Report on Findings

20180203 – 1A
- english version -
Truncated version
dated
12th July 2018

Commissioning Party:

Renusol Europe GmbH
Mr Nils Rossbach
Piccoloministr. 2
51063 Cologne

Testing location:

Institut für Galvano- und Oberflächentechnik
Solingen GmbH & Co. KG
Grünewalder Str. 29-31
42657 Solingen

The results of this analysis relate only to the specimens provided to IGOS GmbH & Co. KG for testing purposes and cannot necessarily be applied to the remainder of the batch. This Report on Findings may only be disseminated in an unmodified form and in its entirety. Reports on Findings not bearing our signature are invalid.
The task

Mr. Rossbach of Renusol Europe GmbH commissioned IGOS to perform salt spray testing to DIN EN ISO 9227 NSS:2017-07 on a total of two aluminium assemblies with a number of terminals.

The testing periods and assessment criteria were selected on the basis of DIN EN ISO 12944-6:1998 for the corrosion classifications of "C4 to C5 high" for 1440 hrs.

This report on findings replaces the report 20180203-1_Truncated version dated 02.07.2018.

**Testing requirements:**

<table>
<thead>
<tr>
<th>DIN EN ISO 12944-6:1998</th>
<th>Requirements for C4 and C5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Salt spray test to DIN EN ISO 9227 NSS</strong></td>
<td></td>
</tr>
<tr>
<td>C4 high: 720 hrs. test duration</td>
<td>Surface corrosion to DIN EN ISO 4628-3:2016 Ri 0 0%</td>
</tr>
<tr>
<td>C5 high: 1440 hrs. test duration</td>
<td>Blistering to DIN EN ISO 4628-2:2016 m0(S0)</td>
</tr>
<tr>
<td></td>
<td>Sub-surface migration around the scribe</td>
</tr>
<tr>
<td></td>
<td>In accordance with DIN EN ISO 17872</td>
</tr>
<tr>
<td></td>
<td>By analogy to DIN EN ISO 4628-8:2013</td>
</tr>
<tr>
<td></td>
<td>≤ 1 mm</td>
</tr>
<tr>
<td></td>
<td>Not applicable due to coating and component configuration</td>
</tr>
<tr>
<td></td>
<td>Degree of cracking to DIN EN ISO 4628-4:2016 m0(S0)</td>
</tr>
<tr>
<td></td>
<td>Degree of flaking to DIN EN ISO 4628-5:2016 m0(S0)</td>
</tr>
<tr>
<td></td>
<td>Cross-cut adhesion test to DIN EN ISO 2409:2013 Gt 0/1</td>
</tr>
<tr>
<td></td>
<td>Not applicable due to coating and component configuration</td>
</tr>
</tbody>
</table>

Table 01: Test requirements
### Implementation:
- **Test period:** 02.04. – 01.06.2018
- **Test duration:** 1440 hrs.
- **Specimens:** Total of 15 terminals
- **Testing chamber:** Erichsen 2
- **Testing chamber volume:** 2000 l
- **Orientation during testing:** 15 – 25° from the perpendicular

### Results

<table>
<thead>
<tr>
<th>Testing duration</th>
<th>Specimen</th>
<th>Evaluation</th>
<th>Fig.</th>
</tr>
</thead>
</table>
| 1440 hrs.        | Silver   | Zinc corrosion on screws  
Zinc corrosion on terminals RS1 40 17, 40 17, 40 17 & 30 15  
No substrate corrosion on steel parts  
Aluminium corrosion on terminals, aluminium  
No blistering, cracks or flaking | 01 – 04 |
|                  | Black    | Zinc corrosion on screws  
Zinc corrosion on terminals RS1 40 17, 40 17, 49 15 & 28 17  
No substrate corrosion on steel parts  
No aluminium corrosion on terminals, aluminium  
No blistering, cracks or flaking | 05 – 08 |

**Table 02: Results**
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Images

Fig. 01

Silver specimen
Test time: 1440 hrs.
Overview 1

Fig. 02

Silver specimen
Test time: 1440 hrs.
Detail view 1
Typical specimen
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Fig. 07

Black specimen
Test time: 1440 hrs.
Detail view 2
Typical specimen

Fig. 08

Black specimen
Test time: 1440 hrs.
Detail view 3
Typical specimen
Conclusions

**Silver specimen**
The testing requirements of 1440 hrs. of salt spray testing without substrate corrosion, blistering, cracks or flaking were met for the clamping feet, screws and terminal caps RS 1. The aluminium terminal caps did not meet the requirement for no substrate corrosion.

**Black specimen**
The testing requirements of 1440 hrs. of salt spray testing without substrate corrosion, blistering, cracks or flaking were met for the clamping feet, screws and terminal caps RS 1 and the aluminium terminal caps.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>C4</td>
<td>720</td>
</tr>
<tr>
<td>C5</td>
<td>1440</td>
</tr>
</tbody>
</table>

**Table 03:** Classification of specimen terminals, Renusol
Classification C5 on the basis of DIN EN ISO 12944-6 for long protection periods

IGOS GmbH & Co. KG

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