

CYCOM® 823 RTM RESIN SYSTEM

CYCOM® 823 RTM is a 125°C (255°F) liquid epoxy resin suitable for resin infusion or RTM processes. Depending on customer preferences, it is available in one- or two-part formats. The one-part system is a final product ready to use without additional mixing.

CYCOM® 823 RTM's viscosity is low enough at room temperature to allow injection without having to heat either the resin or the transfer pipework. When the resin is heated to the cure temperature its viscosity is further reduced, helping to ensure full wet-out of the reinforcing fibres.

CYCOM® 823 RTM is fully cured after one hour at 125°C (255°F) and demonstrates dry Glass Transition temperature of 125°C (257°F) and a hot/wet performance of 108°C (226°F).

CYCOM® 823 RTM neat resin has high elongation, high GIC and high KIC values, all of which are indicative of a tough material.

CYCOM® 823 RTM is compatible with the usual range of reinforcing fibres utilized for the manufacture of composite components, i.e., carbon, glass, aramid, etc.

For reinforcement preforming operations a fully compatible binder system, CYCOM® 7720 RTM has been developed for use with CYCOM® 823 RTM. The binder is available pre-coated onto fabrics of the customer preferred material. A separate datasheet for CYCOM® 7720 is available on request.

Features and Benefits

- Available as a one- or two-part system
- Up to 4 days out-life at 23°C
- Room temperature injectable
- 250 cP initial injection viscosity and <20cP minimum viscosity
- High neat resin toughness
- Storage Life is 6 months@-18°C and up to two years @-18°C for the two part system
- One hour cure at 125°C (255°F)
- 125°C (257°F) Dry Glass Transition temperature and a hot/wet performance of 108°C (226°F)
- Fully compatible toughness enhancing binder, CYCOM® 7720 RTM is available

APPLICATIONS

Primary and secondary structure applications where material fatigue performance is essential (general aviation propellers, helicopter blades, AAM/eVTOL blades, etc).

PRODUCT AVAILABILITY

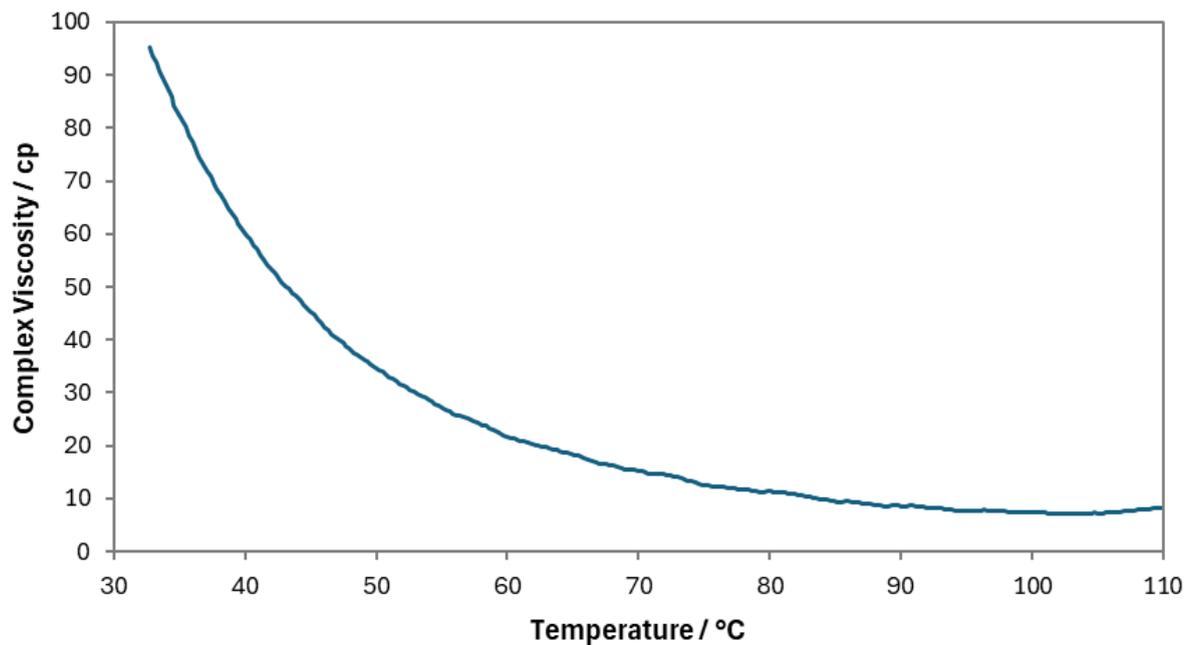
Available as one and two-parts resin systems. Please contact Syensqo for package sizes.



