



# Rilsan®

## COATING PHYSICAL AND CHEMICAL PROPERTIES



# Physical properties of the coatings

## Typical results for coating applied according to Arkema specifications

<b>Melting point</b>	ISO 11357	186 °C	<b>Latent heat of fusion</b>		83,7 kJ/kg
<b>VICAT point</b>	ISO 306	181 °C	<b>Surface resistivity</b>	ASTM D 257	2.4 x 10 <sup>14</sup> Ω
<b>Specific gravity at 20°C</b> natural powders dipping and ES powders, white	ISO 1183	1.040 g/cm <sup>3</sup> 1.065 g/cm <sup>3</sup> to 1.25 g/cm <sup>3</sup>	<b>Inflammability</b>	ASTM D 635	self-extinguishing
<b>Water absorption to saturation</b> at 20 °C and 65% RH  at 20 °C and 100% RH  at 100 °C and 100% RH (boiling water)	ISO 62/1	0.9 to 1.1% according to the type of powder 1.6 to 1.9% according to the type of powder 2.4 to 3% according to the type of powder	<b>Dielectric constant</b>	102 Hz 106 Hz	3.9 3.1
<b>Shore D hardness</b> at 20 °C, measured at a thickness greater than 5 mm to eliminate the influence of the substrate	ISO 868	75-85	<b>Transverse or volume resistivity</b>	ASTM D 257	10 <sup>14</sup> to 10 <sup>16</sup> Ω.cm
<b>Hardness measured with a Persoz pendulum</b> at 20 °C	ISO 1522	180-200	<b>Tangent of the angle of loww (power factor)</b>		0.05
<b>Surface hardness</b> at 20 °C 10 sec. under load	DIN 53-456	80 N/mm <sup>2</sup>	<b>Resistance to surface tracking</b> KA method	DIN 53-480	Grade KA3c
<b>Scratch resistance</b> measured with the Clemen apparatus; load necessary to induce a scratch which reaches the underlying metal for a coating of 0.4 mm thickness	ISO 1518	59 N	<b>Dielectric rigidity</b> ES powders thickness ± 100 µm Dipping powders, thickness 350 to 450 µm	ASTM D 149	55 to 90 kV/mm 30 to 36 kV/MM
<b>Pencil hardness</b>	ECCA T4	Note: B	<b>Dielectric strength</b> Influence of the thickness studied on a natural coating (measured at 20 °C and 65% RH)		0.20 mm 52.8 kV/mm 0.43 mm 38.4 kV/mm 0.70 mm 34.7 kV/mm 0.90 mm 33.1 kV/mm
<b>Shear strength</b>	ASTM D 732	35-42 N/mm <sup>2</sup>	<b>Resistance to boiling water</b>	ISO 1521	Excellent adhesion after 2,000 hours; neither bubbling nor modification
<b>Impact resistance</b> Dip coating powder (thickness 350 µm)  ES powders (thickness 100 µm)	ASTM G14 ISO 3678 ISO 6272	> 2 J > 2.5 J > 19 J	<b>Resistance to outdoor exposure</b>	ASTM D 1235	3 years Florida exposure: Adhesion 4, NFT 58-112 without any corrosion
<b>Abrasion resistance</b> Taber abrasimeter (wheel type CS 17, load 1 kg) loss of weight after 1,000 cycles	ISO 9352	15 mg	<b>Resistance to salt water</b>		No corrosion after 10 years exposure
<b>Coefficient of friction</b>  Black powders	NFT 54-112 (8)	Static K: 0.15-0.3 Dynamic K: 0.05-0.2	<b>Salt spray resistance</b>	ISO 9227, on scribed primed plates (testing according to WIS 4-52-01)	< 1 mm corrosion after 2000 hours
<b>Flexibility</b> Conical mandrel folding	ISO 6860	> 35%			
<b>Specific heat</b>		2.09 kJ/kg K			
<b>Thermal conductivity</b>		0.29 W/mK between 323 and 443 K (50° and 170 °C)			



# » Chemical properties of the coatings

## Resistance of Rilsan® to various chemicals, as a function of temperature

In general, Rilsan® coatings have good resistance to inorganic salts, alkalis, most solvents, and to organic acids. Greater caution must be observed in uses involving inorganic acids, phenols and certain chlorinated solvents. In such cases, it is advisable to consult the Arkema Technical Service Department, specifying the practical problem involved: e.g nature of metal to be protected and the temperature and chemical composition of the liquid.

