

# WWA ECO

Hardener WWB4

**Bio based clear casting epoxy system**



- 37% of biobased carbons in the resin
- Perfectly clear and colorless
- Excellent degassing properties
- Unmatched UV resistance
- Very low viscosity

## INTRODUCTION

The WWA ECO is clear casting epoxy system intended mainly for **decorative applications** but also for scientific instruments. Typical objects produced with the WWA include river tables, jewels, watches or any other casing applications with or without inclusions.

Totally colorless and clear, the system is **compatible with many substrates** such as glass, wood, concrete, stone, terracotta, metals...etc.

Thanks to the benefits of more than **25 years of experience in the clear casting resins formulation**, WWA ECO shows the same advantages as classic WWA range systems such as **total clearness** even with high thicknesses, **excellent UV stability**, **ultra low viscosity for air degassing**, and **moderate exotherm**.

WWA ECO can be coloured with **Resoltech's pigments and dyes** (PIGMENTS and TRANSPARENT datasheets are available on our website). Many fillers can also be added to the resin: **fluorescent**, **opalescent for LED lights** and **nacre/mother of pearl pearlescent fillers** are available.

Resoltech's **OPTICAL BRIGHTNER** additive (sold separately) will provide a unique transparent blue color only visible when exposed to the sun/UV light.

RESOLTECH has always been concerned by the user's health and safety and all the WWA systems are **solvents free and CMR components free**.

For castings in **glass recipients**, a flexible version is possible when using a 100/90 mixing ratio. Please contact our technical department for further information about flexible version.

## KEY INFORMATION

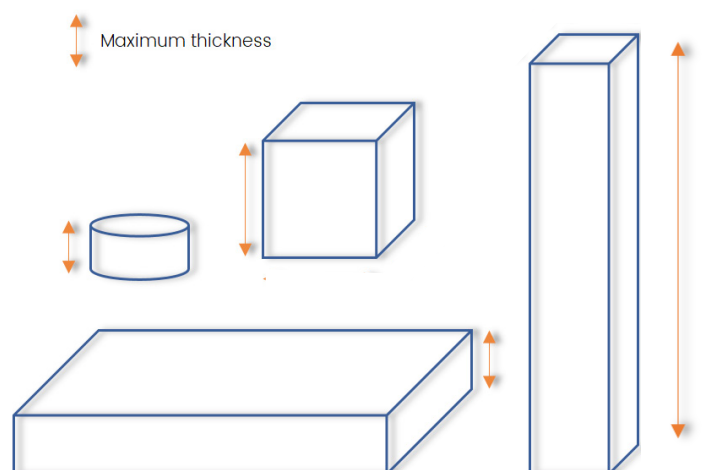
### 1 Understanding exothermic reactions and mass effect

Epoxy resins are thermosetting resin, which means they release energy under the form of heat during hardening.

The thicker the quantity of resin you cast, the more heat is produced, and this is the mass effect.

WWA ECO resin is recommended with a maximum casting thickness (see page 4), beyond this thickness, the heat generated cannot escape out of the resin fast enough and high reaction temperatures may result in yellowing, cracks and shrinkage (= exothermic reaction).

Examples below show which dimension should be considered as «thickness» depending on the shape. The orange arrows show the most constraining dimension for heat to escape.



*However, thickness is not the only constraining parameter, the quantity cast also influences the exotherm temperature as well as the mold material. See next page.*

## What other parameters influences the exotherm?

- **Resin/hardener temperature** : Storage temperature greatly influences the exotherm temperature. The hotter the initial temperature of the product, the higher the exotherm. Yet, storing and using product at lower temperature than 20°C is not recommended as a low temperature makes the viscosity of the resin increase and will affect the natural degassing properties of the resin.
- **Room temperature** : As for storing temperature, room temperature at which the resin is to be used has a major influence on the exothermic peak. WWA resins should not be casted when the room temperature is above 23°C when casting very thick quantities. On the contrary, a lower room temperature will reduce the exotherm and therefore will enable to cast bigger thicknesses. This is particularly important to take in account in summer where it may be necessary to cast in air-conditioned rooms only.

*In summary: if you plan to cast very large art objects for example, the best is either to do it in winter when the temperature will naturally be low in your workshop (you just need to make sure you stored the resin above 20°C before mixing it) – or to make sure you have an air conditioned room.*

- **Mould materials** : The materials used to build the moulds can be heat insulative or heat conductive. An insulative mold (made of wood or foam) will not help the resin dissipate calories generated by the reaction and thus will increase the exotherm temperature. On the contrary, a metal mold will improve heat diffusion and lower the exotherm temperature.

## 2 Heat Resistance

Heat resistances of WWA ECO is given as  $T_g$ , it is the glass transition temperature. Above this temperature, the mechanical properties start to decrease - the resin will become more flexible. This phenomenon though is totally reversible when the temperature decreases.

