



# STYPOL® & XYCON®

## 047-1040 and 040-7263 Pultrusion Resin Systems

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### Type

**XYCON® 047-1040** is a modified thermosetting acrylic resin containing styrene monomer. This resin is designed to be used in conjunction with **Stypol® 040-7263** Aromatic Diisocyanate Prepolymer for the fabrication of composite parts by pultrusion, filament winding and compression molding. Together these products form a tough, heat and water resistant polymer.

### Distinguishing Characteristics

STYPOL® 040-8086 offers the following features:

- Excellent physical properties
- Good retention of physical properties at elevated temperatures
- Excellent hydrolytic properties
- Low water absorption
- Excellent Fatigue Properties
- Good surface properties

### Typical Liquid Properties

Typical liquid properties of **XYCON® 047-1040** are shown below. These values may or may not be manufacturing control criteria. They are listed for a reference guide only. Particular batches will not conform exactly to the numbers listed because storage conditions, temperature changes, age, testing equipment (type and procedure) can each have a significant effect on the testing. Products with properties outside of these readings can perform acceptably. Final suitability of this product is in the end use performance.

Test	Value
Non-Volatile Material	70%
Viscosity Brookfield LV	
• Spindle #2 @ 30 rpm	350 cps
SPI (180°F, 1.0% BPO)	
• Gel Time	12 minutes
• Gel to Peak	2 minutes
• Peak Exotherm	380°F



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Acid Value	10
Hydroxyl Number (solution, uncorrected)	105
Water Content	0.10% max.
Weight per Gallon	9.12 lbs.

**Physical Properties**

The physical properties of **XYCON® 047-1040/STYPOL® 040-7263** are shown below. Properties are shown for pultruded flat bars. The properties of **XYCON® 047-1040/STYPOL® 040-7263** parts are compared to parts made using commercial premium isophthalic polyester vinyl ester resins. All parts were pultruded under the same conditions on the same machine on the same day. These are typical values and are provided for reference only.

Property	Test Method	Orientation	XYCON® 047-1040/ STYPOL® 040-7263	Isophthalic Resin	Vinyl Ester Resin
Tensile Strength	ASTM D638	Lengthwise	77,400 psi	72,500 psi	71,700 psi
		Cross-Direction	8,300 psi	8,000 psi	8,900 psi
Tensile Modulus		Lengthwise	3,769,000 psi	3,807,000 psi	3,670,000 psi
		Cross-Direction	1,556,000 psi	780,000 psi	1,288,000 psi
Tensile Elongation		Lengthwise	3.0%	2.0%	2.6%
		Cross-Direction	2.0%	2.1%	2.1%
Flexure Strength	ASTM D790	Lengthwise	93,000 psi	77,500 psi	86,000 psi
		Cross-Direction	19,100 psi	18,300 psi	19,300 psi
Flexure Modulus		Lengthwise	2,419,000 psi	2,232,000 psi	2,230,000 psi
		Cross-Direction	1,173,000 psi	884,000 psi	1,125,000 psi



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Compressive Strength	ASTM D695	Lengthwise	>33,500 psi <sup>3</sup>	23,500 psi	>33,400 psi <sup>3</sup>
		Cross-Direction	27,500 psi	17,300 psi	23,700 psi
Glass Content, %	ASTM 2584	Not Applicable	61%	56%	59%

<sup>1</sup>All tests run per internal CCP test methods. These methods are similar to the ASTM Methods listed above.

<sup>2</sup>Pultruded bars were 6.5 inches wide and 0.25 inch thick. The bars were fabricated using a 48 inch long die with four heat zones. The front and back zones heaters were turned off. The two middle zones were at 300 – 350°F. The pulling speed was 12 inches per minute.

<sup>3</sup>Load cell limit was exceeded.

Note: The physical properties of thermoset resins evolve as the resin cures. The properties given below are for a well cured pultruded bars. Parts at different stages of cure will have varying properties.

The fiber reinforcement for the pultruded bars was as follows:

- One layer Nexus polyester veil
- One layer 1.5 oz mat – OCF H8643
- Four tiers of 12 654 , 56 yield
- One layer 1.5 oz mat – OCF H8643
- Four tiers of 12 654 , 56 yield
- One layer 1.5 oz mat – OCF H8643
- One layer Nexus polyester veil

Formulations for each resin were as follows:

Formulation Component	Description	XYCON <sup>®</sup> 047-1040/ STYPOL <sup>®</sup> 040-7263	Isophthalic Resin	Vinyl Ester Resin
<b>XYCON<sup>®</sup> 047-1040</b>	Thermosetting modified thermosetting acrylic resin	67.3 lbs	Not applicable	<i>Not applicable</i>
Isophthalic Polyester	Resin	Not applicable	100 lbs	<i>Not applicable</i>
Vinyl Ester	Resin	Not applicable	Not applicable	<i>100 lb</i>
Styrene	Reactive Monomer	9.0 lb	Not applicable	<i>Not applicable</i>
Zinc Stearate	Mold Release	1.0 lb	Not applicable	<i>Not applicable</i>
Mold Wiz PS-125 <sup>1</sup>	Mold Release	Not applicable	1.0 lb	<i>1.0 lb</i>
A208 <sup>2</sup>	Aluminum Trihydrate Filler	Not applicable	15 lb	<i>15 lb</i>
<b>STYPOL<sup>®</sup> 040-7263</b>	Aromatic Diisocyanate Prepolymer	23.7 lb	Not applicable	<i>Not applicable</i>
t-amylperoxy-2-	Initiator	1.5 lb	0.5 lb	<i>0.5 lb</i>



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ethylhexanoate<sup>3</sup>

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<i>Tert-butyl Peroxybenzoate</i>	<i>Initiator</i>	<i>0.5 lb</i>	<i>0.2 lb</i>	<i>0.2 lb</i>
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<sup>1</sup>Axel Plastics Research Laboratories, Inc.

<sup>2</sup>The R. J. Marshall Company, Bayer Grade Aluminum Trihydrate

<sup>3</sup>Chemtura Esperox 570P

<sup>4</sup>Tert-butyl Peroxybenzoate is available from most major suppliers of organic peroxides. Two common tradenames are Arkema Luperox<sup>®</sup> P and Akzo Trigonox<sup>®</sup> C.

## Related Products

**STYPOL<sup>®</sup> 040-7263** Aromatic Diisocyanate Prepolymer

## Storage

XYCON<sup>®</sup> 047-1040 has a shelf life of 90 days from date of shipment from CCP when stored at 73°F or below in a closed, factory-sealed, opaque container, and out of direct sunlight. The usage life is cut in half for every 20°F over 73°F.

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### COMPOSITES SAFETY INFORMATION (October 2011)

All sales of products manufactured by CCP Composites US (CCP), and described herein, are made solely on condition that CCP's 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 Material 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 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 work place 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 Material Safety Data Sheet for each product (identified by product number) before using. If unavailable, these can be obtained, free of charge, from your CCP representative or from: CCP Composites US, P.O. Box 419389, Kansas City, MO 64141-6389; 816-391-6053.

**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.

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