Rigid Urethane Systems for Prototypes and Production Parts

PERFECT FOR:

- *HAND POURED*
- *VACUUM CAST*
- *MACHINE DISPENSED*

PTM&W INDUSTRIES, INC.
10640 South Painter Avenue
Santa Fe Springs, CA 90670-4092
562-946-4511 • 800-421-1518
Fax: 562-941-4773
www.ptm-w.com • info@ptm-w.com

High Performance Products for Prototype and Production Parts

The polyurethane products listed in this catalog combine ease of handling with superior cured physicals to provide prototype and production parts with many beneficial properties.

The proper choice from these products will allow the user to duplicate the properties of a number of engineering plastics with low-cost tooling in a very short time. They cover a broad range of applications, and include high performance materials with outstanding properties and toughness, materials for clear casting, and a full range of excellent fire retardant systems.

A few of these products are certified to the UL94-V0 flame retardant specification, and our PT8902 is certified to USP Class VI requirements.

PTM&W

TABLE of CONTENTS

SECTION I

SECTION II

SECTION III

Rigid Polyurethane Systems for Prototype & Production: Hand-Cast and Vacuum-Cast Products

This section describes PTM&W Industries' polyurethane casting systems designed for processing using hand-casting and vacuum-casting methods.

The products in this group have low mixed-viscosities and longer working times to allow sufficient time for hand mixing, vacuum degassing, casting and pressurizing before the material gels. These systems work very well in vacuum-casting machines, like MCP equipment.

You will find our casting systems to be among the highest performing available on the market. Products like PT8902 and PT8952, while requiring a heated post-cure, generate the highest impact strengths for hard, rigid polyurethanes. A few of these products are certified to UL94-V0 flame-retardant specifications, and PT8902 is certified to USP Class-VI requirements.

Some of the same products listed in this group are also shown with faster-setting hardeners in another section called Twin-Tube and Machine Dispense Products. Normally, those materials set up too rapidly to be used in hand-cast and vacuum-cast processes.

We suggest using PTM&W urethane-based color pastes for color-casting. Pigments from other manufacturers may work, but some have proven to be incompatible with our urethanes, resulting in streaking or molted colors, or retarded cures and tacky surfaces.

Please contact us at 800 421-1518 or info@ptm-w.com, if you have questions about our products or processing requirements.

Rigid Polyurethanes for Hand-Cast and Vacuum Cast Applications

PRODUCTS

PT8902

This urethane system is designed to allow you to produce the toughest parts available for prototype applications! It is a low viscosity urethane system with a very useable pot life. PT8902 forms an extremely tough white, opaque solid when cured. PT8902 has a notched Izod impact strength of over 2.0! PT8902 is Certified to USP Class VI requirements.

PT8948 & PT8949

These companion materials have been designed specifically for hand pouring or mechanized casting of larger parts. They have easy to use volumetric ratios and low viscosities for easy degassing and filling of complicated molds. PT8948 cures to a translucent solid, and PT8949 cures to a brilliant opaque white, but since no pigments are used in either system, they can easily be tinted or colored.

PT8925

Transparent, water-white urethane casting system that is very useful for the production of tough, impact resistant clear parts. Three hardeners are available for producing various size parts from thin-walls to mass castings. Parts B1 and B2 are appropriate for hand cast and vacuum casting uses. Part B3 works well in machine use. The cured parts have excellent toughness and durability.

PT8952

PT8952 is a system developed to provide a tough, impact-resistant material for the production of durable short run and prototype parts. A performance companion to the PT8902 high impact casting system, PT8952 produces parts with very high Izod impact strength with the added benefit of excellent fire retardant characteristics. PT8952 is UL listed for UL 94V-0 at 0.1 inch (2.6 mm) thickness (UL File No. E238713), and meets the requirements of FAR 28.853 for flammability.

PT8955

PT8955 casting system that has been developed to allow the production of parts that are tough, durable and fire retardant. Cured parts are UL Listed for UL94 V-0 at 0.1 inch (2.6 mm) thickness The natural color of this material is a very bright white, and it accepts pigments and colorants readily for a broad range of final colors to suit the application requirements. PT8955 has excellent hot strength, which prevents sagging or distortion in parts that are exposed to higher ambient temperatures in service.

PT8957

PT8957 provides a tough, impact-resistant material for the production of durable short run and production parts. PT8957 in thinner section parts will possess both high impact strength as well as good fire retardant performance. PT8957 meets the requirements of FAR 28.853 for flammability in 0.043 inch (1.1 mm) thickness. PT8957 will solve the problem of brittle fire retardant parts!! It has very good Izod Impact strength, tensile and flexural strength, for outstanding toughness.

PT8964

PT8964 is a two-component urethane casting system with very high temperature resistance that produces prototype and production parts with excellent cured properties. With an easy 2 to 1 mix ratio by weight or volume and very low mixed viscosity, PR8964 processes quickly and allows the casting of complicated configurations in a timely manner. Two hardeners are available for producing either natural amber or black parts.

PT8970

PT8970 is a Shore D-70 urethane system that has a high degree of toughness, and excellent stability for this hardness range. It is a good material for various types of tools and fixtures. Panels and parts made with PT8970 have high impact strength and resistance to cracking, for long, durable service. Part B hardener is more suited to hand casting larger parts, and Part B1 is intended for machine dispensing. Black versions of both hardeners are available.

PRODUCT SPECIFICATIONS and TYPICAL MECHANICAL PROPERTIES

Note: For full specifications and properties with all of the available hardeners, including recommended curing cycles, refer to the individual product bulletins in the next section of this booklet.

	PT8902	PT8948	PT8949	PT8925	PT8952	PT8955	PT8957	PT8964	PT8970
Viscosity-Resin	80 - 100 cps	80 cps	100 cps	400 cps	60 cps	175 cps	120 cps	960 cps	1250 cps
Viscosity-Hardener	650 cps	900 cps	1300 cps	1440 cps	650 cps	4300 cps	750 cps	450 cps	1150 cps
Cured Hardness	85 Shore D	80 - 82 Shore D	70 - 75 Shore D	80 - 85 Shore D	85 Shore D	85 Shore D	88 Shore D	84 Shore D	70 Shore D
Specific Gravity	1.15	1.11	1.08	1.14	1.17	1.205	1.20	1.14	1.108
Izod Impact	2.1	0.46	0.42	0.75	1.6	0.76	1.42	1.72	4.4
Tensile Strength	10,010 psi	10,514 psi	7,263 psi	10,080 psi	10,650 psi	7,480 psi	10,676 psi	9,565 psi	5,314 psi
Flexural Strength	15,575 psi	14,438 psi	9,428 psi	13,576 psi	15,445 psi	14,333 psi	16,743 psi	11,100 psi	4,869 psi
Tg (Method)	213°F (DMA)	286°F (TMA)	212°F (TMA)	166°F (TMA)	211°F (TMA)	192°F (TMA)	203°F (TMA)	298°F (DMA)	300°F (DMA)

Rigid Polyurethane Systems for Prototype & Production:

Twin-Tube and Machine Dispense Products

This section describes PTM&W Industries' polyurethane casting systems designed for processing using twin-tube cartridges and machine dispensers, mixed through static mixers.

These products have low mixed-viscosities, short working times and faster demold times, to allow quick cycling of molds. Most products listed here obtain full properties with room-temperature cures.

All products are listed with mix ratios shown by weight and by volume. You will find a page showing recommended static mixers for each product. Other static mixers may be sufficient, but those we suggest have been tested in our applications lab and have been proven to work.

You will find our casting systems to be among the highest performing available on the market. Products like PT8902 and PT8952, with our fast-setting hardeners, generate the highest impact strengths for hard, rigid polyurethanes with room-temperature cures. A few of these products are certified to UL94-V0 flame-retardant specifications, and PT8902 is certified to USP Class-VI requirements.

Some of the same products listed in this group are also shown with slower-setting hardeners in another section called Hand-Cast and Vacuum-Cast Products. Normally, those materials set up too slowly for twin-tube or machine casting, except where you need the extra working time for very large castings.

We suggest using PTM&W urethane-based color dispersions for color-casting. Pigments from other manufacturers may work, but some have proven to be incompatible with our urethanes, resulting in streaking or molted colors or retarded cures and tacky surfaces.

Please contact us at 800 421-1518 or info@ptm-w.com, if you have questions about our products or processing requirements.

Rigid Polyurethanes for Twin-Tube and Machine Dispense Production

PRODUCTS

PT8902

This urethane system is designed to allow you to produce the toughest parts available for prototype applications! It is a low viscosity urethane system with a very useable pot life. PT8902 forms an extremely tough white, opaque solid when cured. PT8902 has a notched Izod impact strength of over 2.0! PT8902 is Certified to USP Class VI requirements.

PT8907

A fast urethane casting system for machine dispensing that provides tough, durable parts with high impact strength. Two hardeners are available: Part B for fast demold at room temperature, and Part B1 for larger parts. Parts B and B1 can be blended for intermediate working times to suit the application. Both hardeners are black. A buff-colored version is available - the part number is PT8909.

PT8908

A fast urethane casting system for machine dispensing. This is a modification of our PT8907, with a longer pot life and lower mixed viscosity, to allow casting of larger parts. It develops strength quickly, and allows fast demold times for more cycles per day. PT8908 is not brittle in thin sections, and its heat resistance is very good.

PT8925

Transparent, water-white urethane casting system that is very useful for the production of tough, impact resistant clear parts. Three hardeners are available for producing various size parts from thin-walls to mass castings. Hardener B3 works well in machine dispensing use. Hardeners B1 and B2 are more appropriate for hand cast and vacuum casting uses. The cured parts have excellent toughness and durability.

PT8917, PT8918 and PT8919

PT8917, PT8918 & PT8919 are very low viscosity, modified polyurethane systems that provide tough cured parts with excellent heat resistance. They have easy-to-measure, 1 to 1 mix ratios for convenient use in dispensing machines or hand-packed cartridges. These products are identical, except for color, for casting versatility: The clean white color of PT8919 and the translucent natural color of PT8918 provide attractive castings, and they are very easy to dye or pigment for a wide variety of colored parts. PT8917 is black in color, and parts made with it have a rich, opaque, deep black appearance. These products have a fast, 60 second gel time, which allows quick demolding of the parts, and more production in a day. Their very low mixed viscosity allows complete mold filling, even though they have a fast setting time.

PT8959

PT8959 is a fast gelling fire retardant system for machine or cartridge dispensing uses. It has a low mixed viscosity that allows easy filling of thin mold areas. This system allows fast demold times for quick mold turnaround and more cycles per day. PT8959 is UL Listed for UL 94 V-0 at 0.12" thickness (UL File No. E238713.

PT8970

PT8970 is a Shore D-70 urethane system that has a high degree of toughness, and excellent stability for this hardness range. It is a good material for various types of tools and fixtures. Panels and parts made with PT8970 have high impact strength and resistance to cracking, for long, durable service. Part B hardener is more suited to hand casting larger parts, and Part B1 is intended for machine and cartridge dispensing. Black versions of both hardeners are available.

PRODUCT SPECIFICATIONS and TYPICAL MECHANICAL PROPERTIES

Note: For full specifications and properties with all of the available hardeners, including recommended curing cycles, refer to the individual product bulletins in the next section of this booklet.

	PT8902	PT8907	PT8908	PT8925	PT8917, PT8918 & PT8919	PT8959	PT8970
Viscosity-Resin	80 - 100 cps	200 cps	200 cps	400 cps	100 cps	200 cps	1250 cps
Viscosity-Hardener	650 cps	1800 cps	1800 cps	1440 cps	2600 cps	1800 cps	1150 cps
Cured Hardness	85 Shore D	79 Shore D	75 Shore D	80 - 85 Shore D	85 Shore D	86 Shore D	70 Shore D
Specific Gravity	1.15	1.143	1.08	1.14	1.16	1.18	1.108
Izod Impact	2.1	1.1	1.13	0.75	0.82	0.68	4.4
Tensile Strength	10,010 psi	5,805 psi	5,407 psi	10,080 psi	8,420 psi	9,030 psi	5,314 psi
Flexural Strength	15,575 psi	8,300 psi	6,759 psi	13,576 psi	11,212 psi	14,401 psi	4,869 psi
Tg (Method)	213°F (DMA)	326°F (DMA)	298°F (DMA)	166°F (TMA)	259°F (DMA)	227°F (DMA)	300°F (DMA)

PT8902
High Impact Urethane
For Prototype & Production Parts

DESCRIPTION

PT8902 is a unique two-component urethane casting system that has very high cured properties, which allow it to produce extremely durable parts and shapes that have very good heat resistance. PT8902 has a notched Izod Impact strength greater than 2.0! It also has a Glass Transition Temperature (Tg) of 213°F. This material will make tough parts!!

Three hardeners with different working times and very low mixed viscosity with PT8902 Part A make it very easy to handle and cast by hand pour or machine casting techniques. The low viscosity fills thin sections and complicated shapes with ease. The cured material is very tough, and it can be demolded from the toughest mold configuration without breaking. The natural white color of PT8902 can be easily tinted or pigmented for a broad range of colored parts. There is a black version of Part B2, for a cured color of black. Try PT8902 on your most difficult parts and see how easily it produces very successful castings that are tougher than any previously available material.

