



UPS 460 W Polyurethane Coating is designed to help protect wind turbine blade leading edges from damage caused by sand and rain erosion and minor impact.

Wind Blade Protection Coating UPS 460 W is a two-component polyurethane coating that provides excellent erosion protection in a single layer.

UPS 460 W is intended for application in controlled OEM facilities. It is not recommended for use in O&M situations.

Typical Physical Properties

Material	Test Method	Typical Values
Recommended Applied Thickness	Dry Film	250 – 350 microns (0.010 – 0.014 inches)
Pot Life	DIN EN ISO 9514	See Table
Viscosity Part A	Rheom. Cone-plate C35/1°H, D = 35mm	4.1±0.6 Pas @ 10/s 4.0±0.6 Pas @ 100/s
Viscosity Part B	Rheom. Cone-plate C35/1°H, D = 35mm	7.0±1.0 Pas @ 10/s 2.4±0.6 Pas @ 100/s
Density Part A	DIN EN ISO 2811	1.09 g/cm ³
Density Part B	DIN EN ISO 2811	1.38g/cm ³
Gloss 20° / 60°	ASTM D 523	45 / 73
Glass Transition Temperature	DMTA, 2°C/min, 1Hz	-5°C

Performance	Test Method	Typical Values
Rein Erosion Resistance	ASTM G-73 Whirling Arm	>10hrs
UDRI, U.S.A Polytech, Denmark	125 m/s 123 – 151 m/s	>9hrs
Sand Erosion, Initial (Breakthrough in g/m ²)	UDRI, 170 – 240 microns	>30 g/cm ³
Tensile Strength @ Break MPa, Initial	ASTM D882	37
Tensile Strength @ Break MPa, Aged	ASTM D882 AUV A, 1400 h	35
Elongation Break Initial	ASTM D882	730

Elongation Break Aged	% ASTM D882 QUV A, 1400 h	760
Flexibility	ASTM D522 0.5 in diam cyl at RT 2.5 in diam cyl at -40°C	No Cracks No Blistering
Condensing H ₂ O Power Washer Test, Adhesion, Blistering	ASTMD4585	NO Blistering
Pull-Off Adhesion	ISO 4624	10 – 12 MPa
Adhesion (Tape) Cross-Cut QUV A	ASTM D3359 ASTM G154 1400 h	5A Gloss (20/60):11/25, ΔE:0.5, no chalking, cross-cut 5A, Pull of Adhesion: 10-11, See Tensile Elongation
Surface Roughness	DIN EN ISO 4287	Ra = 0,1 Rmax =1,5 Rz = 1 Rt = 2,1
Taber Abrasion (Loss in Grams)	ASTM D4060 CS17, 1000 g wt CS10, 1000 g wt	1000 cycles < 30 mg Loss

Properties	UPS 460 W Base	UPS 460 W Activator
Appearance	Clear & Colourless Liquid	Light Grey Liquid

UPS 460 W is matched to RAL 7035 Light Grey.

Application Information

UPS 460 W Wind Blade Protection Coating provides excellent erosion protection in a single layer. Appropriate temperature and humidity conditions are critical to achieving full cure and maximizing erosion resistance.

Application Conditions

UPS 460 W can be applied when the temperature and relative humidity of the facility are in the green zone

	%RH										
	20	25	30	35	40	45	50	55	60	65	70
15°C	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Red
20°C	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Red
25°C	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Red
30°C	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Red
35°C	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Red
40°C	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Red

*Application window may be expanded with use of heating equipment in the application area. Contact Unique Polymer Systems LTD Technical Department for further details.

The *UPS 460 W* product temperature should be >23°C at time of application.

The optimum temperature range for application is 20 - 25°C.

Coverage & Cure

Thickness: 300 + / - 50 microns

Coats: One

If multiple coats are designed, contact Unique Polymer Systems LTD Technical Department to discuss.

Theoretical Coverage Rate

	250µ	300µ	350µ
Per Litre	4m ²	3.3m ²	2.4m ²
Per 250ml Cartridge	1m ²	0.8m ²	0.6m ²

Mix Ratio

	UPS 460 W Base	UPS 260 W Activator
Per Volume	150 parts	100 parts
Per Weight	100 parts	84.5 parts

Pot Life / Temperature

	15°C	23°C	40°C
Pot life when mixed in container or hose (DIN EN ISO 9514)	TBD	90 sec	45 sec
Work life when applied directly to blade surface (DIN EN ISO 9514)	TBD	6 min	2.5m

Cure Time / Temperature

	15°C	23±C	35°C
At 50% RH	TBD	~ 50 min	~ 30 min
Touch Dry Time (DIN 53150) – No transfer of coating with a light touch	TBD	~ 8 hrs	~ 4 hrs
Hard Dry Time	TBD	~ 8 hrs	~ 4 hrs

Storage

Store in original sealed containers between 5°C (40°F) to 30°C (86°F).

At storage or transportation conditions below 23°C Activator may appear waxy due to crystallization of components. This is not a quality concern. Heating is necessary to fluidize the crystallized material.

Preparation

Product Preparation

Place *UPS 460 W* in a 40°C oven for a minimum of 8 hours (overnight) prior to use. Cartridges should be laid horizontal when placed in oven.

Must not be exposed to temperatures above 40°C for longer durations. Make sure that the material will not be conditioned for less than 8 hours below 35°C.

Allow cartridges to cool to room temperature (~23°C) for 1-hour prior to use.

Area Preparation

- Check that temperature and humidity in the facility are within the acceptable range using the application window on page 1.
- Place a drop sheet beneath the blade leading edge for ease of clean up.

Surface Preparation

- Use a 2-inch wide masking tape to outline the leading edge area where *UPS 460 W* will be applied.
- Abraded blade surface with 120 to 180 grit abrasive.
- Wipe abraded surface with a tack rag to remove sanding debris.

