SAFETY DATA SHEET

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In accordance with Schedule 1 of the Hazardous Products Regulations (HPR) (WHMIS 2015)

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product identifier

Product Name	M-Bond 600 Adhesive
Other Means of Identification	None

Recommended use and restrictions

Recommended use	Adhesives
Restrictions on use	None known

Initial Supplier Identifier

Company Identification	VISHAY MEASUREMENTS GROUP, INC. Post Office Box 27777 Raleigh, NC 27611 USA
Telephone	(+1) 800.204.6278
E-Mail (competent person)	mm.us@vishaypg.com

Emergency telephone number

Emergency Phone No.	1-800-424-9300	CHEMTREC (24 hours)
Languages spoken	English	

SECTION 2: HAZARDS IDENTIFICATION

Classification of the substance or mixture

In accordance with Schedule 1 of the Hazardous Products Regulations (HPR) (WHMIS 2015)

Flammable Liquid - Category 2
Skin corrosion/irritation - Category 2
Eye Irritation - Category 2
Skin Sensitisation - Category
Specific target organ toxicity — single exposure - Category 3
Carcinogenicity - Category 2
Hazardous to the aquatic environment, Chronic - Category 2

Label elements

Hazard Pictogram(s)

Signal Word(s): DANGER

Hazard Statement(s):

Highly flammable liquid and vapour.
Causes skin irritation.
May cause an allergic skin reaction.
Causes serious eye irritation.
May cause drowsiness or dizziness.
May cause respiratory irritation.
Suspected of causing cancer.
Harmful to aquatic life with long lasting effects.

Precautionary Statement(s):

Do not breathe vapour. Obtain special instructions before use.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Keep container tightly closed.
Avoid breathing vapours.
Wash hands and exposed skin thoroughly after handling.

Wear protective gloves/protective clothing/eye protection/face protection.
IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.
Rinse mouth.
IF ON SKIN: Wash with plenty of water.
If skin irritation or rash occurs: Get medical advice/attention.
IF INHALED: Remove person to fresh air and keep comfortable for breathing.
Call a POISON CENTER/doctor if you feel unwell.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If eye irritation persists, get medical advice/attention.
IF exposed or concerned: Get medical advice/attention.

Other hazards May form explosive peroxides.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Substances Not applicable

Mixtures

GHS Classification

Chemical Name	CAS No.	Concentration (%W/W)	Common name(s), synonym(s) of the substance	Hazard classification
Tetrahydrofuran	109-99-9	<55	Tetramethylene oxide; Butane, 1,4-epoxy-	Flammable Liquids - Category 2 Eye Irritation - Category 2 (SCL ≥ 25%) Acute Toxicity (Oral) - Category 4 Specific Target Organ Toxicity - Single Exposure - Category 3 (Narcotic effects / Respiratory Tract Irritation) (SCL ≥ 25%) Carcinogenicity - Category 2
Polymer of Epichlorohydrin (Phenol-Formaldehyde Novolac)	28064-14-4	<40	Phenol, polymer with formaldehyde, glycidyl ether; Bisphenol F - Phenol Polymer	Skin Irritation - Category 2 Skin Sensitizer - Category 1 Eye Irritation - Category 2 Hazardous to the aquatic environment, Chronic - Category 2
Ethyl methyl ketone	78-93-3	<20	Butanone; Butan-2-one; Methyl ethyl ketone	Flammable Liquids - Category 2 Eye Irritation - Category 2 Specific Target Organ Toxicity - Single Exposure - Category 3 (Narcotic effects / CSN)

SECTION 4: FIRST AID MEASURES

Description of first aid measures

Self-protection of the first aider: Use personal protective equipment as required. Wear appropriate personal protective equipment, avoid direct contact. Ensure adequate ventilation. Avoid breathing vapours. Avoid all contact. Contaminated clothing should be laundered before reuse.

Inhalation: IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.

Skin Contact: IF ON SKIN: Remove contaminated clothing and wash all affected areas with plenty of water. Wash contaminated clothing before reuse. If skin irritation or rash occurs: Get medical advice/attention. IF exposed or concerned: Get medical advice/attention.

Eye Contact	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. IF exposed or concerned: Get medical advice/attention.
Ingestion	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth. Make victim drink plenty of water. Do not give anything by mouth to an unconscious person. Do not induce vomiting unless instructed to do so by medical personnel. IF exposed or concerned: Get medical advice/attention.
Most important symptoms and effects, both acute and delayed	Causes skin irritation. May cause an allergic skin reaction. Causes serious eye irritation. May cause respiratory irritation. May cause an allergic skin reaction. May cause drowsiness or dizziness. Suspected of causing cancer.
Indication of any immediate medical attention and special treatment needed	Treat symptomatically. IF INHALED: Respiratory symptoms, including pulmonary edema, may be delayed. IF IN EYES: After rinsing affected eyes must be seen by an ophthalmologist.