PRODUCT SPECIFICATIONS

	PT8902 Part A	PT8902 Part B	PT8902 Part B1	PT8902 Part B2	ASTM Method
Color	Lt. Amber	Clear	Clear	Clear*	Visual
Viscosity,	80 - 100 cps	650 cps	650 cps	650 cps	D2392
Specific Gravity, gms./cc	1.17	1.11	1.11	1.11	D1475
Mix Ratio	---	100 Parts A to 50 Parts B, B1 or B2**			PTM&W
Pot Life, 4 fl.oz. Mass @ 77°F	---	6 - 7 min.	10 - 12 min	90 seconds	D2471

**The Mix Ratio when using Part B2 Black is 100 Parts A to 60 Parts B2 - Black.

*There is a Black version of Part B2, to provide Black parts. When ordering, specify PT8902 Part B2 - Black.

HANDLING and CURING

With hardeners B, B1 and B2, the two clear components of PT8902 form a tough, white, opaque solid when cured properly. The material needs heat to effect a proper cure. At room temperature, the white color change does not occur, and the optimum physical properties are not obtained. You must give this material some heat to initiate the proper cure structure and achieve correct cross linking, which is indicated by the color change. With the Part B2 - Black, there is no visual cue color change when using it, so heat curing is absolutely mandatory in this case.

The mixed PT8902 should be poured into a warm mold (heated to 110°F - 140°F) and given an initial oven heat cure before demolding. The material can be demolded after a minimum of 2 to 3 hours at 150°F to 160°F, and then the cure can be completed out of the mold. If the part has relatively thick wall sections and has a flat surface it can be positioned on, then it can be post cured unsupported in the oven. However, if there are thin walls or standing sections, the part should be supported on a fixture in the oven for the post cure. It is advisable to support the part in the mold or on a fixture all cases for repeatable good results.

The type and extent of post cure will be determined by the eventual operating parameters of the part. With the proper cure, PT8902 achieves very high impact strength as well as very good heat resistance. The high impact strength properties are achieved with even a low to moderate post cure, but the ultimate Tg (heat resistance) is not achieved unless a proper elevated temperature post cure is utilized.

The ultimate cured properties, as listed in this bulletin, were obtained by the following curing cycle: The mixed material was poured into a mold heated to 130°F, and allowed to gel in a pressure chamber. The mold was placed in an oven and cured for 2 ½ hours at 150°F. The mold was removed from the oven, allowed to cool to 100°F, or below, and the part was demolded without distortion. The part was then cured overnight at 180°F, and the samples were tested 7 days after casting.

Here are the results of various cure schedules, to aid in selecting one to obtain the proper cured properties for the intended application:

Handling & Initial Cure Details	Post Cure Used	Izod	Tg	E′
**Pour into Mold Heated to 130°F, Cure 2-2$^1/_2$ hr @ 150°F, Cool, Demold	Overnight @ 180°F	2.1	213°F	193°F
Pour into Mold Heated to 130°F, Cure 2-2$^1/_2$ hr @ 150°F, Cool, Demold	After 7 Days @ Room Temp.	2.04	192°F	159°F
	Overnight @ 150°F	1.72	205°F	186°F
Pour into Mold Heated to 130°F, Cure 2-2$^1/_2$ hr @ 150°F, Cool, Demold	2 hours @ 180°F	1.6	205°F	184°F
Pour into Mold Heated to 130°F, Cure 2-2$^1/_2$ hr @ 150°F, Cool, Demold	2 hous @ 150°F	1.5	195°F	174°F
Pour into Mold Heated to 160°F, Cure 1 hr @ 160°F, Cool, Demold	After 7 Days @ Room Temp.	2.1	197°F	175°F
**Recommended	2 hr. @ 160°F, then 7 Days @ R.T.	2.1	206°F	187°F

TYPICAL MECHANICAL PROPERTIES

	PT8902 Part A with B, B1 or B2	ASTM Method
Mix Ratio, By Weight	With B, B1 or B2 Natural: 100 Resin to 50 Hardener With Part B2 - Black: 100 Resin to 60 Hardener	PTM&W
Color	White (With Part B2 - Black: Black)	Visual
Mixed Viscosity, centipoise	495 cps	D2393
Working Time, 4 fl. Oz. Mass, @77oF	B:6-7 min., B1:10-12 min., B2:90 sec.	D2471
Cured Hardness, Shore D	85 Shore D	D2240
Specific Gravity, grams, cc	1.15	D1475
Density, lb./cu. Inch lb. / gallon	.0417 9.6 lb. / Gallon	D792
Specific Volume, cu. in./lb.	24.0	
Tensile Strength, psi	10,010 psi	D638
Elongation at Break, %	21.6 %	
Tensile modulus, psi	371,155 psi	
Flexural Strength, psi	15,574 psi	D790
Flexural Modulus, psi	386,612 psi	
Compressive Strength, psi	11,943 psi	D695
Compressive Modulus, psi	357,510 psi	
Izod Impact Strength, ft.lbs./inch of Notch, Method A, Notched	2.1	D256
Glass Transition Temperature, DMA: Tg (Peak) E' (Onset)	213°F 193°F	D4065
Heat Deflection Temperature, @ 64 psi Load	190°F	D648
Coefficient of Thermal Expansion, Range 50°C to 100°C	6.09 x 10^{-5} in/in/^{o}F	D696

PACKAGING WEIGHTS

	Gallon Kit	Pail Kit	Drum Kit
PT8902 Part A	8 lb.	40 lb.	460 lb.
PT8902 Part B, Bi or B2 (Natural)	4 lb.	20 lb.	230 lb.
PT8902 Part B2 (Black)	4.8 lb.	24 lb.	276 lb.

SAFETY and HANDLING

PTM&W urethane products are made from raw materials carefully chosen to minimize or even eliminate toxic chemicals, and therefore offer the user high performance products with minimum hazard potential when properly used. Generally, the PTM&W urethane resins and hardeners will present no handling problems if users exercise care to protect the skin and eyes, and if good ventilation is provided in the work areas. However, breathing of mist or vapors may cause allergenic respiratory reaction, especially in highly sensitive individuals. As such, avoid contact with eyes and skin, and avoid breathing vapors. Wear protective rubber apron, clothing, nitrile rubber gloves, face shield or other items as required to prevent contact with the skin. In case of skin contact, immediately wash with soap and water, followed by a rinse of the area with vinegar, and then a further wash with soap and water. The vinegar will neutralize the hardener and lessen the chances of long term effects. Use goggles, a face shield, safety glasses or other items as required to prevent contact with the eyes. If material gets into the eyes, immediately flush with water for at least 15 minutes and call a physician. Generally, keep the work area as uncluttered and clean as possible, and clean up any minor spills immediately to prevent accidental skin contact at a later time. Keep tools clean and properly stored. Dispose of trash and empty containers properly. Do not use any of these types of products until Material Safety Data Sheets have been read and understood.

PT8902 Bulletin / InDesign / 041414-C4

PTM&W Industries, Inc.
10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

Tough, High-Strength Casting System Using PT8902 Urethane and Selected Reinforcing Filler

DESCRIPTION

PT8902 is a unique two-component urethane casting system that has very high cured properties - particularly impact strength. PT8902 has a notched Izod Impact Strength greater than 2.0. By itself, PT8902 produces very tough, impact resistant parts.

In situations where greater part stiffness is required, by the addition of certain reinforcing fillers PT8902 can produce castings that have a very high Flexural Modulus. When these fillers are incorporated into PT8902 castings, the resulting parts have much improved stiffness and excellent impact resistance. This allows the user to produce parts with the strengths to perform in the most demanding prototype and production applications.

FILLER TYPE AND SOURCES

Fiberglass milled fibers are E-glass filaments hammer-milled to various densities. Unlike chopped strands, which are chopped to a precise strand length, milled fibers are milled to an average bulk density, which is determined by the input glass and process conditions.

Milled fibers are available in sizes of $^1/_8$", $^1/_{16}$" and $^1/_{32}$". The $^1/_{32}$" size has proven to be the better for adding to PT8902, as the $^1/_8$" and $^1/_{16}$" fibers cause an unacceptably high viscosity. When using the $^1/_{32}$" fibers, a good pourable viscosity is maintained, and the mold can be filled with a minimum of air entrapment. Milled fibers are available with sizing that is compatible with thermosetting resins. The sizing improves the resin wet-out and adhesion to the fibers. The proper selection of sizing can make significant improvements in the final properties of the finished part.

The properties listed in this bulletin were derived by using PT8902 casting system with two commercially available milled fiber products. These milled fibers are treated with a sizing that gives excellent performance with thermosetting resins such as PT8902. These fibers are:

Product Number	7216M	731 ED $^1/_{32}$"
Supplier	Fibertec, Inc.	Fiberglass Services
Address	35 Scotland Blvd. Bridgewater, MA 02324 PH: 508-697-5100 FAX: 508-697-7140 www.fibertecins.com	Fiberglass Services, Inc. 15331 S. Avalon Blvd. Gardena, CA 90248 310-327-0080 FAX: 310-327-0060 Contact: Tammy Wiswell

HANDLING and CURING

Considering the effects on handling and cured properties, the optimum filler loading of PT8902 appears to be 25% on system. This translates to 100 Parts Resin to 50 Parts Filler to 50 Parts Hardener BY WEIGHT. The milled fiber should be added to the resin, to have a better, more liquid viscosity, than if it were added to the hardener component.

The technique is to add the 50 Parts Milled Fibers to the 100 Parts PT8902 Resin, stir thoroughly, and deair the mixture. At the time of pouring, the proper amount of PT8902 hardener is added to the premixed resin and fiber, mixed thoroughly, and cast into the mold. The casting is then cured according to the schedule outlined on the PT8902 Product Bulletin.

It is recommended that only the amount of material needed to cast at the moment be mixed and used at the same time. If a "Master Batch" of fiber filled resin is going to be made up in advance of casting, additional precautions must be undertaken. First, the milled fibers have a huge surface area per volume, and can attract moisture to the surface. This moisture attached to the fibers can cause problems as the resin/fiber mixture sits around before curing. Reaction with the resin in storage and/or foaming during cure are possible when excess moisture is present. Second, when mixed into the resin in advance, the milled fibers can settle out to a relative hard pack in storage. This hard settled layer of fibers must be thoroughly stirred back into the resin before mixing the material to pour.

HANDLING and CURING, Continued

Since the milled fibers can entrap atmospheric moisture in storage, it is advisable to dry the milled fiber before use. It is mandatory to dry the fibers if a "Master Batch" is to be produced, as the moisture will have a longer time to react with the resin in storage in this instance. The milled fibers used to develop the properties in this bulletin were dried overnight in a 180°F oven before use. Several hours and preferably overnight in a 170°F - 180°F oven before use are recommended.

The mix ratio for a system to be used at the time would be 100 Parts PT8902 Part A to 50 Parts Milled Fibers to 50 Parts PT8902 Part B, BY WEIGHT.

If a "Master Batch" is to be used, the mix ratio would be 100 Parts Resin/Milled Fibers Mixture to 33 Parts PT8902 Part B, BY WEIGHT.

IT IS ESSENTIAL TO MIX THESE MATERIALS BY WEIGHT TO INSURE THAT THE BEST HANDLING, THE PROPER CURED PROPERTIES AND REPEATABLE RESULTS ARE OBTAINED.

TYPICAL MECHANICAL PROPERTIES

	PT8902 A/B Casting System with:		ASTM Method
	Fibertec 7216M	OC 731 ED 1/32"	
Mix Ratio, Resin:Filler:Hardener, By Weight	100 : 50 : 50	100 : 50 : 50	PTM&W
Pot Life, @ 77°F	9 - 10 minutes	9 - 10 minutes	D2471
Mixed Viscosity, @ 77°F, centipoise	2,000 cps	1,200 cps	D2393
Cured Hardness, Shore D	87 Shore D	87 Shore D	D2240
Specific Gravity, grams, cc	1.2 - 1.25	1.2 - 1.25	D1475
Tensile Strength, psi	10,686 psi	5,805 psi	D638
Tensile modulus, psi	627,944 psi	567,900 psi	D638
Flexural Strength, psi	19,170 psi	12,265 psi	D790
Flexural Modulus, psi	821,583 psi	641,315 psi	D790
Compressive Strength, psi	14,477 psi	Not Tested	D695
Compressive Modulus, psi	547,922 psi	Not Tested	D695
Izod Impact Strength, Method A, Notched	.82	1.19	D256
Glass Transition Temp., DMA: Tg	219°F	222°F	D4065

SAFETY and HANDLING

PTM&W epoxy products are made from raw materials carefully chosen to minimize or even eliminate toxic chemicals, and therefore offer the user high performance products with minimum hazard potential when properly used. Generally, the PTM&W epoxy resins and hardeners will present no handling problems if users exercise care to protect the skin and eyes, and if good ventilation is provided in the work areas. However, all epoxy resins and hardeners can be irritating to the skin, and prolonged contact may result in sensitization; and breathing of mist or vapors may cause allergenic respiratory reaction, especially in highly sensitive individuals. As such, avoid contact with eyes and skin, and avoid breathing vapors. Wear protective rubber apron, clothing, gloves, face shield or other items as required to prevent contact with the skin. In case of skin contact, immediately wash with soap and water, followed by a rinse of the area with vinegar, and then a further wash with soap and water. The vinegar will neutralize the hardener and lessen the chances of long term effects. Use goggles, a face shield, safety glasses or other items as required to prevent contact with the eyes. If material gets into the eyes, immediately flush with water for at least 15 minutes and call a physician. Generally, keep the work area as uncluttered and clean as possible, and clean up any minor spills immediately to prevent accidental skin contact at a later time. Keep tools clean and properly stored. Dispose of trash and empty containers properly.

Do not use any of these types of products until Material Safety Data Sheets have been read and understood.

