

SAFETY DATA SHEET

FR4-45 HARDENER

Section 1. Identification

GHS product identifier : FR4-45 HARDENER

SDS code : 64000000D

Relevant identified uses of the substance or mixture and uses advised against

Identified uses

Paint. Professional use Industrial use

Uses advised against

All other uses

Product use : Filler for interior use

Supplier's details

MAPAERO SAS

10, Avenue de la Rijole CS30098

09103 PAMIERS Cedex

France

e-mail address of person responsible for this SDS

: PSRA_PAMIERS@akzonobel.com

Emergency telephone

number (with hours of

operation)

: +33 (0)5 34 01 34 01 +33 (0)5 61 60 23 30

Section 2. Hazards identification

Classification of the substance or mixture

: FLAMMABLE LIQUIDS - Category 4 ACUTE TOXICITY (inhalation) - Category 4

SKIN SENSITIZATION - Category 1

SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract

irritation) - Category 3

Ingredients of unknown

toxicity

: 0%

Ingredients of unknown

ecotoxicity

: 0%

GHS label elements

Hazard pictograms

(!)

Signal word : Warning

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Section 2. Hazards identification

Hazard statements : Combustible liquid.

May cause an allergic skin reaction.

Harmful if inhaled.

May cause respiratory irritation.

Precautionary statements

Prevention : Wear protective gloves. Keep away from flames and hot surfaces. No smoking.

Avoid breathing vapor.

Response : IF INHALED: Call a POISON CENTER or doctor if you feel unwell. Take off

contaminated clothing and wash it before reuse. IF ON SKIN: Wash with plenty of

water. If skin irritation or rash occurs: Get medical advice or attention.

Storage : Store in a well-ventilated place. Keep container tightly closed. Keep cool.

Disposal Dispose of contents and container in accordance with all local, regional, national

and international regulations.

Other hazards which do not : None known.

result in classification

Section 3. Composition/information on ingredients

Substance/mixture Other means of identification

: Not available.

: Mixture

Ingredient name	%	CAS number
Fexamethylene diisocyanate, oligomers	≥25 - ≤50	28182-81-2
1,3,5-Triazine-2,4,6(1H,3H,5H)-trione, 1,3,5-tris(6-isocyanatohexyl)-, reaction products with polyethylene glycol monomethyl ether	≥10 - <25	129217-88-5
Polyisocyanate, aliphatic	≤10	-
n-butyl acetate	≤3	123-86-4
hexamethylene-di-isocyanate	≤0.3	822-06-0

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact

: Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation

: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance

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for 48 hours.

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Section 4. First aid measures

Skin contact

: Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion

: Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contactInhalation: No known significant effects or critical hazards.Inhalation: Harmful if inhaled. May cause respiratory irritation.

Skin contact: May cause an allergic skin reaction.

Ingestion: No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation: Adverse symptoms may include the following:

respiratory tract irritation

coughing

Skin contact: Adverse symptoms may include the following:

irritation redness

Ingestion: No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed.

The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments: No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it

is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing

thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing

: Use dry chemical, CO₂, water spray (fog) or foam.

.. ...

Unsuitable extinguishing

media

media

: Do not use water jet.

Specific hazards arising from the chemical

: Combustible liquid. Runoff to sewer may create fire or explosion hazard. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

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Section 5. Fire-fighting measures

Hazardous thermal decomposition products

: Decomposition products may include the following materials:

carbon dioxide carbon monoxide nitrogen oxides metal oxide/oxides

Special protective actions for fire-fighters

: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

: No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders: If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions

: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill

: Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill

: Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with noncombustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures

: Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapor or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling)

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Section 7. Handling and storage

Advice on general occupational hygiene

equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not reuse container.

: Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities

: Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
<mark>p-</mark> butyl acetate	ACGIH TLV (United States, 1/2022). [Butyl acetates]
	STEL: 150 ppm 15 minutes. TWA: 50 ppm 8 hours.
hexamethylene-di-isocyanate	ACGIH TLV (United States, 1/2022). TWA: 0.03 mg/m³ 8 hours. TWA: 0.005 ppm 8 hours.

Appropriate engineering controls

: Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls

: Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures

: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection

: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

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Section 8. Exposure controls/personal protection

Hand protection

: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection

: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection

: Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection

: Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties and safety characteristics

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

Appearance

Physical state : Liquid.
Color : Colorless.
Odor : Characteristic.
Odor threshold : Not available.

pH : Not available. [DIN EN 1262]

Melting point/freezing point Boiling point, initial boiling point, and boiling range : Not available.: Not available.