SECTION 5: FIRE-FIGHTING MEASURES

Extinguishing media	
Suitable Extinguishing Media	As appropriate for surrounding fire. Extinguish with carbon dioxide, dry chemical, foam or waterspray.
Unsuitable extinguishing Media	Do not use water jet. Direct water jet may spread the fire.
Special hazards arising from the substance or mixture	Highly flammable liquid and vapour. May decompose in a fire giving off toxic fumes. Carbon monoxide, Carbon dioxide, Phenolic and Explosive Peroxides. Vapours are heavier than air and may travel considerable distances to a source of ignition and flashback. Prevent liquid entering sewers, basements and workpits; vapour may create explosive atmosphere. May form explosive peroxides.
Special protective equipment and precautions for fire fighters	Fire fighters should wear complete protective clothing including self-contained breathing apparatus. Do not breathe fumes. Keep containers cool by spraying with water if exposed to fire. Avoid run off to waterways and sewers.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	Ensure adequate ventilation. Stop leak if safe to do so. Eliminate all ignition sources if safe to do so. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use personal protective equipment as required. See Section: 8. Avoid breathing vapours.
Environmental precautions	Avoid release to the environment. Do not allow to enter drains, sewers or watercourses. Spillages or uncontrolled discharges into watercourses must be alerted to the Environment Agency or other appropriate regulatory body. Prevent liquid entering sewers, basements and workpits; vapour may create explosive atmosphere.
Methods and material for containment and cleaning up	Use non-sparking equipment when picking up flammable spill. Adsorb spillages onto sand, earth or any suitable adsorbent material. Transfer to a container for disposal. Ventilate the area and wash spill site after material pick-up is complete. Dispose of this material and its container as hazardous waste.
Reference to other sections	See Section: 8, 13

SECTION 7: HANDLING AND STORAGE

Precautions for safe handling	Ensure operatives are trained to minimise exposures. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid all contact. Do not breathe vapour. Ensure adequate ventilation. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. May form explosive peroxides. Take precautionary measures against static discharges. Use personal protective equipment as required. See Section: 8. Do not eat, drink or smoke when using this product. Wash hands before breaks and after work.
Conditions for safe storage, including any incompatibilities	Ground/bond container and receiving equipment. Keep only in original container. Store in a well-ventilated place. Keep container tightly closed. Keep away from

	heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. May form explosive peroxides. Keep away from direct sunlight.
Storage temperature	Ambient. Keep at temperature not exceeding (℃): 32
Incompatible materials	Keep away from: Oxidizing agents, Corrosive Substances, Reducing agents, Strong Acids and Alkalis.
Specific end use(s)	Adhesives

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Occupational Exposure Limits

SUBSTANCE	CAS No.	ACGIH® TLV® (ppm)		OSHA PEL (ppm)		Note
		TWA	STEL	TWA	STEL	
Tetrahydrofuran	109-99-9	50	100	200	-	A3
Ethyl methyl ketone	78-93-3	200	300	200	-	-

Source: ACGIH: American Conference of Governmental Industrial Hygiene, Threshold Limit Value (TLV) OSHA PELs 1910.1000
Note: A3: Confirmed Animal Carcinogen with Unknown Relevance to Humans: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histological type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiological studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure.

Alberta: Occupational Health And Safety Code, 2009; Quebec: Health and Safety Work Act, 2016

SUBSTANCE	CAS No.	8-hour Occupational Exposure Limits			15-minute or ceiling Occupational Exposure Limits		Note
		ppm	mg/m³	f/cc	STEL (ppm)	STEL (mg/m³)	
Tetrahydrofuran	109-99-9	50	147	-	100	295	Alberta, 1
		100	300	-	-	-	OEL
Ethyl methyl ketone	78-93-3	200	590	-	300	885	Alberta
		50	150	-	100	300	OEL

Source: Alberta: Occupational Health And Safety Code, 2009
OEL: Quebec Work Health and Safety Regulations, Health and safety work Act, (chapter S – 2.1, a. 223)
1: Can be readily absorbed through intact skin.

British Coloumbia: Occupational Health and Safety Guidelines, 2015; Northwest Territories: Occupational Health & Safety Regulations, 2012; Yukon Territory: Occupational Health and Safety Act, 1986

SUBSTANCE	CAS No.	LTEL (8 hr TWA ppm)	LTEL (8 hr TWA mg/m³)	STEL (ppm)	STEL (mg/m³)	Note
Tetrahydrofuran	109-99-9	50	-	100	-	WEL, Sk
		50	-	100	-	NW, Sk
Ethyl methyl ketone	78-93-3	50	-	100	-	WEL
		200	-	300	-	NW
		200	590	250	740	YK

Source: WEL: Occupational Health and Safety Guidelines Part 5: Chemical Agents and Biological Agents (British Columbia)
NW: WSCC, Occupational Health & Safety Regulations, Northwest Territories Volume 3
Yukon Territory (YK): Occupational Health and Safety Act . O.I.C. 1986/164 Occupational Health Regulations.
Sk - Can be absorbed through skin.