However, a  $T_g$  above the maximum use temperature is not always necessary.

For example a thick coating on table top does not need a high  $T_g$ , on the contrary if the table top is totally made of resin then a  $T_g$  of 45°C is recommended.

*When has the resin reached its thermal resistance property?*

*Slow curing resins take also time to obtain their heat resistance ( $T_g$ ). In case you need to speed up this curing process, postcuring the resin once it has passed its gel and its “b stage” (meaning it is hard but still tacky) at 40°C overnight will enable to quickly raise the  $T_g$ .*

### 3 WWA ECO overview

Resin	WWA ECO
Hardener	WWB4
Maximum thickness on a cubic <sup>1</sup> volume at 23°C	9cm
UV resistance	Good
Vaccum needed? <sup>2</sup>	no
Post curing needed ? <sup>3</sup>	no
T <sub>g</sub> max	50°C
% of biobased carbons in the resin	37%
% of biobased carbons in mix	28%
Typical uses	Large castings where low reactivity is key : river tables, scuptures, large embeddings

T<sub>g</sub> tested on DSC, inflection point

<sup>1</sup> tested in PP molds with equal length, width and thickness

<sup>2</sup> Vacuum compulsory to remove air bubbles from the mix.

<sup>3</sup> Post curing needed to avoid brittle stage.

## MIXING RATIO

The mixing ratio must be accurately followed. It is not possible to change the ratio, it would result in lower mechanical properties.  
The mixture should be thoroughly stirred to ensure full homogeneity.

System	WWA ECO / WWB4
Mixing ratio by weight	100/40

## PHYSICAL CHARACTERISTICS

### 1 Visual aspect

**WWA ECO :**

Clear liquid

**WWB4 :**

Clear liquid

**Mix :**

Clear liquid

### 2 Density

References	WWA ECO	WWB4
Density at 23°C	1.14	0.96
Mixed density at 23°C	-	1.04

ISO 1675, ± 0.05 tolerance

### 3 Viscosity

References	WWA ECO	WWB4
Viscosity at 23°C (mPa.s)	600	80
Mixed viscosity at 23°C (mPa.s)	-	300

ISO 12058.2, ± 15% tolerance

## REACTIVITY

System	WWA ECO / WWB4
Gel time on 70mL at 23°C (4cm high mix)	24h
Time at exothermic peak on 70 mL at 23°C	NA*
Temperature at exothermic peak on 70mL at 23°C	NA*

Reactivity measurements realized on Trombotech®

\*NA : Non Applicable

As explained earlier, reactivity will be greatly influenced by parameters such as quantity, shape, temperature and mold materials. If the exotherm is controlled and limited, the minimum time to demold parts is typically 2 to 3 days on small parts and 10-14 days on large parts that could deform due to their own weight if not cured enough (river tables).

## APPLICATION

### 1 Storage

In order to improve degassing, products should be stored at a temperature between 20 and 25°C. The colder the resin, the higher the viscosity, and the higher the viscosity the harder it is for the bubbles to escape from the resin.

This means that storage temperature should ideally always be above 20°C. However, after mixing, pouring and self degassing (approx. 1 h), the mold in which the resin has been poured maybe placed in a colder room during its hardening at temperatures below 20°C as this will help avoiding high exotherm temperature and therefore will allow to cast thicker layers.

### 2 Mixing

The mixing stage is the most important one. 99% of quality variations are the result of a poor mixing. It is highly recommended to follow the basic rules below :

- Our mixing ratios are expressed by weight: always use a scale and check that it is accurate – specially if battery operated.
- Start by pouring the hardener in the pre-mix container.
- Add the corresponding amount of WWA resin.
- Mix thoroughly but slowly not to include too many air bubbles.
- Once the mix is perfectly transparent and homogeneous, pour into second mixing container : This is called the **double potting technique** and it ensures that unmixed resin and hardener from the sides of the 1st mixing container are not used.
- Mix again and ensure perfect optical transparency before casting into the mould.

### 3 Casting

Once the mix is homogeneous, it is ready to be casted in the mould. Bubbles can appear during this stage, those bubbles will disappear withing 15 minutes.

### 4 Hardening

The thinner the resin film, the longer it will take to harden. On the contrary the thicker the cast is, the faster it will harden due to the mass effect.

For thick castings, it is recommended to work with a room temperature below 23°C, it will decrease risks of a high exotherm temperature.

