



PRODUCT INFORMATION

TECHNICAL DATASHEET

8/15/2014

Introduction

DIPRANE™ 590 Series is a polyester based PU elastomer system. The DIPRANE C590/45 Polyol Curative can be reacted with DIPRANE 530 Prepolymer to produce an elastomer of 45°A and with increasing quantities of DIPRANE CA chain extender as a third component to allow the production of elastomers up to 55 Shore D hardness.

DIPRANE 590 SERIES Three Component Elastomer System

The system has been specially developed for applications requiring a high degree of dynamic performance coupled with excellent physical properties and abrasion resistance.

Component Properties

Polyol Component

Product Reference	DIPRANE™ C590/45 Polyol Curative
Appearance	Whitish, waxy solid at 20°C Hazy, amber liquid at 40°C
Viscosity	2500 – 3500 mPa.s at 40°C
Specific Gravity	1.16 – 1.18 at 40°C

Isocyanate Component

Product Reference	DIPRANE™ 530 Prepolymer
Appearance	Pale, amber liquid
Isocyanate Content	16.4 – 16.6%
Viscosity	1900 – 3100 mPa.s at 25°C
Specific Gravity	1.20 – 1.22 at 25°C 1.18 – 1.20 at 40°C

Chain Extender Component

Product Reference	DIPRANE™ CA
Appearance	Whitish, crystalline solid below 20°C Colourless, clear liquid above 20°C
Specific Gravity	1.01 – 1.02 at 20°C

These are typical values and should not be construed as specifications.

Mixing Ratios

DIPRANE™ 590 can be blended in the following proportions to give a range of hardness from 45°A to 55D

Hardness	45A	50A	55A	60A	65A	70A	75A	80A	85A	90A	95A	55D
DIPRANE™ C590/45 Polyol	376.0	209.3	187.6	165.3	145.9	126.4	111.0	97.5	78.0	54.0	49.7	20.0
DIPRANE™ CA	--	7.65	8.60	9.65	10.55	11.40	12.12	12.75	13.65	14.75	14.95	16.30
DIPRANE™ 530 Prepolymer	100	100	100	100	100	100	100	100	100	100	100	100

These are typical values and should not be construed as specifications.

NB: The above ratios are in parts by mass and should be measured to an accuracy of $\pm 1\%$.

DIPRANE™ 590 can be supplied ready blended in the above hardness grades for use as two component systems. They should be thoroughly mixed before use, as separation will occur on standing.

Cured System – Typical Properties

Property	Test Method	Value						Unit
		45A	50A	55A	60A	65A	70A	
Hardness	ISO 868							
Tensile Strength	ISO 527 – Type 5 (2mm)	19	24	30	32	35	36	MPa
100% Modulus	ISO 527	1.2	1.6	1.7	2.3	2.7	3.5	MPa
300% Modulus	ISO 527	1.9	2.1	2.4	4.5	5.7	6.5	MPa
Elongation at Break	ISO 527	750	750	680	620	580	610	%
Angle Tear Strength	ISO 34 – Pt B, Proc A	33	36	39	47	58	67	KN/m
Compression Set 22 hrs at 70°C	ISO 815-1 (Part 1)	20	25	25	25	30	30	%
Resilience	ISO 4662	60	57	55	52	50	49	%
DIN Abrasion	ISO 4649	<30	<30	<30	<30	<30	<30	mm ³

Property	Test Method	Value						Unit
		75A	80A	85A	90A	95A	55D	
Hardness	ISO 868							
Tensile Strength	ISO 527 – Type 5 (2mm)	37	39	44	42	40	33	MPa
100% Modulus	ISO 527	3.9	4.3	5.4	7.6	8.7	14.0	MPa
300% Modulus	ISO 527	7.8	9.6	10.5	15.0	15.5	24	MPa
Elongation at Break	ISO 527	570	540	530	520	550	480	%
Angle Tear Strength	ISO 34 – Pt B, Proc A	68	82	85	95	110	115	KN/m
Compression Set 22 hrs at 70°C	ISO 815-1 (Part 1)	30	30	30	30	30	--	%
Resilience	ISO 4662	48	47	44	40	30	25	%
DIN Abrasion	ISO 4649	<30	<30	<30	<30	<30	<70	mm ³

Average nominal cured density for all grades is 1.21 g/cc @ 23°C

These are typical values and should not be construed as specifications.

