

EASTMAN

The results of insight™

Eastman **TRITAN™**
copolyester

**Redefining the balance
between toughness
and heat resistance.**

A new-generation copolyester



EASTMAN™ Medical Polymers

Eastman — better prepared than ever to meet your packaging needs.

Current trends are driving an increased need for innovative, compliant, and reliable medical devices and packaging. Eastman combines industry experience and polymer capability to help OEMs stay ahead of these trends.

By adding Eastman Tritan™ copolyester MP100 to its proven polymer portfolio, Eastman Chemical Company has strengthened its offering for customers in the rigid medical packaging market

Eastman Tritan™ copolyester MP100 is an enhanced-performance copolyester. This medical-grade polymer delivers a unique balance of design, processing, and performance advantages.

- It offers all the advantages of Eastar™ copolyester 6763, the industry standard for rigid medical packaging for the past 20 years.
- In addition, Tritan MP100 delivers higher heat resistance and greater inherent toughness than Eastar and other polymers, including acrylic multi-polymer and acrylonitrile resins.

Strengthening a proven portfolio

- Eastman Tritan™ copolyester MP100 includes the same properties that have made Eastar™ copolyester 6763 the industry standard for rigid medical packaging, including chemical resistance, clarity, and toughness.
- Tritan MP100 offers extrusion, thermoforming, and sealing properties that are similar to Eastar.
- In addition, Tritan MP100 offers the advantages of higher heat resistance and greater toughness, which satisfy unmet needs for some applications.
- The launch of Tritan MP100 follows the successful introduction of medical-grade Tritan for molded medical devices and housings.



Eastman Tritan™ copolyester MP100 — your rigid standards, exceeded.

By providing a superior combination of heat resistance, best-in-class toughness and clarity, Eastman Tritan™ copolyester MP100 provides packaging benefits in the areas of

- Protection of contents
- Retention of sterile barrier
- Shelf-life validation
- Sterilization
- Processing
- Sustainability

Comparison of physical properties*

	Eastman Tritan™ copolyester MP100	Estar™ copolyester 6763	Acrylonitrile (AN)	Acrylic multi-polymer	PVC
Heat resistance, glass transition (°C)	110	82	84	100	85
Toughness, instrumented impact	20 (40 mil)	11.5 (40 mil)	10 (40 mil)	4.0 (40 mil)	11.4
Energy @ max load, J: (thickness)	12 (20 mil)	6.0 (20 mil)	<4.0 (20 mil)	<2.0 (20 mil)	5.7
Toughness, notched Izod impact @ 23°C (ft•lbf/in.)	18.4	1.9	5.0	1.6	7.9
Toughness, elongation to break (%)	210	130	NA	28	45
Stiffness or flexibility, flexural modulus (kpsi)	225	300	490	350	386
Clarity, haze (%)	1.4	1.8	2.7	11.7	3.6

*Results for injection molded plaques of 1/8-inch thickness, except where noted (instrumented impact)

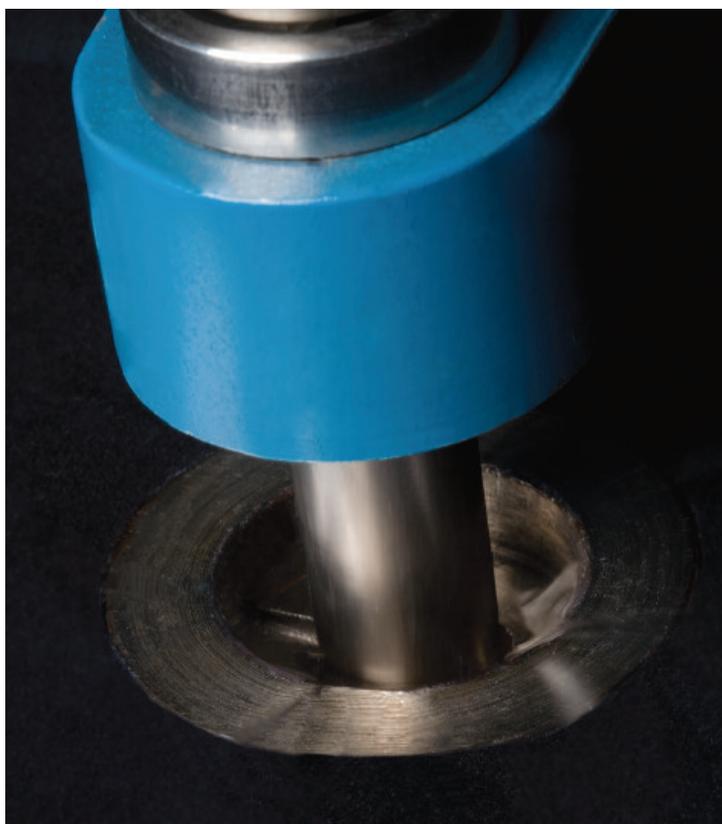
All in one package — best in class toughness *plus* outstanding heat resistance.

