



OptiPLUS[®]

040-8077, 040-8089, 040-8094

High Performance Shrink Controlled Tooling Resin

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Description

OptiPLUS[®] 040-8077, 040-8089, and 040-8094 are high performance tooling resins. Specifically, they are low profile additive modified, shrinkage control resins designed specifically for ambient temperature mold or tool fabrication. These products result in dramatically improved surfaces with minimal shrinkage.

OptiPLUS[®] Tooling Resins are used to build molds for the marine, automotive, RV, medical, and truck equipment parts that are produced by the hand-lay up and spray up processes. They are also used as replacements for isophthalic, vinyl ester, and epoxy resins in tooling applications for casting and high temperature thermoforming of thermoplastic sheets, such as acrylic, polycarbonate, and ABS.

OptiPLUS[®] 040-8077, 040-8089, and 040-8094 tooling resins pre-promoted and pre-thixed, with no additives required other than peroxide initiator (catalyst) for cure. They are clear amber liquid during application that remain clear during fiber wet-out. Upon cure, the laminate will turn a creamy white as an initial visual indicator of proper cure.

OptiPLUS[®] 040-8089 and 040-8094 meet the EPA National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Reinforced Plastic Composites Production and Boat Manufacturing.

OptiPLUS[®] 040-8094 is the summer version (longer gel time version) of *OptiPLUS*[®] 040-8089.

Features and Benefits

- Surface and dimensional control for nearly perfect mold or master replication
- Excellent heat resistance
- Superior laminate mechanical properties
- Formulated for user friendliness and excellent fiber wet-out
- Fast, stress free, laminate build-up, even at 0.250" thickness (wet-on-wet) (040-8089 and 040-8094) or 0.500" thickness (wet-on-wet) or more (040-8077)
- Extended shelf life, with no loss of shrink control

Typical Liquid Properties (at 77°F, 25°C)

The liquid properties of *OptiPLUS*[®] 040-8077, 040-8089, and 040-8094 are shown below. These values may or may not be manufacturing control criteria; they are listed as a reference guide only. Particular batches will not conform exactly to the numbers listed because storage conditions, temperature changes, age, and testing equipment (type and procedure) can each have a significant effect on the results. Products with properties outside of these readings can perform acceptably. Final suitability of these products are in the end use performance.



Test	OptiPLUS® 040-8077	OptiPLUS® 040-8089	OptiPLUS® 040-8094
Solids (max.)	50.0%	52.0%	53.0%
Styrene Monomer	45.7%	34.8%	35.9%
Non-HAP Monomer and Solvents	-	< 10%	< 10%
Viscosity ⁽¹⁾	750 cps	1025 cps	1150 cps
Viscosity ⁽²⁾	250 cps	350 cps	375 cps
Thixotropic Index	3.0	3.0	3.0
Gel Time ⁽³⁾	15 minutes	15 minutes	24 minutes
Peak Time	19 minutes	19 minutes	-
Peak Exotherm	400°F (204°C)	400°F (204°C)	400°F (204°C)
Weight per Gallon	8.8 lbs.	8.7 lbs.	8.7 lbs.

⁽¹⁾ Brookfield RVT, Spindle #3, @ 5 rpm

⁽²⁾ Brookfield RVT, Spindle #3, @ 50 rpm

⁽³⁾ 50 Gram Mass, 1.5% United Initiators Norox® MEKP-9

Physical Properties

The physical properties of *OptiPLUS*® 040-8077, 040-8089, and 040-8094 are shown below. Properties are shown for glass fiber reinforced laminates. These are typical values and are for reference only.

Note: The physical properties of thermoset resins evolve as the resin cures. The properties given below are for well cured laminates. Resin and laminates at different stages of cure will have varying properties.

Test	Test Method ⁽¹⁾	OptiPLUS® Laminate ⁽²⁾
Tensile Strength	ASTM D638	18,200 psi
Tensile Modulus		1,040,000 psi
Tensile Elongation		2.3%
Flexural Strength	ASTM D790	30,200 psi
Flexural Modulus		875,000 psi
Izod Impact, Notched	ASTM D256	20.5 ft.-lbs.
Izod Impact, Unnotched		32.0 ft.-lbs.
Glass Content		38.0%

⁽¹⁾ All tests run per internal Polynt test methods. These methods are similar to the ASTM Method listed above.

⁽²⁾ Laminate schedule – four plies of 1.5 oz. chopped strand mat made with 1.5% United Initiators Norox® MEKP-9 peroxide with *OptiPLUS*® tooling resin.



