



BS5750  
Part 1 Approved  
Certificate No. FM 860

**Robnorganic Systems Ltd.**  
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## MATERIAL SAFETY DATA SHEET

### 1. SUBSTANCE/PREPARATION AND COMPANY IDENTIFICATION

Polyurethane Resin Systems: Robnorganic Systems Limited

No's	EL/HL171C	)	The information hereunder applies
	EL/HL171D	)	to these variants of EL/HL171.
	(EL/HL171E)	)	They are supplied for dip-coating
	EL/HL171F	)	and potting applications - not for
	EL/HL171G	)	application by spraying.

### 2. COMPOSITION/INFORMATION ON INGREDIENTS:

#### (a) Resin Side (EL171C/D/E/F/G):

Mixed Glycerides	20-35%	)	
Inert Fillers	60-80%	)	Non-classifiable
Di-n-Butyl Phthalate (DBP)	2-3%; R: 51/53; 62; 63	)	

Toxic to aquatic organisms; may cause long-term adverse effects in the aquatic environment; possible risk of impaired fertility; possible risk of harm to the unborn child.

#### (b) Hardener Side (HL171C/D/E/F/G):

4,4'-Diphenylmethane Di-Isocyanate - 90-99%

Classification Xn, Harmful; R20-Harmful by inhalation;  
R36/37/38 - Irritant to eyes, respiratory system and skin;

R42 - May cause sensitization by inhalation.

### 3. HAZARDS IDENTIFICATION:

(a) Resin Side: Not classified as hazardous.

(b) Hardener Side: The Di-Isocyanate (MDI) is harmful by inhalation and may cause sensitization by that route. It is irritating to respiratory system, eyes and skin.

/cont....

**Robnor** **RESINS**

Registered in England No. 664718 Established 1960



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**COSSH INFORMATION RELEVANT**

**TO PX/HX314ZG**

Accompanying H & S Sheets Issue 1  
of January 1994

1. Chemical constituents classifiable under the current CPL and CHIP Regulations

(a) In the Resin Side:

Bisphenol A/Epichlorohydrin epoxy resin (Classification - "Irritant")

\* R : 36/38; 43 }  
  } LD50 - oral, rat: 10,000mg/kg  
S : 28; 37/39 }

(b) In the Hardener Side:

(i) 4,4'Diaminodiphenylmethane ("DDM" or "MDA")  
(Classification "Toxic")

\* R : 20/21/22 }  
  } LD50 - oral, rat: ca.520mg/kg  
S : 26;28;36/37/39 }

(ii) Tetrahydro-2-Furylmethanol : (Classification -  
"Irritant")

\* R : 36 }  
  } LD50 - oral, rat: 2,500mg/kg  
S : 39 }

\* R = Risk Phrases ("Approved List")  
S = Safety Phrases ("Approved List")

2. Occupational Exposure Limits (HSE 1991)

(a) Resin Side:

Bisphenol A/Epichlorohydrin Epoxy Resin - no published limit, but skin exposure should be kept to a minimum.

(b) Hardener Side:

(i) 4,4'Diaminodiphenylmethane - 0.8mg/m<sup>3</sup> (8-hr. TWA)

(ii) Tetrahydro-2-Furylmethanol : no published limit.  
Exposure should be minimal.

3. Synergistic Reactions: None known.

4. Handling & Storage Precautions: See Health & Safety Data Sheets and Safety Booklet S.16.

5. Emergency Procedures: As in 4. above.

/cont....

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6. Test Results - Flammability/Explosibility/Toxicity:

Flash Point of product is  $>55^{\circ}\text{C}$  therefore product not classifiable as "Flammable".

Regarding Toxicity, see data in 1.(a), 1.(b), 7.(a) and 7.(b).

7. Potential Hazards in Use, Indicated by Research or Experience:

(a) Resin Side: The epoxy resin can cause skin irritation. Frequent or protracted exposure may cause skin sensitization.

(b) Hardener Side:

(i) 4,4'-Diaminodiphenylmethane is not known to have been carcinogenic to humans. However, it is stated to have had such an effect in small laboratory animals, and it is therefore recommended that skin contact should be avoided. Accidental contact should be treated as indicated in the accompanying Health & Safety Sheets. The vapour pressure of MDA is extremely low - ca. 0.13mPa at  $20^{\circ}\text{C}$ . Consistent with this, no inhalation problems are reported.

