PUR, PIR and Polyol Catalysts
**ES CAT®** is a non-toxic, environment-friendly organometallic catalyst family for efficient polyurethane production.

### Comparison of toxicity characteristics

<table>
<thead>
<tr>
<th>Product</th>
<th>Toxicity</th>
<th>Organotin substances</th>
<th>Reactivity</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES CAT-100E</td>
<td>Non-toxic</td>
<td>MOT, DOT detected</td>
<td>Slower than T-12</td>
<td>PU catalyst, epoxy resin curing agent</td>
</tr>
<tr>
<td>ES CAT-180b</td>
<td>Non-toxic</td>
<td>Not detected</td>
<td>Same as T-12</td>
<td>Catalyst</td>
</tr>
<tr>
<td>ES CAT-100Ag-1822</td>
<td>Non-toxic</td>
<td>Not detected</td>
<td>Same as T-12</td>
<td>High temperature catalyst</td>
</tr>
<tr>
<td>ES CAT-100Ag-18Kmn</td>
<td>Non-toxic</td>
<td>Not detected</td>
<td>Slower than T-12</td>
<td>Catalyst and curing agent</td>
</tr>
<tr>
<td>ES CAT-320-25d</td>
<td>Non-toxic</td>
<td>Not detected</td>
<td>Same as T-12</td>
<td>Silicone resin curing agent, PU catalyst</td>
</tr>
<tr>
<td>ES CAT-B-75</td>
<td>Non-toxic</td>
<td>Not detected</td>
<td></td>
<td>PU catalyst</td>
</tr>
<tr>
<td>ES CAT-B-90N</td>
<td>Non-toxic</td>
<td>Not detected</td>
<td></td>
<td>PU catalyst</td>
</tr>
<tr>
<td>ES CAT-K-90</td>
<td>Non-toxic</td>
<td>Not detected</td>
<td></td>
<td>High temperature catalyst</td>
</tr>
<tr>
<td>ES CAT-5500</td>
<td>Low-toxic</td>
<td>MBT detected</td>
<td></td>
<td>Polyesterification Catalyst</td>
</tr>
</tbody>
</table>

※ 8 toxic substances: MBT, DBT, TBT, TeBT, MOT, DOT, TcyT, TPhT
Toxicity Test Report Example – ES CAT-100Ag-18Kmn

The following sample(s) was/were submitted and identified by ion test.

| SGS File No. | : | AYDA15-00824 |
| Sample Description | : | ES CAT-100Ag-18Kmn (141103) |
| Color | : | N/A |
| Style no./Item no. | : | N/A |
| Order No. | : | N/A |
| Country of Origin | : | N/A |
| Country of Destination | : | N/A |
| Received Date | : | 2015. 01. 13 |
| Test Period | : | 2015. 01. 14 to 2015. 02. 04 |
| Purpose of Test Report | : | For Reference |
| Test Method | : | Please refer to next page(s). |
| Test Results | : | Please refer to next page(s). |
| Test Performed | : | This test report contains results of the client. The results are/are as follows. |
| Result summary | : | Detected test(s) as requested by client. |

Test Results:

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Material No.</th>
<th>Component</th>
<th>Material</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Liquid</td>
<td>Liquid</td>
<td>Transparent</td>
</tr>
</tbody>
</table>

[Table]

Organic Test

Test Method: With reference to ISO 17353:2004. Analysis was performed by GC-MS.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAT-No.</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dibutyltin (DBT)</td>
<td>–</td>
<td>n.d.</td>
</tr>
<tr>
<td>Diocetyl (DOT)</td>
<td>–</td>
<td>n.d.</td>
</tr>
<tr>
<td>Tributyltin (TBT)</td>
<td>–</td>
<td>n.d.</td>
</tr>
<tr>
<td>Triphenyltin (TPhT)</td>
<td>–</td>
<td>n.d.</td>
</tr>
<tr>
<td>Conclusion</td>
<td>–</td>
<td>PASS</td>
</tr>
</tbody>
</table>

Note: n.d. = not detected
mg/kg = ppm
N.A. = Not applicable
* = exceed the limit
Detection limit = 0.03 mg/kg (for individual compound)

