

Fast Cast Polyurethane Casting Resin

Xencast® P2

User Guide

Product Description

Xencast® P2 is an easy-to-use fast-cast polyurethane resin system suitable capable of producing highly detailed castings which can be demoulded within around 10-20 mins. Its unique formulation has been developed to offer the best possible results across a wide range of applications including miniatures, figures, models, patterns, sculptures, prototypes and production parts.

P2 has been formulated for maximum reliability and so requires no degassing and no other specialist equipment. Its low viscosity and modified flow properties result in superior surface detail with minimal air entrapment.

Xencast® P2 is compatible with a wide range of mould materials, fillers, pigments and additives making it the perfect all-purpose casting resin whilst the fast cure time reduces waiting and increases productivity.

Whether you're new to casting or a seasoned professional you're sure to get excellent results with this highly regarded resin system.

Advantages

- Fine surface detail reproduction with minimal air entrapment
- No degassing necessary
- Fast de-mould time (around 20mins)
- Very easy to use - compatible with most mould materials
- Easily pigmented
- Supports a high ratio of filler

Suggested Uses

- Detailed figurines
- RPG miniatures
- Models
- Patterns
- Product prototypes
- Foundry Patterns
- Sculpture/artwork reproductions
- Fishing Lures
- Ornaments
- Architectural Features

Considerations

- Short pot-life of just over 2 minutes means you must work quickly
- Not a toughened system so less suitable for more structural applications

With the addition of ATH filler powder, Xencast® P2 can also be used to reproduce large sculptures, whereas the addition of metal powders and pigments makes it possible to 'cold cast' bronzes and other authentic-looking metallic castings.

Key Processing Information

Xencast® P2 key processing information at a glance:

Ease of Use

Suitable for professional and hobby use (follow SDS advice).

Odour

P2 is almost odourless.

Safety Precautions

Wear gloves and goggles and work in a well ventilated area. Always read the SDS before use.

Ambient Conditions

Can be used from 10 to 30°C although pot-life and cure time will be affected significantly.

Degassing

Not necessary. Simply mix and pour.

Mix Ratio

Mix 'Part A' and 'Part B' 1:1 by weight. Use digital scales.

Mixing

Mix thoroughly by hand for around 1 minute.

Pot-Life

2 mins 15Seconds. Be sure to pour your casting(s) before this time.

Exotherm (Over-Heating)

Resin will heat-up whilst it cures. Large mouldings will require a filler. Once mixed, pour resin immediately.

Thin Sections

Suitable for fine detail. Minimum

section thickness is 0.5mm.

Maximum Thickness

For large castings with a thickness above 50mm (2") aluminium trihydroxide (ATH) filler should be added to reduce overheating and during cure.

Cure Time/Demould

Larger/thicker castings will heat up more and cure quicker (around 30mins). Small castings or thin sections will take longer (around 60mins).

Pigments and Fillers

A wide range of pigments and fillers (including metal powders) can be added to change the properties and appearance of

- Easily pigmented
- No degassing necessary
- Precise detail
- Fast curing

Technical Data

Uncured Resin Properties

Property	Part	Value
Material	A	Formulated Polyol
	B	Isocyanate
	Mix	Polyurethane
Appearance	A	Cream Liquid
	B	White liquid
	Mix	White Liquid
Viscosity (mPa.s) @ 25°C	A	70
	B	60
	Mix	50
Density (g/cm³)	A	1.02
	B	1.14
	Mix	1.08

Mixing & Cure Times

Values are approximate and will depend on a number of variables:

Property	Minutes
Pot Life (200g @ 25°C)	2min 15 sec
Demould Time (200g @ 25°C)	> 20 Min

Cured Properties

The below properties are for a cured sample of Xencast® P4 following a post-cure of 3hrs at 80°C.

Property	Units	Value
Flexural Strength	MPa	55
Flexural Modulus	MPa	1300
Tensile Strength	MPa	32
Tensile Modulus	MPa	1300
Shore Hardness	Shore D	70
Impact Resistance	kJ/m²	25
Linear Shrinkage	%	0.2
Elongation at Break	%	7
Heat Distortion Temp	°C	80

Compatibility Information

Although by no means an exhaustive list, the mould materials, pigments and additives listed below have all been tested and are known to work well with Xencast® P2:

Compatible Moulds

- Condensation/tin cure RTV silicone rubber (such as CS25)
- Addition/platinum cure RTV silicone rubber (such as AS40)
- Polypropylene and polyethylene mould 'trays'

Compatible Pigments

- Polyurethane colour pigment (for vivid opaque colours)
- *Translucent Tinting Pigment* (for less vivid opaque colours)
- *PearlEx®* powder pigments (for shimmering effects)

Compatible Fillers

- All conventional dry filler powders
- All metal powders (for realistic cold castings)
- Photoluminescent (glow in the dark) powders

What to Avoid

- Do not cast into latex rubber moulds without first applying and testing a suitable release agent.
- Do not cast onto substrates or into mould with a high moisture content (such as alginate) - contact with moisture will cause the resin to foam and will result in an improper cure.