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Application

Some separation of the fumed silica thixotropic additive is common and expected, due to the low viscosity and chemistry involved with *OptiPLUS*[®] 040-8077, 040-8089, and 040-8094. Minimal mixing of the *OptiPLUS*[®] tooling resin prior to use is sufficient to reincorporate the thixotropic additive. Use mixing equipment with sufficient horsepower (relative to container size) to achieve thorough circulation from top to bottom and out to the sides of the container. The agitator must be properly sized for the container and must allow for uniform mixing regardless of the liquid level in the container. Air bubbling should not be used for mixing. It is not effective and only serves as a potential source of water or oil contamination. Do not overmix *OptiPLUS*[®]. Overmixing can break down the resin viscosity increasing the tendency to sag.

The cure rate of polyester resins depends on a number of factors including the product's age, temperature, catalyst type, catalyst level and ambient humidity. When used in a laminating application, the laminate cure rate also depends on reinforcement content and laminate thickness as well as other factors. For these reasons, we recommend that customers check the cure rate in their plant.

Adherence to proper process controls, particularly temperature and catalyst levels, is necessary to provide the intended performance of this product. Deviations may negatively impact the gel and cure characteristics of *OptiPLUS*[®] resulting in poor or non-existent shrink control and loss of surface and mechanical properties.

The *OptiPLUS*[®] product line is formulated to be used at 75-95°F, with United Initiators Norox[®] MEKP-9 or equivalents. Higher dimer peroxides such as Akzo Nobel Cadox[®] L-50a, Pergan HiPoint[®]-90, or equivalents can be used, especially if longer gel times are needed in warmer temperatures for additional working times.

In colder conditions (60-75°F) for faster gel and cure, or for thinner (< 0.125") laminate schedules, up to 2.0% of a suggested catalyst is permitted. In warmer conditions (80-95°F) for slower gel and cure, or for thicker (> 0.200") laminate schedules, reductions to 1.0% of a suggested catalyst is permitted. The use of catalyst below the levels suggested will cause under cure of the laminate. The use of catalyst above levels suggested will cause poor cure, poor shrinkage control, and may damage molds due to excessive heat generation. The use of an incorrect quantity or incorrect type of catalyst could also negatively affect shrinkage control and mechanical properties.

Application temperatures outside of 75-95°F are not suggested. Temperatures below 75°F will result in under cure with no shrinkage control. Temperatures above 95°F will generate excessive heat that will cause poor cure, poor shrinkage control, and may cause mold damage.

For processes that run above 95°F, contact a Polynt technical service representative for alternative *OptiPLUS*[®] high temperature products.

The secondary bonding characteristics are excellent with *OptiPLUS*[®] tooling resin products, but should be tested if the secondary bonding is done after three or more days of the original lamination or under very warm temperature conditions.

Refer to current *OptiPLUS*[®] Tooling Resin Application Guide for more application details and suggestions for usage.



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Caution

Do not add any material, other than the recommended peroxide, to this product without the advice of a Polynt representative.

Related Documents

- 040-8077, 040-8089, and 040-8094 Tooling Resin Application Guide
- MB-358 *OptiPLUS*® Repair

Storage Limitations

OptiPLUS® 040-8077, 040-8089, and 040-8094 have a shelf life of 120 days from the date of manufacture when stored at 77°F or below in a closed, factory sealed container, and out of direct sunlight.

SDS / Data Sheets

SDS and data sheets can be obtained by contacting your Polynt representative or Polynt Customer Service at 800-322-8103.

POLYNT SAFETY INFORMATION

All sales of products manufactured by Polynt and described herein, are made solely on condition that Polynt customers comply with applicable health and safety laws, regulations and orders relating to the handling of our products in the workplace. Before using, read the following information, and both the product label and Safety Data Sheet pertaining to each product.

Most products contain styrene. Styrene can cause eye, skin and respiratory tract irritation. Avoid contact with eyes, skin and clothing. Impermeable gloves, safety eyewear and protective clothing should be worn during use to avoid skin and eye contact. Wash thoroughly after use.

Styrene is a solvent and may be harmful if inhaled. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Extended exposure to styrene at concentrations above the recommended exposure limits may cause central nervous system depression causing dizziness, headaches or nausea and, if overexposure is continued indefinitely, loss of consciousness, liver and kidney damage.

Do not ingest or breathe vapor, spray mists or dusts caused by applying, sanding, grinding and sawing products. Wear an appropriate NIOSH/MSHA approved and properly fitted respirator during application and use of these products until vapors, mists and dusts are exhausted, unless air monitoring demonstrates vapors, mists and dusts are below applicable exposure limits. Follow respirator manufacturer's directions for respirator use.

The 12th Report on Carcinogens issued by the National Toxicology Program lists styrene as a "reasonably anticipated" carcinogen, but the Report cautions that the NTP listing does not mean that styrene presents a risk to persons in their daily lives. The Styrene Information and Research Center does not agree with the classification as it did not include a review of all available data. SIRC states: "HHS included styrene in the 12th RoC despite the fact that European Union regulators have determined styrene does not represent a human cancer concern. E.U. scientists reviewed the full styrene database, weighing all of the available data in reaching their conclusion."