PHYSICAL PROPERTIES

Property	Test Method	Result
Cured resin density	Internal	1.23 g/cm ³
Tg onset dry	Internal	125°C
Tg onset wet, ETW ¹	Internal	108°C
Gel time at 125°C (Isothermal)	Internal	15 min
Initial viscosity at 25°C	Internal	200 cP
Min viscosity at 95°C (Dynamic)	Internal	15 cP
Neat Resin Strain Energy Release, GIC	Internal	0.36kJ/m ² (2.0in-lb/in ²)
Neat Resin Fracture Toughness, KIC	Internal	1.3 MPa·m ^{1/2} (1.2ksi·in ^{1/2})

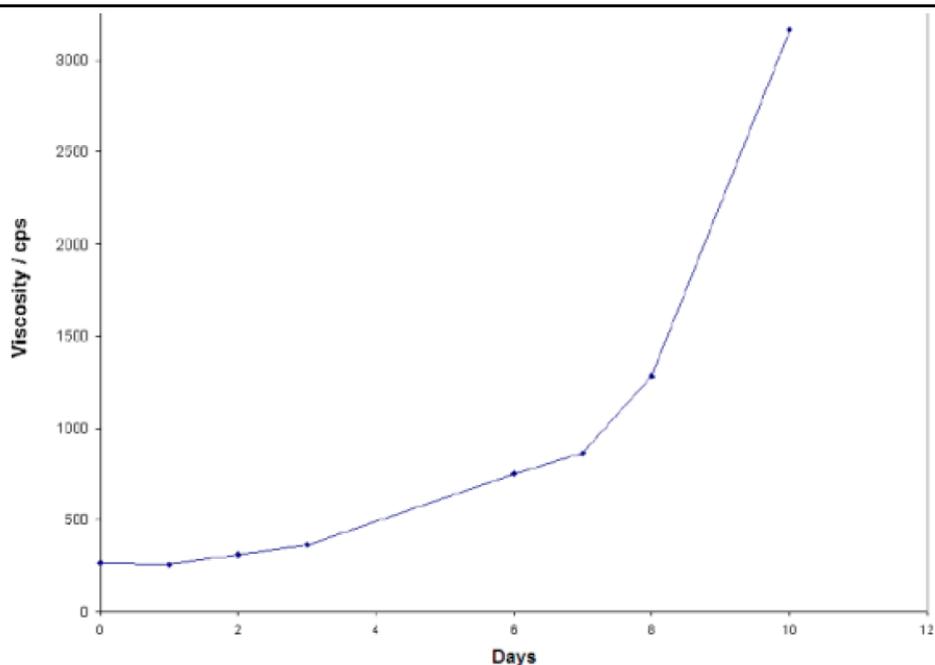
1) ETW denotes a wet pre-test conditioning until weight equilibrium



*Heating rate = 2°C/min

Figure 1: CYCOM 823 RTM Viscosity versus Temperature Profile





*Time below 500cP = 4 days at room temperature. Time below 1000 cP (gel) > 7 days at room temperature.