PT8902 w/Fillers Bulletin / ZW-38 / 012907-C1

PTM&W Industries, Inc.
10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

PT8907

TOUGH, HEAT RESISTANT URETHANE for PROTOTYPE and PRODUCTION PARTS

DESCRIPTION

PT8907 is a low viscosity, modified polyurethane system designed for machine dispensing applications for the fast, efficient production of tough, durable castings and parts. It has a low mixed viscosity which allows easy mold filling into thin sections with low pressure. It develops strength very quickly, and allows fast demold times for more cycles per day. The cured material is very tough and can be demolded without fear of breakage. It is not brittle in thin sections! The heat resistance of PT8907 is very good. It has a high heat distortion temperature - even with only a room temperature cure. A much broader range of part types can be considered with PT8907, as it will withstand exposure to heat better than other materials of this type. PT8907 is a tougher, more versatile product than previously available materials for this application.

The PT8907 Part B1 hardener provides a longer working life system that is designed for casting thicker wall sections and larger parts. The longer pot life of this system allows these larger castings to be made with minimum shrinkage in the finished part. Since they have the same mix ratio, the PT8907 standard Part B and the B1 hardener can be blended for intermediate working and cure times to suit the sizes of different parts.

Among the advantages that PT8907 offers the user are:

Low Mixed Viscosity - Excellent Flow for Low Pressure Molding

Faster Demold Time - Under 10 Minutes - Faster Production Rates!

Low Cured Shrinkage

Toughness Developed Quickly for Demolding Without Breakage

Extremely Tough Cured Properties - Excellent in Thin Sections

Easy to Color with Standard Dyes and Pigments

Very High Heat Resistance - Glass Transition Temperature is 326°F!

PRODUCT SPECIFICATIONS

	PT8907 Part A	PT8907 Part B	PT8907 Part B1	ASTM Method
Color	Tan	Black	Black	Visual
Viscosity, centipoise, @ 77°F	200 cps	1,800 cps	2,000 cps	D2392
Specific Gravity, gms./cc	1.24	1.02	1.05	D1475
Mix Ratio		80A to 100B By Wt.;	67A to 100B By Vol.	PTM&W
Pot Life, 4 fl.oz. Mass @ 77°F		45 - 55 sec.	10 minutes	D2471

HANDLING and CURING

PT8907 is capable of curing at room temperature, however, it is usually cured at elevated temperatures for faster production rates and better cured properties. The system develops toughness rapidly in the mold, so it can be demolded without breakage quickly - as soon as 10 minutes for some part configurations. The part is then allowed to cure, either at ambient temperatures or with heat. In all curing situations, parts should be allowed to cure with a minimum of applied stress, to prevent distortion. If the part has a flat side, or surface upon which it can rest during cure, it is usually not necessary to utilize holding fixtures for room temperature curing. If the part design is such that there is no good base or flat plane on which it can sit, then some sort of fixture is probably a good idea. Full properties are developed with a room temperature cure in 6 to 7 days, though for many applications, sufficient cure for service is achieved sooner than this. Part size, shape and thickness all influence the cure rate, so evaluation is necessary to determine the exact amount of room temperature cure necessary. For applications that require the maximum cured properties, a heat cure is necessary to achieve the best results. A heat cure is mandatory for applications where parts will be subjected to elevated temperatures in service. After the part is demolded at room temperature, it should be allowed to stabilize for a period of time, then oven cured in a supported condition. Recommended oven cure cycles are: [A] Overnight (14 to 16 hours) at 175°F, or, [B] 4 hours at 175°F (80°C), plus 4 hours at 212°F (100°C). The PT8907 Part B1 hardener cures very similar to the Part B hardener, with slightly longer demold times, due to the longer pot life of the system. Inasmuch as the B1 hardener is intended for larger, thicker parts; the heavier cross sections will somewhat offset the longer cure time of the B1 hardener, giving cure cycles very much like the Part B hardener.

TYPICAL MECHANICAL PROPERTIES

	PT8907 A / B		PT8907 A/B1	ASTM Method
	7 Days @ R.T. Cure	14 Hrs.@ 175°F Cure	R.T. Cure	
Color	Black			Visual
Working Time, 4 fl. Oz. Mass, @77oF	45 - 55 seconds		10 minutes	D2471
Cured Hardness, Shore D	78 Shore D	79 Shore D	84 Shore D	D2240
Linear Shrinkage, inch / inch Mold #0 (.5" Radius x 10", .017Gal.) Mold #1 (.875" Radius x 10", .053Gal.)	.0090 .0129	.0099 .0144		D2566
Specific Gravity, grams, cc	1.11		1.13	D1475
Tensile Strength, psi	5,120 psi	5,805 psi	7,550 psi	D638
Elongation at Break, %	7.6 %	8.1 %	3.6 %	
Tensile modulus, psi	159,660 psi	159,359 psi	302,250 psi	
Flexural Strength, psi	7,700 psi	8,300 psi	12,865 psi	D790
Flexural Modulus, psi	185,712 psi	196,834 psi	339,024 psi	
Compressive Strength, psi	22,400 psi	25,180 psi	27,300 psi	D695
Izod Impact Strength, ft.lbs./inch of Notch, Method A, Notched	1.10	1.10	1.15	D256
Glass Transition Temperature, DMA:Tg (Peak)	304°F	326°F	245°F	D4065
Heat Deflection Temperature, @ 66 psi Load @ 264 psi Load	258°F 232°F	292°F 260°F		D648
Coef. of Thermal Expansion, Range 30°C to 60°C	7.02 x 10^{-5} in./in./ °F	6.93 x 10^{-5} in./in./ °F		D696

PACKAGING WEIGHTS

	Gallon Kit	Pail Kit	Drum Kit
PT8907 Part A	6.4 lb.	32 lb.	360 lb.
PT8907 Part B or B1	8 lb.	40 lb.	450 lb.
Kit	14.4 lb.	72 lb.	810 lb.

SPECIAL INFORMATION

As mentioned, the PT8907 hardeners Part B and Part B1 can be blended to provide intermediate working times for different sizes of parts. The chart below gives the pot life for various blends of PT8907 B and B1 hardeners.

% PT8907 B	100	75	50	25	20	15	10	5	---
% PT8907 B1	---	25	50	75	80	85	90	95	100
Pot Life @ 77°F	45 sec.	1 min.	1.5 min.	3 min	4 min 10 sec	5.5 min.	7 min.	8.5 min.	10 min.

SAFETY and HANDLING

PTM&W urethane products are made from raw materials carefully chosen to minimize or even eliminate toxic chemicals, and therefore offer the user high performance products with minimum hazard potential when properly used. Generally, the PTM&W urethane resins and hardeners will present no handling problems if users exercise care to protect the skin and eyes, and if good ventilation is provided in the work areas. However, breathing of mist or vapors may cause allergenic respiratory reaction, especially in highly sensitive individuals. As such, avoid contact with eyes and skin, and avoid breathing vapors. Wear protective rubber apron, clothing, nitrile rubber gloves, face shield or other items as required to prevent contact with the skin. In case of skin contact, immediately wash with soap and water, followed by a rinse of the area with vinegar, and then a further wash with soap and water. The vinegar will neutralize the hardener and lessen the chances of long term effects. Use goggles, a face shield, safety glasses or other items as required to prevent contact with the eyes. If material gets into the eyes, immediately flush with water for at least 15 minutes and call a physician. Generally, keep the work area as uncluttered and clean as possible, and clean up any minor spills immediately to prevent accidental skin contact at a later time. Keep tools clean and properly stored. Dispose of trash and empty containers properly. Do not use any of these types of products until Material Safety Data Sheets have been read and understood.

PT8907 Bulletin / InDesign / 110811-C1

PTM&W Industries, Inc.
10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

PT8908

Black Heat Resistant Urethane for Prototype and Production Parts

DESCRIPTION

PT8908 is a low viscosity, modified polyurethane system designed for machine dispensing applications for the fast, efficient production of tough, durable castings and parts. This system is a modification of our PT8907, and has a longer pot life with lower viscosity, to allow the casting of larger parts. It has a low mixed viscosity which allows easy mold filling into thin cross-sections with low pressure. It develops strength very quickly, and allows fast demold times for more cycles per day.

The cured material is very tough and can be demolded without fear of breakage. It is not brittle in thin sections! The heat resistance of PT8908 is very good, therefore, a broad range of part types can be considered with PT8908, as it will withstand exposure to heat better than other materials of this type. PT8908 is a tougher, more versatile product than previously available materials for this application.

PRODUCT SPECIFICATIONS

	PT8908 Part A	PT8908 Part B or B1 *	ASTM Method
Color	Dark Amber	Part B-Black, Part B1-Natural	Visual
Viscosity,	240 cps	2,000 cps	D2392
Specific Gravity, gms./cc	1.19	1.01	D1475
Mix Ratio		80A to 100B By Wt.; 67A to 100B By Vol.	PTM&W
Pot Life, 4 fl.oz. Mass @ 77°F		70 - 75 seconds	D2471

* Two Parts B are available for use with PT8908: Part B is Black, for a glossy, rich black part; Part B1 is natural to allow easier pigmenting for various colored parts. Cured properties are the same with both hardener

HANDLING and CURING

PT8908 is capable of curing at room temperature, however, it is usually cured at elevated temperatures for faster production rates and better cured properties. The system develops toughness rapidly in the mold, so it can be demolded without breakage quickly -- as soon as 10 minutes for some part configurations. The part is then allowed to cure, either at ambient temperatures or with heat. In all curing situations, parts should be allowed to cure with a minimum of applied stress, to prevent distortion. If the part has a flat side, or surface upon which it can rest during cure, it is usually not necessary to utilize holding fixtures for room temperature curing. If the part design is such that there is no good base or flat plane on which it can sit, then some sort of fixture is probably a good idea.

Full properties are developed with a room temperature cure in 6 to 7 days, though for many applications, sufficient cure for service is achieved sooner than this. Part size, shape and thickness all influence the cure rate, so evaluation is necessary to determine the exact amount of room temperature cure necessary. For applications that require the maximum cured properties, a heat cure is necessary to achieve the best results. A heat cure is mandatory for applications where parts will be subjected to elevated temperatures in service. After the part is demolded at room temperature, it should be allowed to stabilize for a period of time, then oven cured in a supported condition. Recommended oven cure cycles are: [A] Overnight (14 to 16 hours) at 175°F, or, [B] 4 hours at 175°F (80°C), plus 4 hours at 212°F (100°C).

TYPICAL MECHANICAL PROPERTIES

	PT8908 A / B or B1	ASTM Method
Mix Ratio, By Weight By Volume	80A to 100B By Weight 67A to 100B By Volume	PTM&W
Color	With Part B-Black; With B1-Natural	Visual
Working Time, 4 fl. Oz. Mass, @77oF	70 - 75 seconds	D2471
Cured Hardness, Shore D	75 Shore D	D2240
Specific Gravity, grams, cc	1.08	D1475
Density, lb./cu. Inch lb. / gallon	.0393 9.07	D792
Specific Volume, cu. in./lb.	25.5	
Tensile Strength, psi	5,407 psi	D638
Elongation at Break, %	7.3 %	
Tensile modulus, psi	175,257 psi	
Flexural Strength, psi	6,759 psi	D790
Flexural Modulus, psi	171,605 psi	
Compressive Strength, psi	7,190 psi	D695
Compressive Modulus, psi	547,500 psi	
Izod Impact Strength, ft.lbs./inch of Notch, Method A, Notched	1.13	D256
Glass Transition Temperature, DMA: Tg (Peak)	298°F	D4065
Heat Deflection Temperature, @ 66 psi Load @ 264 psi Load	248°F 207°F	D648
Coefficient of Thermal Expansion, Range 50°C to 100°C	8.56 x 10^{-3} in./ in./ ^{o}F	D696

PACKAGING WEIGHTS

	Gallon Kit	Pail Kit	Drum Kit
PT8908 Part A	6.4 lb.	32 lb.	360 lb.
PT8908 Part B or B1	8 lb.	40 lb.	450 lb.
Kit	14.4 lb.	72 lb.	810 lb.

SAFETY and HANDLING

PTM&W urethane products are made from raw materials carefully chosen to minimize or even eliminate toxic chemicals, and therefore offer the user high performance products with minimum hazard potential when properly used. Generally, the PTM&W urethane resins and hardeners will present no handling problems if users exercise care to protect the skin and eyes, and if good ventilation is provided in the work areas. However, breathing of mist or vapors may cause allergenic respiratory reaction, especially in highly sensitive individuals. As such, avoid contact with eyes and skin, and avoid breathing vapors. Wear protective rubber apron, clothing, nitrile rubber gloves, face shield or other items as required to prevent contact with the skin. In case of skin contact, immediately wash with soap and water, followed by a rinse of the area with vinegar, and then a further wash with soap and water. The vinegar will neutralize the hardener and lessen the chances of long term effects. Use goggles, a face shield, safety glasses or other items as required to prevent contact with the eyes. If material gets into the eyes, immediately flush with water for at least 15 minutes and call a physician. Generally, keep the work area as uncluttered and clean as possible, and clean up any minor spills immediately to prevent accidental skin contact at a later time. Keep tools clean and properly stored. Dispose of trash and empty containers properly. Do not use any of these types of products until Material Safety Data Sheets have been read and understood.

PT8908 Bulletin / InDesign / 110811-C1

PTM&W Industries, Inc.
10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

PT8917, PT8918 & PT8919 Urethanes for Prototype and Production Parts

DESCRIPTION

PT8917, PT8918 & PT8919 are very low viscosity, modified polyurethane systems that provides tough cured parts with excellent heat resistance. They have an easy-to-measure, 1 to 1 mix ratio for convenient use in dispensing machines or hand-packed cartridges. These products are identical, except for color, for casting versatility: The clean white color of PT8919 and the translucent natural color of PT8918 provide attractive castings, and they are very easy to dye or pigment for a wide variety of colored parts. PT8917 is black in color, and parts made with it have a rich, opaque, deep black appearance. These products have a fast, 60 second gel time, which allows quick demolding of the parts, and more production in a day. Their very low mixed viscosity allows complete mold filling, even though they have a fast setting time.