(ii) Tetrahydro-2-Furylmethanol : not known for any serious hazards, but is definitely irritating to eyes and skin.

8. Information on Measured Levels of Operator Exposure:

No such information available.

Health & Safety Information for PX/HX314ZG

Contaminated Clothing: Remove and isolate badly-contaminated overalls and personal clothing. Launder thoroughly before re-use.

Ingestion (entry by mouth and swallowing). Immediately rinse the mouth repeatedly with water. Then, if appreciable swallowing has occurred, drink plenty of water and seek medical attention without delay.

Fire: Use as extinguishers: CO<sub>2</sub>, dry powder, foam or water-fog. Avoid inhaling the products of combustion. In the event of a serious fire, efficient canister respirators or air-line breathing equipment may be necessary. Fire-fighters should stay up-wind of fire if possible.

Waste Disposal: Disposal of waste epoxy materials in the uncured state must be carried out in accordance with the requirements of the Deposit of Poisonous Waste Act 1972, the Control of Pollution Act 1974 and The Control of Pollution (Special Waste) Regulations 1980: Stat. Inst. 1709. Waste in the form of cured mixed system is innocuous and may be safely disposed of through normal rubbish-disposal channels.

**ADDENDUM ON WASTE DISPOSAL**

It should be noted that the latest definitive regulations on Waste Disposal are now embodied in the Environmental Protection Act 1990.

Customers are advised to see the relevant booklet published as ISBN 0 11 752557 X by the Department of the Environment: its title is, 'Waste Management - The Duty of Care - A Code of Practice'. It is available from HMSO Bookshops at £5.00 per copy.

The purpose of the Code of Practice is to set out practical guidelines of procedure to help those who are holding controlled waste for disposal. It recommends a series of steps which, it states, would normally be sufficient to ensure compliance with legal requirements.

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TEL. 0793 823741. FAX. 0793 827033

HEALTH & SAFETY DATA INFORMATION : EL/HL171C/D/E/F/G

4. FIRST AID MEASURES

Over-exposure by Inhalation (Hardener only: N.A. to Resin):

Keep patient calm: remove patient to fresh air immediately. Remove any contaminated clothing. Summon medical help. Symptoms of over-exposure by inhalation may not appear until several hours after exposure.

Eye contamination (Resin or Hardener): Immediately irrigate affected eye(s) with copious flow of clean water, continuing for 10-15 minutes. Then take medical advice.

Ingestion (Resin or Hardener): Immediately rinse mouth, then drink plenty of water. Do not induce vomiting. Call doctor.

Skin Contact (Resin or Hardener): Wash thoroughly with plenty of warm, soapy water.

5. FIRE-FIGHTING MEASURES (Resin and Hardener):

Use as Extinguishers: CO<sub>2</sub>, Dry powder, Foam or water fog, but NOT water jets. Avoid inhaling the products of combustion. In the event of a serious fire, efficient canister respirators or air-fed helmets may be necessary - possibly even full chemical protection suit.

Fire-fighters should stay up-wind of fire if possible.

Liberated gases may include: CO, CO<sub>2</sub>, Nitrogen Oxides, HCN and 4,4'-Diphenylmethane Di-Isocyanate.

6. ACCIDENTAL RELEASE MEASURES:

Resin Side Spillages:

Stop spread of spillage by damming with sand, dry soil or other inert absorbent material. Then spread absorbent over spillage and shovel up the waste into plastic sacks or lidded bins for safe disposal.

Hardener Spillages

Ensure adequate ventilation and personal protection for the emergency personnel. Limit the spillage spread as described above for resin spillage. Likewise cover with absorbent and collect into containers for disposal, but do not seal the container.

/cont.....

HEALTH & SAFETY DATA INFORMATION : EL/HL171C/D/E/F/G

7. HANDLING AND STORAGE (Resin & Hardener):

Ensure liberal ventilation throughout the workroom area, with local extraction at work stations where necessary. Such additional extraction might be required at mixing stations where material is handled in bulk and at any locations where a large surface area of the uncured mixed system is exposed to the workroom atmosphere, e.g. in the form of work-pieces which have been dip-coated or filled and left to cure on open racks or benches. If post-curing at elevated temperature is employed in order to reduce the time required to achieve full cure, the curing ovens should have efficient extraction ventilation and should exhaust to the outside atmosphere at a point remote from any factory air-intakes

Containers should be stored, tightly closed, in a dry, well-ventilated store-room at a temperature in the range 15-25°C. Ingress of moisture will cause degrading of hardener and, if serious, may cause pressurization of containers. Drums in storage should be periodically checked for end-bulging as an indication of pressurization: this, if detected, should be safely released.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

(a) Resin Side: N.A.