The following user guide includes instructions for a number of common procedures including basic casting, casting larger pieces and pigmenting your castings.

Each procedure is listed under its own heading.

Basic Casting Instructions

1. Suitable Moulds

Xencast®P2 is most commonly used in the reproduction of small to medium sized plastic components such as miniatures, engineering components and copies of 3D prints which is normally achieved by casting the resin into a 'female' silicone mould. Xencast®P2 is compatible with both addition/platinum cure and condensation/tin cure silicone moulds including Easy Composites' AS40 and CS25 silicone rubbers.

Follow the technical information or user guide for your chosen silicone rubber in order to create your female mould. In all cases, ensure that your silicone mould is clean, dry and in good condition before casting.

Xencast®P2 can also be cast into other self-releasing mould materials such as polypropylene and polyethylene mould 'trays' and even into rigid moulds made from a range of materials, providing a suitable release agent has been applied. When casting into rigid moulds, always test the suitability and effectiveness of the release agent. **WARNING:** Without the use of a release agent, Xencast®P2 will bond to a range of substrates including many plastics, paint finishes and metal.

Maximum Size

Xencast®2 is a fast curing resin design for small to medium sized castings. The critical factor is the cubic dimensions of the casting at its thickest point which should not exceed 10cm³ (10cm x 10cm x 10cm) - too much heat will build up in cubic volumes greater than this. Please note, this does not mean that the maximum dimension for castings is 10cm - there is no limit to any one dimension providing that the casting is not too thick at the same time.

Larger castings are possible but require the addition of a suitable filler powder (see Large Castings section).

2. Safety

Before starting, take time to read and understand the information provided in the safety datasheet (SDS) including recommendations for suitable skin and eye protection and provision of adequate ventilation.

3. Preparation

For best results ensure that the room temperature, mould and casting resin at all approximately 20°C before use.

What you'll need:

- Safety equipment including gloves and eye protection (see SDS)
- Suitable mould (see section 1)
- Digital scales (such as kitchen scales)
- Clean mixing cup and mixing stick
- How much resin?

Before you mix the resin for your casting, you'll need to know how much resin it will require. If you don't know the quantity already then you find out by filling the mould with water and then weighing the amount of water it holds. Although the resin and water are slightly different densities, this will still give you a very close guide as to how much resin to mix. If you use this method, aim to mix about 10% more resin than the weight of the water you measured.

For example; fill your mould with water and weigh the water. If the water weighs 50g then you should aim to mix 55g of resin.

If you use the above method to calculate the amount of resin needed for your casting then it is essential to ensure the mould is FULLY DRIED before you use it. Any traces of water will react with the resin and affect the finished casting and so it is strongly recommended to use a hair dryer to fully dry your mould.

4. Mixing

Xencast®P2 consists of a Part A and Part B which are mixed together at a ratio of 1:1 by weight.

This means that you should measure an equal weight of Part A and Part B.

This is NOT the same as 1:1 by volume and so you should NOT measure equal quantities by volume. Doing so will result in the ratio between the two parts being incorrect and will reduce the performance of the cured resin.

Part A needs to be thoroughly shaken to dislodge its sediment and homogenise the resin. Turn the container upside down and shake vigorously for at least one minute before use. After shaking, leave the resin for several minutes before use to allow any air shaken into the resin to release.

Place the mixing cup on the scales and zero/tare the scales. Carefully pour in the required weight of Part A, trying to measure as accurately as possible. Next, zero/tare the scales again and weigh in the same amount of Part B.

Using a clean mixing stick, thoroughly mix Part A and Part B together, paying particular attention to the sides and base of the cup and to resin clinging to the mixing stick. Insufficiently thorough mixing is one of the main causes of a poor cure and so aim to spend around one minute combining the two materials and constantly scraping and mixing the sides and base.

The typical pot-life of the resin is 2 minutes 15 seconds although this will be reduced in higher ambient temperatures or when mixing larger quantities. This means that the whole mix of resin must be poured into your moulds within this time, ideally, as quickly as possible.

5. Pouring

Pour the resin into your moulds carefully, aiming to pour the resin into a single point on the mould and allowing the mould to fill up from there. Don't pour from a height as this may result in air entrapment.

If you have multiple moulds to fill, work quickly and ensure that you pour all your castings well within the 2-3 minute working time.

6. Curing and Demoulding

Different castings will cure at different speeds. Larger castings, particularly those which are thicker, will cure quicker than smaller, thinner castings. In almost all circumstances, Xencast®P2 should be sufficiently cured to demould and handle in 20 - 25 minutes but for thicker castings this may be 15 minutes or less.

Please note that Xencast®P2 will continue to cure and will not develop its full strength for several days after casting. During this time the resin will feel hard and cured but will not have reached its full strength potential.

For fast turnaround, you may need to experiment with exactly how long you need to leave your castings before you can safely demould them. Removing a casting too soon may result in it distorting as it continues to cure out of the mould. Cure speed can be increased significantly by placing the poured casting into a heated oven.

Once cured, Xencast®P2 castings are safe to handle and can be machined and painted.