PRODUCT SPECIFICATIONS

	PT8917, 18 & 19 Part A	PT8917, 18 & 19 Part B	ASTM Method
Color	Amber	PT8917-Black; PT8918-Translucent; PT8919-White	Visual
Viscosity, @ 77°F, centipoise	100 cps	2600 cps	D23932
Specific Gravity, gms./cc	1.20	1.04	D1475
Mixing Ratio	100 : 85 By Weight;	100 : 100 By Volume	PTM&W
Pot Life, 4 fl. Oz. Mass @ 77°F	60 - 70 seconds		D2471

HANDLING and CURING

PT8917, PT8918 & PT8919 will cure completely at room temperature, and they can be cured at elevated temperatures for faster production rates. The systems develop toughness rapidly in the mold, and can be demolded without breakage quickly - as soon as 15 minutes for most part configurations. After demolding, the part is allowed to complete the cure, either at ambient temperature or with heat. In all curing situations, parts should be allowed to cure with a minimum of applied stress, to prevent distortion. If the part has a flat side, or surface upon which it can rest during cure, it is usually not necessary to utilize holding fixtures for room temperature curing. If the part design is such that there is no good base or flat plane on which it can sit, then some sort of fixture is probably a good idea.

Full properties are developed with a room temperature cure in 6 to 7 days, though for many applications, sufficient cure for service is achieved sooner than this. Part size, shape and thickness all influence the cure rate, so evaluation is necessary to determine the exact amount of room temperature cure necessary. For applications that require the maximum cured properties, a heat cure is necessary to achieve the best results. A heat cure is mandatory for applications where parts will be subjected to elevated temperatures in service. After the part is demolded at room temperature, it should be allowed to stabilize for a period of time, then oven cured in a supported condition. Recommended oven cure cycles are: (A) Overnight (14 to 16 hours) at 175°F , or, (B) 4 hours at 175°F (80°C), plus 4 hours at 212°F (100°C).

PACKAGING WEIGHTS

	Gallon	Pail	Drum
PT8917, PT8918 or PT8919 Part A	10 lb.	45 lb.	440 lb.
PT8917, PT8918 or PT8919 Part B	8.5 lb.	38.5 lb.	375 lb.
Kit	18.5 lb.	83.5 lb.	815 lb.

TYPICAL MECHANICAL PROPERTIES

	PT8917, PT8918 and PT8919 A/B	ASTM Method
Mixing Ratio	100 : 85 By Weight; 100 : 100 By Volume	PTM&W
Color	PT8917-Black; PT8918-Translucent; PT8919-White	Visual
Gel Time, 4 fl. Oz. Mass, @77°F	60 - 70 seconds	D2471
Demold Time (1/8" Thick): Room Temp Cure 40°C to 60°C Cure	15 - 30 minutes 5 minutes	PTM&W
Cured Hardness, Shore D	85 Shore D	D2240
Shrinkage, in/in, Mold Number 0, Volume: .017 gallon	.015	D2566
Specific Gravity, grams, cc	1.16	D1475
Density, lb./cu. Inch	.0420	D792
Specific Volume, cu. in./lb.	23.8	D792
Izod Impact Strength, ft.-lbs./in. of Notch Method A	0.82	D256
Tensile Strength, psi	8,420 psi	D638
Elongation at Break, %	7.2 %	
Tensile modulus	274,110 psi	
Flexural Strength	11,212 psi	D790
Flexural Modulus	282,790 psi	
Compressive Strength	10,560 psi	D695
Glass Transition Temperature, Tg, DMA	259°F	D4065
Heat Deflection Temperature @ 66 psi @ 264 psi	252°F 236°F	D648
Coefficient of Thermal Expansion	6.95×10^{-5} in./in./ °F	D696

SAFETY and HANDLING

PTM&W urethane products are made from raw materials carefully chosen to minimize or even eliminate toxic chemicals, and therefore offer the user high performance products with minimum hazard potential when properly used. Generally, the PTM&W epoxy resins and hardeners will present no handling problems if users exercise care to protect the skin and eyes, and if good ventilation is provided in the work areas. However, breathing of mist or vapors may cause allergenic respiratory reaction, especially in highly sensitive individuals. As such, avoid contact with eyes and skin, and avoid breathing vapors. Wear protective rubber apron, clothing, nitrile rubber gloves, face shield or other items as required to prevent contact with the skin. In case of skin contact, immediately wash with soap and water, followed by a rinse of the area with vinegar, and then a further wash with soap and water. The vinegar will neutralize the hardener and lessen the chances of long term effects. Use goggles, a face shield, safety glasses or other items as required to prevent contact with the eyes. If material gets into the eyes, immediately flush with water for at least 15 minutes and call a physician. Generally, keep the work area as uncluttered and clean as possible, and clean up any minor spills immediately to prevent accidental skin contact at a later time. Keep tools clean and properly stored. Dispose of trash and empty containers properly. Do not use any of these types of products until Material Safety Data Sheets have been read and understood.

PT8917-18-19 Bulletin / ZW-38 /1022 03-C1

PTM&W Industries, Inc.

10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

PT8925
HARD TRANSPARENT URETHANE

DESCRIPTION

PT8925 is a transparent, water-white urethane casting system that is useful for the production of tough, impact resistant clear parts. Three different hardeners that have different gel times are available for use with this resin, for either thin walled parts or mass castings. The PT8925 B1 and PT8925 B2 hardeners are intended for the production of small parts or those with thinner walls. PT8925 B1 has a 90 second gel time, and PT8925 B2 has a 10-12 minute gel time. The B1 and B2 hardeners can be blended to provide intermediate gel times for optimum results in different wall thicknesses and part sizes. PT8925 Part B3 has a 45 to 50 minute gel time, and is suitable for the production of large parts with heavy cross sections. The slower setting time of hardener B3 provides lower shrinkage in thicker sections, to maintain dimensional stability and good clarity in the finished parts. PT8925 B3 is the usual choice for hand mixing and pouring parts, as its longer gel time allows sufficient time to thoroughly mix, deair and pour by hand. PT8925 B2 can be hand mixed and poured when smaller parts are involved. With either of these three hardeners, parts made with PT8925 exhibit an excellent water-white appearance with no distortion. The cured material is hard, tough and very durable. It can be polished to a gloss finish with ease. PT8925 has higher heat resistance than is normally achieved with clear urethanes, so it is able to operate in more harsh environments than previous materials of this type. As urethanes typically exhibit less severe attack on silicone molds, longer life can be expected with the mold than with epoxy casting systems, for lower overall mold costs.

Typical applications for PT8925 include:

- **High Volume, Machine Dispensed, Heat Cured Production Parts**
- **Hand Poured, Room Temperature Cured Parts**
- **Preproduction Prototypes**
- **Thin Wall Clear Parts with Good Toughness**
- **Prototype Die Segments To Observe Material Flow**
- **Transparent Colored Parts, with The Addition of Dyes**

PRODUCT SPECIFICATIONS

	PT8925 A	PT8925 B1	PT8925 B2	PT8925 B3	ASTM Method
Color	Clear	Clear	Clear	Clear	Visual
Viscosity, @ 77°F, centipoise	400 cps	1440 cps	1440 cps	1440 cps	D2392
Specific Gravity, gms./cc	1.11	1.07	1.07	1.07	D1475
Pot Life, 4 fl. Oz. Mass @ 77°F		90 seconds	10 - 12 min.	45 - 50 min.	PTM&W
Mixing Ratio		100 : 60 By Weight;	1.6 to 1 By Volume		D2471

HANDLING and CURING

When the PT8925 Part A is mixed together with any of the Part B hardeners, they form an opaque white liquid. As various components begin to react, the mixture begins to change to a water-clear liquid. This change usually takes approximately one-half of the pot life. When mixing and pouring parts by hand, certain steps should be taken to insure clear, void free cast parts. The PT8925 resin and hardener should be mixed thoroughly for the first five minutes after combining. A complete mix is necessary to prevent streaks or mix lines in the finished casting. Wood and paper mixing gear should be avoided, as they might introduce contaminants and/or moisture into the mix, and ruin the casting. Even the smallest dirt and dust particles detract considerably from the appearance of a finished transparent casting. Use metal or plastic mixing apparatus and containers to minimize the chance of contaminants. It is best to degas PT8925 before the mixture clears, or the air bubbles become more difficult to remove. After degassing, the mixed PT8925 should be periodically stirred until the mixture clears, and then immediately poured into the mold. After the PT8925 is poured, it is advisable to vacuum the material in the mold, or, place the mold in a pressure chamber, if available.

HANDLING and CURING, cont'd

PT8925 will cure completely at room temperature with hardener B1. When either hardeners B2 or B3 are used, the mixture should be heat cured for more realistic production rates. With hand cast parts, that have heavy cross sections, the material should be allowed to gel at room temperature before heat curing. In those cases, the parts should be allowed to cure at room temperature for 6 to 8 hours, after which they can be placed in an oven to complete the cure. Typical heat cure cycles for urethanes are 4 to 6 hours at 140°F to 165°F. When using hardener B1 and machine dispensing for production applications, in which the material is deaired when cast, the material can be injected into the mold, and then placed into an oven immediately for curing. The dispensing machine is sealed, so no contaminants will be introduced into the PT8925 before it enters the mold, and the material is deaired when dispensed, so there will not be any air voids in the part as it cures. The B1 hardener cross-links so quickly that the opaque white phase does not occur, and therefore the immediate heat cure is possible with no streaking, as might occur with hardeners B2 or B3. The typical urethane curing schedule can be used for guidelines, and an optimum heat cure can be arrived at by experimentation, determined by part volume and configuration, mold materials and construction, etc.

TYPICAL MECHANICAL PROPERTIES

	PT8925A w/ PT8925 B1, B2 or B3	ASTM Method
Color	Transparent, Water-White	Visual
Mixed Viscosity, @77°F, centipoise	1100 cps	D2393
Cured Hardness, Shore D	80 - 85D	D2440
Specific Gravity, grams / cc	1.14	D1475
Density, pounds/cubic inch	.0413 lb./cu. in.	D792
Specific Volume, cubic inches / pound	24.2 cu. in. / lb.	
Tensile Strength, psi	10,080 psi	D638
Elongation at Break, %	41 %	
Tensile Modulus, psi	69,720 psi	
Flexural Strength, psi	13,576 psi	D790
Flexural Modulus, psi	3.52×10^5 psi	
Compressive Strength, psi	11,010 psi	D695
Compressive Modulus, psi	3.63×10^5 psi	
Glass Transition Temperature (Tg)	166°F	TMA
Coefficient of Thermal Expansion, Range: 100°F to 150°F	4.94×10^{-5} inch/inch/°F	D696

SPECIAL INFORMATION

PT8925 hardeners B1 and B2 can be blended to provide a range of gel times from 90 seconds to 12 minutes. This is useful for "tailoring" the system to specific wall thicknesses and cross sections for optimum cure time and minimum shrinkage. The table below shows the effects on the gel time of various blends of these two hardeners.

% Hardener B1	100	75	50	25	20	15	10	5	0
% Hardener B2	0	25	50	75	80	85	90	95	100
Gel Time, minutes	1.5 min.	2 min.	3 min.	4.5 min.	5.5 min.	6.5 min.	7.5 min.	9 min.	11 min.

PACKAGING WEIGHTS

	Quart Kit	Gallon Kit	Pail Kit	Drum Kit
PT8925 A	1.7 lb.	7.5 lb.	45 lb.	440 lb.
PT8925 B1, B2 or B3	1 lb.	4.5 lb.	27 lb.	264 lb.
Kit	2.7 lb.	12 lb.	72 lb.	704 lb.

PT8925 Bulletin / ZW-38 / 102103-C1

PTM&W Industries, Inc.
10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

PT8948 & PT8949
Tough Urethanes for Part Production by Hand Pouring or Machine Casting

DESCRIPTION

PT8948 and PT8949 are hard rigid urethanes designed specifically for hand pouring or mechanized casting of larger parts. These products have volumetric mix ratios of 1 to 1 and 2 to 1, which will also allow convenient dispensing through twin-tube mixers. Their very low mixed viscosities allow easy vacuum degassing, and make them readily pourable into complicated molds, where they give good reproduction of fine details. PT8948 cures to a translucent solid, and PT8949 cures to a brilliant opaque white, but since no pigments are incorporated into them, both systems can be easily colored. A significant benefit of these systems is that they have quick demolding times in relation to their working times. These materials reach full properties with a room temperature cure. PT8949 cures to a hardness of 70-75 Shore D, and PT8948's hardness is 80-82 Shore D. Proper selection between the two systems allows the simulation of a wide range of thermoplastic shapes and parts. PT8948 and PT8949 are ideal for casting prototypes to simulate molded parts, proof testing of injection molding cavities, industrial models, holding fixtures and high performance production parts.

