

Technical Data Sheet

Eastman Tritan™ Copolyester EX401

Application/Uses

- Baby bottles
- Breast pumps
- Infant care
- Pacifiers

Key Attributes

- Chemical resistance
- Clarity
- Global food contact regulatory clearances
- Heat resistance
- Hydrolytic stability
- Impact resistance
- Processing ease
- Sterilization capable via steaming or boiling water

Product Description

Tritan™ EX401, specifically developed for the Infant Care market, is an amorphous copolyester with excellent appearance and clarity. Tritan™ EX401 contains a mold release derived from vegetable based sources. Its most outstanding features are clarity, excellent toughness, hydrolytic stability, and heat and chemical resistance. Tritan™ EX401 meets infant care sterilization requirements via boiling water or microwave steam sterilization. This new-generation copolyester can also be molded into various applications without incorporating high levels of residual stress. Combined with Tritan™ copolyester's outstanding chemical resistance and hydrolytic stability, these features give molded products enhanced durability in the dishwasher environment, which can expose products to high heat, humidity, and aggressive cleaning agents.

Tritan™ EX401 can be converted into parts using injection molding, injection stretch blow molding (ISBM), and extrusion blow molding techniques.

Tritan™ EX401 copolyester may be used in repeated use food contact articles under United States Food and Drug Administration (FDA) regulations. Contact Eastman representative for details on global food contact regulatory clearances.

Eastman Tritan™ EX401 copolyester is included in Eastman Chemical Company's Customer Notification Procedure which details our policy for customer notification when significant changes are made in Tritan™ EX401 sold into the infant care market. This procedure provides the infant care industry an added layer of confidence in the consistent quality and performance of Tritan.

Typical Properties (Preliminary)

Property ^a	Test ^b Method	Typical Value, Units ^c
General Properties		
Specific Gravity	D 792	1.17
Injection Mold Shrinkage	D 955	0.005-0.007 mm/mm (0.005-0.007 in./in.)
ISBM Blow Mold Shrinkage ^d	EMN	0.012-0.016 mm/mm

Mechanical Properties

Tensile Stress @ Yield	D 638	44 MPa (6400 psi)
Tensile Stress @ Break	D 638	53 MPa (7700 psi)
Elongation @ Yield	D 638	7%
Elongation @ Break	D 638	140%
Tensile Modulus	D 638	1585 MPa (2.28 x 10 ⁵ psi)
Flexural Modulus	D 790	1585 MPa (2.28 x 10 ⁵ psi)
Flexural Yield Strength	D 790	66 MPa (9600 psi)
Rockwell Hardness, R Scale	D 785	115
Izod Impact Strength, Notched		
@ 23°C (73°F)	D 256	650 J/m (12.2 ft·lbf/in.)
@ -40°C (-40°F)	D 256	126 J/m (2.4 ft·lbf/in.)
Impact Strength, Unnotched		
@ 23°C (73°F)	D 4812	NB
@ -40°C (-40°F)	D 4812	NB
Impact Resistance (Puncture), Energy @ Max. Load		
@ 23°C (73°F)	D 3763	59 J (43 ft·lbf)
@ -40°C (-40°F)	D 3763	63 J (46 ft·lbf)

Mechanical Properties (ISO Method)

Tensile Strength @ Yield	ISO 527	45 MPa
Tensile Strength @ Break	ISO 527	49 MPa
Elongation @ Yield	ISO 527	7%
Elongation @ Break	ISO 527	130%
Tensile Modulus	ISO 527	1624 MPa
Flexural Modulus	ISO 178	1531 MPa
Izod Impact Strength, Notched		
@ 23°C	ISO 180	66 kJ/m ²
@ -40°C	ISO 180	14 kJ/m ²

Thermal Properties

Deflection Temperature		
@ 0.455 MPa (66 psi)	D 648	109°C (228°F)
@ 1.82 MPa (264 psi)	D 648	92°C (198°F)

Optical Properties

Total Transmittance	D 1003	92%
Haze	D 1003	<1%

Properties After Boiling

Haze After 8 hr boiling	EMN	<1%
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Izod Impact Strength, Notched, 23 C

After 8 hr boiling	EMN	650 J/m
After re-equilibration		643 J/m
Tensile Stress @ Yield		
After 8 hr boiling	EMN	44 MPa
After re-equilibration		45 MPa
Elongation @ Yield		
After 8 hr boiling	EMN	7%
After re-equilibration		6.5%

ISBM Bottle Properties

Fill Volume Shrinkage - Boiling, 1 hr ^e	EMN	<1%
Fill Volume Shrinkage - Boiling, 2 hr ^e	EMN	<1.5%
Fill Volume Shrinkage - Dishwasher ^e	EMN	<1%
Microwave Steam Sterilization, Total Energy (Wattage * Minutes) ^e	EMN	Up to 11,200 W-min
Microwave Boiling, Oven Power ^e	EMN	Up to 2200 W
Thermal Shock, Water Immersion, 98 C to 35 C ^e	EMN	No effect

Typical Drying Conditions

Drying Temperature	88°C (190°F)
Drying Time	4-6 hrs
Dewpoint	< -35°C (< -30°F)

Typical Processing Conditions - Injection Molding

Processing Melt Temperature	260-282°C (500-540°F)
Mold Temperature	38-66°C (100-150°F)

Typical Processing Conditions - Injection Stretch Blow Molding (ISBM)

Processing Melt Temperature	270-285°C (520-545°F)
Injection Mold Temperature	60-70°C (140-160°F)
Preform Temperature at Blow	185-195°C (365-385°F)
Primary Blow Pressure	0.03-0.08 MPa (4-12 psi)
Secondary Blow Pressure	0.2-0.3 MPa (25-40 psi)
Blow Mold Temperature	80-90°C (175-195°F)
Residual stress under polarized light, Fringe Count	EMN <= 3

Typical Processing Conditions - Extrusion Blow Molding (EBM)

Processing Melt Temperature	240-250°C (465-480°F)
Mold Temperature	25-45°C (80-110°F)

^a Unless noted otherwise, all tests are run at 23°C (73°F) and 50% relative humidity.

^b Unless noted otherwise, the test method is ASTM.

- c Units are in SI or US customary units.
- d Applies to the stretch blow molded portion only (not the injection molded preform).
- e Properties are typical of bottles made with proper processing to minimize residual stress.

Comments

Properties reported here are based on limited testing. Eastman makes no representation that the material in any particular shipment will conform exactly to the values given.

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03-Feb-2014 11:14:47 AM