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REPORT

Testing of system ZINGA / 2 layers PU TARFREE MIO according to ISO 12944-6 Im2 and Im3 High

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1 INTRODUCTION

1.1 Order

By order of Zingametall bvba in Eke, Belgium, the Centrum voor Onderzoek en Technisch Advies (COT bv) in Haarlem, The Netherlands, has tested the system Zinga / 2 layers PU Tarfree MIO according to ISO 12944-6 Im2 and Im3 High.

The order for the test has been given in the order form 2012/078/FP/GW of April 13th 2012.

1.2 General information

COT sample number	Samples	Received
17-04-12/0282	9 Coated steel test panels, with system Zinga / 2 layers PU Tarfree MIO, dimensions 100 x 150 x 5 mm	17 April 2012

2 PAINT APPLICATION

The coating system has been applied at Zingametall on Sa 3 grit blasted steel panels.

Specified Dry Film Thickness	:	Zinga	:	60 µm
		PU Tarfree MIO	:	100 µm
		PU Tarfree MIO	:	100 µm
Test specification	:	ISO 12944-6		
Corrosivity category	:	Im2 and Im3		
Durability range	:	High		

3 PROCEDURE

3.1 Dry film thickness

Before starting the tests the dry film thickness of the coating system has been measured according to ISO 2178 with a magnetic dry film thickness meter (Elcometer 456, COT E004). On each panel ten measurements have been carried out and the values have been corrected with a specific correction value of 47 micrometer according to Annex D of ISO 19840. The minimum, the maximum, the average and the standard deviation have been reported.

3.2 Adhesion

The adhesion of the coating system has been determined by a pneumatic adhesion tester (COT A006) in accordance with ISO 4624 on the unexposed panels and on the panels which have been exposed in the different artificial ageing tests.
The coating surface and the dolly have been sanded lightly and the epoxy adhesive has been applied. After the adhesive has been cured and prior to testing the coating and the adhesive have been drilled around the dolly down to the bare metal. Three trials on the unexposed panel and two trials on each of the tested panels have been done and the average has been reported.

3.3 Neutral Salt Spray

Resistance to salt spray has been tested in accordance with ISO 9227 NSS. Three panels have been tested during 1440 hours and in the panels a vertical scribe mark parallel to the longer edge of the panel has been made through the coating till the substrate using a sharp knife according to ISO 2409.

General data

Apparatus number	:	COT S006
Type of water	:	Demineralised water (< 1 µS)
Salt	:	Sodium chloride (NaCl) p.a.
Test temperature	:	35 °C
Collected salt solution	:	1.0 – 2.0 ml/hour/80 cm^2
pH of the collected salt solution	:	6.5 – 7.2
Salt concentration of the collected solution	:	50 ± 5 g/l
Exposition angle	:	ca. 20 ° from the vertical
Start of test	:	May 10th, 2012
End of test	:	July 9th, 2012

Directly after the test the panels have been examined for defects according ISO 4628 and the corrosion creep.

3.4 Immersion test

Three panels have been immersed during 3000 hours for three-quarters of their length in a sodium chloride 5 % (m/m) aqueous solution at 40 °C.

Start of immersion	:	May 7th, 2012
End of immersion	:	September 10th, 2012

Directly after the test the panels have been examined for defects according to ISO 4628.

4 RESULTS

4.1 Assessment before Artificial Ageing tests

Table 1: Adhesion of reference panels

ISO 4624	**COT Sample number** 17-04-12/0282			**Requirements**
	Panel 1	**Panel 2**	**Panel 3**	
Min. – max. DFT (µm)	184 - 219	202 – 232	183 – 234	--
Average DFT (µm)	200 ± 11	214 ± 11	206 ± 14	--
ISO 4624 (MPa) Break type	7.8 ± 0.6 100 % in 2nd or 3rd layer	8.4 ± 0.6 100 % in 2nd or 3rd layer	8.1 ± 0.8 100 % in 2nd or 3rd layer	No adhesion break to the substrate unless the values are ≥ 5 MPa

4.2 Assessment after Neutral Salt Spray test

Table 2: Assessment after 1440 hours NSS test

1440 hours ISO 9227 NSS	**COT Sample number** 17-04-12/0282			**Requirements**
	Panel 7	**Panel 8**	**Panel 9**	
Min. – max. DFT (µm)	192 - 225	172 – 230	196 – 234	
Average DFT (µm)	207 ± 11	204 ± 21	209 ± 11	--
ISO 4628-2 (blistering)	0(S0)	0(S0)	0(S0)	0(S0)
ISO 4628-3 (rusting)	Ri0	Ri0	Ri0	Ri0
ISO 4628-4 (cracking)	0(S0)	0(S0)	0(S0)	0(S0)
ISO 4628-5 (flaking)	0(S0)	0(S0)	0(S0)	0(S0)
Annex A (corrosion of the substrate from the scribe)	< 0.5	< 0.5	< 0.5	Not exceed 1 mm
ISO 4624 (MPa) Break type	7.8 ± 0.6 100 % in 2nd or 3rd layer	7.6 ± 0.3 100 % in 2nd or 3rd layer	8.9 ± 1.0 100 % in 2nd or 3rd layer	No adhesion break to the substrate unless the values are ≥ 5 MPa

4.3 Assessment after Immersion test

Table 3: Assessment after 3000 hours immersion test

3000 hours in sodium chloride 5 % (m/m) aqueous solution at 40 °C	**COT Sample number** 17-04-12/0282			**Requirements**
	Panel 13	**Panel 14**	**Panel 15**	
Min. – max. DFT (µm)	204 - 249	192 – 214	169 – 202	
Average DFT (µm)	223 ± 14	206 ± 8	187 ± 11	--
ISO 4628-2 (blistering)	0(S0)	0(S0)	0(S0)	0(S0)
ISO 4628-3 (rusting)	Ri0	Ri0	Ri0	Ri0
ISO 4628-4 (cracking)	0(S0)	0(S0)	0(S0)	0(S0)
ISO 4628-5 (flaking)	0(S0)	0(S0)	0(S0)	0(S0)
ISO 4624 (MPa) Break type	5.3 ± 0.2 100 % in 2nd or 3rd layer	5.3 ± 0.1 100 % in 2nd or 3rd layer	5.3 ± 0.3 100 % in 2nd or 3rd layer	No adhesion break to the substrate unless the values are ≥ 5 MPa

5 CONCLUSION

The system Zinga / 2 layers PU Tarfree MIO, dry film thickness 60/100/100 µm (COT sample number 17-04-12/0282) meets the requirements of ISO 12944-6 Im2 and Im3 High.

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