FEATURES and BENEFITS

- **Versatile Processing Parameters: Hand Pour, Vacuum Casting Machine or Cartridges**
- **Very Low Viscosities Fill Molds & Pick Up Details Easily**
- **Easy-To-Use Volumetric Mix Ratios - Ideal for Dispenser or Cartridges**
- **Easily Colored With Tints or Pigments**
- **Rapid Demold & Full Properties - All At Room Temperature!**

PRODUCT SPECIFICATIONS

	PT8948 Part A	PT8948 Parts B & B1	PT8949 Part A	PT8949 Parts B & B1	Test Method
Color	Lt. Amber	Translucent	Light Amber	Clear	Visual
Viscosity, @77°F, centipoise	80 cps	900 cps	100 cps	1300 cps	ASTM D2393
Specific Gravity, gms./cc	1.18	1.05	1.10	1.06	ASTM D1475
Mix Ratio	100 : 88 By Weight 100 : 100 By Volume		100 : 50 By Weight or Volume		PTM&W
Pot Life, 4 fl. Oz. Mass @ 77°F	Part B: 6 min. Part B1: 12 min.		Part B: 5 - 5 ½ min. Part B1: 11-12 min.		ASTM D2471

HANDLING and CURING

PT8948 and PT8949 will cure completely at room temperature. Two hardeners are available for each system that provide two different working times for each, and thereby allow the versatility to complete more types of applications. The Parts B of these systems have working times of 5 to 6 minutes. Demold time for castings with the Part B hardeners, in typical prototype part cross sections, is usually one hour or less. When using the Parts B1 for these systems, a working time of 12 to 13 minutes is available. This longer gel time allows the material to be used in mechanical casting machines where more time is needed for mixing, deairing and casting. The Parts B1 are also helpful for larger parts, where the slower cure and lower shrinkage are big advantages. Demold time for castings with the Part B1 hardeners, in typical prototype part cross sections, is usually one to two hours. With all hardeners, PT8948 and PT8949 castings will develop strength sufficient for most applications in 18 to 24 hours at 77°F, and ultimate properties are reached in 4 to 7 days at room temperature. Oven curing can accelerate full cured properties, but some fixturing may be required. The time of an oven cure will depend upon the curing temperature; for example: 4 to 6 hours at 120°F, or 2 to 3 hours at 150°F. Precise minimum oven curing times should be determined in the field, as it is influenced by many variables, such as: part size and configuration, mold material and construction, casting method, heat source and type and others. Heat curing will induce a slight increase in the heat stability of the material.

TYPICAL MECHANICAL PROPERTIES

	PT8948A With B or B1		PT8949A With B or B1		Test Method
	RT Cure	150°F Cure	RT Cure	150°F Cure	
Mix Ratio	100 : 88 By Weight 100 : 100 By Volume		100 : 50 By Wt. or Volume		PTM&W
Color	Natural Translucent		White		Visual
Mixed Viscosity, @77°F, centipoise	250 cps		200 cps		ASTM D2393
Working Time, 4 fl. Oz. Mass, @77°F	B: 6 min. B1: 12 min.		B: 5 - 5 ½ min. B1: 11 - 12 min.		ASTM D2471
Demold Time, 1/8" Sample @ 77°F @ 150°F	B: 1 hour < 1 hour	B1: 2 hours < 2 hours	B: 1 hour < 1 hour	B1: 2 hours < 2 hours	PTM&W
Peak Exotherm, 200 gram mass	B: 240°F / B1: 211°F		B: 220°F / B1: 203°F		ASTM D2471
Cured Hardness, Shore D	80 - 82D		70 - 75 D		ASTM D2240
Shrinkage, inch/inch Mold #, Volume	B: 0.002 / B1: 0.001 (Mold #0; 0.017 Gallon)		B: 0.0015 / B1: 0.0009 (Mold #0; 0.017 Gallon)		ASTM D2566
Specific Gravity, grams, cc	1.11		1.08		ASTM D1475
Density, lb./cu. Inch	.0402		.0392		ASTM D792
Specific Volume, cu. in./lb.	24.9		25.5		ASTM D792
Ultimate Tensile Strength, psi	10,514 psi	10,262 psi	6,555 psi	7,263 psi	ASTM D638
Elongation at Break, %	7.2 %	7.5 %	6.6 %	7.6 %	
Tensile Modulus, psi	381,615 psi	357,765 psi	267,600 psi	238,110 psi	
Ultimate Flexural Strength, psi	14,438 psi	14,800 psi	9,428 psi	10,253 psi	ASTM D790
Flexural Modulus, psi	390,911 psi	369,110 psi	274,424 psi	244,498 psi	
Compressive Strength, psi	14,770 psi	14,457 psi	9,017 psi	9,273 psi	ASTM D695
Compressive Modulus, psi	418,977 psi	393,170 psi	288,613 psi	276,097 psi	
Glass Transition Temperature, Tg	195°F	207°F	212°F	216°F	TMA
Thermal Coefficient of Expansion Range: 50°C to 100°C	5.26×10^{-5} in./in./ °F	6.11×10^{-5} in./in./ °F	9.97×10^{-5} in./in./ °F	7.4×10^{-5} in./in./ °F	ASTM D696
Heat Deflection Temp., 66 psi 264 psi	130°F 126°F	166°F 151°F	134°F 129°F	175°F 166°F	ASTM D648
Izod Impact Strength, Notched (ft-lb. per inch of notch) Unnotched	0.36 2.4	0.46 3.5	0.39 2.6	0.42 3.2	ASTM D256

PACKAGING WEIGHTS

	Gallon Kit	Pail Kit	Drum Kit
PT8948 Part A	9 lb.	45 lb.	450 lb.
PT8948 Part B or B1	8 lb.	40 lb.	400 lb.
Kit	17 lb.	85 lb.	850 lb.
PT8949 Part A	9 lb.	2 @ 40 lb.	480 lb.
PT8949 Part B or B1	4.5 lb.	40 lb.	240 lb.
Kit	13.5 lb.	120 lb.	720 lb.

PT8948 & PT8949 Bulletin / ZW-38 / 090803-C2

PTM&W Industries, Inc.

10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

PT8952
High Impact Fire Retardant Urethane for Prototypes

DESCRIPTION

PT8952 is a two-component urethane casting system developed to provide a tough, impact-resistant material for the production of durable short run and prototype parts. A performance companion to the recently-developed PT8902 high impact casting system, PT8952 produces parts with very high Izod impact strength with the added benefit of excellent fire retardant characteristics.

PT8952 is UL listed for UL 94V-0 at 0.1 inch (2.6 mm) thickness (UL File No. E238713), and meets the requirements of FAR 28.853 for flammability. This has been accomplished without the use of toxic Polybrominated Diphenyl Ethers (PBDEs)

PT8952 is an unfilled liquid system that has a very low mixed viscosity. This allows it to fill thin, complicated mold sections quite readily, producing void-free parts routinely. It's 7 to 8 minute working time combined with this low viscosity provides ample time for complete mold filling on even the most complicated parts. PT8952 has a 2 to 1 mix ratio by weight or volume, for easy measuring, whether hand mixing or cartridge dispensing. PT8952 will solve the problem of brittle fire retardant parts!! It has very high Izod Impact strength, tensile strength and flexural strength, so it has outstanding toughness built-in.

PRODUCT SPECIFICATIONS

	PT8952-A	PT8952-B	ASTM Method
Color	Light Amber	Clear	Visual
Viscosity, centipoise	60 cps	650 cps	D2392
Specific Gravity, gms./cc	1.20	1.11	D1475
Mix Ratio	100 : 50 By Weight or Volume		PTM&W
Pot Life, 4 fl. Oz. Mass @ 77°F	7 - 8 minutes*		D2471

* Two additional hardeners are available for use with PT8952 Part A to provide a longer pot life (11 minute - Part B1), and a shorter pot life (4 minutes - Part B2) for applications where these different working times are needed. There are only minute differences in the chemical makeup of these three hardeners, so the cured properties are the same, regardless of the hardener selected.

HANDLING and CURING

PT8952 works quite well in hand mix and pour applications. The 7 to 8 minute pot life allows plenty of time to mix and deair before pouring, as the system components have very low viscosities that combine readily and flow into thin sections easily, minimizing pouring time.

The mixed PT8952 should be poured into a warm mold (heated to 110°F - 140°F) and given an initial oven heat cure before demolding. The material can be demolded after a minimum of 2 to 3 hours at 150°F to 160°F, and then the cure can be completed out of the mold. An oven post cure is required, to achieve maximum cured properties and the highest heat resistance. If the part has relatively thick wall sections and a flat surface it can be positioned on, then it can be post cured unsupported in the oven. However, if there are thin walls or standing sections, the part should be supported on a fixture in the oven for the post cure. It is advisable to support the part in the mold or on a fixture all cases for repeatable good results.

As to processing: Curing time will depend upon the part thickness, mold type and construction and curing temperature. For example, at a temperature of 180°F, cure can be completed in 6 to 8 hours. If the curing temperature is lower, 150°F, for example, the cure time may take as long as 12 to 18 hours.

TYPICAL MECHANICAL PROPERTIES

	PT8952 A/B	ASTM Method
Mix Ratio	100 : 50 By Weight or Volume	PTM&W
Working Time, 4 fl. oz. mass, @ 77°F	7 - 8 minutes	D2471
Color	Translucent Off-White	Visual
Mixed Viscosity, @ 77°F, centipoise	150 cps	D2393
Cured Hardness, Shore D	85 D	D2240
Specific Gravity, grams, cc	1.17	D1475
Density, lb./cu. Inch	.0422	D792
Specific Volume, cu. in./lb.	23.7	
Tensile Strength, psi	10,650 psi	D638
Elongation at Break, %	24.5 %	
Tensile modulus, psi	381,675 psi	
Flexural Strength, psi	15,445 psi	D790
Flexural Modulus, psi	424,275 psi	
Compressive Strength, psi	15,360 psi	D695
Compressive Modulus, psi	413,816 psi	
Izod Impact Strength, ft.lbs/inch, Method A, Notched	1.6	D256
Glass Transition Temperature, Tg (Peak) E' (Onset)	211°F 176°F	TMA
Heat Deflection Temperature, @ 66 psi Load	179°F	D648
Coefficient of Thermal Expansion Range: 100°F - 175°F	5.99×10^{-5} inch / inch / °F	D696
Flammability per UL 94 Specification	UL Listed for UL 94 V-0 at 0.1 inch (2.6 mm) - UL File No. E238713 -	UL 94

PACKAGING WEIGHTS

	Gallon Kit	Pail Kit	Drum Kit
PT8952 Part A	9 lb.	45 lb.	450 lb.
PT8952 Part B	4.5 lb.	22.5 lb.	225 lb.
Kit	13.5 lb.	67.5 lb.	675 lb.

SAFETY and HANDLING

PTM&W urethane products are made from raw materials carefully chosen to minimize or even eliminate toxic chemicals, and therefore offer the user high performance products with minimum hazard potential when properly used. Generally, the PTM&W urethane resins and hardeners will present no handling problems if users exercise care to protect the skin and eyes, and if good ventilation is provided in the work areas. However, many urethane resins and hardeners can be irritating to the skin, and prolonged contact may result in sensitization; and breathing of mist or vapors may cause allergenic respiratory reaction, especially in highly sensitive individuals. As such, avoid contact with eyes and skin, and avoid breathing vapors. Wear protective rubber apron, clothing, gloves, face shield or other items as required to prevent contact with the skin. In case of skin contact, immediately wash with soap and water, followed by a rinse of the area with vinegar, and then a further wash with soap and water. The vinegar will neutralize the hardener and lessen the chances of long term effects. Use goggles, a face shield, safety glasses or other items as required to prevent contact with the eyes. If material gets into the eyes, immediately flush with water for at least 15 minutes and call a physician. Generally, keep the work area as uncluttered and clean as possible, and clean up any minor spills immediately to prevent accidental skin contact at a later time. Keep tools clean and properly stored. Dispose of trash and empty containers properly. Do not use any of these types of products until Material Safety Data Sheets have been read and understood.

PT8952 Bulletin / ZW-8 / 102604-C2

PTM&W Industries, Inc.
10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

PT8955
FIRE RETARDANT URETHANE CASTING SYSTEM

DESCRIPTION

PT8955 is a two-component polyurethane casting system that has been developed to allow the production of parts that are tough, durable and fire retardant. Cured parts are UL Listed for UL94 V-0 at 0.1 inch (2.6 mm) thickness (UL File No. E238713). PT8955 has a 1 to 1 mixing ratio, a low mixed viscosity and relatively fast demold time, which makes it a very easy-to-use material. The natural color of this material is a very bright white which, by itself, produces rich looking parts with good color and opacity, even in thin sections. It also accepts pigments and colorants quite readily for a broad range of final colors to suit the application requirements. PT8955 has excellent hot strength, which prevents sagging or distortion in parts that are exposed to higher ambient temperatures in service. PT8955 does not contain any hazardous antimony or brominated fire retardant compounds, for safer working conditions. Overall, PT8955 is an excellent material for the rapid production of parts that have very good appearance and possess tough, durable properties.

PRODUCT SPECIFICATIONS

	PT8955 Part A	PT8955 Part B	Test Method
Color	Amber	White	Visual
Viscosity, @77°F, centipoise	175 cps	4300 cps	ASTM D23932
Specific Gravity, gms./cc	1.20	1.21	ASTM D1475
Mix Ratio	100 : 100 By Weight or Volume		PTM&W
Pot Life, 4 fl. Oz. Mass @ 77°F	10 - 12 minutes		ASTM D2471

HANDLING and CURING

PT8955 is well suited for hand mix and pour applications. The 10 - 12 minute pot life allows plenty of time to mix and deair before pouring, and the low mixed viscosity of the system flows into thin sections readily to minimize pouring time. PT8955 also works very well in vacuum casting equipment. The resin and hardener components of PT8955 can sometimes exhibit a tendency to have a slight initial incompatibility. With adequate mixing, however, the two components combine completely to provide proper parts. It is not necessary to utilize unusual or extreme mixing practice to properly prepare this product. Conscientious mixing with attention to detail is all that is required. When mixing, observe the solution to make sure that there are no streaks or mottled texture evident. When the resin and hardener have combined to a smooth, uniform consistency, the material is ready to cast.