### 5 Example : Manufacturing a river table

- **Selection of timber** : Select dry/seasoned wood as flat as possible. Do not leave bark as it would be a weak spot, remove it and sand the edges where the bark was.
- **Stabilization of the wood** : Wood is a porous material; some air bubbles could get out of the wood during hardening. To avoid this, it is recommended to coat the wood with a layer of epoxy. Fill cracks, knots, and any porous areas starting with what will be the bottom of the table, so that when you will place the bottom of the wood into the resin no air will be trapped. Like for any hardened epoxy, you will need to sand/deglaze before pouring more resin on it to ensure adhesion.
- **Casting techniques** : One of the many techniques possible once the wood stabilized consists in pouring a thin layer of resin in the mould (2 to 3 mm) to avoid any possible air pockets under the wood when placing it in the mould. Once the wood placed on the resin bed of 2/3 mm, clamp the wood in place so it won't float with non-stick spacers between the clamp and the wood. You can now pour the resin and flood the mould.

Another technique consists into placing the wood in the resin bed, pour the resin up to half to its final level and let cure overnight to b stage (resin has partially hardened, but is still stricky and you can put you nail into it) while holding the wood with clamps. The next day you can remove the clamps, the wood will be held in place and you can now do your final pour and flood the wood with the final desired resin thickness.

- **Casting thicknesses** : As explained before thickness and room temperature are key points to determine the project feasibility.

*Example : a 2m long x 30 cm wide x 4,5 cm thick casting in a 19mm melaminated wood mould in one shot is possible if the room temperature is between 18°C and 20°C, but the same casting at 23°C room temperature would see the resin heat up during hardening and cause yellowing, cracks and shrinkage. This means that just 4 or 5 °C temperature difference may be critical.*

**Play safe: In case of doubt, cast in 2 times with equals thicknesses for each castings.**

- **Using resin translucent tints** : tints give great color aspects, but trying to obtain the same color at each mix is impossible. It is best to tint all the resin you plan onto using in one go. Nacre powder and metallic powders & flakes may also be used. Make sure all tints or fillers are epoxy compatible before using them.
- **Hardening** : The WWA ECO+WWB4 system cures slowly and as a result, the temperature resistance increases slowly too. If you need to speed up the temperature resistance, once the resin has initially hardened, heat up at 40°C overnight.
- **Polishing** : WWA ECO sands and polishes well due to its excellent hardness. Best practice includes starting with 180 grit and wet sand from 400 grit onwards up to 2000 grit and then using any available polishing paste.

- **Varnishing** : In order to save time, it is possible to varnish the WWA ECO/WWB4 system, sand from 180 grit to 400, dust off and clean with ethanol. Varnish with a spray gun.

*Ask for technical advice : Resoltech's distributor networks consists of trained and experimented technicians Do not doubt in contacting them or our technical department for expert advice.*

## 6 Effects/Causes/Solutions table

Effects	Causes	Solutions
The mix is not totally clear, some «filaments» are visible	<b>The mix is not homogeneous enough</b>	Stir until the mix becomes totally clear
Some bubbles won't go up, there are stuck on mould sides or on included parts.	<b>Bubbles are stuck because of the capillarity or because of the shape.</b>	Soak all surfaces with mixed resin prior to casting
Resin hardened but there are still some «filaments» inside	<b>Hardening is not 100% complete or the mix was not homogenous enough</b>	Wait during 72h
- Strong yellowing during hardening	<b>Highly exotherm reaction</b>	<ul style="list-style-type: none"> <li>- Lower room temperature or product temperature</li> <li>- Decrease casting thickness</li> </ul>
- Surface is not flat (waves in surface)		
- Cracks		
- Important shrinkage		
Hardening did not occurred after 72h	<b>Mixing ratio was incorrect or hardening is very slow due to low temperature</b>	Check mixing ratio or increase room temperature, oven post curing is possible (not over 40°C)

## PACKAGING

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WWA ECO system is available in kits of :

- 1kg (plastic jerrycan) + hardener
- 5kg (plastic jerrycan) + hardener
- 25kg (plastic drum) + hardener
- 225kg (steel drum) + hardener
- 1000kg (IBC) + hardener

## TRANSPORT & STORAGE

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Keep containers sealed and away from heat and cold preferably between 10°C and 30°C in a well ventilated area. Our products are guaranteed in their original packaging (check expiry date on the label).

## HEALTH & SAFETY

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Skin contact must be avoided by wearing protective nitrile gloves & overalls or other protective clothing.

Eye protection should be worn to avoid risk of resin, hardener, solvent or dust entering the eyes. If this occurs flush the eye with water for 15 minutes, holding the eyelid open, and seek medical attention.

Ensure adequate ventilation in work areas. Respiratory protection should be worn with ABEKP coded filters.

Resoltech issues full Material Safety Data Sheet for all hazardous products. Please ensure that you have the correct MSDS to hand for the materials you are using before commencing work.



The data provided in this document is the result of tests and is believed to be accurate. We do not accept any responsibility over the mishandling of these products and our liability is limited strictly to the value of the products we manufacture and supply.



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