Toughness that protects sterile contents and the environment.

The toughness of Eastman Tritan™ copolyester MP100 has been proven in notched Izod impact tests, dart impact tests, aged internal drop tests, and independent third-party packaging validation tests following three rounds of ethylene oxide (EtO) sterilization.

This provides benefits throughout the lifetime of the packaging — and beyond

- More robust and durable protection of sterilized contents against damage and breach of sterile barrier
- Enables potential redesign of packaging to reduce material usage through downgauging or lightweighting
- Can reduce the need for secondary packaging



Eastman Tritan™ copolyester



Acrylic multi-polymer



Acrylonitrile

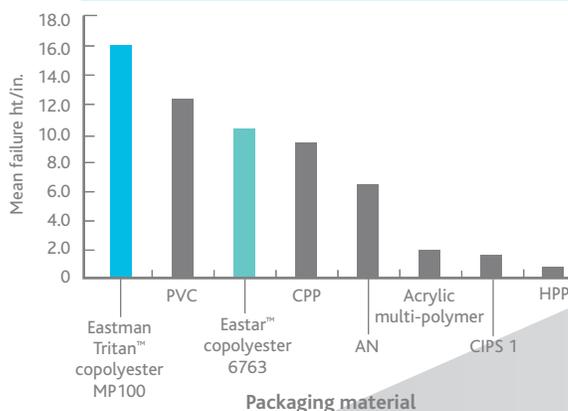
Gardner impact test method, ASTM D5420

Eastman Tritan™ copolyester vs. acrylic multi-polymer and AN

In this test, an 8-pound weight was dropped from a height of 6 inches on each sheet of material. The results: Eastman Tritan™ copolyester did not break or tear while the other materials were penetrated.

Gardner impact test results

ASTM D5420-04
20 mil sheet / 8 lb failing weight



Packaging material	Mean failure ht./in.
Eastman Tritan™ copolyester MP100	16.5
PVC	12.5
Eastar™ copolyester 6763	10.5
CPP	9.5
AN	6.5
Acrylic multi-polymer	2.0
CIPS 1	1.5
HPP	0.5

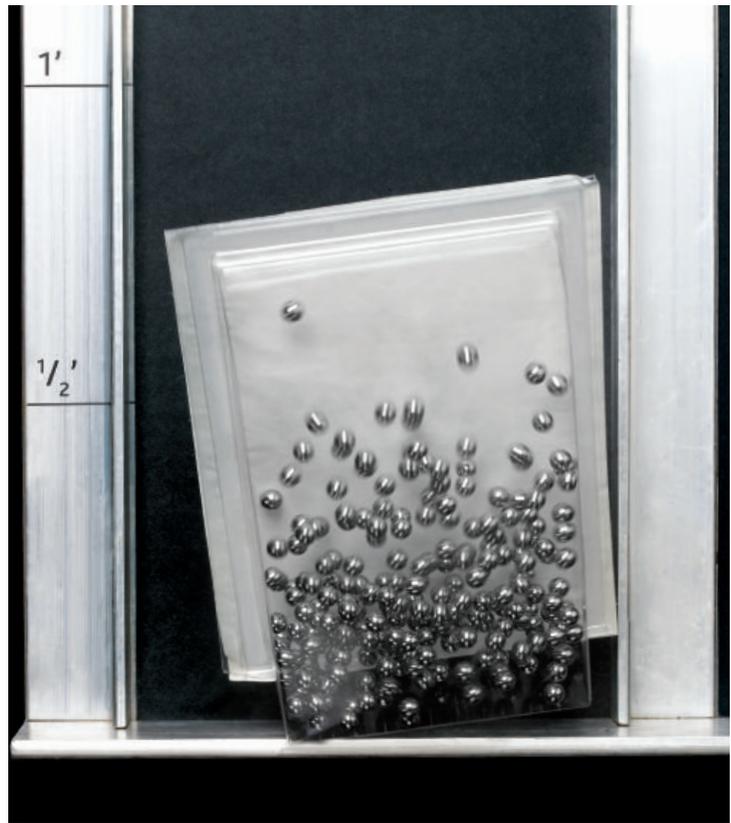
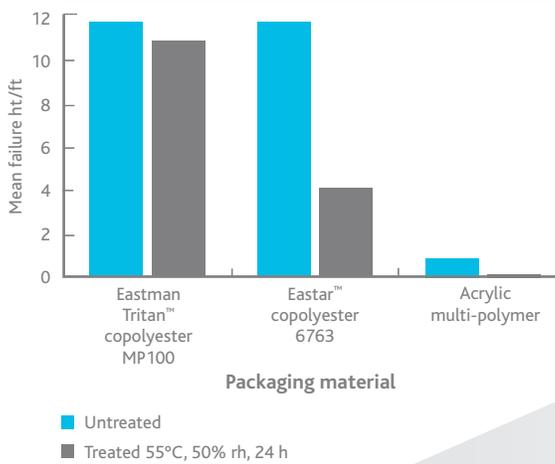
Eastman's drop impact test