PT8955 will gel hard at room temperature. Heat is not required to set PT8955, but will shorten the time when more rapid production is required. Even though PT8955 gels hard at room temperature, an oven post cure is recommended for full properties and maximum performance by the cured material. As to processing; thin section parts poured in room temperature molds can be removed from the mold in about 2 hours at room temperature. The same parts poured into warmed molds and cured in an oven at moderate temperatures can be removed from the mold in half this time or less. Exact cure time will depend upon part thickness, mold material and mold temperature, and curing temperature. For example, a typical heat cure for urethanes is 4 to 6 hours at 150°F to 165°F. Higher curing temperatures will allow shorter curing times.

PACKAGING WEIGHTS

	Gallon Kit	Pail Kit	Drum Kit
PT8955 Part A	9 lb.	45 lb.	450 lb.
PT8955 Part B	9 lb.	45 lb.	450 lb.
Kit	18 lb.	90 lb.	900 lb.

TYPICAL MECHANICAL PROPERTIES

		PT8955 A/B	Test Method
Mix Ratio		100 : 100 By Weight or Volume	PTM&W
Color		White	Visual
Mixed Viscosity, @77°F, centipoise		700 cps	ASTM D2393
Working Time, 4 fl. Oz. Mass, @77°F		10 - 12 minutes	ASTM D2471
Cured Hardness, Shore D	@ Room Temp. @ 150°F	85 D 80 D	ASTM D2240
Shrinkage, inch/inch		0.0012	ASTM D2566
Specific Gravity, grams, cc		1.205	ASTM D1475
Density,	lb./cu. inch lb./gallon	.0435 10.06	ASTM D792
Specific Volume, cu. in./lb.		22.97	ASTM D792
Tensile Strength, psi		7,480 psi	ASTM D638
Elongation at Break, %		4.73 %	
Tensile modulus, psi		505,965 psi	
Flexural Strength, psi		14,333 psi	ASTM D790
Flexural Modulus, psi		532,035 psi	
Compressive Strength, psi		13,305 psi	ASTM D695
Compressive Modulus, psi		450,270 psi	
Izod Impact, ft.lbs./ in. ,	Notched, Method A Notched, Method E Unnotched	0.76 4.82 7.36	ASTM D256
Glass Transition Temperature, Tg,	TMA	192°F	ASTM D3386
Heat Deflection Temperature, @ 66 psi		161°F	ASTM D648
Coefficient of Thermal Expansion, Range: 100°F to 200°F		5.532×10^{-5} inch / inch / °F	ASTM D696
Flammability per UL 94 Specification		UL Listed for UL 94 V-0 at 0.10" (2.6 mm) UL File No. E238713	UL 94
Water Absorption, 1/8 inch Sample, 24 hours immersion @ 150°F		0.64 %	ASTM D570

PT8955 Bulletin / ZW-38 / 090803-C1

PTM&W Industries, Inc.
10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

PT8957
High Impact Fire Retardant Urethane for Prototypes

DESCRIPTION

PT8957 is a two-component urethane casting system developed to provide a tough, impact-resistant material for the production of durable short run and prototype parts. PT8957 is a modification of our PT8952 fire retardant high impact casting system, that is designed to have somewhat better fire retardant characteristics than PT8952, to make thinner section parts that possess both high impact strength as well as good fire retardant performance.

PT8957 meets the requirements of FAR 28.853 for flammability in 0.043 inch (1.1 mm) thickness. This has been accomplished without the use of toxic Polybrominated Diphenyl Ethers (PBDEs)

PT8957 is an unfilled liquid system that has a very low mixed viscosity. This allows it to fill thin, complicated mold sections quite readily, producing void-free parts routinely. It's 7 to 8 minute working time combined with this low viscosity provides ample time for complete mold filling on even the most complicated parts. PT8957 has a 2 to 1 mix ratio by weight or volume, for easy measuring, whether hand mixing or cartridge dispensing. PT8957 will solve the problem of brittle fire retardant parts!! It has very good Izod Impact strength, tensile strength and flexural strength, so it has outstanding toughness built-in.

PRODUCT SPECIFICATIONS

	PT8957-A	PT8957-B	ASTM Method
Color	Light Tan	Clear	Visual
Viscosity, centipoise	120 cps	750 cps	D2392
Specific Gravity, gms./cc	1.25	1.11	D1475
Mix Ratio	100 : 50 By Weight or Volume		PTM&W
Pot Life, 4 fl. Oz. Mass @ 77°F	7 - 8 minutes		D2471

HANDLING and CURING

PT8957 works quite well in hand mix and pour applications. The 7 to 8 minute pot life allows plenty of time to mix and deair before pouring, as the system components have very low viscosities that combine readily and flow into thin sections easily, minimizing pouring time.

The mixed PT8957 should be poured into a warm mold (heated to 110°F - 140°F) and given an initial oven heat cure before demolding. The material can be demolded after a minimum of 2 to 3 hours at 150°F to 160°F, and then the cure can be completed out of the mold. An oven post cure is required, to achieve maximum cured properties and the highest heat resistance.If the part has relatively thick wall sections and a flat surface it can be positioned on, then it can be post cured unsupported in the oven. However, if there are thin walls or standing sections, the part should be supported on a fixture in the oven for the post cure. It is advisable to support the part in the mold or on a fixture all cases for repeatable good results.As to processing:

Curing time will depend upon the part thickness, mold type and construction and curing temperature. For example, at a temperature of 180°F, cure can be completed in 6 to 8 hours. If the curing temperature is lower, 150°F, for example, the cure time may take as long as 12 to 18 hours.

TYPICAL MECHANICAL PROPERTIES

	PT8957 A/B	ASTM Method
Mix Ratio	100 : 50 By Weight or Volume	PTM&W
Working Time, 4 fl. oz. mass, @ 77°F	7 - 8 minutes	D2471
Color	Dark Amber	Visual
Mixed Viscosity, @ 77°F, centipoise	200 - 250 cps	D2393
Cured Hardness, Shore D	88 D	D2240
Specific Gravity, grams, cc	1.20	D1475
Density, lb./cu. Inch	.0435	D792
Specific Volume, cu. in./lb.	23.0	
Tensile Strength, psi	10,676 psi	D638
Elongation at Break, %	25.0 %	
Tensile modulus, psi	390,220 psi	
Flexural Strength, psi	16,743 psi	D790
Flexural Modulus, psi	435,747 psi	
Compressive Strength, psi	12,878 psi	D695
Compressive Modulus, psi	406,265 psi	
Izod Impact Strength, ft.lbs/inch, Method A, Notched	1.42	D256
Glass Transition Temperature, Tg (Peak) E' (Onset)	203°F 179°F	TMA
Flammability per FAA FAR Volume III, Part 25.853	Passes 60 Second Burn Test at 0.043 inch (1.1 mm)	FAA

PACKAGING WEIGHTS

	Gallon Kit	Pail Kit	Drum Kit
PT8957 Part A	9 lb.	45 lb.	450 lb.
PT8957 Part B	4.5 lb.	22.5 lb.	225 lb.
Kit	13.5 lb.	67.5 lb.	675 lb.

SAFETY and HANDLING

PTM&W urethane products are made from raw materials carefully chosen to minimize or even eliminate toxic chemicals, and therefore offer the user high performance products with minimum hazard potential when properly used. Generally, the PTM&W urethane resins and hardeners will present no handling problems if users exercise care to protect the skin and eyes, and if good ventilation is provided in the work areas. However, many urethane resins and hardeners can be irritating to the skin, and prolonged contact may result in sensitization; and breathing of mist or vapors may cause allergenic respiratory reaction, especially in highly sensitive individuals. As such, avoid contact with eyes and skin, and avoid breathing vapors. Wear protective rubber apron, clothing, gloves, face shield or other items as required to prevent contact with the skin. In case of skin contact, immediately wash with soap and water, followed by a rinse of the area with vinegar, and then a further wash with soap and water. The vinegar will neutralize the hardener and lessen the chances of long term effects. Use goggles, a face shield, safety glasses or other items as required to prevent contact with the eyes. If material gets into the eyes, immediately flush with water for at least 15 minutes and call a physician. Generally, keep the work area as uncluttered and clean as possible, and clean up any minor spills immediately to prevent accidental skin contact at a later time. Keep tools clean and properly stored. Dispose of trash and empty containers properly. Do not use any of these types of products until Material Safety Data Sheets have been read and understood.

PT8957 Bulletin / ZW-8 / 113007-C2

PTM&W Industries, Inc.

10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

PT8959
Fire Retardant 85D Urethane for Machine Dispensing

DESCRIPTION

PT8959 is a hard, tough polyurethane which is ideally suited for the rapid production of prototype and/or production parts that have high heat resistance and tough cured properties. It has an easy 1 : 1 mix ratio by weight or volume, a low mixed viscosity, and a fast cure and demold capability, for quick, efficient production. PT8959 works equally well with meter-mix machines or twin-tube cartridge guns. This material is UL listed for UL 94V-0 at 0.12 inch (3 mm) thickness (UL File No. E238713), and meets the requirements of FAR 25.853 for flammability
resistance in thin-walled parts.

FEATURES and BENEFITS

- Low Viscosity - Easy Room Temperature Processing
- Very Good Heat Resistance
- Lower Specific Gravity - More Parts Per Pound
- Fast Demold Time - Even At Room Temperature
- No Hazardous Antimony or Brominated Fire Retardant Compounds
- UL Listed for UL 94V-0 in 0.12" (3.0 mm) Thickness (UL File No. E238713)
- Balanced 1 : 1 Ratio - Good for Machine Dispense or Cartridges
- No Restricted or Hazardous Metal Compounds

PRODUCT SPECIFICATIONS

	PT8959 Part A	PT8959 Part B	Test Method
Color	Amber	White	Visual
Viscosity, centipoise	200 cps	1800 cps @ 77°F (580 cps @ 110°F)	ASTM D23932
Specific Gravity, gms./cc	1.19	1.18	ASTM D1475
Mix Ratio, Part A : Part B	100 : 100 By Weight or Volume		PTM&W
Pot Life,4 fl. Oz. Mass @ 77°F	110 - 120 seconds		ASTM D2471

HANDLING and CURING

PT8959 Parts A and B are very compatible, and combine readily and quickly. The combined materials have a low mixed viscosity, so the filling of even highly detailed molds and thin cross sections is accomplished with ease. PT8959 gels rapidly, and it is possible to demold parts within 45 minutes, even at room temperature, if it is desirable, to recycle the molds quickly. If the Part B is warmed slightly (110°F to 115°F, for example), the mixed viscosity is even lower, and the demold time will be shortened somewhat. At demold, PT8959 has hardened sufficiently to allow complicated parts to be removed from the mold without distortion. They can then be set aside and allowed to cure, or given an oven post cure, depending upon preference. PT8959 will cure completely at room temperature, but it is usually preferable to heat cure the gelled parts for more rapid turnaround. As with most urethanes, PT8959 will cure at room temperature in 3 to 5 days, and achieve virtually full properties by that time. A more realistic production cure, however, would be to allow the material to gel at room temperature, followed by an oven post cure. The temperature and duration of the post cure will be determined by factors such as part size and configuration, mold material and temperature, length of time in the mold and others. An oven post cure for PT8959 parts should be a minimum of 4 to 6 hours @150°F. If parts are to be put into elevated temperature service immediately, and there is no time to allow the parts to complete their cure at room temperature, then additional time at 150°F will improve the heat resistance. Increasing the post cure temperature to180°F will shorten the time required for full cure. Curing temperature decisions must include consideration of part thickness and shrinkage tolerances. With urethanes, increasing curing temperatures will cause some increase in shrinkage.

TYPICAL MECHANICAL PROPERTIES

		PT8959 A / B	ASTM Method
Mix Ratio, By Weight or Volume		100 : 100	PTM&W
Color		Cream	Visual
Mixed Viscosity, centipoise,	@ 77°F @ 110°F	950 cps 500 cps	D2393
Working Time, 4 fl. Oz. Mass,	@77°F	110 - 120 sec.	D2471
Cured Hardness, Shore D		86 D	D2240
Specific Gravity, grams / cc		1.18	D1475
Density,	lb./cu. Inch	.0426	D792
Specific Volume,	cu. in./lb.	23.5	D792
Tensile Strength, psi		9,030 psi	D638
Elongation at Break, %		5.52 %	D638
Tensile modulus, psi		4.80×10^5 psi	D638
Flexural Strength, psi		14,401 psi	D790
Flexural Modulus, psi		4.77×10^5 psi	D790
Compressive Strength, psi		14,670 psi	D695
Compressive Modulus, psi		4.26×10^5 psi	D695
Izod Impact, ft.lbs./in.,	Notched, Meth. A Notched, Meth. E Unnotched	.68 4.83 7.00	D256
Glass Transition Temp, Tg, DMA,	Cured Overnight @R.T. Cured 6 hr. @ 150°F Cured 6 hr. @ 180°F	195°F 214°F 227°F	D4065
Heat Deflection Temperature,	@ 66 psi @ 264 psi	224°F 208°F	D648
Coefficient of Thermal Expansion;	Range: 50°C to 100°C	8.719×10^{-5} in./in./°C	D696
Flammability Per UL 94 Specification		UL Listed for UL94 V-0 at 0.118" (3 mm) UL File No. E238713	UL 94
Water Absorption, 1/8 " Sample,	24 hr. Immersion @ 150°F	.68 %	D570

PACKAGING WEIGHTS

	Gallon Kit	Pail Kit	Drum Kit
PT8959 Part A	9 lb.	45 lb.	450 lb.
PT8959 Part B	9 lb.	45 lb.	450 lb.
Kit	18 lb.	90 lb.	900 lb.