(b) Hardener Side: The current Max. Exposure Limit for Total Isocyanate is 0.02mg/m<sup>3</sup>(8-hr.TWA). It is easy in normal dip-coating or potting operations to maintain the MEL well below this level since the volatility of MDI is extremely low at workroom ambient temperature - i.e., the recommended processing temperature for Robnor polyurethane resin systems in general.

The isocyanate concentration in the workroom atmosphere can be conveniently monitored by one of the commercially available sensitive-tape instruments which have been developed for this purpose.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

(a) Resin Side: Viscous liquid: colour to customer specification.

(b) Hardener Side: Moderately viscous liquid (100-200 mPas); amber-brown colour.

Odour:

(a) Resin Side: Very faint.

(b) Hardener Side: Earthy musty-faint.

/cont.....

HEALTH & SAFETY DATA INFORMATION : EL/HL171C/D/E/F/G

PHYSICAL AND CHEMICAL PROPERTIES (cont...)

pH Value:

- (a) Resin Side: N.A.
- (b) Hardener Side: N.D.

Boiling Point/Range:

- (a) Resin and Hardener - N.A.

Melting Point/Range: N.A. to either resin or hardener.

Flash Point: N.D. but both resin and hardener >55°C.

Flammability: Technically non-flammable - see Flash Point.

Autoflammability: N.D. for either resin or hardener.

Explosive Properties: N.A. to either resin or hardener.

Oxidizing Properties: N.A. " " " " "

Vapour Pressure at 25°C: ca. 0.00001mb.

Specific Gravity: (Approx. value, 25°C):

Resin: 1.80 approx.; Hardener: 1.22 approx.;  
Mixed System: 1.74 approx.

Solubility:

- (a) Resin Side EL171C/D/E/F/G:

Contains high content of inorganic fillers which are insoluble in both water and organic solvents.

- (b) Hardener Side HL171C/D/E/F/G:

The hardener(4,4'Diphenylmethane Di-Isocyanate) does not dissolve in water - it reacts with water and is thereby decomposed.

Miscibility: Both the resin side and hardener side are dispersible in many organic solvents.

Viscosity of Mixed System: <130 Poise at 21°C.

Resistivity (Volume):  $1.6 \times 10^{14}$  ohm.cm.

Thermal Conductivity):  $\frac{1 \times 10^{-3} \text{ cal}}{\text{sec.cm}^2 \cdot ^\circ\text{C/cm}}$  i.e 0.42W  
m.K

Flammability (Cured mixed Product): Self-extinguishing (UL94 V-0)

Evaporation Rate: very low, both resin and hardener.

cont/...

HEALTH & SAFETY DATA INFORMATION : EL/HL171C/D/E/F/G

10. STABILITY AND REACTIVITY

Both resin and hardener are stable under normal dry storage conditions. They may decompose, however, at elevated temperatures especially above 300°C, or if brought into contact with strong oxidizing agents. Such reactions will produce complex mixtures of largely undetermined composition, some of which are likely to be hazardous to the respiratory system. Excessive temperatures and contact with strong oxidizing agents are therefore to be avoided; so, of course, is contact with moisture - see reference in Section 7 above.

11. TOXICOLOGICAL INFORMATION

(a) Resin Side EL171C/D/E/F/G: The resin side of the system is not classifiable under current regulations.

(b) Hardener Side HL171C/D/E/F/G:

LD50 oral, rat:>500

LC50 (inhaln) rat: ca 360mg/m<sup>3</sup> (4hr, aerosol).

See also 3(b) and 8(b) above.

12. ECOLOGICAL INFORMATION

(a) Resin Side: DBP is non-volatile and water-insoluble. Could therefore accumulate in soil, but is expected to be biodegradable. If released into slow-moving waters, resin composition could release glyceride material which, by forming a surface film, might prevent oxygenation of the water, with consequent damage to aquatic life. However, the glycerides are ultimately biodegradable and not expected to be toxic for fish.