Processing Details

The following information is given as a guide to processing this product. It is recommended that optimum conditions for a specific application are determined experimentally. Our Technical Service Department can offer more detailed advice.

Recommended Processing Temperatures

Polyol Component	50 – 55°C
Isocyanate Component	50 – 55°C
Chain Extender Component	25 – 30°C
Mould Temperature	85 – 95°C
Gel Time	3 – 8 minutes
Typical Demould Time	15 – 40 minutes

These are typical values and should not be construed as specifications.

Material Preparation

Both DIPRANE™ C590/45A polyol component and DIPRANE 530 Prepolymer isocyanate component are viscous liquids, and, depending on the storage temperature, may freeze or crystallise.

Polyol component

The polyol component forms a waxy solid at the recommended storage temperature of 0 – 30°C. Heat is required to liquefy the polyol and / or to condition the polyol to the processing temperature. It is recommended that the polyol be warmed slowly either:

- in an air circulating oven (preferred) or a hot box,
- with a drum blanket,
- with band heaters.

Temperatures up to 60°C are recommended.

CAUTION: Exposure to temperatures above 60°C should be avoided as this will lead to degradation of the product.

It is recommended that the warming/melting process should be carefully controlled, taking care to avoid overheating or heating for extended periods of time. Hot spots can cause degradation and should, therefore, be avoided.

In general, warming for a longer time period at a lower temperature (50°C) is preferred compared to a short time period at a higher temperature (60°C).

Typically, at 50 – 55°C:

- a 25kg drum (pail) of polyol requires 16 hours to melt;
 - a 200kg drum requires 24 – 48 hours,
- although this will depend on the initial temperature of the material and the heat distribution efficiency of the heating method. It is recommended that the optimum conditions for a particular application are determined experimentally by the user.

It is recommended that the polyol component is NOT stored:

- at 40 – 50°C for greater than 1 week;
- at 50 – 55°C for greater than 5 days;
- at 55 – 60°C for greater than 3 days.

In each case this assumes unopened, tightly sealed containers.

Please Note: It is essential that the polyol component is thoroughly rolled / mixed before use.

Strong turbulence and mixing with air should be kept to a minimum by adopting a careful mixing technique (e.g. drum/keg rolling) or using low air introducing mixers. It is recommended that any air introduced during mixing is subsequently removed through degassing by either machine or vacuum chamber. It is the responsibility of the customer to ensure that the product is mixed and degassed sufficiently for use. Please consult the Dow Technical Service Department if you are unsure of the recommended methods for degassing material.

Isocyanate component

DIPRANE™ 530 Prepolymer is a pale amber, transparent, low viscosity, stable liquid at the recommended storage temperature of 15 – 30°C, however below this temperature range it can crystallise and solidify. The crystalline portion of the solidified product is 4,4'- diphenylmethane diisocyanate and, in this solid form, it exhibits the same dimerisation characteristics as pure diphenylmethane diisocyanate. Unless proper action is taken to reform the original solution, subsequent dimerisation will proceed quickly and deteriorate the clarity and assay of the product.

The recommended technique for melting crystallised material is by drum rolling (5 - 10 RPM) in atmospheric steam. This method helps to provide for efficient heat transfer while the solid block of frozen diphenylmethane diisocyanate cools the liquefied portion, so that the product temperature should not reach a high enough level (>60°C) as to cause excessive dimerisation.

CAUTION: Exposure to temperatures above 60°C should be avoided as this will lead to degradation of the product.