PT8959 Bulletin / ZW-38 / 090803-C2

PTM&W Industries, Inc.

10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

PT8964
High Temperature Material for High Strength Parts

DESCRIPTION

PT8964 is a two-component urethane casting system with very high temperature resistance that produces prototype and production parts with excellent cured properties. With an easy 2 to 1 mix ratio by weight or volume and very low mixed viscosity, PR8964 processes quickly and allows the casting of complicated configurations in a timely manner. Two hardeners are available for producing either natural amber or black parts.

PRODUCT SPECIFICATIONS

	PT8964-A	PT8964-B	PT8964-B1	ASTM Method
Color	Clear	Black *	Amber	Visual
Viscosity, centipoise	960 cps	450 cps	380 cps	D2392
Specific Gravity, gms./cc	1.13	1.16	1.16	D1475
Mix Ratio, By Wt.	100 : 50 By Weight or Volume			PTM&W
Pot Life, 4 fl. Oz. Mass @ 77°F	—	8 minutes	6 minutes	D2471

*** PT8964 Part B should be mixed before each use to redisperse the black pigment.**

HANDLING and CURING

PT8964 is processed by mixing and degassing techniques typical in the industry. The low mixed viscosity of the components allows combining, mixing and deairing to be accomplished rather quickly, so there is ample time to fill the mold well within the pot life. PT8964 should be cast into a preheated mold (100-120°F) and allowed to cure for 60-90 minutes at 150°F before demolding. Various post-curing times and temperatures will result in different properties. At a minimum, we recommend 4 hours at 150°F as a post cure. During the oven post cure, take care to insure the part is positioned on a flat surface and is stable, to prevent distortion.

PACKAGING WEIGHTS

	Gallon	Pail	Drum
PT8964 Part A	8 lb.	40 lb.	440 lb.
PT8964 Part B or B1	4 lb.	20 lb.	220 lb.
Kit	12 lb.	60 lb.	660 lb.

TYPICAL MECHANICAL PROPERTIES

	PT8964 A/B	PT8964 A/B1	ASTM Method
Mix Ratio, By Weight	100 : 50 By Weight or Volume		PTM&W
Working Time, 4 fl. oz. mass, @ 77°F	8 minutes	6 minutes	D2471
Color	Black *	Amber	Visual
Mixed Viscosity, @ 77°F, centipoise	950 cps	840 cps	D2393
Cured Hardness, Shore D	84 Shore D	83 Shore D	D2240
Specific Gravity, grams, cc	1.14		D1475
Density, lb./cu. Inch lb./gallon	0.0412 9.5		D792
Specific Volume, cu. in./lb.	24.28		
Tensile Strength, psi	9,920 psi	9,565 psi	D638
Elongation at Break, %	49%	56%	
Tensile modulus, psi	252,760 psi	241,650 psi	
Flexural Strength, psi	12,029 psi	11,100 psi	D790
Flexural Modulus, psi	296,501 psi	256,151 psi	
Compressive Strength, psi	11,984 psi	13,006 psi	D695
Compressive Modulus, psi	274,254 psi	263,050 psi	
Izod Impact Strength, ft.lbs/in of Notch, Method A, Notched	1.52	1.72	D256
Glass Transition Temperature, Tg, DMA, E' - Tg Onset Tg Peak	215°F 306°F	210°F 298°F	D4065

*** PT8964 Part B should be mixed before each use to redisperse the black pigment.**

The above properties were obtained after curing test specimens 1 hour @ 70°C (158°F) plus 1 hour @ 100°C (212°F) plus 2 hours @ 110°C (230°F).

SAFETY and HANDLING

PTM&W urethane products are made from raw materials carefully chosen to minimize or even eliminate toxic chemicals, and therefore offer the user high performance products with minimum hazard potential when properly used. Generally, the PTM&W urethane resins and hardeners will present no handling problems if users exercise care to protect the skin and eyes, and if good ventilation is provided in the work areas. However, many urethane resins and hardeners can be irritating to the skin, and prolonged contact may result in sensitization; and breathing of mist or vapors may cause allergenic respiratory reaction, especially in highly sensitive individuals. As such, avoid contact with eyes and skin, and avoid breathing vapors. Wear protective rubber apron, clothing, gloves, face shield or other items as required to prevent contact with the skin. In case of skin contact, immediately wash with soap and water, followed by a rinse of the area with vinegar, and then a further wash with soap and water. The vinegar will neutralize the hardener and lessen the chances of long term effects. Use goggles, a face shield, safety glasses or other items as required to prevent contact with the eyes. If material gets into the eyes, immediately flush with water for at least 15 minutes and call a physician. Generally, keep the work area as uncluttered and clean as possible, and clean up any minor spills immediately to prevent accidental skin contact at a later time. Keep tools clean and properly stored. Dispose of trash and empty containers properly. Do not use any of these types of products until Material Safety Data Sheets have been read and understood.

PT8964 Bulletin / 093009-C1

PTM&W Industries, Inc.

10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

PT8970 A/B
Shore D-70 Urethane for Parts and Assemblies

DESCRIPTION

PT8970 is a Shore D-70 urethane system that has a high degree of toughness, and excellent stability for this hardness range. It is a good material for various types of tools and fixtures. Panels and parts made with PT8970 have high impact strength and resistance to cracking, for long, durable service.

PRODUCT SPECIFICATIONS

	PT8970 Part A	PT8970 Part B	PT8970 Part B1	ASTM Method
Color	Clear	Amber*	Amber*	Visual
Viscosity,	1,250 cps	1,150 cpa	1,150 cps	D2392
Specific Gravity, gms./cc	1.145	1.073	1.073	D1475
Mix Ratio, By Wt. - Natural Versions Black Versions	--	100 A to 100 B or B1 By Weight 100 A to 102 B or B1 By Weight		PTM&W
Pot Life, 4 fl.oz. Mass @ 77°F	--	9 - 9.5 min.	3 - 4 minutes	D2471

*** There are black versions of the two PT8970 hardeners that provide a black cured material. <u>The mix ratio for both black hardeners is 100 : 102 By Weight</u>, and the pot life of each is unchanged. The materials should be ordered by specifying: PT8970 A/B or B1 Natural or Black**

HANDLING and CURING

The 9 minute pot life version of PT8970 works quite well in hand mix and pour applications, allowing plenty of time to mix and deair before pouring, as the system components combine readily and flow into thin sections easily, minimizing pouring time. When using the faster, Part B1 version of PT8970, the system is more suited to cartridge and/or machine dispensing.

The mixed PT8970 should be poured into a warm mold (heated to 110°F - 140°F) and given an initial oven heat cure before demolding. The material can be demolded after a minimum of 1.5 to 2 hours at 150°F to 160°F, and then the cure can be completed out of the mold. An oven post cure is required to achieve maximum cured properties and the highest heat resistance. If the part has relatively thick wall sections and a flat surface it can be positioned on, then it can be post cured unsupported in the oven. However, if there are thin walls or standing sections, the part should be supported on a fixture in the oven for the post cure. It is advisable to support the part in the mold or on a fixture in all cases, for repeatable good results.

As to processing: Minimum curing time will depend upon the part thickness, mold type and construction, and curing temperature. For example, maximum cured properties as listed in this bulletin were obtained with an initial cure of 1.5 hours at 150°F, followed by an overnight cure at a temperature of 180°F. If the post curing temperature is lower, 150°F, for example, the cure time will take longer to achieve these properties, and test cures should be run to determine the cure time required for the specific part configuration.

TYPICAL MECHANICAL PROPERTIES

	PT8970 Part A with Part B or B1	ASTM Method
Mix Ratio, By Weight - Natural Versions By Weight - Black Versions	100 A to 100 B or B1 By Weight 100 A to 102 B or B1 By Weight	PTM&W
Color	Buff or Black	Visual
Mixed Viscosity, centipoise	1,800 cps	D2393
Working Time, 4 fl. Oz. Mass, @77°F	Part B - 9-9.5 min. Part B1 - 3-4 min.	D2471
Cured Hardness, Shore D	70 Shore D	D2240
Specific Gravity, grams, cc	1.108	D1475
Density, lb./cu. Inch	.0400	D792
Specific Volume, cu. in./lb.	24.99	
Tensile Strength, psi	5,314 psi	D638
Elongation at Break, %	90 %	
Tensile modulus, psi	113,110 psi	
Flexural Strength, psi	4,896 psi	D790
Flexural Modulus, psi	116,091 psi	
Compressive Strength, psi	8,730 psi	D695
Compressive Modulus, psi	113,937 psi	
Izod Impact Strength, ft.lbs./inch of Notch, Method A, Notched	4.40	D256
Glass Transition Temp., Tg, DMA: Cured Overnight @ 150°F Cured Overnight @ 180°F	262°F 300°F	D4065
Tear Strength, Die C, pli	554 pli	D624
Compression Set, Method B	89.1 %	D395
Bashore Rebound	39.8 %	D2632
Taber Abrasion, H18 Wheel, 1000 grams, 1000 cycles, mg loss	59.3 mg	D1044

PACKAGING WEIGHTS

	Gallon Kit	Pail Kit	Drum Kit
PT8970 Part A	8 lb.	40 lb.	400 lb.
PT8970 Part B or B1 (Natural)	8 lb.	40 lb.	400 lb.
PT8970 Part B or B1 (Black)	8.2 lb.	41 lb.	410 lb.

SAFETY and HANDLING

PTM&W urethane products are made from raw materials carefully chosen to minimize or even eliminate toxic chemicals, and therefore offer the user high performance products with minimum hazard potential when properly used. Generally, the PTM&W urethane resins and hardeners will present no handling problems if users exercise care to protect the skin and eyes, and if good ventilation is provided in the work areas. However, breathing of mist or vapors may cause allergenic respiratory reaction, especially in highly sensitive individuals. As such, avoid contact with eyes and skin, and avoid breathing vapors. Wear protective rubber apron, clothing, nitrile rubber gloves, face shield or other items as required to prevent contact with the skin. In case of skin contact, immediately wash with soap and water, followed by a rinse of the area with vinegar, and then a further wash with soap and water. The vinegar will neutralize the hardener and lessen the chances of long term effects. Use goggles, a face shield, safety glasses or other items as required to prevent contact with the eyes. If material gets into the eyes, immediately flush with water for at least 15 minutes and call a physician. Generally, keep the work area as uncluttered and clean as possible, and clean up any minor spills immediately to prevent accidental skin contact at a later time. Keep tools clean and properly stored. Dispose of trash and empty containers properly. Do not use any of these types of products until Material Safety Data Sheets have been read and understood.

PT8970 Bulletin / InDesign / 041414-C3

PTM&W Industries, Inc.
10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

PTM&W Industries, Inc.

10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Questions: info@ptm-w.com

Flexible Urethanes For Prototype and Production Parts

DESCRIPTION

The four elastomer systems listed on this bulletin are excellent materials for use in casting a wide variety of tough flexible prototype and/or short-run production parts. They vary in hardness from 40 Shore A to 70 Shore A, to provide a range that is suitable for softer parts requirements. These products combine ease of use with tough cured properties to allow rapid production of attractive, durable cured parts. They are low in color, so it is easy to add dyes or pigments to achieve a broad range of colors in the finished castings. All four have low, very fluid mixed viscosities, which allow easy mixing and pouring, and efficient mold filling, even in thin wall sections.

These four systems have been designed specifically for the pouring of prototype and production parts, and they can be adjusted for rather rapid curing, for faster production rates. The base working times and associated demold times for these systems can be shortened by the addition of a catalyst - PA8399 - to achieve the optimum demold time for individual part size and configuration. A table on the next page provides guidelines for the use of PA8399 catalyst to achieve different working and demold times with these urethanes.

PRODUCT SPECIFICATIONS

		Color	Viscosity	Specific Gravity	Mix Ratio By Wt.	Pot Life, 4 fl. oz. Mass
ASTM Test Method		Visual	D2392	D1475	PTM&W	D2471
40 A	PT8442 Part A	Lt. Amber	1175 cps	1.04	100 : 75	25 minutes
	PT8442 Part B	Lt. Amber	25 cps	1.08		
50 A	PT8452 Part A	Lt. Amber	1600 cps	1.04	100 : 70	20 minutes
	PT8452 Part B	Lt. Amber	20 cps	1.08		
60 A	PT8462 Part A	Lt. Amber	1600 cps	1.04	100 : 55	15 minutes
	PT8462 Part B	Lt. Amber	30 cps	1.10		
70 A	PT8472 Part A	Lt. Amber	1600 cps	1.04	100 : 25	8 minutes
	PT8472 Part B	Lt. Amber	30 cps	1.18		

HANDLING and CURING

These four urethane systems will cure completely at room temperature, but they can also be heat cured for faster production rates. The working times of the systems - without any catalyst added - allow demolding of the castings in from one to two hours, depending upon which system is being cast. These cure times are sometimes too slow for a production schedule, so it is best to heat cure the uncatalyzed systems for most efficient processing. With the addition of PA8399, demold times at room temperature can be shortened to the point where room temperature cures are acceptable in many cases. The catalyzed systems can also be heat cured, for even better production rates. The final catalyst content, working time cure method and demold time must be determined by the user, based on the part size, mold type and production requirements. The table and chart on the next page will provide additional information to aid in these decisions.

