Product Datasheet

Resicoat® R4-ES
for Electrostatic Spray Application on Preheated Surfaces
Code: HJF14R

Product Description

Resicoat® R4 is a high quality thermosetting epoxy powder coating for the corrosion protection of valves and fittings, manufactured from cast iron or steel. The powder coating is applied in one layer on a preheated surface by electrostatic spray application. Typical film thickness achieved is in the range of 10 – 20 mil (250 – 500 µm). The resultant thermoset epoxy has a high mechanical resistance with excellent electrical insulation properties. Drinking water approvals are available to confirm the coatings suitability, as a hygienic and environmental friendly coating. The outstanding adhesion of Resicoat R4® epoxy powders to the metal substrate provides long term protection of the coated component. It ensures a reliable conservation to the function and value of the parts for the common water and gas distribution network. The applicator of Resicoat® R4 benefits from a modern and environmentally friendly process. It is possible to overcoat Resicoat® R4 with polyester powder and liquid coatings to achieve UV protection.

Powder Properties

	Typical value	Method
Binder System	Epoxy	
Density	1.45 – 1.55 g/cm³	ISO 8130-2
Gel time at 392 °F (200 °C)	25 – 40 sec.	modified ISO 8130-6
Particle size distribution	D10 = 10 - 15 µm D90 = 135 - 160 µm	Malvern ISO 8130-1
Storage stability	6 months at ≤ 74 °F (23 °C)	
Safety precautions	See Material Safety Datasheet (MSDS)	

Application Data

Preheating temperature object	356 – 428 °F (180 – 220 °C) object temperature
Post cure conditions object	The coating is self curing, if the wall thickness of the steel/cast iron is greater than 8 mm. If the wall thickness of the steel/cast iron is less than 8 mm, additional curing of 3 to 8 minutes at 392 °F (200 °C) object temperature is required.

Coating Process

1. Pre-cleaning	The surface must be free of oil, grease, salt, and other impurities.
2. Blasting	Molding sand, rust and sharp edges must be removed with angular steel grit. The graphite from the cast iron must be removed from the blasting material according NACE No.2 / SSPC-10 / Sa 2.5. Recommended anchor profile of ≥ 60 µm should be stored max. 4 hours before pre-heating (dust-free and dry).
3. Pre-heating	This form of heating produces a uniform, defined temperature in the component. Any oxidation should be avoided.
4. Coating application	Immediately after preheating, the coating process starts without losing any object temperature. The coating is done in the shortest possible time in a single pass with no interruption

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		Typical value	Method
Coating Process (continued)	**5. Coating cure**	Curing is achieved by the heat contained in the object. If the heating capacity of the work piece is sufficient. To confirm fully curing, MIBK is dropped for 30 sec. on the film surface with no visible change.	
Material Properties	**Color**	blue, ca. RAL 5015	
	Recommended film thickness	10 – 14 mils (250 – 350 µm)	
	Flow	smooth	
	Gloss at 60° angle	70 – 100 units	ISO 2813
	Cross cut	Gt 0	DIN EN ISO 2409
	Impact resistance	> 5 Joule	DIN 30677-2
		> 2.26 Joule	ASTM D 2794 20 inchpound
		> 18 Joule	ASTM G 14 modified 1/8 in (3.2 mm) steel plate
	Abrasion resistance	< 40 mg	ASTM D 4060 CS-17, 1000 g, 1000 cycles
	Dielectric strength	≥ 30 kV/mm	IEC 60243-1
	Volume resistivity (DC voltage)	1.1 x 10^{15}	ASTM D 257
	Elongation	> 5 %	DIN 30677-2
	Indentation resistance **48 h, 158 °F (70 °C)** **24 h, 140 °F (60 °C)**	 < 30 % < 10 %	 DIN 30677-2/DIN EN 14901 ASTM G 17
	Compressive strength	> 100 MPa	ASTM D 695
	Shear adhesion	> 35 MPa	ASTM D 1002
	Heat aging **in air (110° C, 90 days)** **in water (70° C, 7 days)**	 pass pass	DIN EN 14901
	Thermal stability under heat aging	pass	AS/NZS 4158:2003
	Weathering (Xenon test), 100 days	pass	ASTM D 2596
	Hardness (Buchholz)	> 100	DIN EN ISO 2815
	Strain polarization	pass	WIS 4-52-01
	Cathodic disbonding **30 d, 74° F (23 °C)**	≤ 10 mm	DIN 30677-2, GSK
	Hot water immersion **90 d, 158 °F (70 °C)**	pass	AWWA C550
	Adhesion after 7 d, 194 °F (90 °C) water	≥ 16 MPa	ISO 4624, GSK

