



Redux® 319

High Performance Modified epoxy film adhesive



Product Data Sheet

Description

Redux® 319 is a high performance modified epoxy film adhesive curing at 175°C. It is available in both supported and unsupported versions at areal weights between 180 and 400 g/m². The supported versions contain a woven nylon carrier for glueline thickness control and improved handleability. Redux® 319 is a hot melt film which is free from solvents and consequently it has a very low volatile content.

Features

- Cures in 60 minutes at 175°C
- Good performance at temperatures ranging from -55°C to 150°C
- Good short-term exposure performance at 175°C
- Excellent peel properties
- Good drape at ambient temperatures
- Less than 1% volatile content

Applications

- Aluminium to aluminium bonding
- Fibre-reinforced composite to composite bonding
- Aluminium honeycomb sandwich bonding
- Aramid honeycomb sandwich bonding

Forms

Grey flexible film adhesive, available unsupported or with a woven nylon carrier.

Product Description	Areal Weights g/m ²	Support	Standard Roll m ²
Redux® 319L	180	Unsupported	50
Redux® 319	367		40
Redux® 319A	240	Woven nylon carrier	40
Redux® 319A	300		40
Redux® 319A	400		40

Instructions For Use

Pretreatment

It is essential that all substrates for bonding are free of contamination and in as ideal a state as possible. As pretreatment varies significantly depending on the substrates being used, please refer to the Hexcel publication Redux® Bonding Technology for optimum procedures.



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If there is to be a delay between the pretreatment and bonding of aluminium, the pretreated surface should be protected with Redux® 119 surface pretreatment protection solution to conserve the optimum bonding surface. This will enable bonding to be delayed for up to 2 months without deterioration of the pretreated surface. The correct application of Redux® 119 should not alter the bonding performance of Redux® 319 (for full application details consult the relevant data sheet).

Application

1. If stored cold allow sufficient time for the adhesive to warm to room temperature (19 - 27°C) before removing the protective polythene.
2. Cut the film to the shape and size required.
3. Remove the release paper and position the adhesive on the prepared bonding surface.
4. Remove the polythene backing sheet.
5. Complete the joint assembly and apply pressure while the adhesive is being cured. For sandwich structures the pressure application should be selected to suit the type of core used.

Curing

Redux® 319 adhesives should be cured at 175 ± 5°C for 60 minutes to obtain optimum properties. Enough time should be allowed for heat to penetrate through the assembled parts to ensure that the adhesive reaches that temperature before timing starts. A cure pressure of around 140 - 700 kPa and heat up rate of approximately 5°C per minute is recommended during cure. After curing it is recommended that components are cooled to below 70°C before releasing the pressure.

Cure Time (hours)	1	2	4
Cure Temperature °C	175	160	150

Mechanical Properties

All the performance values given in this data sheet are based on experimental, routine Quality Control and Specification testing results obtained under laboratory conditions. They are typical values expected for the Redux® 319 series prepared and cured as recommended and under the conditions indicated. They do not and should not constitute specification minima.

Metal Bonding Strengths

Redux® 319 series adhesives were used to bond Alclad 2024-T3 aluminium test specimens; the aluminium was pretreated (chromated/sulphuric acid pickling) in accordance with Method O of BSI Code of Practice CP 3012 (Method O of DEF Standard 03-2/1).

The honeycomb tests used HexWeb® 7.9-1/4-40 (5052) T aluminium honeycomb.

Test	Test Temperature °C	Redux® 319L 180g/m ²	Redux® 319 367g/m ²	Redux® 319A 240g/m ²	Redux® 319A 300g/m ²	Redux® 319A 400g/m ²
Lap Shear Strength MPa	22	42	45	31	36	38
	150	22	26		16	16
Bell Peel N/25mm	22	175	180 190	140	170	170 175
Climbing Drum Peel N/76mm	22	270	600 620	200	330	460 480
Flatwise Tensile MPa	22		8.9 9.3			8.9 9.03

(Figures in bold refer to results on substrates primed with Redux® 119).



