

## EVOPRENE™ Thermoplastic Elastomer (TPE) Compounds - GENERAL INFORMATION

### INTRODUCTION

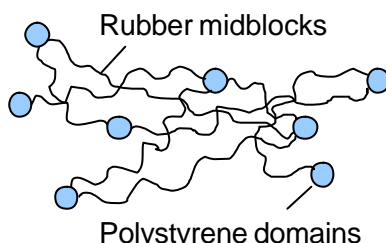
The Evoprene™ range of thermoplastic elastomer compounds was first formulated over 25 years ago. Since then the range has been continually developed, revised and refined so that today's compounds are available to meet demanding requirements in nearly all areas of our lives – from parts for appliances, automobiles and consumer products, through gaskets, seals and fittings for construction to regulated areas such as baby products, toys, food and medical components.

### TECHNOLOGY

Most Evoprene™ Compounds are based on styrene block copolymers (SBCs), either hydrogenated – H-SBC – (SEBS – styrene-ethylene butylenes-styrene or similar) or non hydrogenated (SBS – styrene-butadiene-styrene) or alloys of these and other compatible polymers. Various thermoplastics, process oils, fillers and stabilisers are compounded in high shear mixing equipment to produce a wide range of grades. All Evoprene™ TPE compounds are pelletised and packaged in pe sacks or in bulk containers.

SBC based Evoprene™ TPE compounds process easily on standard thermoplastic moulding and extrusion equipment at temperatures from 150 to 220°C (300 to 430°F), dependent on grade. Processing information is available in our separate Processing Guides

Once cooled to ambient temperature they acquire their characteristic properties of rubber-like feel with excellent extensibility, good recovery and high friction. These properties are provided by the chemical structure of the SBC. The flexible, rubbery midblocks are held together by the polystyrene end blocks which, because of their affinity for each other, coalesce together to form domains which act as physical crosslinks.



As the compound is heated the domains eventually start to break apart and the material begins to flow. This is a gradual transition but does provide an upper service temperature limit for each compound which is dependent not only on the grade of SBC used but also on the other additives compounded in.

The process is fully reversible which is why these compounds can be reground and reused many times over with little loss of physical properties.

The low temperature service life is mostly determined by the stiffening of the rubber-like mid blocks. This does not occur until around -60°C allowing most Evoprene™ compounds to be used at very low temperatures with minimal loss of flexibility and no risk of cracking.

*For performance, versatility, and distinction, choose Evoprene™. Learn more by requesting additional information or visiting our website: [www.alphagary.com](http://www.alphagary.com).*

EVOPRENE™ G SERIES

EVOPRENE™ G COMMODITY

EVOPRENE™ SUPER G

EVOPRENE™ STANDARD

EVOPRENE™ COGEE

EVOPRENE™ HP

#### Additional Information about:

- Material Selection
- Processing
- Mould Shrinkage
- Chemical Resistance
- Packaging & Labeling

can be obtained by visiting [www.alphagary.com](http://www.alphagary.com), emailing us at [info@alphagary.com](mailto:info@alphagary.com), or contacting one of our offices

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**UK Office: +44 (0) 1664 502222**

**US & Canada Office: 978-537-8071 / 800-232-9741**

AlphaGary Ltd, Beler Way, Melton Mowbray, Leicestershire LE13 0DG (UK)

AlphaGary Canada Ltd, 5 Pinelands Avenue, Stoney Creek, Ontario L8E 3A4 (Canada)

AlphaGary Corporation, 170 Pioneer Drive, Leominster, MA 01453 (USA)

AlphaGary Corporation, 9635 Industrial Drive, Pineville, NC 28134 (USA)

This information is intended for general guidance only and may contain information which could be inappropriate under particular conditions of application or use. Each customer or user must conduct its own studies to check for suitability for the intended end use.

