# Tritan™ EX401

### Copolyester

#### Eastman Chemical Company

#### Message:

Tritan<sup>™</sup> EX401, specifically developed for the Infant Care market, is an amorphous copolyester with excellent appearance and clarity. Tritan<sup>™</sup> 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<sup>™</sup> 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<sup>™</sup> 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<sup>™</sup> EX401 can be converted into parts using injection molding, injection stretch blow molding (ISBM), and extrusion blow molding techniques. Tritan<sup>™</sup> 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<sup>™</sup> 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<sup>™</sup> 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.

| General Information |                                |      |             |
|---------------------|--------------------------------|------|-------------|
| UL YellowCard       | E118289-100169390              |      |             |
| Additive            | demoulding                     |      |             |
| Features            | Copolymer                      |      |             |
|                     | Impact resistance, high        |      |             |
|                     | Workability, good              |      |             |
|                     | Good chemical resistance       |      |             |
|                     | Heat resistance, high          |      |             |
|                     | Definition, high               |      |             |
|                     | Good toughness                 |      |             |
|                     | Compliance of Food Exposure    |      |             |
|                     | Hydrolysis stability           |      |             |
|                     | Good demoulding performance    |      |             |
|                     | Good appearance                |      |             |
|                     | amorphous                      |      |             |
|                     | Disinfect with steam           |      |             |
|                     |                                |      |             |
| Uses                | Infant Care                    |      |             |
|                     | Bottle                         |      |             |
|                     | Rubber nipple                  |      |             |
|                     |                                |      |             |
| Agency Ratings      | FDA Food Exposure, Not Rated   |      |             |
| Processing Method   | Injection Stretch Blow Molding |      |             |
|                     | Extrusion blow molding         |      |             |
|                     | Injection molding              |      |             |
|                     |                                |      |             |
| Physical            | Nominal Value                  | Unit | Test Method |

| Specific Gravity                  | 1.17          | g/cm³ | ASTM D792                                 |
|-----------------------------------|---------------|-------|---|
| Molding Shrinkage - Flow          |               |       |   |
| Blow Molded                       | 1.2 - 1.6     | %     | Internal method                           |
| Injection Molding                 | 0.50 - 0.70   | %     | ASTM D955                                 |
| Hardness                          | Nominal Value | Unit  | Test Method                               |
| Rockwell Hardness (R-Scale, 23°C) | 115           |       | ASTM D785                                 |
| Mechanical                        | Nominal Value | Unit  | Test Method                               |
| Tensile Modulus                   |               |       |   |
| 23°C                              | 1590          | MPa   | ASTM D638                                 |
| 23°C                              | 1620          | MPa   | ISO 527-2                                 |
| Tensile Strength                  |               |       |   |
| Yield, 23°C                       | 44.0          | MPa   | ASTM D638, Internal<br>Methods            |
| Yield, 23°C <sup>1</sup>          | 45.0          | MPa   | Internal Methods, ISO<br>527-2            |
| Fracture, 23°C                    | 53.0          | MPa   | ASTM D638                                 |
| Fracture, 23°C                    | 49.0          | MPa   | ISO 527-2                                 |
| Tensile Elongation                |               |       |   |
| Yield, 23°C <sup>2</sup>          | 7.0           | %     | Internal Methods, ASTM<br>D638, ISO 527-2 |
| Yield, 23°C <sup>3</sup>          | 6.5           | %     | Internal method                           |
| Fracture, 23°C                    | 140           | %     | ASTM D638                                 |
| Fracture, 23°C                    | 130           | %     | ISO 527-2                                 |
| Flexural Modulus                  |               |       |   |
| 23°C                              | 1590          | MPa   | ASTM D790                                 |
| 23°C                              | 1530          | MPa   | ISO 178                                   |
| Flexural Strength (Yield, 23°C)   | 66.0          | MPa   | ASTM D790                                 |
| Impact                            | Nominal Value | Unit  | Test Method                               |
| Notched Izod Impact               |               |       |   |
| -40°C                             | 130           | J/m   | ASTM D256                                 |
| 23°C                              | 650           | J/m   | ASTM D256, Internal<br>Methods            |
| 23°C <sup>4</sup>                 | 640           | J/m   | Internal method                           |
| -40°C                             | 14            | kJ/m² | ISO 180                                   |
| 23°C                              | 66            | kJ/m² | ISO 180                                   |
| Unnotched Izod Impact             |               |       | ASTM D4812                                |
| -40°C                             | No Break      |       | ASTM D4812                                |
| 23°C                              | No Break      |       | ASTM D4812                                |
| Instrumented Dart Impact          |               |       | ASTM D3763                                |
| -40°C, Energy at Max Load         | 63.0          | J     | ASTM D3763                                |
| 23°C, Energy at Max Load          | 59.0          | J     | ASTM D3763                                |
| Thermal                           | Nominal Value | Unit  | Test Method                               |
| Deflection Temperature Under Load |               |       | ASTM D648                                 |