Resistance (°C)	20	40	60	90
<b>Inorganic bases</b>				
ammonium hydroxide (concentrated)	G	G	G	G
ammonia (liquid or gas)	G	G		
lime-wash		G	G	G
potassium hydroxide (50%)	G	L	P	P
sodium hydroxide (5%)	G	G	L	
sodium hydroxide (10%)	G	L	L	
sodium hydroxide (50%)	G	L	P	P
<b>Inorganic acids</b>				
chromic acid (10%)	P	P	P	P
hydrochloric acid (1%)	G	L	P	P
hydrochloric acid (10%)	G	L	P	P
nitric acid (all concentrations)	P	P	P	P
phosphoric acid (50%)	G	L	P	P
sulphuric acid (1%)	G	L	L	P
sulphuric acid (10%)	G	L	P	P
sulphuric trioxide	L	P	P	P
<b>Inorganic salts</b>				
alum	G	G	G	
aluminium sulphate	G	G	G	G
ammonium nitrate	G	G	G	
ammonium sulphate	G	G	L	
barium chloride	G	G	G	G
calcium arsenate (concentrated solutions of slurries)	G	G	G	
calcium chloride	G	G	G	G
calcium sulphate	G	G	L	
copper sulphate	G	G	G	G
diammonium phosphate	G	G	L	
magnesium chloride (50%)	G	G	G	G
potassium ferrocyanide	G	G	G	
potassium nitrate	G1	G1	P	P
potassium sulphate	G	G	G	G
sodium carbonate	G	G	L	P
sodium chloride (saturated)	G	G	G	G
sodium silicate	G	G	G	
sodium sulphide	G	L	L	
trisodium phosphate	G	G	G	G

Resistance (°C)	20	40	60	90
<b>Other inorganic products</b>				
agricultural sprays	G	G		
bleach solution	L	P	P	P
bromine	P	P		
chlorine	P	P	P	P
fluorine	p	p	p	p
hydrogen	G	G	G	G
hydrogen peroxide (20 volumes)	G	L		
mercury	G	G	G	G
oxygen	G	G	L	P
ozone	L	P	P	P
potassium permanganate (5%)	P	P		
sea water	G	G	G	
soda water	G	G	G	G
sulphur	G	G		
water	G	G	G	G
<b>Aldehydes and ketones</b>				
acetaldehyde	G	L	P	
acetone (pure)	G	G <sup>3</sup>	L	P
benzaldehyde	G	L	P	
cyclohexanone	G	L	P	
formaldehyde (technical)	G	L	P	
methylethylketone	G	G	L	P
methylisobutylketone	G	G	L	P
<b>Hydrocarbons</b>				
acetylene	G	G	G	G
benzene	G	G <sup>2</sup>	L	
butane	G	G	G	
cyclohexane	G	G	L	
decalin	G	G	G	L
HFA (Forane®)	G			
hexane	G	G	G	
methane	G	G	G	
naphthalene	G	G	G	L
propane	G	G	G	
styrene	G	G <sup>3</sup>		
toluene	G	G <sup>3</sup>	L	L
xylene	G	G <sup>3</sup>	L	L

Resistance (°C) 20 40 60 90

#### Organic bases

aniline (pure)	L	P	P	P
diethanolamine (20%)	G	G <sup>3</sup>	G <sup>3</sup>	L
pyridine (pure)	L	P	P	P
urea	G	G	L	L