Surface must be clean, dry and free from oil, grease and other contamination.

Application Tip

Outline the 'Theoretical Coverage Area' for on cartridge with masking tape to help achieve the appropriate thickness. Note where each cartridge change should occur. Prepare the cartages (equalize and attached nozzles) required for the leading edge and place them with ease reach of the blade.

Application

Confirm that temperature and relative humidity are in the acceptable range. Appropriate temperature and humidity conditions are critical to achieving full cure and maximizing erosion performance.

Load & Equalize the Cartridge

- Load the *UPS 460 W* cartridge onto the applicator and remove the cap.
- Dispense product and make sure it is coming out of both side of the cartridge.
- Attach the nozzle to cartridge and secure retaining ring.
- Cut first 3 – 5mm off nozzle and secure retaining ring to increase output (if desired).
- To ensure adequate mixing, 'equalize' the cartridge by pointing it toward the ceiling and slowly dispensing coating into nozzle (to remove the air bubble).

Dispense & Spread the Coating

Work in teams of 2 people with 1 person dispensing and 1 person brushing.

- Dispense *UPS 460 W* onto the leading edge surface.
- Distribute using Brush and the following techniques:
 - Low angle
 - Smooth, consistent brush strokes
 - Brush motions parallel to the leading edge

- Use wet thickness gauge to confirm desired thickness.
- Remove masking tape as soon as application is complete to allow coating to flow to a tapered edge.
- Discard brush.

UPS Wind Blade Protection Coating Brush should be used to obtain a smooth *UPS 460 W* finish and enable best performance. A new brush is recommended for each application.

Application Tip

When applying beneath the leading edge (on a horizontal blade), a second 'distribution brush' can be used to help dispense the coating onto the blade surface from below.

Finishing

Remove masking tape as soon as possible to allow *UPS 460 W* to flow to a tapered edge.

It may be possible to accelerate the cure with heat blankets or IR lights no to exceed 60°C.

Cleaning

- Discard brush once material has cured on it.
- All equipment must be cleaned immediately after use.
- Use a VOC-compliant cleaner.

Disposal

Dispose of *UPS 460 W* in accordance with local regulation. Cured material and uncontaminated accessories can be disposed of in a sanitary landfill.

Supplies

Supplies
UPS 460 W Blade Protection Coating
Base & Activator, 250ml Dupack Cartridge
Base, 18lt Drum
Activator, 18lt Drum
Wind Blade Protection Coating Brush
Wind Blade Protection Coating Manual Applicator – 250ml – 1.5:1
Wind Blade Protection Coating Pneumatic Applicator – 250ml – 1.5:1
Wind Blade Protection Coating Mixing Nozzle
Accessories: Abrasives, Random Orbital Sander, Masking Tape
Other Supplies: Thickness gauge, dropcloth for floor, gloves, knife

Repair

For ease of repair, complete the repair as soon as possible after application.

Immediate – Before *UPS 460 W* is dry to touch

- Remove as much *UPS 460 W* as possible with a squeegee or spatula. Take care not to damage composite.

- Remove *UPS 460 W* residue with a pad and acetone, IPA or an alternative. Consult local air quality regulations for products used in removal process. Do not allow acetone or IPA to contact other areas of *UPS 460 W*.
- Assure the surface is smooth, clean and debris-free.
- Dispense *UPS 460 W* directly onto the repair area and use a brush to feather it into the surrounding area.
- Apply a second layer of *UPS 460 W* (if necessary) to obtain the desired finish.

Intermediate – While finger can still make an impression / indentation on the *UPS 460 W* surface with pressure

- Cut through the *UPS 460 W* around the repair area. Take care not to damage the blade surface.
- Using the cuts as a starting point, remove as much *UPS 460 W* as possible with a squeegee or spatula. Take care not to damage composite.
- Remove *UPS 460 W* residue with pad (on a random orbital sander, if needed) and acetone, IPA or an alternative. Consult local air quality regulations for products used in removal process. Do not allow acetone or IPA to contact other areas of *UPS 460 W*.
- Assure the surface is smooth, clean and debris-free.
- Dispense *UPS 460 W* directly onto the repair area and use a brush to feather it into the surrounding area.
- Apply a second layer of *UPS 460 W* (if necessary) to obtain the desired finish.

After 8+ Hours at 23°C, 50% RH – Hard Dry

Waiting until this stage to repair *UPS 460 W* is not recommended because the coating is very difficult to remove.

- For minor repairs, the top portion of *UPS 460 W* can be removed using a 120 grit Clean Sanding Disc on a random orbital sander. To remove all *UPS 460 W* from the blade surface, use a Right Angle Grinder. Do not damage the composite surface below. Control tool speeds and heat generated so *UPS 460 W* does not 'melt'.
- Assure the surface is smooth, clean and debris-free.
- Dispense *UPS 460 W* directly onto the repair area and use a brush to feather it into the surrounding area.
- Apply a second layer of *UPS 460 W* (if necessary) to obtain the desired finish.

Shelf Life

These products have a shelf life of 12 months from date of manufacture when stored in the original, unopened container under the suggested storage conditions.

Important Notice;

All statements, technical information and recommendations are based on information believed to be reliable, but the accuracy or completeness is not guaranteed. Before using the *Unique Polymer Systems LTD* product, you must evaluate it and determine if it is suitable for your intended application. Because conditions of product use are outside of Unique Polymer Systems LTD controls and vary widely you assume all risks and liability associated with such use. Any product related statements not contained in current Unique Polymer Systems LTD publications, or any contrary statements contained in your purchase order, shall have no force or effect unless expressly agreed to in writing by an authorized Unique Polymer Systems LTD personal.

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