## EVOPRENE™ Thermoplastic Elastomer (TPE) Compounds - GENERAL INFORMATION

### COMPOUND BENEFITS

*Evoprene™ compounds are produced in our own compounding plants in the UK and North America and are tested against strict quality control procedures. Test results are maintained on file as is traceability of ingredients used in each mix. The systems in place together with those used to track developments in our technical department form part of our ISO 9001 accreditation.*

Most Evoprene™ grades have been formulated for specific applications then adapted for other requirements. There are a number of features which all grades exhibit and which provide a benefit to the processor or end customer:

- Easy to process on standard thermoplastics processing equipment
- Fully recyclable at all stages
- No degradation during normal processing
- Pelletised compound is ready to use usually without predrying
- Generally easy to colour with universal or pe based masterbatch or with liquid colours
- Suitable for moulding with cold or hot runner systems
- All grades are free from phthalate or similar plasticisers
- All grades except the flame retardant grades (identified separately) are halogen-free
- Extensive development and technical service support available

### MASTERBATCHING/COLOURING

One of the benefits of using Evoprene™ TPE compounds over thermoset rubbers is they can be readily coloured. H-SBC-based Evoprene™ G grades in particular can be stabilised to give excellent colour retention over long periods of time, making them particularly useful for brightly coloured articles. Orders from our UK manufacturing plant of 2T or more can be supplied readily pigmented and a colour matching service is available with the help of our sophisticated colour computer. For smaller volume users, or those who prefer to manage their stock with larger volumes of natural we recommend the use of either pe based (preferred for all the Evoprene™ G types) or universal masterbatches. Liquid systems are also very effective.

### PACKAGING & LABELING

Evoprene™ compounds are normally packaged either in 20kg or 25kg polyethylene heat sealed bags or in bulk containers (Octabins or boxes) holding between 400 and 1000kg. The labels show details of the grade reference, full product code and batch number. The batch number is important as it provides full traceability in the case of a query. The table below shows how to interpret the batch code. For ease of tracking in our warehouse all stock is bar coded.

e.g. 7F10/02

Single Number	Year	7=2007
Single Letter	Month	F=June
2 numbers	Day	10=10 <sup>th</sup>
/ number	Pallet No.	/02=2 <sup>nd</sup> pallet

### PRE-DRYING

It is not normally necessary to pre-dry Evoprene™ compounds although there are some circumstances where this may be beneficial if the compound has been in storage for more than 6 months.

The shelf life of all filled Evoprene™ G grades in dry conditions at ambient temperature is normally in excess of 2 years and 1 year for standard grades. Unfilled Evoprene™ G grades have been known to process well even after 5 years in storage.

Some of the Evoprene™ COGEE compounds contain hygroscopic ingredients and some of the Evoprene™ G flame retardant grades process better when pre-dried. Please contact our technical department for further details.

### RECYCLING

Another major benefit of Evoprene™ TPE grades over their thermoset cousins is the ease with which they can be recycled at all stages. During processing, any sprues, runners, offcuts, etc. can be reground and fed back in with virgin material. Care must be taken to avoid contamination and sharp knives are important during the grinding stage. Recommended loadings in virgin compound are up to 20% although higher loadings are possible. Evoprene™ compounds can also be recycled when the useful life of the component has finished although in some cases some additional stabilisation will be necessary.

## EVOPRENE™ Thermoplastic Elastomer (TPE) Compounds - GENERAL INFORMATION

### REGULATORY POSITION IN THE EU

The regulations for plastics in contact with food have been undergoing major revisions within the EU for a number of years. One of the first amendments to be published was 90/128 EC which provided a list of allowable ingredients for monomers and starting substances. A positive list of additives was produced and amended several times. Both sections were combined in a updated Directive, 2002/72 EC but this has also been amended several times.

The positive lists, which are legally binding in some EU countries and recommendations in others, will all cease to become valid after the finalised EU directive is published. This is expected in 2007. After this all EU countries will adopt the new regulations. In the meantime, however, it is important to check the latest position within your own market to ensure compliance.

For food contact applications the EU Directive requires a compound to be based on ingredients specified within the positive lists, including meeting their Specific Migration Limits (SML). The compound also has to meet Global or Overall Migration levels into the food with which it is intended to come in contact. This is assessed by tests in one or more simulants. There are 4 simulants in total and a wide range of test conditions can be specified.