The International Agency for Research on Cancer (IARC) reclassified styrene as Group 2B, "possibly carcinogenic to humans." This revised classification was not based on new health data relating to either humans or animals, but on a change in the IARC classification system. The Styrene Information and Research Center does not agree with the reclassification and published the following statement: Recently published studies tracing 50,000 workers exposed to high occupational levels of styrene over a period of 45 years showed no association between styrene and cancer, no increase in cancer among styrene workers (as opposed to the average among all workers), and no increase in mortality related to styrene.

Styrene is classified by OSHA and the Department of Transportation as a flammable liquid. Flammable products should be kept away from heat, sparks, and flame. Lighting and other electrical systems in the workplace should be vapor-proof and protected from breakage.

Vapors from styrene may cause flash fire. Styrene vapors are heavier than air and may concentrate in the lower levels of molds and the work area. General clean air dilution or local exhaust ventilation should be provided in volume and pattern to keep vapors well below the lower explosion limit and all air contaminants (vapor, mists and dusts) below the current permissible exposure limits in the mixing, application, curing and repair areas.

Some products may contain additional hazardous ingredients. To determine the hazardous ingredients present, their applicable exposure limits and other safety information, read the Safety Data Sheet for each product (identified by product number) before using. If unavailable, these can be obtained, free of charge, from your Polynt representative or from: Polynt, 99 East Cottage Avenue, Carpentersville, IL 60110, 800-322-8103.

FIRST AID: In case of eye contact, flush immediately with plenty of water for at least 15 minutes and get medical attention; for skin, wash thoroughly with soap and water. If affected by inhalation of vapors or spray mist, remove to fresh air. If swallowed, get medical attention.

Those products have at least two components that must be mixed before use. Any mixture of components will have hazards of all components. Before opening the packages read all warning labels. Observe all precautions.

Keep containers closed when not in use. In case of spillage, absorb with inert material and dispose of in accordance with applicable regulations. Emptied containers may retain hazardous residue. Do not cut, puncture or weld on or near these containers. Follow container label warnings until containers are thoroughly cleaned or destroyed.

FOR INDUSTRIAL USE AND PROFESSIONAL APPLICATION ONLY. KEEP OUT OF REACH OF CHILDREN.

LIMITED WARRANTY AND LIMITATION OF LIABILITY

LIMITED WARRANTY.

Seller warrants that: (i) Buyer shall obtain good title to the product sold hereunder, (ii) at shipment such product shall conform to Seller's specifications for the product; and (iii) the sale or use of such product will not infringe the claims of any U.S. patent covering the product itself, but Seller does not warrant against infringement which might arise by the use of said product in any combination with other products or arising in the operation of any process. **SELLER MAKES NO OTHER WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, EVEN IF THAT PURPOSE IS KNOWN TO SELLER. ANY ADDITIONAL REPRESENTATIONS OR SUGGESTIONS REGARDING THE PRODUCT OR ITS POSSIBLE USES ARE BASED UPON SELLER'S GOOD FAITH OPINION AND BELIEF, BUT ARE NOT TO BE CONSTRUED AS AFFIRMATIONS OF FACT, PROMISES, OR DESCRIPTIONS, AND SHALL IN NO WAY BE DEEMED PART OF THE SALE OF PRODUCT.** In particular, and without limiting the foregoing, because of environmental and use conditions beyond Seller's control, Seller offers no warranty and makes no promise concerning the results that may be obtained by the Buyer (or the Buyer's customer) with the product or the performance of the product. Each user should satisfy itself, by adequate testing, of the suitability of the product for its particular application.

LIMITATION OF LIABILITY.

- (a) Seller's total liability for any claim arising out of or in connection with this contract, including for breach of contract, warranty, statutory duty, or for other tort, including seller's negligence, shall not exceed the purchase price of such product as to which such liability arises. Seller shall not be liable for any injury, loss or damage, resulting from the handling or use of the product shipped hereunder whether in the manufacturing process or otherwise. **IN NO EVENT SHALL SELLER BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION LOSS OF PROFITS, CAPITAL OR BUSINESS OPPORTUNITY, DOWNTIME COSTS, OR CLAIMS OF CUSTOMERS OR EMPLOYEES OF BUYER, WHETHER IN AN ACTION UNDER CONTRACT, NEGLIGENCE OR ANY OTHER THEORY, ARISING OUT OF OR IN CONNECTION WITH THIS CONTRACT, OR THE USE, INABILITY TO USE, OR PERFORMANCE OF THE PRODUCT.**
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The information provided is believed to be accurate at the time of preparation, or prepared from sources believed to be reliable, but it is the responsibility of user to investigate and understand other pertinent sources of information, to comply with all laws and procedures applicable to the safe handling and use of the product and to determine the suitability of the product for its intended use.