A second, but slower technique for melting crystallised material, involves warming in a hot air-circulating fan oven at up to 60°C, ideally including slow drum rolling (5 – 10 RPM) inside such an oven. Static melting in hot air ovens (i.e. with no air circulation) is not recommended because this can lead to hot spots.

Another method for melting crystallised material is static melting in a steam chest.

As can be seen, agitation and subsequent but even heating is the key to help maintain DIPRANE™ 530 Prepolymer quality during melting, and this should be for as short a time period as possible in order to achieve its typical appearance.

Further information can be found in Dow's information sheet 'Safe Handling – Pure, Modified and Polymeric MDI' Form No. 109-01224X-1009P&M.

In the case of isocyanate that is already a pale amber, transparent liquid with no solid particles (i.e. already melted), further heating may be necessary to condition the material to the recommended processing temperature.

The recommended technique should be to warm the isocyanate slowly either:

- in an air circulating oven (preferred) or a hot box,
- with a drum blanket,
- with band heaters.

Temperatures up to 60°C are recommended.

CAUTION: Exposure to temperatures above 60°C should be avoided because this will lead to degradation of the product.

It is recommended that the warming/melting process should be carefully controlled, taking care to avoid overheating or heating for extended periods of time. In general, warming for a longer time period at a lower temperature (40 – 50°C) is preferred compared to a short time period at a higher temperature, although the exact time/temperature combination will depend on the initial temperature of the material and the heat distribution efficiency of the heating method. **It is recommended that the optimum conditions for a particular application are determined experimentally by the user.**

It is recommended that the isocyanate component is NOT stored:

- at 40 – 50°C for greater than 2 weeks;
- at 50 – 55°C for greater than 7 days;
- at 55 – 60°C for greater than 3 days.

In each case this assumes unopened, tightly sealed containers.

Chain extender component

The chain extender component should remain a colourless, clear liquid at a storage temperature of 20 – 30°C, however below this temperature range it can crystallise and solidify. Heat is required to liquefy the chain extender and / or to condition the chain extender to the processing temperature. It is recommended that the chain extender be warmed slowly either:

- in an air circulating oven (preferred) or a hot box,
- with a drum blanket,
- with band heaters.

Temperatures up to 60°C are recommended.

CAUTION: Exposure to temperatures above 60°C should be avoided because this will lead to degradation of the product.

The warming/melting process should be carefully controlled, taking care to avoid overheating or heating for extended periods of time. Hot spots can cause degradation and should, therefore, be avoided.

In general, warming for a longer time period at a lower temperature (25 - 30°C) is preferred compared to a short time period at a higher temperature (60°C).

Melting times will depend on the initial temperature of the material and the heat distribution efficiency of the heating method. **It is recommended that the optimum conditions for a particular application are determined experimentally by the user.**

It is recommended that the chain extender component is NOT stored at 40 – 45°C for greater than 2 weeks, assuming the containers are unopened and tightly sealed. Storage at temperatures greater than 45°C is not recommended.

Hot air circulating oven requirements

A recommended warming method for all components is in an air circulating fan oven, capable of rapid air circulation from top to bottom of the oven. The oven must be capable of achieving and maintaining the recommended material temperature. The oven type should be sufficient to ensure that the required temperature is reached quickly. An even temperature distribution throughout the oven is extremely important to help achieve product consistency. The material containers should be raised off the floor of the oven (for example, on pallets) to allow good air circulation under and around them.

One of the most effective warming methods to help ensure even temperature distribution throughout the material is by slow rolling (5 -10 RPM) inside such an air circulating oven.

Please Note: Depending on the heat distribution efficiency of the oven, the oven set point may not correspond to the internal air temperature or the material temperature. It is recommended that the optimum conditions for a particular application are determined experimentally by the user.

Our Technical Service Department can offer advice on oven design.

Degassing

It is recommended that all components are degassed before use, either by machine or in a vacuum chamber. Please consult the Dow Technical Service Department if you are unsure of the recommended methods for degassing material.