		Typical value	Method
Material Properties (continued)	**Disinfectant resistance** according DVGW work sheet W 291 (chlorine dioxide, sodium hypochlorite)	no change of surface, no chalking	After 10 test stages à 15 h
		The following migration test with demineralised water showed no defects of the film. The concentration of the examined para-meters in the tested water were below the limits of the epoxy guideline for ancillaries for pipes DN > 300 mm (in main trunks)	
	Water condensation test (Cleveland test), 21 days	no change	ASTM D 4585
	Salt spray resistance, 2000 h	no blistering, no loss of adhesion	BS 3900:F4
	Salt spray test, 4000 h	no under-rusting on the cut	DIN EN ISO 9227 (steel substrate)
	Water absorption, 100 d, 74 °F (23°C)	pass	AS/NZS 3862
	Chemical resistance pH 3 – 13, 74 °F (23°C)	fulfilled	EN 598

Conformities

- **AWWA C550**
- **DIN EN 14901**
- **ISO 12944-2, table 1** (standard does not include powder coating systems)
  It is expected that Resicoat® R4 is suitable to meet the high atmospheric corrosivity category C4 (typically in industrial areas and coastal areas with moderate salinity) and the very high atmospheric- corrosivity - categories C5-I (industrial) and C5-M (marine) if applied as a holiday-free coating at a film thickness >400 µm. A sufficient film thickness is highly required to ensure good edge coverage. For gloss and color stability a UV-resistant polyester topcoat has to be applied.

Approvals

Drinking water:
US: ANSI/NSF 61 Drinking Water System Components – Health Effects, NSF
DE: UBA-Coatings Guideline, Approval no.: K-235947-13, Hygiene Institute
DE: DVGW directive work sheet W 270, Approval no. W-279700k-17, Hygiene Institute
FR: DGS/VS 4 No99/217, AFNOR XP P41-250-1-3, No. de dossier: ACS 16 MAT LY 257, LSEHL
CZ: Regulation no. 409/2005 Statute Book; Mark 17/2016, Regional Institute of Public Health in Ostrava
AT: ÖNORM B 5014 Teil 1, Dok. Nr. D-1714218, AGES
IT: D.M. del 6/04/04 n. 174, Rapporto di prova N. 2417, SSICA
BE: Pidpa/Hydrocheck 011, Certificat R4 Blue, Belgaqua

Gas:
DE: Test of resistance to gas according G 260, Report no.: 06/069/5123/3, DVGW

Biogas:
DE: Test of resistance to biogas (gases from regenerative sources) according G 262, Report no.: 07/040/5110/3, DVGW

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Resistance against chemical substances of Resicoat® R4 at room temperature

Acetic acid	10 %	2 years	no change
Ammonia	10 %	2 years	no change
Ammonia	36 %	1.5 years	no change
Antifrogen L	50 %	1 year	no change
Antifrogen N	50 %	1 year	no change
Benzol		1 month	no change
Bore oil		1 year	no change
Butanol		6 months	no change
Carbon tetra chloride		1 year	no change
Caustic soda solution	10 %	2 years	no change
Caustic soda solution	50 %	2 years	no change
Chlorine cleanser and disinfectant		1.5 years	no change
Citric acid		2 years	no change
Deicer Safeway KF HOT		1 year	no change
Deicer Safeway SF (solid)		1 year	no change
Deicer Safewing MP II 1951		1 year	no change
Dichromatic potassium	10 %	1 year	no change
Diesel		2 years	no change
Engine oil SAE 20		1 year	no change
Ethanol		1 year	no change
Ethyleneglycole		1 year	no change
Formaldehyde	37 %	6 months	no change
Formic acid	5 %	2 years	no change
Formic acid	10 %	1.5 years	no change
Glycerol		1 year	no change
Glysantin		1 year	no change
Hydrochloric acid	concentrated	1 week	no change
Hydrochloric acid	10 %	2 years	no change
Hydrochloric acid	25 %	1.5 years	no change
Hydrofluoric acid	1 %	1 day	no change
Hydrogen peroxide	3 %	1 year	no change
Hydrogen peroxide	10 %	1 year	faded

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Lactic acid	10 %	1 week	no change
Methanol		1 week	no change
Methyl tert-butyl ether (MTBE)	100%	6 months	softening
Nitric acid	10 %	1.5 years	no change
Nitric acid	25 %	1 year	no change
Oxalic acid	5 %	6 months	no change
Palm oil	at 90° C	7 days	no change
Petrol		2 years	no change
Petroleum		1 year	no change
Phosphoric acid	10 %	2 years	no change
Phosphoric acid	50 %	2 years	no change
Potassium hydroxide	10 %	1 year	no change
Potassium hydroxide	25 %	1 year	no change
Potassium hydroxide	50 %	1 year	no change
Propanol		1 year	no change
Sea water		2 years	no change
Sodium acetate	10 %	1 year	no change
Sodium carbonate	20 %	1 year	no change
Sodium hypochlorite (15 % Cl_2)		10 weeks	no change
Sodium chloride	2 %	1 year	no change
Sodium chloride	20 %	1 year	no change
Sodium formiate	10 %	1 year	no change
Suds	1 %	1 year	no change
Sulphuric acid	2 %	2 years	no change
Sulphuric acid	20 %	2 years	no change
Sulphuric acid	50 %	2 years	no change
Tartaric acid	5 %	1 year	no change
Toluol		1 year	no change
Turpentine oil		1 year	no change
Urea	10 %	1 year	no change
Urine		1 year	no change
Xylol		1 year	no change