



*Beratung - Schadensfallaufklärung - Qualitätssicherung - Forschung - Prüfung*

- Akkreditiertes Prüflabor für Korrosion, Korrosionsschutz und Korrosionsanalytik
- DAR-Registriernummer: **DAP-PL-1131.00**
- Institut im Verbund der Technischen Akademie Wuppertal e. V.
- Institut an der TU Bergakademie Freiberg

+49 (0)351 871 7100  
 Fax+49 (0)351 871 7150  
 +49 (0)351 871 7123

Institut für Korrosionsschutz Dresden GmbH • Gostritzer Str. 61 – 63 • D-01217 Dresden

**Test report**  
**PB500/06/07**

Customer: Emil Frei GmbH & Co.  
 Am Bahnhof 6  
 78199 Bräunlingen

Order: Testing of powder-coated galvanised steel specimens in accordance with the Draft Standard DIN EN ISO 12944-6:2006, corrosivity category C 5-I, high durability

Date of order: 2006-09-04  
 Laboratory number of order: 194/06/6568  
 Period of testing: 2006-09-07 to 2007-01-02

Number of pages: 5

Tested system: Priming coat: PE 1204A  
 Top coat: PF 1004A

Person responsible for testing: sgd. Dipl.-Ing. (FH) P. Lebelt

Head of testing department/  
 Head of testing laboratory: sgd. Dr. A. Rudolf

Head of testing department: sgd. Dr. J. Gehrke

Dresden, 2007-02-07

created: Dipl.-Ing.(FH) Lebelt	checked: Dr. A. Rudolf	released: Dr. J. Gehrke
Signum:	Signum:	Signum:
Date: 2007-02-07	Date: 2007-02-07	Date: 2007-02-07

**Translation according to original test report PB500/06/07**

Dresden, 14.06.2011

Head of testing department

  
 Dr. Andrea Rudolf

## 1 Test specimens

The customer has provided 10 powder-coated galvanised steel sheets, measuring 150 mm x 100 mm x 2 mm, to be tested regarding corrosion protection in accordance with the Draft Standard DIN EN ISO 12944-6:2006. 9 test sheets have been used for stress applications and 1 test sheet as reference specimen. The powder-coating system with the system number 27 has been applied to a sweep-cleaned surface and consists of:

Priming coat: PE 1204A

Top coat: PF 1004A

The preparation of the test sheets and the measuring of the film thicknesses has been done by the customer. Examinations for the identification of the coating materials, deviating from the Draft Standard DIN EN ISO 12944-6:2006, have not been conducted.

## 2 Test conditions

The stress application or the duration of the stress application has been selected in accordance with Draft Standard DIN EN ISO 12944-6:2006. The corrosivity category C5-I with the durability high has been taken as a basis. Three test sheets have been exposed to each of the following stresses in accordance with test system 1:

- 1) 720 hours of continuous condensation in accordance with DIN EN ISO 6270-1
- 2) 720 hours of humid atmospheres containing sulfur dioxide in accordance with DIN EN ISO 3231-1,0S
- 3) 2160 hours of stress caused by neutral salt spray (fog) in accordance with DIN EN ISO 7253 (updated DIN EN ISO 9227:10-2006)

By agreement with the customer the test method for chemical resistance in accordance with DIN EN ISO 2812-1 has been replaced by the method in accordance with DIN EN ISO 3231-1,0S. The edges of the test sheets have been protected from corrosion by means of additional coating (edge protection).

In case of 3 selected test sheets the total film thickness of the powder-coating system has been determined by the IKS Dresden GmbH in accordance with DIN EN ISO 2808 and has been expressed in the summary of results. Measuring values obtained by the customer, which have been taken into the test report, are marked with an asterisk.

### **3 Evaluation**

The adhesive strength of the powder-coating system prior to the artificial stress application has been obtained by means of the cross-cut test in accordance with DIN EN ISO 2409.

Every stress application has been followed by a visual evaluation of the test sheets in accordance with DIN EN ISO 4628, Part 2 to 5. Irregularities, which are not to be evaluated in accordance with DIN EN ISO 4628, have not been noticed.

Furthermore, the adhesive strength has been tested by means of the cross-cut test in accordance with DIN EN ISO 2409 prior to and after the removal of the tape after the end of the respective stress application after conditioning of the specimens in an indoor environment for 24 hours.

### **4 Summary of results**

The results are summarised in the following table 1.