Recommended Max. Limit:
- Tributyltin (TBT) 0.6 mg/kg
- Dibutyltin (DBT) 1.0 mg/kg
- Triphenyltin (TPhT) 0.6 mg/kg
- Dicetyltrimethyltin (DOT) 1.0 mg/kg
Other: Not applicable

Remark: * = Exceeds the relevant requirement of the 2/3-composite mix. Detected substance(s) may come from one or more component(s) in composite testing. Individual testing of mixed components is highly recommended.
Reactivity comparisons of ES CAT® organometallic catalyst family

Characteristics of ES CAT® organometallic catalyst family

1. ES CAT compound catalysts are based on silver, bismuth, and zinc, which prevent the growth of fungi. These catalysts replace mercury and lead-based catalysts; they are tin-free and non-toxic.

2. These non-toxic, environment-friendly catalysts are utilized for PU synthesis by a global shoe manufacturer for insole coatings. Silver acts as an anti-bacterial agent and metallic bismuth acts as a hardener with the ability to form a smooth gel.

3. The organometallic composites can be customized upon your request.

Benefits of ES CAT® organometallic catalyst family

1. These catalysts can be used with DBTDL in identical amounts.(as their reactions are adjusted).

2. These catalysts are formulated to promote NCO/OH reactions with high hydrolytic-stability.

3. These catalysts allow the coordination of amines rather than catalyzing NCO/H₂O reactions in one component PU.

4. These catalysts can be used alone or in combination with additives and other organometallic compounds.
ES CAT® polyurethane catalysts are used in the following applications:

<table>
<thead>
<tr>
<th>Product</th>
<th>Epoxy Resin</th>
<th>Adhesives</th>
<th>TPU</th>
<th>Elastomers</th>
<th>Paints</th>
<th>Silicone</th>
<th>PU Rigid</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES CAT-100E</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
</tr>
<tr>
<td>ES CAT-180b</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
</tr>
<tr>
<td>ES CAT-100Ag-1822</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
</tr>
<tr>
<td>ES CAT-100Ag-18Kmn</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
</tr>
<tr>
<td>ES CAT-320-25d</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
</tr>
<tr>
<td>ES CAT-B-75</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
</tr>
<tr>
<td>ES CAT-B-90N</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
</tr>
<tr>
<td>ES CAT-K-90</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
</tr>
<tr>
<td>ES CAT-5500</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
</tr>
</tbody>
</table>

**Recommended Recipes**

1. PU Resin: Recommended catalyst is ES CAT-100E or ES CAT-100Ag-18kmn. Add 0.05-0.5% organometallic catalyst.
2. Polyurethane Adhesives: Recommended catalyst is ES CAT-100E, ES CAT-320-25d or ES CAT-100Ag-18kmn. Add catalyst mentioned in 1) and 2) for each polyol (%).
3. Silicone Sealants: Recommended catalyst is 0.05-0.5% ES CAT-320-25d.
4. Polyurethane elastomers: Recommended catalyst is ES CAT-100E, ES CAT-180b, ES CAT-100Ag-18kmn or ES CAT-B-75 or ES CAT-B-90N. Add 0.05-0.5% catalyst for each polyols (%).

**Manufacturing Capacity**

- Metal and amine catalysts and their derivatives: 6,000 Metric Tons/year.
- Curing Accelerator for Resin of INK: 3,000 Metric Tons/year.
- Special Organic Metal Compounds: 2,000 Metric Tons/year.
- Polyester Polyol: 20,000 Tons/year.
- Rigid Foam System House: 20,000 Tons/year.
ES CAT-5500

ES CAT-5500 is a highly active esterification catalyst at temperatures in the range of 200°C - 230°C. It is a white solid, which dissolves upon reaction with carboxylic acids. The active catalyst product is soluble in systems such as phthalate or isophthalate esters.

The use of ES CAT-5500 minimizes the dehydration and oxidative degradation of alcohols. ES CAT-5500 is a highly selective catalyst, which results in higher product purity by minimizing byproducts.