Figure 2: CYCOM 823 RTM room temperature OutLife

MECHANICAL PROPERTIES

Property	Condition	Test Method	CYCOM 823 RTM BX NCF HTS 40 12K 268gsm ⁽³⁾	CYCOM 823 RTM 6K-5HS-HTA-370
0° Tensile Strength, MPa (ksi)	RT/Dry	EN2561 B	2359 (342)	-
0° Tensile Modulus, GPa (Msi)			153 (22.2)	-
0° Compressive strength, MPa (ksi)	RT/Dry	EN2850 B	559 (81.1)	788 (114)
	70°C/Wet ⁽²⁾		-	560 (81.2)
0° Compressive modulus, GPa (Msi)	RT/Dry		127 (18.4)	59.2 (8.6)
	70°C/Wet ⁽²⁾		-	60.0 (8.7)
Interlaminar Shear Strength, MPa (ksi)	RT/Dry	EN2563	91 (13.2)	72.7 (10.5)
	70°C/Wet ⁽²⁾		-	46 (6.6)
In-plane shear strength, MPa (ksi)	RT/Dry	ISO 14129	122 (17.7)	-
In-plane shear modulus, GPa (Msi)			4.6 (0.67)	-
Compression after impact at 30J ⁽¹⁾ , MPa (ksi)	RT/Dry	EN 6038	177 (25.7)	-
1. 536gsm fabric was used 2. Wet denotes a 48-hour water boil prior to testing, 1.1% moisture uptake 3. Fibre dominating properties normalised to 60% Vf				



Property	Condition	Test Method	BIMAX-196-50.89-IM7	T800H-6K-40B/3900-2D ⁽²⁾	
0° TS, MPa (ksi)	RT/Dry	ASTM D3039	1186 (172)	1014 (147)	
	-65°F/Dry		1062 (154)	1103 (160)	
0° TM, GPa (Msi)	RT/Dry		75.2(10.9)	72.4 (10.5)	
	-65°F/Dry		73.8 (10.7)	73.8 (10.7)	
90° TS, MPa (ksi)	RT/Dry		1186 (172)	1076 (156)	
	-65°F/Dry		1062 (154)	1076 (156)	
90° TM, GPa (Msi)	RT/Dry		75.2 (10.9)	72.4 (10.5)	
	-65°F/Dry		73.8 (10.7)	73.11 (10.6)	
Open Hole Tension (ksi)	RT/Dry		ASTM D5766	478 (69.3)	
	-65°F/Dry			448 (65.1)	
Open Hole Compression (ksi)	RT/Dry		ASTM D6484	303 (43.9)	
	160°F/Wet ⁽¹⁾			241 (35)	
Unnotched Tension (ksi)	RT/Dry	ASTM D3039	814 (118)		
	-65°F/Dry		772 (112)		
Unnotched Tension Modulus (Mpsi)	RT/Dry		54.5 (7.9)		
	-65°F/Dry		49.6 (7.2)		
0° CS, MPa (ksi)	RT/Dry	ASTM D6641	683 (99)	606 (87.9)	
	160°F/Wet ⁽¹⁾		474 (63.8)	528 (76.6)	
0° CM, GPa (Msi)	RT/Dry		66.2 (9.6)	67 (9.72)	
	160°F/Wet ⁽¹⁾		69 (10.0)	66.8 (9.69)	
90° CS, Mpa (ksi)	RT/Dry		683 (99)	627 (91.0)	
	160°F/Wet ⁽¹⁾		474 (68.2)	501 (72.8)	
90° CM, GPa (Msi)	RT/Dry		69 (9.9)	66.8 (9.69)	
	160°F/Wet ⁽¹⁾		70.3 (10.2)	66.1 (9.59)	
ILSS, (5%) MPa (ksi)	RT/Dry		ASTM D2344		76.6 (11.1)
	160°F/Wet ⁽¹⁾				47.7 (6.92)
SBS, MPa (ksi)	RT/Dry			73 (10.6)	81.4 (11.8)
	160°F/Wet ⁽¹⁾			42.8 (6.2)	58.6 (8.5)
CAI@30J, MPa (ksi)	RT/Dry	ASTM D7137	231 (33.5)		

1. Wet denotes a 48-hour water boil prior to testing, 1.1% moisture uptake
 2. Fibre dominating properties normalised to 55% Vf



MIXING INSTRUCTIONS FOR TWO-PART RESIN SYSTEM

Refer to the CYCOM 823 RTM parts A and B Safety Data Sheets before handling the resin.

At room temperature both part A and part B will be low viscosity liquids, hence no additional heating is required for the mixing process.

The Mix ratio A : B is 4 : 1.

Parts A and B should be accurately weighed to the correct mix ratio and thoroughly mixed prior to use. Alternatively, one full can of part A and one full can of part B can be mixed together without the need for pre-weighing.