Flash point : Closed cup: 66°C (150.8°F) [Pensky-Martens]

	Closed cup		Closed cup		Open cı	ıp
Ingredient name	°C	°F	Method	°C	°F	Method

Flammability
Lower and upper explosion
limit/flammability limit

Not available.Not available.

Vapor pressure :

	Vapor Pressure at 20°C		Var		Va	por pressure	e at 50°C
Ingredient name	mm Hg	kPa	Method	mm Hg	kPa	Method	
Polyisocyanate, aliphatic	<825	<110					
n-butyl acetate	11.25	1.5	DIN EN 13016-2				
DPG-DME	7	0.93					
pentane-2,4-dione	6.98	0.93					
hexamethylene-di-isocyanate	0.01	0.0013					
[3-(2,3-epoxypropoxy)propyl] triethoxysilane	0.00053	0.000071					
Hexamethylene diisocyanate,	0.000018	0.0000024	EU A.4				

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Section 9. Physical and chemical properties and safety characteristics

 oligomers
 0.000000058
 0.000000077
 OECD 104

Relative vapor density: Not available.

Density : **1**.065 g/cm³ [DIN EN ISO 2811-1]

Solubility(ies) :

MediaResultpold waterNot soluble [OESO (TG 105)]

Partition coefficient: n-

octanol/water

: Not applicable.

Auto-ignition temperature

Ingredient name	°C	°F	Method	
P PG-DME	165	329		
pentane-2,4-dione	340	644		
dibutyltin dilaurate	400	752	EU A.15	
n-butyl acetate	415	779	EU A.15	
hexamethylene-di-isocyanate	454	849.2		

Decomposition temperature: Not available.

Viscosity : Knematic (room temperature): 56 mm²/s (56 cSt) [DIN EN ISO 3219]

Kinematic (40°C (104°F)): 101 mm²/s (101 cSt) [DIN EN ISO 3219]

Particle characteristics

Median particle size : Mot applicable.

Section 10. Stability and reactivity

Reactivity: No specific test data related to reactivity available for this product or its ingredients.

Chemical stability: The product is stable.

Possibility of hazardous

reactions

: Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld,

braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials: Reactive or incompatible with the following materials:

oxidizing materials

Hazardous decomposition

products

: Under normal conditions of storage and use, hazardous decomposition products

should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

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Section 11. Toxicological information

Product/ingredient name	Result	Species	Dose	Exposure
⊮examethylene	LC50 Inhalation Dusts and mists	Rat	18500 mg/m³	1 hours
diisocyanate, oligomers				
n-butyl acetate	LC50 Inhalation Gas.	Rat	390 ppm	4 hours
	LC50 Inhalation Vapor	Mouse	6 g/m ³	2 hours
	LD50 Dermal	Rabbit	>17600 mg/kg	-
	LD50 Intraperitoneal	Mouse	1230 mg/kg	-
	LD50 Oral	Guinea pig	4700 mg/kg	-
	LD50 Oral	Mouse	6 g/kg	-
	LD50 Oral	Rabbit	3200 mg/kg	-
	LD50 Oral	Rat	10768 mg/kg	-
hexamethylene-di-	LC50 Inhalation Dusts and mists	Rat	124 mg/m³	4 hours
isocyanate				
-	LC50 Inhalation Dusts and mists	Rat	462 mg/m ³	4 hours
	LD50 Dermal	Rabbit	570 uL/kg	-
	LD50 Intravenous	Mouse	5600 µg/kg	-
	LD50 Oral	Mouse	350 mg/kg	-
	LD50 Oral	Rat	710 uL/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Mexamethylene diisocyanate, oligomers	Eyes - Moderate irritant	Rabbit	-	100 mg	-
	Skin - Moderate irritant	Rabbit	-	500 mg	-
n-butyl acetate	Eyes - Moderate irritant	Rabbit	-	100 mg	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500	-
				mg	

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Hexamethylene diisocyanate, oligomers	Category 3	-	Respiratory tract irritation
n-butyl acetate hexamethylene-di-isocyanate	Category 3 Category 3	-	Narcotic effects Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

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Section 11. Toxicological information

Information on the likely

routes of exposure

: Not available

Potential acute health effects

Eye contact : No known significant effects or critical hazards.Inhalation : Harmful if inhaled. May cause respiratory irritation.