Table 1: Powder-coating system: Priming coat PE 1204A  
 Top coat PF 1004A

<b>Assessment prior to stress application</b>				
		Test panel 5		
DIN EN ISO 2808	Film thickness/ $\mu\text{m}$	203,2 <sup>max. 223 <math>\mu\text{m}</math> *</sup> min. 190 $\mu\text{m}$		
DIN EN ISO 2409	Cross-cut	0		
<b>Assessment after stress application</b>				
<b>Test 1: DIN EN ISO 6270-1 - Continuous condensation</b>				
<b>Duration 720 h</b>		Test panel 1	Test panel 2	Test panel 3
DIN EN ISO 2808	Film thickness/ $\mu\text{m}$	168,6 <sup>max. 192 <math>\mu\text{m}</math> *</sup> min. 157 $\mu\text{m}$	169,8 <sup>max. 181 <math>\mu\text{m}</math> *</sup> min. 157 $\mu\text{m}$	215 $\pm$ 14
DIN EN ISO 2409	Cross-cut	0	0	0
DIN EN ISO 4628-2	Degree of blistering	0 (S0)	0 (S0)	0 (S0)
DIN EN ISO 4628-3	Degree of rusting Ri	Ri 0	Ri 0	Ri 0
DIN EN ISO 4628-4	Degree of cracking	0 (S0)	0 (S0)	0 (S0)
DIN EN ISO 4628-5	Degree of flaking	0 (S0)	0 (S0)	0 (S0)
<b>Test 2: DIN EN ISO 7253 - Stress caused by neutral salt spray (fog)</b>				
<b>Duration 2160 h</b>		Test panel 8	Test panel 9	Test panel 10
DIN EN ISO 2808	Film thickness/ $\mu\text{m}$	173,5 <sup>max. 199 <math>\mu\text{m}</math> *</sup> min. 161 $\mu\text{m}$	177,3 <sup>max. 199 <math>\mu\text{m}</math> *</sup> min. 156 $\mu\text{m}$	212 $\pm$ 10
DIN EN ISO 2409	Cross-cut	0	0	0
DIN EN ISO 4628-2	Degree of blistering	0 (S0)	0 (S0)	0 (S0)
DIN EN ISO 4628-3	Degree of rusting Ri	Ri 0	Ri 0	Ri 0
DIN EN ISO 4628-4	Degree of cracking	0 (S0)	0 (S0)	0 (S0)
DIN EN ISO 4628-5	Degree of flaking	0 (S0)	0 (S0)	0 (S0)
<b>Test 3: DIN EN ISO 3231-1,0S - Humid atmospheres containing sulfur dioxide</b>				
<b>Duration 30 cycles 720 h</b>		Test panel 4	Test panel 6	Test panel 7
DIN EN ISO 2808	Film thickness/ $\mu\text{m}$	167,7 <sup>max. 193 <math>\mu\text{m}</math> *</sup> min. 149 $\mu\text{m}$	180,8 <sup>max. 193 <math>\mu\text{m}</math> *</sup> min. 172 $\mu\text{m}$	187 $\pm$ 15
DIN EN ISO 2409	Cross-cut	0	0	0
DIN EN ISO 4628-2	Degree of blistering	0 (S0)	0 (S0)	0 (S0)
DIN EN ISO 4628-3	Degree of rusting Ri	Ri 0	Ri 0	Ri 0
DIN EN ISO 4628-4	Degree of cracking	0 (S0)	0 (S0)	0 (S0)
DIN EN ISO 4628-5	Degree of flaking	0 (S0)	0 (S0)	0 (S0)

\*Measuring values have been obtained and reported by the customer.

**5 Assessment of test results**

The powder coatings can only be evaluated and assessed following the Draft Standard DIN EN ISO 12944-6:2006, since powder coatings are not taken into account in the standard. In order to pass the test the powder-coating system shall meet the conditions in accordance with table 2 after all stress applications. In doing so, only one out of 3 specimens may deviate from the requirements.

Table 2: Conditions for a passed test in accordance with Draft Standard  
DIN EN ISO 12944-6:2006

Test method	Requirements
Cross-cut in accordance with DIN EN ISO 2409 prior to stress application (film thickness < 250µm)	Characteristic value 0 to 1
Degree of blistering in accordance with DIN EN ISO 4628-2	0 (S0)
Degree of rusting in accordance with DIN EN ISO 4628-3	Ri 0
Degree of cracking in accordance with DIN EN ISO 4628-4	0 (S0)
Degree of flaking in accordance with DIN EN ISO 4628-5	0 (S0)
Cross-cut in accordance with DIN EN ISO 2409 after stress application (film thickness < 250µm)	Characteristic value 0 to 1

**The tested powder-coating system passed the test in accordance with standard draft DIN EN ISO 12944-6:2006, corrosivity category C 5-I, high durability.**