

Test Report

Aspect Quality GmbH, 72805 Lichtenstein

Report No.

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Client ZF1 Nanotech LLc		Order No. Customer -	
Subject No., Subject Customer ZF1 Liquid Protector Universal no 6005			
Project No. -		Project -	
Test Date 21.05.2013 till 25.05.2013		Test description and duration Salt spray test, duration 96 hours	
Test Specification DIN EN ISO 9227 - NSS (September 2012) respectively ASTM B117 (2011)			
Test Equipment Salt spray chamber Liebisch			
Copies to Mr. Fontanet			
List of contents 1. Procedure, 2. Part data, 3. Brief result, 4. Result, 5. Pictures, 6. Records if necessary			

1. Procedure

The reason for the test was the evaluation of the corrosion protection effect of ZF1 Liquid Protector on steel plates.

Purpose of salt spray tests: testing of corrosion protection, rapid detection of flaws, pores and defects as well as damages in coatings. In addition a comparative test regarding the quality of coatings is possible, if the samples are sufficiently similar in their characteristics.

The test was conducted according to the parameters of the DIN EN ISO 9227-NSS with the test chamber temperature 35°C and for the duration of 96 hours.

Working standards acc. to DIN EN ISO 9227 were used as steel plates: 150 mm x 70 mm, 1 mm thickness, consisting of steel DC04 acc. to ISO 3574 with practically faultless surface and dull looking (mean roughness index $R_a = 0,8 \mu\text{m} \pm 0,3 \mu\text{m}$).

Prior to the test the steel plates have been accurately cleaned by using a organic solvent.

Subsequent ZF1 Liquid Protector was well applied on both sides of the steel plates with a brush (see picture 1). Only after a drying time of at least 6 hours the test was started.

2. Test part data

Quantity of parts and markings: **3 steel plates with ZF1 Liquid Protector,**
without marking

Filling date of ZF1 Liquid Protector: 17.05.2013

Conditioning of the steel plates: until beginning of the test at ambient conditions (ca. 23°C)

The steel plates have been oriented in the test chamber acc. to the specification at an angle of about 20 degrees from vertical, see picture No 2.

3. Brief result

The 3 test plates have only selective red rust.

Therefore after consultation with the customer ZF1 Liquid Protector meets the requirements.

4. Result

Visual assessment of the 3 test plates after the salt spray test:

- the 3 test plates have only selective red rust on the test surface
- no red rust at the edges of the 3 test plates
- no other visual abnormalities
- see also pictures No 3 and 4

Result: after consultation with the customer ZF1 Liquid Protector meets the requirements.

There were no functional troubles with the test chamber during the total testing procedure.

5. Pictures



Picture 1: applying of ZF1 Liquid Protector with a brush



Picture 2: test setup in the salt spray chamber



Picture 3: overview of the test plates after the test



Picture 4: exemplarily a test plate after the test in detail

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6. Records

Amount of the collected salt solution: (required: $1,5 \pm 0,5$ ml/h in an area of 80 cm^2):

In the left field of the chambers: **1,7 ml/h**

In the right field of the chambers: **1,7 ml/h**

Concentration of the collected salt solution (required: 1,029 - 1,036 kg/l): **1,034 kg/l**

pH-value of the collected salt solution (required: 6,5 - 7,2): **pH 7,0** (potentiometric measure)

Mass loss per unit area of steel working standards in the chamber (required: $70 \pm 20 \text{ g/m}^2$): **73,286 g/m²**

The test results only refer to the above mentioned subjects. It's not allowed to copy this test report in extract without permission of Aspect Quality GmbH.

Conducted by			Released by	
Name	Date	Signature	Date	Signature
Markus Theurer	16.03.2015		16.03.2015	