A =	Water for aqueous foods with pH > 4.5
B =	3% acetic acid for acidic food with pH < 4.5
C =	10% ethanol for alcoholic foods (>10% for higher alcohol content)
D =	rectified olive oil for fatty foods. A mixture of synthetic tricyclerides or 95% ethanol can be used when olive oil is unsuitable

### EVOPRENE™ FOR FOOD CONTACT

#### IMPORTANT NOTICE

It is the responsibility of the end user to determine for themselves the suitability of any Evoprene™ compound in their own application under their own conditions of use. The comments regarding suitability for food contact use provided in the tables are intended **for guidance only**.

Most Evoprene™ compounds are based on ingredients from the positive lists meeting SML limits. Unfilled (translucent and transparent) compounds comply with global migration limits in simulants A, B and C. Some filled grades fall outside the limits for acetic acid migration. SEBS polymers have recently been approved for fatty food contact in simulant D. New Evoprene™ SEBS oil-free compounds with limited fatty food compliance are now available. Details from our technical team

### CHEMICAL RESISTANCE

*Although the chemical resistance of Evoprene™ TPE compounds varies from grade to grade some useful generalisations and predictions can be made.*

E = Excellent      G = Good      M = Moderate      P = Poor

	Temp °C	Super	G	P	G / HP	GC	Standard
Acetone	23		G	M	G/M	M	M
Acids up to 80%	23		E		E	G	M
Alcohol	23		E		E	G	G
Alkalis	23		E		E	G	G
Brake fluid	23		G		G	M	M
Chlorinated solvents	23		P		P	P	P
Diesel	23		P		P	P	P
Ethylene glycol	23		E		E	E	E
Petrol (gasoline)	23		P		P (G if >85 A)	P	P
Salt solution	23		E		E	G	G
Soda lye	23		E		E	G	M
Water - cold	23		E		E	E	G
Water - hot	95		E		G	M	P

## EVOPRENE™ Thermoplastic Elastomer (TPE) Compounds - GENERAL INFORMATION

### STABILISATION OF EVOPRENE™ TPE COMPOUNDS

Evoprene™ compounds produced in our UK plant are coded with a 4 digit colour and stabilisation code in addition to the 3 or 4 digit grade reference. A number of standard stabiliser systems are in use to provide different levels of protection. If a colour is also required the reference will be reissued with its own unique number to avoid any possibility of mistakes during compounding. Examples of standard stabiliser references are shown in the table:

- General purpose Natural – 1000, 2436, 4140
- General purpose Black – 5156, 4286, 4311
- Food Contact Natural – 4179, 4313
- High UV stability – Natural 4262, 4305, Black 5157



Evoprene™ is widely used for soft grips on coat hangers

It is important to specify the application so the appropriate stabiliser system is used. Failure to do so could lead to a number of problems with the final parts.

#### **IMPORTANT NOTES: The following information relates to the technical data we provide.**

All tests are carried out at 23°C unless otherwise stated. Data is generated on injection moulded samples

- **Hardness:** This is measured on 6-6.5mm thick injection moulded bars. Readings are taken after 10 seconds.
- **Flow:** An assessment of flow is given by the Macklow-Smith extrusion rheometer. The value quoted for each grade is the average force required to extrude a sample through a strip die 10mm X 1mm at 90mm/minute. The test is carried out at 180°C for all Evoprene™ G grades and 150°C for Evoprene™ Standard grades except those types indicated.
- **Stress strain properties:** These are tested on film gated 2mm thick injection moulded samples. The results are quoted as an average of those obtained perpendicular and parallel to the direction of flow.
- **Service temperature guide:** This is intended as a guide only for components continually exposed in a clean, dry atmosphere. Temperatures outside of those shown can often be tolerated for short periods.
- **Food contact:** Certain grades are based on ingredients approved for use in contact with foodstuffs according to EU, FDA, or other world regulations. It is important that this requirement is discussed with AlphaGary during the recommendation process. It is the responsibility of the end-user to ensure that the finished article meets all required performance characteristics and regulations.

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