

TECHNICAL DATA SHEET

EC-440

EPOXY CASTING SYSTEM UNFILLED, HIGH TEMPERATURE

DESCRIPTION

EC-440 High Temperature Epoxy Mass Cast System was developed for use in prototype or low volume production tooling applications. EC-440, used in conjunction with our N-6 and N-61 ceramic fillers, offers the user a complete tooling system with excellent physical properties while maintaining a lower cost when compared with conventional aluminum filled mass cast systems. The EC-440 Tooling System will reach a B-stage cure overnight at room temperature, however, it can be used at elevated temperatures when subjected to a moderate post-cure. The EC-440 High Temperature Epoxy Mass Cast System can be utilized as a back-fill material for nickel-shell tooling applications or used in conjunction with one of ADTECH's high temperature epoxy surface coats, including SP-707 (same as former ES-229) and ES-221.

APPLICATIONS

- Resin Transfer Molds (RTM)
- Compression Molds
- Reaction Injection Molds (RIM)
- Other High Temperature Mass Cast Tooling Applications.

PROPERTIES

		EC-440 Resin	EC-440 Hardener
Composition		Epoxy	Amine
Mix ratio by weight		100	30
Mix ratio R/ H / N-6 / N-60 fillers		100	30/280/750
Mixed viscosity at 77°F (25°C) unfilled (cps)	ASTM D2393		875
Specific Gravity at 77°F (25°C) unfilled (g/cc)	ASTM D792		1.13
Work life at 77°F (25°C) (260 g) unfilled (min)	ASTM D2471		60 – 80
Demold time (hours)			18 - 24

MECHANICAL and THERMAL PROPERTIES ¹ (CAST BAR - UNFILLED)			
Property	Method	Units	EC-440
Hardness	ASTM D2240	Shore D	90 - 95
Tensile Strength	ASTM D638	psi (MPa)	10,900 (75)
Tensile Modulus	ASTM D638	psi (MPa)	380,000 (2,622)
Tensile Elongation	ASTM D638	%	4.0
Flexural Strength	ASTM D790	psi (MPa)	20,000 (138)
Flexural Modulus	ASTM D790	psi (MPa)	464,000 (3,202)
Compressive Strength	ASTM D695	psi (MPa)	16,500 (114)
IZOD Impact	ASTM D256	ft-lb/in ²	8.6
Tg per DMA (Heat Cured 8hr/150°F)	ASTM D4065	°F (°C)	208 (97.8)
HDT @ 66 psi (Heat Cured 2hrs/212°F (100°C) + 2 hrs/302°F (150°C))	ASTM D648	°F (°C)	235 (113)

⁽¹⁾ The above properties were obtained under laboratory conditions using standardized specimens. Cure was 7 days @ R.T. unless noted

MECHANICAL and THERMAL PROPERTIES ¹ CAST BAR FILLED (FILLED per mix ratio - N-6 / N-60 fillers per above ratio)			
Property	Method	Units	EC-440
Hardness	ASTM D2240	Shore D	95
CTE (Coefficient of Thermal Expansion)	ASTM D386	ppm/°F (°C)	12 (22)
Linear Shrinkage (4650 cm ³ Mold)		In/in	0.0009
Linear Shrinkage		In/in	0.0013
Peak Exotherm 3 ft ³ Mold		°F (°C)	127 (53)

⁽¹⁾ The above properties were obtained under laboratory conditions using standardized specimens. Cure was 7 days @ R.T. unless noted

PROCESSING

GENERAL CASTING GUIDELINES Properly prepare your mold, model, or pattern with a sealer followed by several coats of an appropriate mold release or parting agent. Construct and attach a leak proof containment box around the model which is strong enough to support the weight of the cast without deflection. Cross bracing may be required. Apply release agent to the containment walls to prevent bonding. Thoroughly mix the resin and hardener at the appropriate mix ratio, and pour the mixture slowly into the lowest points of the cavity until full. Allow the product to cure on the model until the time at which the material can be demolded. If necessary, proceed with the remaining cure schedule per the Product Bulletin.

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RECOMMENDED CURE SCHEDULE

Always allow tools to gel at room temperature before subjecting them to the post cure. 24 hours is recommended. This will prevent excessive exotherm and shrinkage from occurring. The recommended post cure schedule for the EC-440 system is as follows: ♦ Cure for 24 hours at room temperature 77°F (25°C) + Heat cure on the model, if possible, for 8 hours at 150°F (66°C)

CURE - 24 hours @ 77°F (25°C) + 8 hours @ 150°F (66°C). Heat cure on model if possible.

You may de-mold tool after the preliminary schedule is complete and the tool has cooled.

HEAT CONDITIONING OF METAL REINFORCED, CAST EPOXY MOLDS It is always advisable to heat cure cast epoxy molds internally on the model to 150°F (66°C) using the temperature control system built into your mold (i.e. copper tubing or electrical grid). If oven curing is your only option, it is advisable to complete an initial cure on the model at 125°F (52°C) for 6-8 hours or overnight before increasing the oven temperature. Extremely large cast molds should always be heat cured internally and should not be moved or transported to another location prior to an internal heat cure process of 150°F (66°C).

RATES FOR HEATING AND/OR COOLING OF CAST EPOXY MOLDS When taking tools through the post cure phase, always place in a room temperature oven and increase the temperature at a rate of no more than 50°F (30°C) per hour. When cooling, allow the tools to remain in the heated environment and decrease the temperature at a rate of no more than 50°F (30°C) per hour. Never remove the tool from the oven until it has reached 100°F (38°). Removing a tool heated above 100°F (38°) can result in thermal shock and warping. Ensure proper curing temperatures are met by installing a thermocouple directly in the center of the tool. **MATERIAL ESTIMATOR** The mixed density of EC-440 at the appropriate mix ratio (by weight) of 100 parts resin: 30 parts hardener: 208 parts N-61 Fine Bulk Filler: 750 parts N-6 Chipped Bulk Filler is 21.7 lbs./gallon or 162.3 lbs./cu. ft. To determine the volumetric yield for EC-440, calculate the amount of cubic feet that will be cast and multiply this number by 162.3. For assistance on a material estimation for a specific application, please contact our Technical Service Department

CRYSTALLIZATION Epoxies may form small crystals when exposed to moisture, dirt, low temperatures, or temperature cycling. To return the material back to its original state, heat to 150°F (66°C) until all crystals liquefy then stir and cool to room temperature before adding hardener. Do not catalyze crystallized epoxy until all crystals are returned to liquid form and resin has cooled to room temperature.

HANDLING PRECAUTIONS

Normal health and safety precautions should be observed when handling these products:

- Ensure good ventilation.
- Wear gloves, glasses and protective clothes.

For further information, please consult the Safety Data Sheets.

STORAGE CONDITIONS

- This product has a shelf life of 12 months for the resin as indicated by the expiration date on the container when stored in original unopened containers between 47°F – 77°F (8°C – 25°C). The product shelf life for the hardener is 24 months between 60°F (15°C) and 77°F (25°C). Any opened can must be tightly closed.

PACKAGING

Packaging information on request, please contact your local sales representative or find your local contact on www.sikaadvancedresins.us

LEGAL NOTICE

The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the product's suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

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