7. Post Curing

Although not required, post-curing castings for 3hrs at 80°C will allow full cure to be reached more quickly and result in improved mechanical properties of the cured parts.

Post curing should only be undertaken after the part has reached initial cure at ambient temperature (to prevent over-heating during the initial cure). It is recommended to post-cure the part in the mould to eliminate any potential for distortion.

Large Castings

Although Xencast®P2 has been developed for casting detailed small to medium sized pieces, it can also be used to cast considerably larger, bulkier pieces such as sculptures providing that an appropriate filler powder is used.

For larger castings, a filler powder is necessary in order to reduce the 'exotherm' effect of the resin as it cures which would otherwise cause larger castings to get too hot and distort or crack during Xencast®P2's rapid cure. Adding an inert filler such as aluminium trihydroxide (ATH) will 'bulk out' the mixture, reducing the resin content and therefore significantly reducing the amount of heat given off during the cure and making larger castings possible.

A filler such as aluminium trihydroxide will also increase the density of the casting, making it feel less plastic-like and instead heavier and more ceramic, it will also reduce the overall cost of the casting and make it less prone to shrinkage.

What Counts as a Large Casting?

Different shaped moulding will dissipate heat at different rates and so it's difficult to say exactly what the maximum 'size' is that can be cast before the casting would require the addition of a filler powder. Certainly, regardless of shape, any casting where you are mixing less than 100g of resin would be described as a small casting and not require any filler powder. When casting pieces weighing more than 100g, thinner pieces with more surface area will dissipate more heat and can be quite large indeed before any filler powder is needed whereas thicker castings (a sphere for example) have less surface area and are more likely to overheat without filler powder.

A simple way to determine if a casting will require filler powder is to picture

a cube positioned in the largest part of your casting. If the cube exceeds 10cm³ (10x10x10cm) then we consider this a large casting and filler powder is recommended.

Maximum Size

With ATH filler added to the Xencast®P2 at a ratio of at least 1:1 the maximum castable size is most likely to be limited only by how much resin it is practical to thoroughly mix and pour within the short pot-life of the resin. As a guide, Xencast®P2 is not suggested for castings requiring a mix in excess of 10kg.

Suitable Fillers

The recommended filler to add to Xencast®P2 when casting larger pieces is aluminium trihydroxide, also known as ATH. Although ATH sounds like it may be a metallic filler, it is actually an inert, non-metallic white powder that looks more like an incredibly fine sand. Other filler powders that can be added to Xencast®P2 to make it suitable for larger castings include talc, marble dust and sand, although each will have a different behavior.

In this section, we assume ATH filler powder is being used.

How Much Filler?

ATH can be added to Xencast®P2 up to a maximum ratio of 2:1 by weight; this means that you can add up to 200g of ATH for every 100g of mixed Xencast®P2, however, a ratio of 2:1 will considerably thicken the resin and may not be possible when casting more detailed pieces. It is therefore suggested to start with a ratio of 1:1.

ATH filler ratio of 1:1; example: 100g ATH, 50g Xencast Part A, 50g Xencast Part B.

When to Add?

Because Xencast®P2 is a highly reactive (fast curing) polyurethane, it is recommended to add the filler to Part A before combining with Part B. This will allow time to fully disperse the filler into Part A before Part B is added and reaction begins.

Because the filler powder will increase the viscosity of Part A, you will need to be even more careful when mixing the filled Part A with Part B to ensure a proper mix.

Pigmenting

Xencast®P2's formulation is ideal for pigmenting and ensures that vivid, vibrant castings can be achieved even from low pigment ratios.

When pigmenting the resin, it is essential to use pigments that are compatible with polyurethane resin. See the information below on compatible pigments.

In all cases, pigments should be added to Part A first, using the minimum amount of pigment required to achieve the desired strength of colour; remember that the intensity of the colour may reduce slightly when you mix the pigmented Part A with Part B. You will normally find that darker colours (like black and blue) require less pigment than lighter colours (like yellow and white).

Pigment Pastes (typically 2-6% by weight)

Pigment pastes are the most effective way to add vivid, opaque colour to your castings. The pastes are made from pigment powder that has been extensively milled into a small amount of base resin in order to produce a liquid paste that can be easily dispersed into the casting resin.

Because the pigment paste is made using a base resin, this resin must be the same type as the resin it will be used to pigment. When pigmenting Xencast®P2 this means the pigment paste must be a 'polyurethane pigment paste'. A full range of Polyurethane Pigments are available from Easy Composites Ltd.

Powder Pigments (typically 1-3% by weight)

Powder pigments are pure pigment powder which has not been milled into or combined with a resin base which means that powder pigments can generally be used to pigment all types of resin. The disadvantage to powder pigments is that the powder can be difficult to fully disperse into the resin mix, resulting in inconsistent appearance or a lack of intensity.

Tinting Pigments (typically a few drops to 2%)

Although developed for use primarily with clear casting resins, Easy Composites' Translucent Tinting Pigments can be used to add softer, more pastel-like colours to Xencast®P2.

Disclaimer

This data is not to be used for specifications. Values listed are for typical properties and should not be considered minimum or maximum.

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