Corrosion, odor and color problems can be eliminated, which are commonly encountered with the use of acid catalysts. Neutralization and washing is not required. In addition, excess alcohol can be recovered and reused without expensive purification processes.

Typical Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formula</td>
<td>BuSnOOH 90%</td>
</tr>
<tr>
<td>Physical Form</td>
<td>Amorphous white Powder</td>
</tr>
<tr>
<td>Specific Gravity(@25°C)</td>
<td>1.46</td>
</tr>
<tr>
<td>Solubility</td>
<td>insoluble in most organic solvents: dissolves upon reaction with carboxylic acids</td>
</tr>
</tbody>
</table>

Recommended Uses

Esterification trans-esterification and polycondensation reactions

- Unsaturated polyester especially isophthalates
- Powder coatings
- Terephthalates
- Polyester polyols
- Specialty enamels
- Adipates
- Phthalates
- Coil coatings
- Alkyd resins

Normal concentrations are 0.05% to 25% by weight based on total charge. A reaction temperature near 220°C is recommended. ES CAT-5500 is soluble in most ester products.

Rapid esterification of isophthalic acid with Propylene glycol is obtained using ES CAT-5500 at the reflux temperature (190°C to 220°C). The recommended catalyst level is 0.1% of total charge in order to obtain an acid value of 5mg KOH/g after five hours.

Performance data for the preparation of Bis(2-hydroxypropyl) isophthalate are generated for each application.
ES CAT-100Ag-18kmn

Chemical name & Specification
- Chemical name: organic metal compound
- Degree of purity (%): 99.0min

Properties
- Appearance: yellowish & clear
- Specific Gravity(@25℃): 1.060

General Descriptions
This catalyst belongs to the family of Organic Metal compounds. It is used in Polyurethane Composite reactions and as a hardening accelerator. It has superior qualities not only for toxicity but also for performance as a thermal stabilizer compared to other metallic catalysts. Specifically, it has outstanding effectiveness in polymerization of Urethane resins, esters and polyols.
- This is a substitute for DBTDL (Dibutyltin dilaurate)
- Tin-free & free of MBT, DBT, TBT, TeBT, MOT, DOT, TOT, TchT, TPT
- Higher activity than Escat-100E in reaction

Application
- Catalyst for polyurethane synthesis
- Tin-free & Non-toxic accelerator for synthetic leather, fiber and shoes
- Hardening accelerator for silicone resin and silicone sealant

Package Description:  
16kg net
180kg net
ES CAT-180B

Product
Organic metal Compound

Properties
- Appearance: Yellowish colored liquid
- Specific Gravity (@25°C): 0.92
- Degree of purity(%): 99.0min
- Viscosity: below 100cps

Package Description: 20kg net
200kg net

General Descriptions
This is a metal Mercaptide catalyst. It is used as a Polyurethane Composite reaction catalyst and as a hardening accelerator. It has superior qualities not only for toxicity but also for performance as a thermal stabilizer compared to other metallic catalysts. Specifically, it has outstanding effectiveness in the polymerization of Urethane resins, esters and polyols.

- This is substitute for DBTDL (Dibutyltin dilaurate)
- Free of MBT, DBT, TBT, TeBT, MOT, DOT, TehT, TPT
- Higher activity than ESCAT-100E in reaction

Recommended Use
- Catalyst for Polyurethane Resin Composition
- Polyol Polymerization reaction catalyst
- Hardening catalyst: For wet & Dry Process
- Stabilizer-Resin, Ester reaction

Innocuousness Approval Institution & Number:
FDA (21CFR178.2020) Max. 2.0%
BGD (ILA, 4C) Max. 1.2%
JHPA (C-8-(10)-1) Max. 2PHR%
ES CAT-100L

Product

Dioctyltin Dilaurate

Properties

- Appearance: Yellowish & clear.
- Specific Gravity (@25°C): 1.55
- Degree of Purity (%): 99.0min
- Sn content (%): 15.2

Application

- Catalyst for polyurethane resins
- Non-toxic accelerator for synthetic leather, fiber, and shoes
- Hardening accelerator for silicone and sealant

Package Description:

- 18kg net
- 200kg net

- This is substitute for DBTDL (Dibutyltin dilaurate)
- Free of MBT, DBT, TBT, TeBT, TcyT, TPhT
Chemical name & Specification
- Chemical name: organic metal compound
- Degree of purity (%): 99.0min

Properties
- Appearance: yellowish & clear
- Specific Gravity(@25°C): 1.150

General Descriptions
This catalyst belongs to the family of Organic Metal compounds and is used in Polyurethane Composite reactions and as a hardening accelerator. It has superior qualities not only for toxicity but also for performance as a thermal stabilizer, compared to other metallic catalysts. Specifically, it has outstanding effectiveness in polymerization of Urethane resins, esters and polyols.

- This is substitute for DBTDL (Dibutyltin dilaurate)
- Tin-free & free of MBT, DBT, TBT, TeBT, MOT, DOT, TOT, TchT, TPT

Application
- Catalyst for polyurethane synthesis
- Tin-free & Non-toxic accelerator for synthetic leather, fiber, and shoes
- Hardening accelerator for silicone resin and silicone sealant

Package Description: 16kg net
180kg net
**ES CAT-100E**

### Chemical name & Specification
- Chemical name: organic metal compound
- Color (Gardner): 2 Max
- Degree of purity (%): 99.0 min
- Metal content (%): 18.8

### Properties
- Appearance: yellowish & clear
- Specific Gravity (@25℃): 0.990

### Application
- Catalyst for polyurethane resins
- Non-toxic accelerator for synthetic leather, fiber and shoes
- Hardening accelerator for silicone and sealant

### Package Description
- 18kg net
- 200kg net

- The different physical properties of ES CAT-100E can be produced at request
- This is substitute for DBTDL (Dibutyltin dilaurate)
- Free of MBT, DBT, TBT, TeBT, TchT, TPT
Chemical name & Specification
- Chemical name : organic metal compound
- Color (Gardner) : 2Max
- Degree of purity (%) : 99.0min
- Metal content (%) : 23±1

Properties
- Appearance : yellowish & clear
- Specific Gravity (@25°C) : 1.125

Application
- Catalyst for polyurethane resins
- Accelerator for synthetic leather, fiber, and shoes
- Hardening accelerator for silicone and sealant

Package Description : 20kg net
200kg net
- This is substitute for DBTDL (Dibutyltin dilaurate)
- Free of MBT, DBT, TBT, TeBT, TchT, TPT, MOT, DOT
ES CAT-T-1

Product
Dibutyltin diacetate

Properties
- Colored liquid.
- Soluble in hydrocarbon-type solvents.
- Approximate Density 1.010
- Flash Point 204°C, PMCC Method
- Sn content(%) : 33.0

Package Description : 25kg net
250kg net

Handling
- Avoid contact with eyes and skin
- Protect from moisture or open flame
- See MSDS for further information

ES CAT-K-15

Chemical name & Specification
- Chemical name : Potassium Octoate
- Color (Gardner) : 2Max
- Purity(%) : 99.0min

Properties
- Appearance : yellowish & clear
- Specific Gravity (@25°C) : 1.10±0.03
- Flash Point (°C) : 137

Handling
- Dryer for paint
- Catalyst for polyurethane spray
- Catalyst for polyisocyanurate foam

Package Description : 18kg net
200kg net
ES CAT-B-75

Product
Bismuth Octoate
Bi(OOCC7H15)3

Properties
- Straw colored liquid
- Soluble in hydrocarbon solvents
- Approximate Density : 1.05
- Degree of purity(%) : 99.0min

Package Description :
18kg net
200kg net

Handling
- Avoid contact with eyes and skin
- Protect from moisture or open flame
- See MSDS for further information

ES CAT-B-90N

Product
Bismuth Neodecanoate (CAS #34364-26-6).

Properties
- Appearance : Light Yellowish Liquid
- Viscosity(25°C) : <5,000
- Flash point(°C) : >110
- Density(g/ml@25°C) : 1.05-1.15
- Boiling point(°C) : 300

Application
- Effective catalyst for Silicone Sealants
- Bismuth-based catalyst for a good balance in pot life and cure
- Good non-tin alternative to DBTL for polyurethane coatings, adhesive/sealants, and elastomer systems

Handling
- Should be stored in the original packaging at moderate temperature
- Prevent from freezing
- Close tightly after each use to maximize shelf life. Package Description: 18kg net, 200kg net.