PACKAGING WEIGHTS

	PT8442 (40 A)		PT8452 (50 A)		PT8462 (60 A)		PT8472 (70 A)	
	Part A	Part B	Part A	Part B	Part A	Part B	Part A	Part B
Quart Klt	2 lb.	1.5 lb.	2 lb.	1.4 lb.	2 lb.	1.1 lb.	2 lb.	.5 lb.
Gallon Kit	8 lb.	6 lb.	8 lb.	5.6 lb.	8 lb.	4.4 lb.	8 lb.	2 lb.
Pail Kit	40 lb.	30 lb.	40 lb.	28 lb.	40 lb.	22 lb.	40 lb.	10 lb.

WORK LIFE and CURE TIME REDUCTION with THE USE OF PA8399 CATALYST

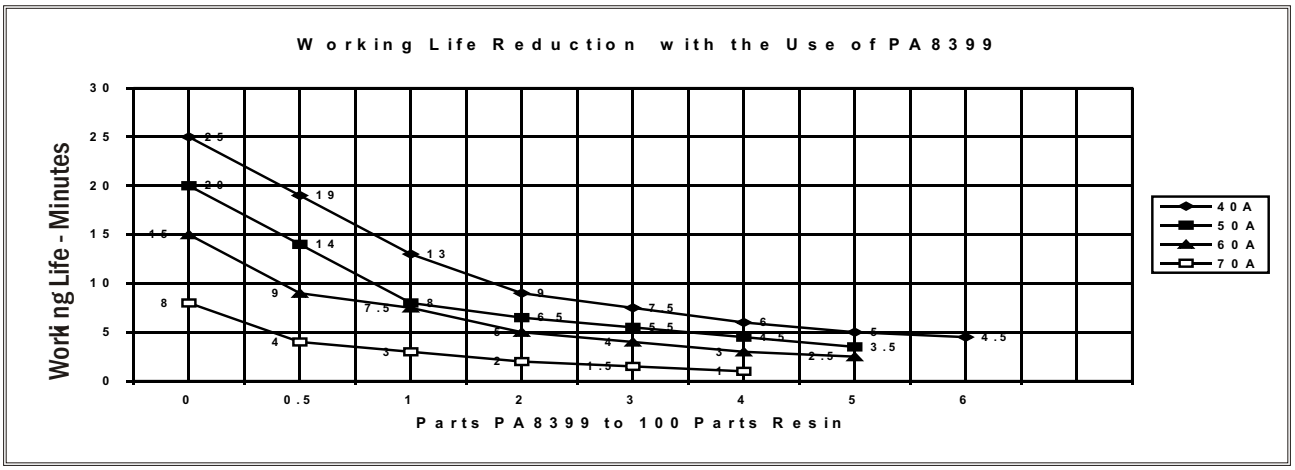
PA8399 is a low viscosity, liquid catalyst that can be used to accelerate the cure of the urethane systems listed in this bulletin. It is designed to be added in small quantities to achieve a faster demold time to meet required production rates. PA8399 is either added to the correctly proportioned resin and hardener at the time of mixing, or, it can be added to the resin ahead of time to make a master batch of a certain curing speed if desired. PA8399 should not be added to the hardener alone, as it will react with this component and yield undesirable results. The table and chart below outline the effects of different levels of PA8399 catalyst on the four urethane systems.

Effects of PA8399 Catalyst on The Working Time of Urethane Systems:

Resin/Hardener Ratio by Weight	Parts PA8399 to 100 Parts Resin (1)							
	0	0.5	1	2	3	4	5	6
PT8442 A/B 100 : 75	25 min.	19 min.	13 min.	9 min.	7.5 min.	6 min.	5 min.	4.5 min.
PT8452 A/B 100 : 70	20 min.	14 min.	8 min.	6.5 min.	5.5 min.	4.5 min.	3.5 min.(2)	xx(2)
PT8462 A/B 100 : 55	15 min.	9 min.	7.5 min.	5 min.	4 min.	3 min.(2)	2.2 min.(2)	xx(2)
PT8472 A/B 100 : 25	8 min.	4 min.	3 min.	2 min.(2)	1.5 min.(2)	1 min.(2)	xx(2)	xx(2)

(1) The amount of PA8399 catalyst listed is the parts of catalyst per hundred parts resin to use in the mixture. For example, to get a five minute work life with the PT8442 A/B (Shore A-40 System) the mix would be: 100 Parts Resin to 75 Parts Hardener to 5 Parts Catalyst.

(2) A full range of catalyst additions and resulting working times is listed, however, it is usually impractical to work with a system faster than five minutes. Therefore, the portion of the table with times faster than five minutes is shaded as a recommendation to avoid these mixtures. With a material that is gelling too fast, the resultant inadequate mold filling, improper cures, and greatly increased shrinkage, will usually yield unacceptable parts.



SPECIAL INFORMATION

It is possible to produce castings with cured hardnesses of Shore A-55 and Shore A-65 with the resins and hardeners on this bulletin. The table below gives details regarding the hardener blends to use with PT8452 A Resin to achieve these intermediate hardnesses. The cured properties for these two systems will be similar to results obtained with the individual hardeners.

Hardness Required	Hardener Blend Details	Mix Ratio of Hardener Blend with PT8452 A Resin
Shore A - 55	50% PT8452 B + 50% PT8462 B	100 Parts Resin to 60 Parts Hardener Blend
Shore A - 65	50% PT8452 B + 50% PT8472 B	100 Parts Resin to 34 Parts Hardener Blend

TYPICAL MECHANICAL PROPERTIES

	PT8442 A/B	PT8452 A/B	PT8462 A/B	PT8472 A/B	ASTM Method
Mix Ratio, By Weight	100 : 75	100 : 70	100 : 55	100 : 25	PTM&W
Color	Lt. Amber	Lt. Amber	Lt. Amber	Lt. Amber	Visual
Mixed Viscosity, @ 77°F, centipoise	825 cps	950 cps	1350 cps	2500 cps	D2393
Working Time, 4 fl.oz. mass @77°F	25 min.	20 min.	15 min.	8 min.	D2471
CURING DETAILS:					
Material w/ zero PA8399 Catalyst:					
Demold Time w/RT Cure (75°F)	2.5 - 3 hrs	2 - 2.5 hrs.	2 - 2.5 hrs.	2 - 2.5 hrs.	
Demold Time w/ 150°F Cure	30-40 min.	30-40 min.	30-40 min.	30-40 min.	PTM&W
Material w/ PA8399 Catalyst added to Attain A 5-minute Working Time:					
Demold Time w/RT Cure (75°F)	20-25 min.	20-25 min.	20-25 min.	20-25 min.	
Demold Time w/ 150°F Cure	10-12 min.	10-12 min.	10-12 min.	8-10 min.	
Cured Hardness, Shore A	40 A ± 5	50 A ± 5	60 A ± 5	70 A ± 5	D2240
Shrinkage, in/in, Mold Number 1, Volume: .053 Gal.	.0006	.0009	.0008	.0015	D2566
Specific Gravity, grams, cc	1.057	1.056	1.061	1.065	D1475
Tensile Strength, psi	800 psi	775 psi	1400 psi	1375 psi	D638
Elongation at Break, %	525 %	450 %	500 %	400 %	D638
Modulus @ 100% Elongation	175 psi	200 psi	300 psi	500 psi	
Modulus @ 200% Elongation	300 psi	375 psi	560 psi	875 psi	D412
Modulus @ 400% Elongation	520 psi	550 psi	1010 psi	1200 psi	
Tear Strength, pli, Die C	180 pli	165 pli	195 pli	340 pli	D624
Compression Set, %	45 %	30 %	29 %	27 %	D395
Bashore Rebound	65 %	64 %	60 %	60 %	D2632
Taber Abrasion, H18 Wheel, 1000 grams, 1000 cycles, mg loss	6 mg.	5 mg.	10.2 mg.	2 mg.	D1044

SAFETY and HANDLING

PTM&W urethane products are made from raw materials carefully chosen to minimize or even eliminate toxic chemicals, and therefore offer the user high performance products with minimum hazard potential when properly used. Generally, the PTM&W epoxy resins and hardeners will present no handling problems if users exercise care to protect the skin and eyes, and if good ventilation is provided in the work areas. However, breathing of mist or vapors may cause allergenic respiratory reaction, especially in highly sensitive individuals. As such, avoid contact with eyes and skin, and avoid breathing vapors. Wear protective rubber apron, clothing, nitrile rubber gloves, face shield or other items as required to prevent contact with the skin. In case of skin contact, immediately wash with soap and water, followed by a rinse of the area with vinegar, and then a further wash with soap and water. The vinegar will neutralize the hardener and lessen the chances of long term effects. Use goggles, a face shield, safety glasses or other items as required to prevent contact with the eyes. If material gets into the eyes, immediately flush with water for at least 15 minutes and call a physician. Generally, keep the work area as uncluttered and clean as possible, and clean up any minor spills immediately to prevent accidental skin contact at a later time. Keep tools clean and properly stored. Dispose of trash and empty containers properly. Do not use any of these types of products until Material Safety Data Sheets have been read and understood.

Flexible Urethanes for Parts / ZW-38 / 102203-C1

PTM&W Industries, Inc.
10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Send Questions To: info@ptm-w.com

ACCESSORY PRODUCTS

PRODUCTS

PTM&W provides a variety of accessory tools and materials for tooling and production. They include:

RELEASE AGENTS

PA0801	Non-silicone paste wax for room temperature or elevated temperature applications. Easy to apply, it works equally well on metal or composite tooling. Can be used to release epoxies, polyurethanes, polyesters, and most adhesives based on those materials. Service temperature to 375° F
PA0810	A green water/alcohol solution of water soluble, film forming PVA for use as a parting agent for separation between polyester or epoxy resins and various mold surfaces. Used with PA0801 paste wax for easy, effective production release in a variety of applications.
PA0828	Rich silicone release for tooling or production uses. PA0828 is the best all purpose release for metal & plastic molds - easy release every time! Also an effective lubricant.
PA0868	Modified silicone release designed to provide glossy surface finish and easy release from the mold. PA0868 is especially effective for releasing thermosetting urethane elastomers from either epoxy or metal tooling. PA0868 can be removed from the parts easily with soap and water, thereby avoiding the use of potentially dangerous solvent cleanup.

BULK FILLER

PA0738	Hydrated alumina bulk filler for use with epoxy and polyurethane casting resins. Economical, it provides lower overall cost castings. Generally, the addition of PA0738 lowers the exotherm of the casting and thereby lowers the cured shrinkage. Castings made with a high content of PA0738 are very easy to machine or work with hand tools.

ACCESSORY PRODUCTS

Tooling Brushes	2-Inch Wooden handle brushes with 3/4" blunt-cut solvent resistant bristles designed specifically for hand laminating and surface coat application. The 100% Pure China bristles have excellent chemical resistance, so the brushes can be used with solvent-containing systems if desired. The bristles are firmly locked into the ferrule, so they will not pull out during use and contaminate the material being applied.
Squeegees	Durable 3" x 5" plastic squeegees for spreading thick resins and for laminating. The high density plastic composition allows easy cleanup in common shop solvents. Cured resin pops off the flexible squeegees. Dual tapered sides and rounded corners allow use with thin fabrics with minimum snags. These squeegees are equally useful for graphics applications or other projects.
Urethane Color Pastes	Opaque color pastes made with urethane compatible raw materials and additives to minimize moisture contamination when used with urethanes: PA0511 - Black PA0512 - White PA0513 - Red PA0514 - Green PA0515 - Blue PA0516 - Yellow PA0517 - Orange PA0518 - Brown

SELECTION and HANDLING GUIDELINES for RIGID CASTING URETHANES

PTM&W Product	Color	When Pigmenting for A Master Batch, Add Color Paste To This Component	Use To Simulate This Material	Recommended Handling / Dispensing Method			Recommended Static Mixers for These Products	
				Hand Pour/ Gravity Feed	Machine or Cartridge, Pressure Feed	Vacuum Casting	TAH Industries #160-840 3/8" I.D. X 40 Elements	TAH Industries #160-648 1/4" I.D. X 48 Elements
PT5409 (Epoxy)	Translucent	Part A (Use Epoxy Dispersions)	Glass Filled Nylon, Hi-Impact ABS	X	X	X		
PT8902	White	Part A**	Hi-Impact ABS Polycarbonate	X		X	X	X
PT8907	Black	N.A.	ABS, HDPE		X		X	
PT8908	Black	N.A.	ABS, HDPE		X		X	
PT8909	Buff	Part B	ABS, HDPE		X		X	
PT8917	Black	N.A.	ABS		X			X
PT8918	Translucent	Part B	ABS		X			X
PT8919	White	Part B	ABS		X			X
PT8925	Transparent	Part B	Acrylic, Polycarbonate	X		X		
PT8948	Translucent	Part B	ABS, HDPE	X	X	X		X
PT8949	White	Part B	LDPE, PP, TPO	X	X	X		X
PT8952	Translucent Off-White	Part A**	Hi-Impact ABS Polycarbonate	X		X	X	X
PT8955	White	Part B	ABS			X		X
PT8957	Off-White	Part A**	Hi-Impact ABS	X		X	X	X
PT8964	Black/Amber	Part B1 (Part B is Black)	ABS, HDPE	X	X	X	X	X

**** Pigmenting of PT8902, PT89582 & PT8957 should be done at the time of casting. Pre-pigmented master batches with these products are not storage stable, and therefore not recommended.**

PTM&W Industries, Inc.
10640 S. Painter Avenue Santa Fe Springs, CA 90670-4092
562-946-4511 800-421-1518 FAX: 562-941-4773
Visit Us At: www.ptm-w.com Questions: info@ptm-w.com

PTM&W INDUSTRIES, INC.
10640 South Painter Avenue
Santa Fe Springs, CA 90670-4092
562-946-4511 • 800-421-1518
Fax: 562-941-4773
www.ptm-w.com • info@ptm-w.com