Eastman Tritan™ copolyester vs. acrylic multi-polymer

Each package contained 2 pounds of ball bearings with a Tyvek heat-sealed lid. Both packages were dropped from a height of 6 feet, at a 70° angle. The results: Eastman Tritan™ copolyester package did not fail, even after 4 drops, while the acrylic package shattered after 1 drop.

Eastman's drop test results

40 mil sheet



Eastman Tritan™ copolyester



Acrylic multi-polymer

Heat resistance that slows aging, speeds validation, and sterilization.

The high glass transition temperature (110°C) of Eastman Tritan™ copolyester MP100 provides advantages for sterilization and durability. These advantages can translate to timely rewards for customers who specify Tritan for rigid medical packaging:

- Allows more rapid accelerated-aging protocols — faster and more reliable shelf-life qualification can help reduce time, labor, and go-to-market delays
- Higher sterilization chamber temperatures are not limited by the package, allowing faster EtO cycle time and reduced risk of warping and sticking.
- Slower aging and increased shelf life provide greater confidence.

Here's one more clear advantage to throw into the package.

Eastman Tritan™ copolyester MP100 delivers unmatched clarity, seen in its high level of light transmittance, low level of haze, and minimal color shift — even after EtO or gamma radiation. This provides some valuable benefits for the quality perception of your brand:

- Outstanding post-sterilization clarity and color, compared with other polyesters and, especially, other competitive materials
- Rapidly returns to crystal clarity following gamma sterilization
- Higher-quality appearance throughout packaging life cycle

Temperature resistance testing to 90°C

Eastman Tritan™ copolyester vs. APET and AN

Each tray was heated to 90°C for 10 minutes. Although these were extreme temperatures, Eastman Tritan™ copolyester did not warp or discolor.



Eastman Tritan™ copolyester

APET

AN

Thinking outside the package — predictable processing and enduring sustainability benefits.

More of what you expect from Eastman.

Eastman Tritan™ copolyester MP100 delivers the same reliable results as Eastar™ copolyester 6763 throughout the extrusion, thermoforming, and heat-sealing processes. Mold shrinkage and heat-sealing parameters of Tritan are all similar to Eastar 6763.

When less is more — making packaging more sustainable.

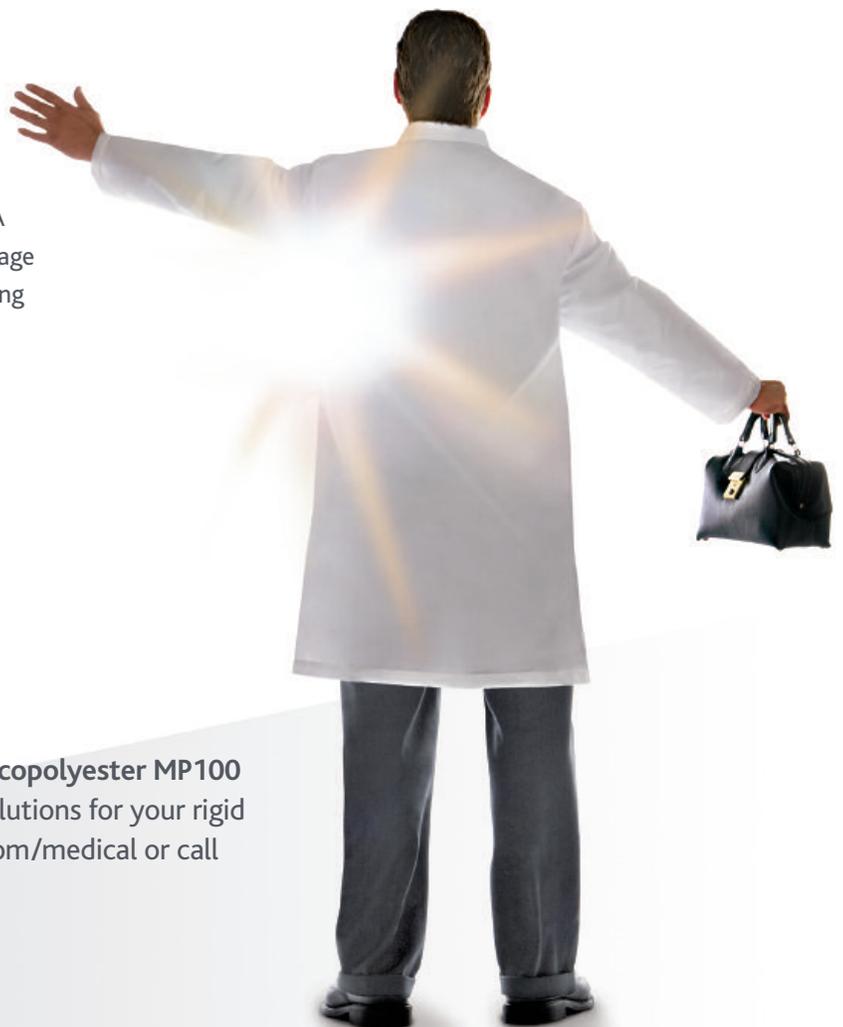
The toughness of Eastman Tritan™ copolyester MP100 provide an opportunity to redesign the packaging to reduce thickness, which requires less source material and may result in reduced shipping costs and energy use. Tritan also can reduce the need for secondary packaging, such as complicated cardboard and foam liners.

