the zinc coatings shall preferably be done by the magnetic method according to ISO 2178. If it is impossible to apply the magnetic method, the thickness measurement shall be done by the microscopical method as specified in ISO 1463.

3 Guarantee

3.1 General
The manufacturer is obliged to prove by regular random test that the requirements specified in chapter 2 are observed, and to keep the inspection documents accessible to the customer.

3.2 Initial sample
Together with each initial delivery several initial samples and the initial sample inspection report shall be submitted for the inspection of dimensions and material.

3.3 Guarantee
The current supplies must conform to the released sample, to the requirements defined in this specification and to the drawings.

The Product Development and Quality Assurance teams have to be informed about any modifications. This also applies to planned modifications of the pretreatment and of the types of electrolytes. In these cases, new sampling and written release will be required.