(b) Hardener Side: The Diphenylmethane Di-Isocyanate reacts with water to form CO<sub>2</sub> and an insoluble polyurea which is inert and non-biodegradable.

13. DISPOSAL CONSIDERATIONS

Resin, hardener and mixtures of these can be disposed of via authorized waste disposal contractors to approved waste disposal sites with due observance of the Environmental Protection (Duty of Care) Regulations 1991. Waste mixtures in which the proper Mixing Ratio has been observed can simply be cured off and the innocuous product disposed of via the ordinary rubbish disposal channel.



HEALTH & SAFETY DATA INFORMATION : EL/HL171C/D/E/F/G

14. TRANSPORT INFORMATION

Resin Side: IMDG: RID/ADR & IATA - Not Regulated.

Hardener: IMDG: 6140: UN 2489; Class 6.1;  
Pkg Group III; Marine Pollutant.  
(4,4'Diphenylmethane Di-isocyanate).

ADR/RID 6.1 19°(c) 60 2489

IATA 6.1 Pkg Grp III UN 2489

15. REGULATORY INFORMATION

Contains 4,4'Diphenylmethane Di-Isocyanate + Isomers and Homologues. Hazard Symbol Xn - Harmful.

R-Phrases:

R20 Harmful by inhalation.  
R36/37/38 - Irritating to eyes, respiratory system and skin.  
R42 - May cause sensitization by inhalation.

S-Phrases:

- S26 - In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S28 - After contact with skin, wash immediately with plenty of warm soapy water.
- S38 - In case of insufficient ventilation, wear suitable respiratory equipment.
- S45 - In case of accident, or if you feel unwell, seek medical advice immediately (show the label where possible).

Contains Isocyanates. See information supplied by the manufacturer.

16. OTHER INFORMATION

This Safety Data Sheet has been written to comply with Directives 91/155/EEC (the "Safety Data Sheet Directive") and 83/379/EEC (the "General Preparations Directive").

Product Application: As a flame-retardant flexible potting resin for light electrical applications and for low-cost cable-joint applications.

Date of Issue: February, 1996 : Issue 1

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DATA SHEET FOR ROBNOR POLYURETHANE RESIN EL171C

This material is a halogen free, flame retardant, flexible potting resin for light electrical applications. It is specifically designed for low-cost encapsulations and cable joints. It exhibits good adhesion to a wide range of substrates. The standard colours are Black and Grey.

METHOD OF USE

Twinpacks:-

Twinpacks contain evacuated resin and material is ready for use immediately after mixing the twinpacks.

Mixing Instructions for Twinpacks

1. Remove outer wrapper - cut with scissors being careful not to pierce the inner pack. Unfold sachet, grip each half firmly along top edge.
2. Remove Clip - Pull apart to release central plastic clip and remove separator completely. Do not slide apart as this may puncture the sachet.
3. Mix - Mix the contents inside the pack by using fingers and thumbs of both hands, being sure to include material in corners and around edges. The pack should be mixed for 15 seconds to 3 minutes depending on viscosity of material and operator experience. Care should be taken not to put undue pressure on the pack seals.
4. Cut off the cone shaped corner - this will provide a dispensing cone, the size of the cut determining the rate of flow.

/Continued...

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5. Dispense - as required.

Care should be taken to ensure thorough mixing of both bulk material or twinpacks. Incomplete mixing will be characterised by erratic or even partially incomplete curing of material even after extended time periods.

Bulk Material

The resin has been formulated to minimise sedimentation. Any sediment which may have been produced over long time periods in bulk resin should be readily dispersed either by rolling the can or stirring with a broad-bladed spatula. This operation should be carried out, if necessary, BEFORE removal of any material from the can. Long-term sedimentation will be aggravated by storage at high temperatures and this should be avoided.

If in bulk form the resin and hardener should be mixed in the ratio:

8.5 : 1 By Weight  
6.0 : 1 By Volume

The resin is supplied evacuated and care should be taken when mixing with hardener not to stir in large amounts of air. If this is unavoidable, the mixed resin and hardener should be re-evacuated before use.

Mixing and dispensing machinery is available from Robnorganic Systems which will mix resin and hardener in the correct proportions without any risk of introducing entrapped air.