Like all Eastman™ medical-grade copolyesters, Eastman Tritan™ copolyester MP100 is free of many compounds that create disposal problems, including halogens, orthophthalate plasticizers, and bisphenol-A (BPA). Tritan also is free of chlorine, which helps manage the risk of generating polychlorinated pollutants during incineration of medical waste.

A more robust portfolio for the medical industry.

Eastman Chemical Company has supplied a wide range of materials for the medical market for more than 65 years. Today, as always, Eastman is committed to the long-term needs of the medical industry and is a reliable supplier of technical support and innovative medical-grade polymers for protective and functional rigid medical packaging as well as non-implantable medical-device applications.

Eastman can leverage its industry understanding, along with extensive design, engineering, and manufacturing expertise, to help customers develop products and bring them to market efficiently and then follow through with strong technical support.



For more information about Eastman Tritan™ copolyester MP100 and how Eastman can help you find the best solutions for your rigid medical packaging needs, visit www.eastman.com/medical or call 1-800-EASTMAN (1-800-327-8626).



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Material Safety Data Sheets providing safety precautions, that should be observed when handling and storing Eastman products, are available online or by request. You should obtain and review the available material safety information before handling any of these products. If any materials mentioned are not Eastman products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed.

It is the responsibility of the medical device manufacturer ("Manufacturer") to determine the suitability of all component parts and raw materials, including any Eastman product, used in its final product in order to ensure safety and compliance with requirements of the United States Food and Drug Administration (FDA) or other international regulatory agencies.

Eastman products have not been designed for nor are they promoted for end uses that would be categorized either by the United States FDA or by the International Standards Organization (ISO) as implant devices. Eastman products are not intended for use in the following applications: (1) in any bodily implant applications for greater than 30 days, based on FDA-Modified ISO-10993, Part 1, "Biological Evaluation of Medical Devices" tests (including any cosmetic, reconstructive, or reproductive implant applications); (2) in any cardiac prosthetic device application, regardless of the length of time involved, including, without limitation, pacemaker leads and devices, artificial hearts, heart valves, intra-aortic balloons and control systems, and ventricular bypass assisted devices; or (3) as any critical component in any medical device that supports or sustains human life.

For manufacturers of medical devices, biological evaluation of medical devices is performed to determine the potential toxicity resulting from contact of the component materials of the device with the body. The ranges of tests under FDA-Modified ISO-10993, Part 1, "Biological Evaluation of Medical Devices" include cytotoxicity, sensitization, irritation or intracutaneous reactivity, systemic toxicity (acute), subchronic toxicity (sub-acute), implantation, and hemocompatibility. For Eastman products offered for the medical market, limited testing information is available upon request. The Manufacturer of the medical device is responsible for the biological evaluation of the finished medical device.

The suitability of an Eastman product in a given end-use environment is dependent upon various conditions including, without limitation, chemical compatibility, temperature, part design, sterilization method, residual stresses, and external loads. It is the responsibility of the Manufacturer to evaluate its final product under actual end-use requirements and to adequately advise and warn purchasers and users thereof.

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