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Environmental Resistance

Redux® 319A - 400 gsm was used to prepare lap-shear specimens which were then exposed to a variety of “harsh” environments in accordance with DTD 5577 (Type 4 Class 4PH) and MMM-A-132, respectively. The specimens were subsequently tested and single overlap shear results in MPa were as follows:

Conditioning of Redux® 319 400 gsm	Test Temp. (°C)	Lap Shear Strength Unprimed (MPa)	Lap Shear Strength Primed (MPa)
None	22	44	45
None	150	23	23
12 months at 150°C	22	30	
	150	22	
1000 hrs in Silcodyne ‘H’ at 22°C	22	43	45
1000 hrs in synthetic esters at 22°C	22	44	44
1000 hrs in Skydrol 500A at 22°C	22	42	44
1000 hrs in Kerosene fuel at 22°C	22	45	45
1000 hrs in distilled water at 22°C	22	42	43
1000 hrs in anti-icing fluid at 22°C	22	44	46
1000 hrs in hydraulic oil at 22°C	22	43	46
1000 hrs in water/methanol at 22°C	22	42	43

Adhesives storage life

Shelf Life: 18 months at -18°C
Out Life: 120 days at 19-27°C

The storage life is considered to have expired when either of these conditions has elapsed. Refer to the box label to determine the specific batch expiry date.

Definitions

Shelf life: The maximum storage time for Redux® adhesives from date of manufacture, when stored continuously in a sealed moisture-proof bag at -18°C.
Out life: The maximum accumulated time allowed at 19-27°C between removal from the freezer for use and return to freezer after use.

Storage Conditions

Redux® 319 has been formulated for maximum storage life consistent with its high performance. However certain precautions can help to enhance storage life as follows:

1. When not in use rolls of film adhesive should be stored at -18°C in their original, sealed packaging.
2. To avoid the risk of local thinning of the film under its own weight, the roll should be kept on a horizontal mandrel passed through the tube core on which the roll is wound.
3. When returning rolls to refrigeration it is essential to protect the film by sealing it within a water vapour barrier packaging material such as polythene. Original packaging should be used where possible.
4. On withdrawal from refrigeration the water vapour barrier packaging must not be removed until the roll of adhesive has reached room temperature. This may take up to 24 hours depending on the size of the roll and the temperature involved. Failure to observe this will result in the film becoming damp.
5. The film must be handled with care whilst in the frozen state since it will be brittle and easily cracked.



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Volatile Content

Redux® 319 adhesives have a very low volatile content, usually well below 1%. In practice, the loss in weight when cured is negligible and emission of volatile products is not of practical significance.

Associated products

Redux® 119 surface pretreatment protection solution (primer)

Redux® 219/2-NA foaming film adhesive

Handling and safety precautions

When used properly Redux® 319 film adhesives presents a low risk of handling hazard for the following reasons:

- The film is covered on both sides by protective release paper and polythene sheet which are not removed until final component assembly. It should be cut to shape before removing the protective coverings and virtually no handling of the film is necessary.
- It is virtually tack-free (dry) at normal room temperature. The film is dependent on elevated temperature for wetting-out the adherend surfaces.
- It is volatile-free at normal room temperature.
- It is splash-free, leak-free, spillage-free.

However, the usual precautions necessary when handling synthetic resins should be observed. A Material Safety Data Sheet for Redux® 319 is available on request.

Release Certification

The Quality System at Hexcel Composites Duxford has been certified to ISO 9001 by Lloyd's Register Quality Assurance, and is approved by the UK Civil Aviation Authority and Ministry of Defence. Certificates of Conformity and Test Reports can be issued for batches of Redux® 319 on request.

For more information

Hexcel is a leading worldwide supplier of composite materials to aerospace and industrial markets. Our comprehensive range includes:

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| • HexTow® carbon fibers | • HexMC® molding compounds | • Acousti-Cap® sound attenuating honeycomb |
| • HexForce® reinforcements | • HexFlow® RTM resins | • Engineered core |
| • HiMax™ multiaxial reinforcements | • Redux® adhesives | • Engineered products |
| • HexPly® prepregs | • HexTool® tooling materials | |
| | • HexWeb® honeycombs | |

For US quotes, orders and product information call toll-free 1-800-688-7734. For other worldwide sales office telephone numbers and a full address list, please go to:

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