Skin contact: May cause an allergic skin reaction.

Ingestion: No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : Adverse symptoms may include the following:

respiratory tract irritation

coughing

Skin contact: Adverse symptoms may include the following:

irritation redness

Ingestion: No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate

: Not available.

effects

Potential delayed effects: Not available.

Long term exposure

Potential immediate : Not available.

effects

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : Once sensitized, a severe allergic reaction may occur when subsequently exposed

to very low levels.

Carcinogenicity : No known significant effects or critical hazards.
 Mutagenicity : No known significant effects or critical hazards.
 Reproductive toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
-butyl acetate	Acute LC50 32 mg/l Marine water	Crustaceans - Artemia salina	48 hours
	Acute LC50 62000 µg/l Fresh water	Fish - Danio rerio	96 hours
	Acute LC50 100000 µg/l Fresh water	Fish - Lepomis macrochirus	96 hours
	Acute LC50 185000 µg/l Marine water	Fish - Menidia beryllina	96 hours
	Acute LC50 18000 µg/l Fresh water	Fish - Pimephales promelas	96 hours

Persistence/degradability

Not available.

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Section 12. Ecological information

Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
⊮ examethylene diisocyanate,	5.54	367.7	low
oligomers			
n-butyl acetate	2.3	-	low
hexamethylene-di-isocyanate	0.02	57.63	low

Mobility in soil

Soil/water partition coefficient (Koc)

: Not available.

Other adverse effects

: No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods

: The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and

Section 14. Transport information

	Brazil	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-
Transport hazard class(es)	-	-	-
Packing group	-	-	-
Environmental hazards	No.	No.	No.

Additional information

IMDG

: MDG Code Segregation group Not applicable

Special precautions for user : Transport within user's premises: always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according : Not available. to IMO instruments

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Section 15. Regulatory information

Inventory list

Australia : Not determined.

Canada : At least one component is not listed in DSL but all such components are listed in

NDSL.

China : Not determined.

Eurasian Economic Union: Russian Federation inventory: Not determined.

Japan : Japan inventory (CSCL): Not determined.

Japan inventory (ISHL): Not determined.

New Zealand : Not determined.

Philippines : Not determined.

Republic of Korea : Not determined.

Taiwan : Not determined.

Thailand : Not determined.

Turkey : Not determined.

United States : All components are active or exempted.

Viet Nam : Not determined.

National regulations

ABNT NBR 14725 Standard. Regulatory Standard No. 26.

Section 16. Other information

History

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Key to abbreviations : ATE = Acute Toxicity Estimate

BCF = Bioconcentration Factor

GHS = Globally Harmonized System of Classification and Labelling of Chemicals

IATA = International Air Transport Association

IBC = Intermediate Bulk Container

IMDG = International Maritime Dangerous Goods

LogPow = logarithm of the octanol/water partition coefficient

MARPOL = International Convention for the Prevention of Pollution From Ships,

1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)

N/A = Not available SGG = Segregation Group UN = United Nations

Procedure used to derive the classification

Classification	Justification
► AMMABLE LIQUIDS - Category 4	On basis of test data
ACUTE TOXICITY (inhalation) - Category 4	Calculation method
SKIN SENSITIZATION - Category 1	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract	Calculation method
irritation) - Category 3	

Indicates information that has changed from previously issued version.

Notice to reader

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Section 16. Other information

FOR PROFESSIONAL USE ONLY

IMPORTANT NOTE The information in this data sheet is not intended to be exhaustive and is based on the present state of our knowledge and on current laws: any person using the product for any purpose other than that specifically recommended in the technical data sheet without first obtaining written confirmation from us as to the suitability of the product for the intended purpose does so at his own risk. It is always the responsibility of the user to take all necessary steps to fulfill the demands set out in the local rules and legislation. Always read the Material Data Sheet and the Technical Data Sheet for this product if available. All advice we give or any statement made about the product by us (whether in this data sheet or otherwise) is correct to the best of our knowledge but we have no control over the quality or the condition of the substrate or the many factors affecting the use and application of the product. Therefore, unless we specifically agree in writing otherwise, we do not accept any liability whatsoever for the performance of the product or for any loss or damage arising out of the use of the product. All products supplied and technical advice given are subject to our standard terms and conditions of sale. You should request a copy of this document and review it carefully. The information contained in this data sheet is subject to modification from time to time in the light of experience and our policy of continuous development. It is the user's responsibility to verify that this data sheet is current prior to using the product.

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