

# Technical Data and Application Guide

## Abcite® 500 ES



### Product description

Abcite® 500 ES is a general purpose, single layer, primer-free, halogen-free thermoplastic powder coating which provides excellent and durable corrosion protection to steel and other metals.

Abcite® 500 ES is very flexible and highly adhesive to the metal substrate. It has a high resistance to long-term outdoor exposure as well as acid and alkaline chemical attack.

Abcite® 500 ES is designed for coating metal parts by electrostatic spraying or hot flocking.

### Typical applications

Abcite® 500 ES is a versatile product, ideal for coating outdoor furniture such as street lighting, sign posts, fencing, and cable trays.

### Product range

Abcite® 500 ES is available in the following colors\* :

Neutral, Beige (RAL 1001), Blue (RAL 5017), Green (RAL 6005, 6013), Grey (RAL 7001, 7016), Black (RAL 9005) and White (RAL 9016).

Other colors are available upon request.

Standard packaging : 20 kg cardboard box with inner plastic bag.

\* RAL references provided are the closest match but may slightly differ from the finished coating.

### Product certifications

**Food Contact\*** : Compliant with the EU regulation No. 10/2011 and FDA CFR Title 21

\* Certificates valid for certain colors. Please contact your Axalta Coating Systems representative for additional information.

### Storage

Abcite® 500 ES should be stored in a cool (<50°C) and dry space, out of direct sunlight exposure. The product should be used within 5 years after the production date.

Agglomerates may form during transportation and storage. This reversible phenomenon is not a sign of poor quality but may occur in case of specific environmental conditions causing compaction. The powder can easily be brought back to its original state through sieving.

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General properties	Measure	Unit	Standard and test conditions
Maximum particle size	150	µm	ISO 8130-1
Bulk density	0.33	g.cm <sup>-3</sup>	ASTM D1895 (Method A)
Specific gravity	0.93	g.cm <sup>-3</sup>	ISO 1183
Melt flow index	32	g/10min	ISO 1133 (190°C, 2.16kg)
Gloss 60°	60-80	%	ISO 2813
<b>Thermal properties</b>			
Melting temperature	95	°C	ISO 3146
Vicat softening temperature	77	°C	ISO 306
Maximum continuous temperature	80	°C	Test Axalta
Flammability rating	V-0		UL 94
<b>Mechanical Properties</b>			
Abrasion resistance (Taber)	35	mg (weight loss)	ISO 9352 (CS-10, 1000g)
Adhesion	>8 (100% Y)	MPa	ISO 4624 (20mm dolly)
Hardness	50	Shore D	ASTM D2240
Impact resistance	>18.2	J	ASTM D2794 (1.5mm steel; ball diameter : 15.9mm)
Tensile strain at break	580	%	ISO 527
Tensile strength	16	MPa	ISO 527
<b>Electrical properties</b>			
Dielectric strength	56	kV.mm <sup>-1</sup>	ASTM D149
Volume resistivity	2.10 <sup>17</sup>	Ω.cm	ASTM D257
<b>Properties under accelerated aging</b>			
Salt spray resistance	1000h	<1	mm (steel substrate corrosion)
UV stability*	2000h	No damage	ISO 4892-3†
* Color and gloss deviation is color-dependent and available upon request			
† UVB-313 lamp, cycles: 8h at 60°C (black panel) and 0.71 W/m <sup>2</sup> /nm (at 310nm), then 4h at 50°C with condensation.			
Chemical resistance*	20°C	60°C	
	Acids	Excellent	Excellent
	Alkalis	Excellent	Excellent
	Fuels	Good	Poor
	Solvents	Good	Not recommended
* A specific chemical resistance test is recommended before any industrial application.			
These tests were performed using Abcite® 500 ES Neutral, with degreased, grit-blasted steel panels coated by dipping in a fluidized bed (thickness 500 ± 100µm), or with injected samples. The results may vary for other Abcite® 500 ES colors, other substrate types or a different coating thickness.			

