



D.E.R.™ 324

Liquid Epoxy Resin

Description

D.E.R.™ 324 Liquid Epoxy Resin is a mono-functional reactive diluent modified liquid epoxy resin.

Introduction

D.E.R. 324 Epoxy Resin is a C₁₂-C₁₄ aliphatic glycidylether modified bisphenol A based liquid epoxy resin of extreme low viscosity.

D.E.R. 324 Liquid Epoxy Resin offers a lower surface tension ($\approx 15\%$) than other reactive diluent modified liquid epoxy resins. The lower surface tension results in excellent surface wetting, adhesion and lower viscosity at given filler loading. The extreme low viscosity in combination with the significantly reduced surface tensions can translate into cost savings of the formulated system as more filler can be used to reach the same viscosity.

The aliphatic chain reactive diluent increases pot life as well as flexibility (impact resistance). Although the reactive diluent limits the solvent resistance somewhat, acid resistance is improved.

A wide variety of curing agents is available to cure this liquid epoxy resin at ambient conditions. Most frequently used are cycloaliphatic polyamines, polyamides, amidoamines, and modified versions of these. Such systems are sometimes cured at elevated temperatures to improve selected properties such as chemical resistance and glass transition temperature. If anhydride or catalytic curing agents are employed, elevated temperature and long-post cures are required to develop full end properties.

NOTE: D.E.R. 324 Epoxy Resin might crystallize. This reversible physical phenomenon can be greatly avoided by storing the resin at temperatures not below 25°C. For further details see the Dow technical bulletin, *Crystallization of Liquid Epoxy Resins*, Form No. 296-01652.

Typical Applications

This product is suitable for use in applications such as:

- Adhesives
- Casting and Tooling
- Civil Engineering
- Composites
- Marine and Protective Coatings
- Potting and Encapsulation

Typical Properties

Property ⁽¹⁾	Value	Method
Epoxide Equivalent Weight (g/eq)	195 – 204	ASTM D-1652
Epoxide Percentage (%)	21.1 – 22.1	ASTM D-1652
Epoxide Group Content (mmol/kg)	4900 – 5130	ASTM D-1652
Color (Gardner)	1 Max.	ASTM D-1544
Viscosity @ 25°C (mPa s)	600 – 800	ASTM D-445
Density @ 25°C (g/ml)	1.10	ASTM D-4052
Clarity	Pass	DowM 101303
Shelf Life (Months)	24	

(1) Typical properties, not to be construed as specifications.

Trowelable Mortar

The very low viscosity of D.E.R.™ 324 Epoxy Resin and the excellent wetting properties make this epoxy resin suitable for self-leveling flooring systems as well as epoxy trowelable floorings or mortars. An example of such trowelable epoxy formulation is shown below.

Part A	Parts By Weight
D.E.R. 324 Liquid Epoxy Resin	100
Anti-foam Agent	0.1 – 0.05
Part B	
D.E.H.™ 39 Epoxy Hardener	21.5
Part C	
Silica Sand: 0.4 – 1.2 mm	274
Silica Sand: 0.18 – 0.4 mm	152
Silica Sand: 0.12 – 0.18 mm	182

Physical Properties	
Binder Gel Time (100 g) (min)	24
Initial Set (300 g Formulation) (min)	105
Final Set (300 g Formulation) (min)	165
Tensile Strength (MPa)	13.7
Flexural Strength (MPa)	31.4
Compressive Strength (MPa)	87.9
Heat Deflection Temperature (°C)	61
Coefficient of Linear Expansion @ 25-30°C (ppm/°C)	17.7

Trowelable epoxy compounds such as this example can be designed as complete flooring systems but can also be designed for anchoring heavy machinery and the like. Besides mechanical strength they can also be tailored to offer different levels of chemical resistance. Some chemical resistance data for the above formulation are shown in below table.

Chemical	% Weight Change	
	3 Days	7 Days
30% Hydrochloric Acid	1.7	3.1
30% Nitric Acid	2.2	3.6
30% Sulphuric Acid	5.5	9.8
30% Caustic	0.02	0.04
n-Butanol	0.53	0.53
Methyl Ethyl Ketone	6.3	Failed
Toluene	2.1	3.6
Distilled Water	0.11	0.22

Self-leveling Flooring

Self-leveling flooring formulations, typically up to 3 mm, contain a low filler/binder ratio and are therefore relatively free-flowing. Such formulations are characterized by their excellent balance between chemical resistance and physical properties and, in the majority of cases, high gloss. Typical applications include decorative floorings or flooring systems designed for light traffic.