Moisture

Some of the components in the DIPRANE™ 590 Series are hygroscopic. Care should be taken to avoid moisture contamination. If containers are vented during the warming period, a drying tube or dry nitrogen should be used. If the components are to be opened and then resealed, a blanket of dry nitrogen should always be used.

To help achieve the most satisfactory results – PROTECT FROM MOISTURE.

Mould Preparation

Aluminium, steel, alloy, brass GRP, polyurethane or silicone RTV moulds can be used, of which metal moulds are the recommended choice. Aluminium is considered to be the best material for large mouldings because it offers good heat transfer characteristics and is lightweight.

Ensure the mould is cleaned thoroughly and is well sealed so as to prevent material from escaping. The mould should then be treated with a recommended mould release agent.

Pre-heat the mould to the recommended mould temperature before casting; this helps to ensure a uniform cure cycle, and is considered to be the most satisfactory operating procedure to allow the production of uniform castings. An even temperature distribution throughout the mould is extremely important to achieve product consistency.

Demould

DIPRANE™ 590 elastomers can be demoulded hot. Removal from the mould should not be a problem, providing the correct release agent has been employed. Care should be taken when demoulding large or complicated mouldings to avoid causing damage or distortion whilst hot.

Recommended Cure Cycle

To help achieve rapid attainment of mechanical properties for DIPRANE™ 590 castings, a post-cure of 12 -16 hours at approximately 80°C is recommended, followed by a minimum of 48 hours at ambient temperature.

Curing at other temperatures is possible, although the cure time should be adjusted accordingly.

The recommended curing method is in an air circulating fan oven, capable of rapid air circulation from top to bottom of the oven – see page 6. It is important that moulds be heated and maintained at the recommended temperature to help achieve satisfactory demould times and subsequent curing of the elastomer.

It is recommended that the optimum conditions for a particular application are determined experimentally by the user.

Additional Processing Details

Machine Mixing

Our Technical Service Department can offer advice on suitable two or three component polyurethane dispensing equipment for processing DIPRANE™ 590 series elastomers

Hand Mixing

When hand mixing, the following procedures should be adhered to:

- 1) Precondition the components to the recommended temperature.
- 2) DIPRANE™ C590/45 Polyol should be mixed by rolling the drum before use.
- 3) Weigh out the required quantities of DIPRANE™ C590/45 Polyol and DIPRANE™ CA into the mixing vessel and mix together.
- 4) Weigh the required amount of DIPRANE™ 530 Prepolymer into the vessel and mix thoroughly for approximately one minute.
- 5) Put the mixture under vacuum (5 Torr min) for 1 - 2 minutes or until bubbling ceases.
- 6) Pour the reaction mixture into heated moulds, which have been treated with mould release agent.

Storage and Handling

		Shelf life
Polyol Component	Store in tightly sealed containers at a temperature of 0 - 30°C. Condition to the processing temperature and mix well before use. Avoid contact with moisture. Storage at low temperatures may result in freezing of the polyol component; should this occur it should be melted out by warming to the recommended temperature and mixed thoroughly before use. Please refer to the "material preparation" section of this document.	12 months
Isocyanate Component	Store in tightly sealed containers at a temperature of 15 - 30°C. Avoid contact with moisture. Storage below the recommended minimum temperature may result in freezing of the Isocyanate. If the Isocyanate does not fully melt out when raised to the processing temperature it may be necessary to re-melt at a temperature of up to 60°C following the procedures laid down in the information sheet 'Safe Handling – Pure, Modified and Polymeric MDI' Form No. 109-01224X-1009P&M.	6 months

Chain Extender Component Store in tightly sealed containers at a temperature of 15 – 30°C. 12 months
Raise to the processing temperature and mix well before use.
Avoid contact with moisture.

More detailed information on the storage and handling of polyurethane components can be obtained by contacting Dow Technical Service Department.

Packaging

Polyol Component	25 kg, 225 kg
Isocyanate Component	25 kg, 240 kg
Chain Extender Component	25 kg, 205 kg

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