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### Surface preparation

Abcite® 500 ES protective coating can be used on various metals: primarily steel, and others such as aluminum and copper. In order to achieve its optimum performance level, Abcite® 500 ES requires careful preparation of the metal surface :

1. **Check the finish** of the parts. Sharp edges, corners and ridges must be avoided. Weld seams should be smooth and without porosity.
2. **Clean** the substrate (using a solvent or an aqueous detergent solution) to remove grease and dirt.
3. **Grit blast** to roughen the metal surface and remove any rust or contaminant. Carefully control this step to achieve a surface cleanliness level Sa2½ or Sa3, and a surface roughness *Rt* of 60µm and *Rz* of 50µm. Choose a hard, angular grit (carbon or stainless steel), with a size of 0.5mm or larger. Regularly check the grit and replace if not clean or worn out.
4. **Blow** any dust off the surface. Ensure that the compressed air used for cleaning is free of moisture, oil or any other contamination.

A single layer of Abcite® 500 ES applied on carbon steel prepared following these 4 steps will durably protect it from corrosion.

**No primer** or chemical surface treatment is required in order to achieve Abcite® 500 ES highest corrosion protection level. Nevertheless, if a chemical treatment has been applied on the grit blasted metal surface, Abcite® 500 ES can also be used.

**Hot-dip galvanized steel** substrates must be sweep blasted and free of zinc oxide and dust when coated with Abcite® 500 ES.

### Facility recommendations for optimal performance

#### Oven :

- Metal substrate **preheating is recommended** to achieve the best protective performance. As a best practice, the preheating oven should be able to heat up to at least 220°C.
- Convection ovens (electrical and gas without direct flame), and radiation ovens (IR, induction, etc.) can be used. Gas IR ovens and gas ovens with direct flame may cause steel and coating oxidation.
- Even and precise oven temperature control should be available and any variation between the temperature set point and the actual oven temperature must be known.
- As a best practice, test parts should be used to check the metal surface **heating and cooling curve** before production runs.
- The **transfer time** between the preheating oven and the spraying booth should be as short as possible. For example a large 6mm thick steel beam preheated at 250°C has a cooling rate of 15°C/min.

#### Spray equipment :

- **Corona and triboelectric** charging guns can be used to spray Abcite® 500 ES.
- The **compressed air supply must be filtered** to remove any trace of moisture, oil, or other contaminants.
- It is advised to use a spraying system able to reach a **high powder flow**. The powder flow rate is mainly dependent on the pumping system and powder feed design.
- For a given system, the flow rate can be optimized by using large hose diameters and limited hose lengths.
- A good practice is to aim for 1 spraying gun for every 4 m<sup>2</sup> area to coat, each gun reaching a powder output of at least 300 g/min.

Before using this product, please read carefully the product safety data sheet, available from your Axalta Coating Systems representative.

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### Preheating and post-heating

Preheating the substrate to a temperature between 180 and 260°C (depending on the geometry) is strongly recommended in order to improve adhesion of Abcite® 500 ES.

Preheating parameters have to be adjusted for each part, taking into account the metal type and thickness, as well as the part size and geometry. The table below provides basic setting guidance for steel plates.

The metal surface temperature before spraying should be carefully controlled with a contact probe.

#### Preheating guidelines :

Steel thickness	1-2mm	3-5mm	6-10mm
Oven temperature (minimum)	260 – 320°C	200 – 260°C	180 – 220°C
Part preheating time	10 – 20 min	20 – 40 min	30 – 60 min

#### Optional post-heating :

Depending on the part to be coated, on the thickness target, and on the preheating parameters, a post-heating may be necessary to **smoothen** the Abcite® 500 ES coating surface.

In order to avoid any risk of Abcite® dripping during post-heating, it is recommended to use a **maximum oven temperature of 175°C**, for 5 to 20 minutes.

### Electrostatic spraying

Common corona or triboelectric charging spray guns can be used with various nozzles. The compressed air supply must be filtered to remove any trace of moisture, oil, or other contaminants. Start with following settings:

- Voltage 60kV, decrease if back ionization is observed when the coating thickness is increasing
- No current limitation, maximum powder output

It is advised to focus **first on coating the coolest and/or thinnest areas** of the part, and then finish with the thickest areas, which retain heat for a longer time :

- First, apply a thin layer over the entire surface before the metal surface temperature drops below 160°C.
- Secondly, increase the thickness up to 300µm or more, applying the powder in crossed (bidirectional) passes to ensure uniformity of the coating.

