

Expert Report N°. 3800b1/07/2020

dated: 24.02.2021



Sachverständiger für Korrosionsschutz
Expert for Corrosion Protection

Test of the PU-Coating “Protegol UR Coating 32-60 Systems” according to DIN EN ISO 21809-3, Type 18B at T_{max.} +95 °C

Client: TIB Chemicals AG
Mülheimer Str. 16-22
68219 Mannheim
Germany

Order: 2129777

This expert report contains:

1 cover sheet
3 pages text including
2 tables

1 Introduction

The company TIB Chemicals AG placed an order with me for testing “**Protegol UR Coating 32-60 Systems**” according to DIN EN ISO 21809-3, type 18B, coating system: PU liquid $T_{max.} +95\text{ °C}$.

For this test I was provided with:

- coated steel plates 200 mm • 200 mm
- coated steel plates 300 mm • 150 mm

2 Test

Tables 1 and 2 summarizes the test conditions and the corresponding requirements. Detail information are listed in tables 1 to 2.

The test certificate is according to DIN EN 10204 and ISO 10474.

3 Result

The tested PU coating “**Protegol UR Coating 32-60 Systems**” fulfills the requirement of DIN EN ISO 21809-3, type 18B for design temperature up to $T_{max.} +95\text{ °C}$.

4 Normative reference

DIN EN ISO 868; 10.2003	Plastics and ebonite - Determination of indentation hardness by means of a durometer (Shore hardness)
DIN EN ISO 4624; 08.2016	Paint and varnishes - Pull-off test for adhesion
DIN EN 10204; 01.2005	Metallic products - Types of inspection documents; German version EN 10204:2004
ISO 10474; 07.2013	Steel and steel products - Inspection documents
DIN EN ISO 21809-3; 09.2020	Petroleum and natural gas industries - External coatings for buried and submerged pipelines used in pipeline transportation systems - Part 3: Field joint coatings

Korrosionstechnik Heim


Dipl. Ing. Thomas Heim



Table 1

DIN EN ISO 21809-3; Type 18 B

Properties	Clause	Test Condition	Requirements for		Actual Value
			by agreement	average in mm	
Minimum thickness	18.5.2	annex B device: gauge; electromagnetic measuring; ±10 % reading accuracy		average in mm	1,8 mm
Visual inspection	-	visual	continuous and uniform film free of sages runs and colour striations (when applicable)		pass
Holiday detection	18.5.3	annex C device: holiday detector, gauge; test voltage: 5kV / mm; max. 25kV		no holidays	no holidays pass
Impact resistance	18.5.5	annex D device: impact tester; number of impacts: 10; spherical diameter: 25 mm; height: 1 m; load: (1 kg ± 0,005 kg) depending of the coating thickness		test temperature: (23 ± 2) °C	
				the samples is supported; between two point of impacts: ≥ 50 mm; hard steel punch shall be check every 30 impacts, if damage it shall be replace; holiday detection according to clause 18.5.3	(20 ± 3) °C
Indentation resistance	18.5.10	annex E device: indentation tester; dial gauge: accurate ± 0,01 mm; cylindrical punch diameter: (1,80 ± 0,05) mm		test period (reading): demand: 1 hrs real: 24 hrs	
				punch cross sectional: 2,5 mm ² ; mass: 2,5 kg; pressure: 10,0 N/mm ² ; U _{1,23V} : -1,26V (the potential is corrected in the respective temperature); disbondment: 12 measurements; the disbonded area is the outside ring of the dark meta*1	T _{max} : (95 ± 2) °C
Cathodic disbondment	18.5.7	annex G device: cell, potentiostat, oven (isotherm); electrolyte: 3 % NaCl; holiday diameter: 6 mm		average ≤ 10 mm	0,6 mm
				average ≤ 20 mm	17,5 mm
Hardness Shore D	18.5.6	device: hardness tester; load mass: 5 kg (automatically); no tripod use		as per manufacturer specification	71
					68 - 76

* Investigation procedure (acc. ISO 21809-3 Annex G; G.5)
 “[...] In case, the metal is dark is considered as the area of disbondment”

Table 2

DIN EN ISO 21809-3; Type 18 B		Test Condition	Requirements (Nominal Value)	Actual Value
Properties	Clause			
Adhesion to pipe surface	18.5.4	DIN EN ISO 4624, device: automatically pull off adhesion tester; dolly (steel) diameter: 10 mm; test temperature: (23 ± 2) °C; speed: 1MPa/sec test time: ≤ 90 sec	pipe surface: steel	>12,9 MPa
		DIN EN ISO 4624, device: automatically pull off adhesion tester; dolly (steel) diameter: 10 mm	plant coating: PE	>11,3 MPa
Adhesion to pipe surface after 28 days hot- water immersion test at T _{max} limited as per annex I	18.5.8	annex I and DIN EN ISO 4624; preparation: holiday detection according to annex C; test device: cell, oven, holiday detector, pull off adhesion tester; test temperature of tap water: (95 ± 2) °C	pipe surface: steel	>11,1 MPa
		annex I and DIN EN ISO 4624; preparation: holiday detection according to annex C; test device: cell, oven, holiday detector, automatically pull off adhesion tester; test temperature of tap water: (95 ± 2) °C; electrolyte: tap water	plant coating: PE	9,6 MPa
Specific electrical insulation resistance (R _{S100})	18.5.11	annex F electrolyte: c _{NaCl} : 0,1 mol/L; test temperature: (23 ± 2) °C; test time: 100 days	R _{S100}	>1,2 · 10 ⁻¹⁰ Ωm ²
			R _{S100} / R _{S70}	1 > 0,8 pass

* Figures applicable for PQT and PPT. For production testing, results of 70 % of these figures may be accepted by agreement due to a possible lack of curing of the glue during the allowable duration of testing, provided that the failure occurs within the glue.

** It is necessary that this requirement be fulfilled only if the specific electrical insulation resistance after 70 days is less than 10 times the requirement of the specific electrical insulation resistance after 100 days.