#### Organic acids and anhydrides

acetic acid	L	P	P	P
acetic anhydride	L	P	P	P
citric acid	G	G	L	P
formic acid	P	P	P	P
lactic acid	G	G	G	L
oleic acid	G	G	G	L
oxalic acid	G	G	L	P
picric acid	L	P	P	P
stearic acid	G	G	G	L
tartaric acid (saturated solution)	G	G	G	L
uric acid	G	G	G	L

#### Various organic compounds

anethole	G			
carbon disulphide	G <sup>3</sup>	L <sup>2</sup>	P	
diacetone alcohol	G	G <sup>3</sup>	L	P
dimethyl formamide	G	G	L	
ethylene chlorhydrin	P	P		
ethylene oxyde	G	G	L	P
furfural	G	G <sup>3</sup>	L	P
glucose	G	G	G	G
tetraethyl lead	G			
tetrahydrofurane	G	G	L	

#### Salts, esters, ethers

amyl acetate	G	G	G	L
butyl acetate	G	G	G	L
diethyl ether	G			
diethylphosphate	G	G	G	L
diethylphthalate	G	G	G	L
ethyl acetate	G	G	G	
fatty acid esters	G	G	G	G
methyl acetate	G	G	G	
methyl sulfate	G	L		
tributylphosphate	G	G	G	L
tricesylphosphate	G	G	G	L

Condition after 18 months contact: G: Good - L: Limited - P: Poor

Resistance (°C) 20 40 60 90

#### Alcohols

benzyl alcohol	L	P	P	P
butanol	G <sup>3</sup>	L	P	
ethanol (pure)	G <sup>3</sup>	G	L	
glucérine (pure)	G	G	L	P
glycol	G	G	G	P
methanol (pure)	G <sup>3</sup>	L	P	

#### Chlorinated solvents

carbon tetrachloride	P			
methyl bromide	G	P		
methyl chloride	G	P		
perchloroethylene	G	G	L	
trichloroethane	L	P		
trichloroethylene	G	L		

#### Phenols

	P	P	P	P
--	---	---	---	---

#### Various products

beet	G			
cider	G			
crude petroleum	G	G	G <sup>3</sup>	
diesel fuel	G	G	G <sup>3</sup>	
fruit juices	G	G		
fuel-oil	G	G	G	
greases	G	G	G	G
ground-nut oil	G	G		
high octane petrol	G	G	G <sup>3</sup>	
kerosene (paraffin)	G	G	G <sup>3</sup>	
linseed cake	G	G	G	G
milk	G	G	G	G
mustard	G			
normal petrol	G	G	G <sup>3</sup>	
oils	G	G	G	G
solutions or emulsions D.D.T. or lindane				
hydroxy-quionoline (agricultural sprays)	G			
soap solution	G			
stearin	G	G	G	
solvent naphtha	G	G	G <sup>3</sup>	
town gas	G	G		
turpentine	G	G	G <sup>3</sup>	
winegar	G			
wine	G			

1: Slight yellowing - 2: Yellowing - 3: Swelling action

A world-class chemical concern, Arkema combines three strategically related, integrated businesses: Vinyl Products, Industrial Chemicals and Performance Products. With operations in more than 40 countries and 17,700 employees, the company reported revenue of € 5.7 billion in 2005. Leveraging six research centers in France, the United States and Japan and internationally recognized brands, Arkema holds leadership positions in each of its principal markets.

The information contained in this document is based on trials carried out by our Research Centres and data selected from the literature, but shall in no event be held to constitute or imply any warranty, undertaking, express or implied commitment from our part. Our formal specifications define the limit of our commitment. No liability whatsoever can be accepted by Arkema with regard to the handling, processing or use of the product or products concerned which must in all cases be employed in accordance with all relevant laws and/or regulations in force in the country or countries concerned.



4-8, cours Michelet  
92800 Puteaux - France  
Tel.: 33 (0)1 49 00 80 80  
Fax: 33 (0)1 49 00 83 96  
www.arkema.com

www.rilsanfinepowders.com