Package Description :
18kg net
200kg net
TEDA (TRI ETHYLENE DIAMINE), ES CAT L-33, L33E

- TEDA is a solid, white and crystalline tertiary amine compound.
- TEDA is extensively used as a catalyst to promote both gelling and blowing activities in the production of flexible, semi-rigid, and rigid polyurethane foams, as well as elastomers. It is also available in a solution of dipropylene glycol (ESCAT-33) and ethylene glycol (ESCAT-33E).

**Properties**
- Degree of purity (%) : 99.5 min
- Freezing point (°C) : 159.9
- Boiling point (°C) : 174

**Package Description** : 25kg net

**Application**
- Dryer for paint
- Catalyst for polyurethane spray
- Catalyst for polyisocyanurate foam

---

**ES CAT-L-33**

ES CAT L-33 is mixed with Triethylene diamine and 67% Dipropylene glycol. ES CAT L-33 is extensively used as liquid for promoting both galling and blowing activities in the production of flexible, semi-rigid, and rigid polyurethane foams, and elastomers.

It is easily soluble in water, acetone, benzene, alcohol, and straight chain hydrocarbons like pentane, hexane, and heptane. When exposed to air, it absorbs moisture, deliquesces, and agglomerates in lumps. It also absorbs CO₂ in air and turns yellow.

**Properties**
- Chemical name : Triethylene diamine with Dipropylene glycol
- Molecular weight : 112.18
- Degree of Purity : 33.3%
- Moisture : 1.0%
- Boiling point : 220°C

**Package Description** : 18kg net, 200kg net

**Handling**
- Avoid contact with eyes and skin
- Keep away from moisture and open flame

---

**ES CAT-L-33E**

ES CAT L-33E is mixed with Triethylene diamine 33% and 67% Ethylene glycol. ES CAT L-33E is extensively used as a catalyst for promoting both galling and blowing activities in the production of flexible, semi-rigid, and rigid polyurethane foams as well as elastomers.

It is easily soluble in water, acetone, benzene, alcohol, and straight chain hydrocarbon like pentane, hexane, and heptane. When exposed to air, it absorbs moisture, deliquesces, and agglomerates in lumps. It also absorbs CO₂ in air and turns yellow.

**Properties**
- Chemical name : Triethylene diamine with Ethylene glycol
- Molecular weight : 112.18
- Degree of Purity : 33.3%
- Moisture : 1.0%
- Boiling point : 220°C

**Package Description** : 18kg net, 200kg net

**Handling**
- Avoid contact with eyes and skin
- Keep away from moisture and open flame
ES CAT-TB400

### Product
Tert-butyl Monoperoxymaleate, Paste

### Properties
- Appearance: White Paste
- Specific Gravity: 1.035
- Active Oxygen: 2.29 ~ 2.82 wt%
- Purity: 38.0 ~ 41.0 wt%
- Molecular Weight: 188.2
- UN No.: 3103
- C.A.S. Registry No.: 1931-62-0

### Applications
ES CAT-TB400 is usable as a hardener for artificial marble. Artificial marble can be manufactured in various shapes and is mainly used for manufacturing kitchenware and bathroom items. ES CAT TB-400M can be also used as a hardener for MMA resin.
# POLYESTER POLYOL SERIES