Prior to the application of an epoxy flooring/coating it is necessary to ensure that the substrate is sound and optimum adhesion can be achieved. To ensure a suitable substrate, the use of a primer/sealer is often required. Their main task is to close the concrete pores. In case of doubt or for highly porous concrete, a second primer layer may be advisable. The primer shall be hydrophobic, alkali-resistant and shall have excellent adhesion to the cement/concrete. Typically the primers consist of the unfilled binders of the following functional layer and are applied at a usage rate of 3-5 square meters per liter (200-300 gr/m²). The chemical nature of the D.E.R.[™] 324 Epoxy Resin combines a good resistance against acids with a sufficient high level of resistance against slow, as well as rapid, deformation (impact). The performance properties of the finished flooring system can be altered by selecting other curing agents typically suited for civil engineering applications. For instance, by selecting an FDA-compliant curing agent, the flooring composition will become FDA compliant for dry food stuffs at room temperatures. Below is an example of a starting formulation for a self-leveling flooring compound using D.E.R. 324 Epoxy Resin.

Typical Starting Point Formulation	Parts By Weight
Binder: D.E.R. 324 Liquid Epoxy Resin	252
Epoxy-amine Adduct Curing Agent (e.g. Ancamine 1618 ex. Air Products or similar)	151
Fillers: Quartz Sand: 0.1 – 0.3 mm	351.8
Quartz Flour: < 0.06 mm	224.8
Pigment (e.g. Titanium Dioxide or Iron Oxide)	16.6
Additive(s) Air Release Agent (e.g. BYK A-525 ex. BYK-Chemie)	3.8
Mixing Ratio's (by weight) Resin to Hardener	100 / 59.9
Filler to Binder	1.47 / 1
Mixing Viscosity @ 25°C (mPa s) Clear Binder	640
Formulation	11400
Pot Life (time to 100 Pa s) @ 23°C (min) Clear Binder (100 g)	55
Formulation (150 g)	120

When using any epoxy product it is important that the components are thoroughly mixed in the correct proportions. It is recommended that no more flooring material than can reasonably be applied within the pot life of the material be prepared. The mixed composition shall be placed immediately after mixing has been completed. Application should be done by skilled and experienced workers using for a plastic comb or broom. Since the formulation is self-leveling the composition has sufficient flow to ensure a smooth glossy surface without extensive effort. It can be advantageous to roll the floor covering with a spiked ("porcupine") roller in order to assist with any air release.

Safety and Handling

The Dow Chemical Company provides its customers with a product specific Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) to cover potential health effects, safe handling, storage, use and disposal information. Dow strongly encourages its customers to review the MSDS or SDS on its products and other materials prior to their use.

D.E.R.™ 324 Liquid Epoxy Resin is supplied in bulk or in 225 kg tight-head drums. The resin should be stored in a dry place in its original closed packaging. D.E.R. 324 Epoxy Resin should retain its chemical properties for a period of at least 24 months.

For further handling information, consult the Dow brochure entitled, *DOW Epoxy Resins Product Stewardship Manual, Safe Handling and Storage*, Form No. 296-00312 and the Dow technical bulletin, *Product Coding, Shelf-life and Storage Stability*, Form No. 296-01657.

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- (c) use as a critical component in medical devices that support or sustain human life; or
- (d) use specifically by pregnant women or in applications designed specifically to promote or interfere with human reproduction.

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D.E.R. 324 Liquid Epoxy Resin

Form No. 296-01446-1207X-TD

Food Contact Applications

When properly formulated and cured for food contact applications, this resin will comply with the Food, Drug and Cosmetic Act as amended under Food Additive Regulation 21 CFR 175.300 (Resinous and Polymeric Coatings), BUT ONLY FOR BULK DRY FOODS AT ROOM TEMPERATURE OR BELOW. This use is also subject to good manufacturing practice and any limitations specified in each regulation. Please consult the regulations for complete details.

If your applications include food contact requirements, please contact your Dow representative for further information and forthcoming EC regulations. Also consult the Dow data sheet, *Food Additive Status for Epoxy Resins, Curing Agents and Epoxy Novolac Resins*, Form No. 296-01425.

Regulatory Status

The base bisphenol A epoxy resin is regarded as a substance, according to Council Directive 92/32/EEC of 30 April 1992, the 7th Amendment of Council Directive 67/548/EEC, is reported to the EC Commission as a No-Longer Polymer (NLP), is registered under NLP # 500-033-5, and is, therefore, exempt from the European Inventory of Existing Chemical Substances (EINECS). In addition, Dow confirms that the chemicals and intentional additives which form the basis of this product are listed on EINECS.

The C₁₂-C₁₄ alkyl glycidyl ether is listed on EINECS under the number 271-846-8 and under CAS registration number 68609-97-2.

For more information on the regulatory status of this product, please refer to the MSDS or SDS for this product.

Chemical Inventory Listing

CAS Number ⁽¹⁾		25085-99-8 (25068-38-6) / 68609-97-2
Europe	EINECS	NLP # 500-033-5 / 271-846-8
United States	TSCA	25085-99-8 / 68609-97-2
Canada	DSL	25085-99-8 / 68609-97-2
Australia	AICS	25085-99-8 / 68609-97-2
Japan	ENCS	7-1279 / 2-2426
Korea	KECI	KE-24083 / KE-27545
Philippines	PICCS	25085-99-8 / 68609-97-2
China	SEPA	25085-99-8 / 68609-97-2

(1) Please refer to the MSDS or SDS for this product to ensure this CAS number is consistent with the product(s) you use.

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