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CHARACTERISTICS OF RESIN AND HARDENER

	<u>Value</u>	<u>Standard</u>
Colour of Mixed System	: Black or Grey	
Density of Resin	: 1.74 g/ml	Robnor
Density of Hardener	: 1.24 g/ml	"
Density of Mixed System	: 1.67 g/ml	"
Density of Cured System	: 1.75-1.85 g/ml	"
Viscosity of Resin	: 100-155 Poise @ 21°C	ISO 2555
Viscosity of Hardener	: < 2.5 Poise @ 21°C	"
Viscosity of Mixed System	: < 130 Poise @ 21°C	"
Pot Life	: 10 mins @ ambient temp (designated by a doubling of the initial viscosity).	Robnor
Gel Time	: 20-30 mins @ ambient temp (for 200 g mass)	"
Cure Time	: overnight @ 23°C	"
Hardness	<u>OR</u> 1 Hour @ 80°C : 65 → 50 Shore D (After 24 Hours @ 100°C)	"
Flash Point	: > 200°C for resin and hardener.	"

CHEMICAL CHARACTERISTICS

	<u>Value</u>	<u>Unit</u>	<u>Standard</u>
Water Absorbtion (Total Immersion for 24 hrs @ 23°C)	: <0.2	%	Iso 62 : 1982
Flame Retardancy	: Conforms to UL94V-0 @ 6mm		Robnor

PHYSICAL CHARACTERISTICS

Tensile Strength	: >5.3	Mpa	BS2782 : 1976
Thermal Conductivity	: 0.42	W/m <sup>o</sup> K	BS 874 : 1986
Elongation at Break	: >125%		
Coefficient of expansion	: 6 x 10 <sup>-5</sup>	mm/mm/°C	

ELECTRICAL CHARACTERISTICS

Permittivity (1K Hz @ 23°C)	: 3.23		BS4542 : 1970
Power Factor (tan delta)	: 0.042		
Volume Resistivity	: 12.2 Log <sub>10</sub>	OHM/M	BS6233 : 1982
Surface Resistivity	: 14.14 Log <sub>10</sub>	OHM	BS6233 : 1982
Electrical Strength	: 16.2 kv/mm		IEC 243.1:1988

N.B. These results do not constitute a specification and are quoted for guidance use only. /Continued...

### Cleaning Equipment

All equipment should be cleaned before the compound has hardened. Robnorganic Systems' TS130 is a suitable non-flammable cleaning agent, although other solvents may be found suitable.

TS130 is also suitable for removing cured resins - data available on request.

### STORAGE

The resin and hardener should be stored separately in tightly sealed containers until required for use. The shelf life of this material is 12 months unless otherwise stated on the label. Preferred storage temperature is 20 - 25 degrees Centigrade.

### CAUTION

Polyurethane systems are generally quite harmless to handle, provided that certain precautions normally taken when handling chemicals are observed. The uncured materials must not, for instance, be allowed to come into contact with foodstuffs or food utensils, and measures should be taken to prevent the uncured materials from coming into contact with the skin. The use of barrier creams or impervious gloves is advised. The skin should be thoroughly cleansed at the end of each working period, either by washing with soap and warm water or by using a resin removing cream - use of solvents is to be avoided. Disposable paper towels - not cloth towels should be used to dry the skin. Adequate ventilation of the working area is recommended.

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Polyurethane hardeners are moisture sensitive. Containers of both resin and hardener should be kept tightly closed when not in use to prevent ingress of atmospheric moisture.

The information given is derived from test and/or extrapolations believed to be reliable. However, the product is offered for evaluation on the understanding that the customer will satisfy himself that the product is suitable for his intended use.

Advice on specific applications will be given on request.

In order that potential users may satisfy themselves by experiment that the material meets their requirements, free of charge samples are readily available.

None of the data and/or recommendations contained herein are to be assumed as an inducement to infringe any patent.

The Company's liability is limited to the replacement of materials shown to be defective as delivered, or to a cash refund. We accept no liability for loss of damage brought about by the use of unsuitable or defective material, or by subjecting viable material to inappropriate conditions.

Our General Safety Booklet S.18 gives guidance on the safe handling requirements of this and other polyurethane systems in our range.

NOTE :-

Before handling any material supplied by Robnor, users should familiarize themselves with the Health & Safety Information provided by the company both in written correspondence and the information sources listed hereunder:

- i) The Product Applications/Performance details.
- ii) The labels on the product packages and containers.
- iii) The product Health & Safety Data Sheets.
- iv) The relevant Safety Data Booklet S.18 for Polyurethanes.

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