<table>
<thead>
<tr>
<th>Grade</th>
<th>Appearance</th>
<th>Viscosity (25C cps)</th>
<th>OH Value</th>
<th>Water (max %)</th>
<th>Application</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP-150</td>
<td>Clear Brown</td>
<td>60,000±10,000</td>
<td>150 ±10</td>
<td>1.0</td>
<td>• PIR/PUR Applications</td>
<td></td>
</tr>
<tr>
<td>SP-190</td>
<td>Clear Brown</td>
<td>3,000±500</td>
<td>200 ±10</td>
<td>1.0</td>
<td>• PIR/PUR Applications</td>
<td></td>
</tr>
<tr>
<td>SP-200</td>
<td>Clear Brown</td>
<td>30,000±10,000</td>
<td>200 ±10</td>
<td>1.0</td>
<td>• PIR/PUR Applications</td>
<td></td>
</tr>
<tr>
<td>SP-240Y</td>
<td>Clear Brown</td>
<td>5,000±500</td>
<td>240 ±20</td>
<td>1.0</td>
<td>• PIR/PUR Applications</td>
<td></td>
</tr>
<tr>
<td>SP-240P</td>
<td>Clear Brown</td>
<td>8,500±1,000</td>
<td>245 ±10</td>
<td>1.0 (0.37)</td>
<td>• Laminate boards, metal panels</td>
<td></td>
</tr>
<tr>
<td>SP-240SA</td>
<td>Clear Brown</td>
<td>3,500±700</td>
<td>240 ±10</td>
<td>1.0</td>
<td>• Laminate boards, metal panels, appliances</td>
<td>Provides good flow &amp; improved HC &amp; HFC stability</td>
</tr>
<tr>
<td>SP-250Y</td>
<td>Clear Brown</td>
<td>5,000±500</td>
<td>240 ±20</td>
<td>1.0</td>
<td>• Metal panels, spray foams, appliances, pour-in-place</td>
<td>Improves thermal resistance</td>
</tr>
<tr>
<td>SP-320GA</td>
<td>Clear Brown</td>
<td>3,000±500</td>
<td>320 ±20</td>
<td>1.0</td>
<td>• Spray foam, bunstock, pour-in-place</td>
<td>Improves thermal resistance</td>
</tr>
<tr>
<td>SP-320N</td>
<td>Clear Brown</td>
<td>3,300±500</td>
<td>320 ±20</td>
<td>1.0</td>
<td>• Spray foam, bunstock, pour-in-place</td>
<td>High stability with HC &amp; HFC</td>
</tr>
<tr>
<td>SP-330AP</td>
<td>Clear Brown</td>
<td>8,000±2,000</td>
<td>320 ±20</td>
<td>1.0</td>
<td>• Metal panels, spray foam, appliances, bunstock, pour-in-place</td>
<td>Improves green strength &amp; thermal resistance</td>
</tr>
</tbody>
</table>
POLY ESTER POLYOL SP-240

Product name : SP-240

Description
SP-240 is a modified Terephthalic acid (TPA)

Applications
Rigid polyisocyanurate boardstock blown with HCFC-141b/water, or blown with hydrocarbons; extender for polyurethane foams.

Features
SP-240 can used for production of polyisocyanurate board stock meeting industry requirements for commercial roofing and residential sheathing applications. Its high aromatic content contributes to polymer rigidity and heat resistance. As a result of its pure raw material base, this polyol offers low viscosity and consistent performance.

Specifications and Properties
“Hydroxyl number, mg KOH/g : 240”
Water(%) : Max1.0
“Acid-Value, mg KOH/g : MAX 1.0”
Specific Gravity(@25C) : 1.21
“Viscosity(@25C) : 1,200”
Appearance : Pale yellow liquid
POLY ESTER POLYOL SP-320GA

- **Product name**: SP-320GA

- **Description**
  SP-320GA is a diethylene glycol terephthalic acid based polyester polyol.

- **Applications**
  Rigid isocyanurate boardstocks, or low density for pour and spray, or high density for packaging polyurethane foams. It can also be used in formulating urethane coatings, adhesives, sealants, and elastomers.

- **Features**
  SP-320GA exhibits excellent hydrolysis resistance, very good thermal stability, and primary hydroxyl advantage. It may promote adhesion to a variety of metal and plastic substrates. This product has low viscosity for ease of blending and high aromatic content.

- **Specifications and Properties**
  - “Hydroxyl number, mg KOH/g : 320”
  - Water(%) : Max1.0
  - “Acid-Value, mg KOH/g : 2.0 MAX”
  - Specific Gravity(@25C) : 1.21
  - “Viscosity(@25C) : 2,500”
  - Appearance : Pale yellow liquid.