| 0.45 MPa, not annealed  | 109                    | °C    | ASTM D648       |  |  |
|---|------------------------|-------|-----------------|--|--|
| 1.8 MPa, not annealed   | 92.0                   | °C    | ASTM D648       |  |  |
| Optical   | Nominal Value          | Unit  | Test Method     |  |  |
| Transmittance (Total)   | 92.0                   | %     | ASTM D1003      |  |  |
| Haze  |                        |       |                 |  |  |
| 5   | < 1.0                  | %     | Internal method |  |  |
|   | < 1.0                  | %     | ASTM D1003      |  |  |
| Additional Information  | Nominal Value          | Unit  | Test Method     |  |  |
| Fill Volume Shrinkage <sup>6</sup>  |                        |       | Internal method |  |  |
| Boiling, 1 hr   |                        | %     | Internal method |  |  |
| Boiling, 2 hr   |                        | %     | Internal method |  |  |
| Dishwasher  |                        | %     | Internal method |  |  |
| Microwave Boiling - Oven Power <sup>7</sup>   |                        | Watts | Internal method |  |  |
| Microwave Steam Sterilization - Total<br>Energy <sup>8</sup>  |                        | W-min | Internal method |  |  |
| Thermal Shock-Water Immersion(35 to 98°C) <sup>9</sup>  | No effect              |       | Internal method |  |  |
| Injection   | Nominal Value          | Unit  |                 |  |  |
| Drying Temperature  | 88.0                   | °C    |                 |  |  |
| Drying Time   | 4.0 - 6.0              | hr    |                 |  |  |
| Processing (Melt) Temp  | 260 - 282              | °C    |                 |  |  |
| Mold Temperature  | 38.0 - 66.0            | °C    |                 |  |  |
| Injection instructions  |                        |       |                 |  |  |
| Injection Stretch Blow Molding Parameters:Processing Melt Temperature: 270 to 285°CInjection Mold Temperature: 60 to 70°CPreform Temperature at<br>Blow: 185 to 195°CPrimary Blow Pressure: 0.03 to 0.08 MPaBlow Mold Temperature: 80 to 90°CResidual stress under polarized light, Fringe Count, EMN:<br><=3 |                        |       |                 |  |  |
| Extrusion   | Nominal Value          | Unit  |                 |  |  |
| Melt Temperature  | 240 - 250              | °C    |                 |  |  |
| Extrusion instructions  |                        |       |                 |  |  |
| Extrusion Blow Molding Mold Temperature: 25 to 45°C   |                        |       |                 |  |  |
| NOTE  |                        |       |                 |  |  |
| 1.  | After re-equilibration |       |                 |  |  |
| 2.  | After 8 hr boiling     |       |                 |  |  |
| 3.  | After re-equilibration |       |                 |  |  |
| 4.  | After re-equilibration |       |                 |  |  |
| 5.  | After 8 hr boiling     |       |                 |  |  |
| 6.  | ISBM Bottle            |       |                 |  |  |
| 7.  | ISBM Bottle            |       |                 |  |  |
| 8.  | ISBM Bottle            |       |                 |  |  |

ISBM Bottle

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