During spraying, Abcite® 500 ES particles melt on the heated metal surface into a continuous coating. **No curing or cross-linking** occurs. Once the powder has melted into a smooth and uniform coating, no further heating is needed.

If natural cooling is considered too slow, cooling of coated parts can be forced using **air or water-quenching**. Water-quenching when the coating temperature is above 150°C may result in surface finish alteration without any effect on performance. Coated parts can be safely handled when the Abcite® surface temperature is below 50°C.

### Coating thickness

In order to ensure continued protection of the substrate in case of potential exposure to severe abrasion or impacts, a coating thickness of **at least 400µm** is advised.

For less aggressive environments, Abcite® 500 ES should not be used with a film thickness below 250µm.

During the coating process or after quality control, if the Abcite® 500 ES film is too thin, it can be corrected by placing the part in a post-heating oven (not longer than 5 minutes at maximum 175°C), then spraying more powder on the melt coating surface.

### Coating of contact points or hook marks

If needed, locally heat any uncoated area of the part with a hot air gun and apply Abcite® 500 ES by spraying, sprinkling or patching. See the Abcite® repair guide for more details.

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### Over coating with a thermoset powder

Abcite® 500 ES corrosion protection, flexibility and toughness can be combined with the full range of colors, glosses and textures given by Alesta® powder coatings. This is achieved by spraying the Alesta® topcoat directly after application, or later on the re-heated Abcite® X45 coating.

For best results, the surface temperature of the Abcite® 500 ES coating should be between 120 and 140°C when the thermoset powder coating is applied. This will enable a high interlayer adhesion while avoiding an excessive topcoat thickness. The voltage should be set at 30kV or lower in order to avoid back ionization.

The curing oven temperature should be set at a maximum temperature of 190°C.

### Coated part controls

It is recommended to perform a high voltage porosity test (1kV per 100µm) according to ISO 29601 in order to confirm the absence of defects in the coating and good substrate protection.

A qualitative adhesion test is advised. With a sharp blade, cut 2 parallel lines through the Abcite® coating, 1 cm apart and 3 cm long. Join the 2 lines with a 45° cut and attempt to delaminate the corners. Alternatively, a dolly pull-off test (ISO 4624) can be performed. No delamination between the coating and the substrate should be observed.

### Troubleshooting

Symptom	Potential cause	Corrective action
Irregular coating Orange peel Pinholes	Insufficient heat  Coating too thin	Raise the preheating temperature Add or extend a post-heating step at 160-175°C  Increase the coating thickness
Abcite® dripping Poor edge coverage Formation of fisheyes (craters)	Substrate and/or oven too hot	Reduce or avoid the post-heating  If the issue is observed without post-heating, reduce the preheating temperature and/or time
Stains or fisheyes	Contamination on the substrate or in the compressed air	Check the degreasing step and the compressed air filter efficiency. Strictly avoid silicone-based lubricants in the application area
Coating thickness variation or difficult to increase	Insufficient heat  Electrostatic charges accumulation	Raise the preheating temperature  Progressively decrease the spraying voltage while applying the powder
Damaged coating	Poor finish of the part or the welds, edges too sharp, inadequate application parameters, damage caused during transport or installation	Repair following the Abcite® repair guide, available from your Axalta Coating Systems representative.

*The information provided herein corresponds to our knowledge on the subject at the date of its publication. This information may be subject to revision as new knowledge and experience becomes available. The data provided fall within the normal range of product properties and relate only to the specific material designated; these data may not be valid for such material used in combination with any other materials or additives or in any process, unless expressly indicated otherwise. The data provided should not be used to establish specification limits or used alone as the basis of design; they are not intended to substitute for any testing you may need to conduct to determine for yourself the suitability of a specific material for your particular purposes. Since Axalta cannot anticipate all variations in actual end-use conditions Axalta makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent rights.*

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