Add the required amounts of part A and part B to a suitable mixing vessel. If possible use a mixing vessel to which a vacuum can be applied as this will help to reduce the amount of air that might be mixed into the resin. If using such a vessel apply a minimum vacuum level of 26" of Hg prior to the start of mixing.

Set speed of mixing blades at 30-40 rpm. Mix resin for 15-20 minutes until homogeneous.

If resin is to be transferred to another container for injection it should be dispensed through a 60 micron mesh filter to remove any contamination that may have been introduced during the mixing process.

Once mixed, the resin can be stored at ambient temperature for up to 5 days, before its viscosity becomes too high for injection. After this time any unused resin should be discarded. Note that the outlife of the mixed resin can be prolonged to up to 6 months by storage at -18°C.

Refer to main CYCOM 823 RTM Material Safety Data Sheet for handling of the fully mixed 2-part resin.

SUGGESTED PROCESSING PARAMETERS AND CURE CYCLE

CYCOM 823 RTM resin has an initial viscosity of 250 cP at room temperature. At this viscosity it is easily transferable to the RTM equipment injection system (e.g., pressure pot, piston ram, etc.) without the need for further heating.

Degas resin in homogenizer for a minimum of 30 minutes at room temperature, under a minimum of 25" Hg vacuum, prior to injecting.

Apply full vacuum to tool containing the preformed reinforcement, ensuring that there is no vacuum loss.

Preheat the tool to (125 + 5)°C [(255 + 8)°F]. At this temperature, the resin will gel in 15 minutes after injection has been completed.

Depending on total cure cycle time requirements, degree of heating control on the tool, component size and geometry, etc., it is possible to inject the resin under alternate conditions in order to ensure full wet-out of the reinforcement. The resin may be injected into a tool anywhere between room temperature and 125°C (255°F). The tool may then be heated to 125°C (255°F) at 2 – 3°C/minute (3 – 5°F /minute) after injection has been completed.

Close off the vacuum line and open the homogenizer to start injecting. Then increase homogenizer pressure (typically to 1 – 2 bar) to fill the tool.

When the resin appears in the vent lines, close off the vent lines and continue injecting under pressure until the resin has gelled (15 minutes). Then shut off the inlet valve to trap the pressure.

Dwell at (125 + 5)°C [(255 + 9)°F] for 1 hour before cooling to 60°C (140°F) or below before attempting to release the part from the tool.

The above cure parameters have been used at Syensqo to mold test panels (280mm x 530mm x 2mm) for process and mechanical performance evaluation. A Plastech Hypaject system was used to inject the resin into



a steel tool held in a heated platen press. Some parameters may require adjustment depending on the nature of the part being molded and the equipment being used.

For larger or thicker parts, some parameters may require adjustment to avoid the risk of exotherm. Injection pressure for larger parts/alternative tooling may require adjustment to ensure filling of the tool cavity within the resin gel time (if injecting into a pre-heated tool) and to ensure full consolidation of the component.

Different injection equipment may require alternative conditions for degassing.

STORAGE

Storage Life, One-Part Resin System, at -18°C (0°F)	6 months
Storage Life, One-Part Resin System, at 23°C (73°F)	Up to 4 days
Storage Life, Two-Part Resin System, <28°C (82°F)	365 days
Storage Life, Two-Part Resin System, at -18°C (0°F)	Up to 2 years

Once the two-part resin system is mixed, the resin storage conditions become similar to the one-part system.

EXOTHERM

CYCOM® 823 RTM resins are reactive formulations which can undergo severe exothermic heat up during the initial curing process if incorrect curing procedures are followed.

Great care must be taken to ensure that safe heating rates, dwell temperatures and lay-up/bagging procedures are adhered to, especially when moulding solid laminates in excess of 10mm (0.4in) thickness. The risk of exotherm increases with lay-up thickness and increasing cure temperature. It is strongly recommended that trials, representative of all the relevant circumstances, are carried out by the user to allow a safe cure cycle to be specified. It is also important to recognise that the model or tool material and its thermal mass, combined with the insulating effect of breather/bagging materials can affect the risk of exotherm in particular cases.

HEALTH & SAFETY

Please refer to the product SDS for safe handling, personal protective equipment recommendations and disposal considerations.