Ontario: Occupational Health and Safety Act, 1990

SUBSTANCE	CAS No.	Time Weighted Average (TWA) (ppm)	STEL (ppm)	Note
Tetrahydrofuran	109-99-9	50	100	WEL
Ethyl methyl ketone	78-93-3	200	300	WEL

		200	300	SK

Source: WEL: Occupational Health and Safety Act, R.R.O. 1990, REGULATION 833, CONTROL OF EXPOSURE TO BIOLOGICAL OR CHEMICAL AGENTS (Ontario)

Biological limit value

SUBSTANCE	CAS No.	Biological exposure determinant factors	Biological Exposure Indices	Sampling Time	Note
Tetrahydrofuran	109-99-9	Tetrahydrofuran: Urine	2 mg/L	End of Shift	Ns
Ethyl methyl ketone	78-93-3	Ethyl methyl ketone: Urine	2 mg/L	End of Shift	Ns

Source: 2015 ACGIH Biological Exposure Indicies (BEIs)
Ns - Nonspecific

Exposure controls

Appropriate engineering controls

Ensure operatives are trained to minimise exposures. Ensure adequate ventilation. Atmospheric levels should be controlled in compliance with the occupational exposure limit.

Individual protection measures, such as personal protective equipment (PPE)

General hygiene measures for the handling of chemicals are applicable. Keep good industrial hygiene. Avoid all contact. Avoid breathing vapours. Wash hands before breaks and after work. Keep work clothes separately. Do not eat, drink or smoke at the work place. IF exposed: Flush with fresh water if contact with skin or eyes.

Eye/face protection

Wear protective eye glasses for protection against liquid splashes. Wear eye protection with side protection.

Skin protection

Hand protection:
Wear impervious gloves. Gloves should be changed regularly to avoid permeation problems. Breakthrough time of the glove material: refer to the information provided by the gloves' producer. Recommended: Polyethylene-Laminate (Minimum thickness 0.1mm).

Body protection:
Wear impervious protective clothing, including boots, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Respiratory protection

In case of inadequate ventilation wear respiratory protection. A suitable mask with filter type A may be appropriate.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Almost colourless Liquid
Odour	Ether-like Odour
Odour threshold	Not available.
pH	Not established.
Melting point/freezing point	Not available.
Initial boiling point and boiling range	66℃
Flash point	-14 ℃ (Mixture)
Evaporation rate (Water = 1)	8 (BuAc = 1)
Flammability (solid, gas)	Not applicable - Liquid

Upper/lower flammability or explosive limits	Flammable Limits (Upper) (%v/v): 11.8 (Acetone) Flammable Limits (Lower) (%v/v): 1.8 (Acetone)
Vapour pressure	129 (mmHg) @ 20℃
Vapour density	2.4 (Air = 1)
Relative density	0.9 (Water = 1)
Solubility(ies)	Water: >50%
Partition coefficient: n-octanol/water	Not available.
Auto-ignition temperature	320 ℃
Decomposition Temperature	Not available.
Viscosity	Not available.
Explosive properties	Not available. (May form explosive peroxides.)
Oxidising properties	Not oxidising.
Other information	Volatile Organic Compound Content: 598 g/L

SECTION 10: STABILITY AND REACTIVITY

Reactivity	Stable under normal conditions. May form peroxides on prolonged storage if air is present.
Chemical stability	Stable under normal conditions.
Possibility of hazardous reactions	Highly flammable liquid and vapour. The vapour may be invisible, heavier than air and spread along ground. May form explosive peroxides. Contact with aliphatic amines will cause irreversible polymerization with considerable heat build-up.
Conditions to avoid	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Keep away from direct sunlight. Keep at a temperature not exceeding (℃): 32. Avoid contact with air. Avoid contact with heat and ignition sources and oxidizers. Avoid distillation to dryness, which can form explosive peroxides.
Incompatible materials	Oxidizing agents, Corrosive Substances, Reducing agents, Strong Acids and Alkalis.
Hazardous decomposition product(s)	May decompose in a fire giving off toxic fumes. Carbon monoxide, Carbon dioxide, Phenolic and Explosive Peroxides.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on toxicological effects

Acute toxicity - Ingestion	Based upon the available data, the classification criteria are not met. Acute Toxicity Estimate Mixture Calculation: Estimated LC50 > 2000 mg/kg bw/day.
Tetrahydrofuran:	Acute Toxicity (Oral) - Category 4 LD50 1650 mg/kg bw/day (Unnamed, 1978)
Acute toxicity - Inhalation	Based upon the available data, the classification criteria are not met. Acute Toxicity Estimate Mixture Calculation: Estimated LC50 > 20.0 mg/l.
Acute toxicity - Skin Contact	Based upon the available data, the classification criteria are not met. Acute Toxicity Estimate Mixture Calculation: Estimated LC50 > 2000 mg/kg bw/day.
Skin corrosion/irritation	Skin Irritation - Category 2: Causes skin irritation.
Polymer of Epichlorohydrin (Phenol-Formaldehyde Novolac)	Skin Irritation - Category 2 No data
Ethyl methyl ketone:	Not classified Prolonged skin contact will result in defatting of the skin, leading to irritation, and in some cases, dermatitis. (Smith R & Mayers MR, 1944).
Serious eye damage/irritation	Eye Irritation - Category 2: Causes eye irritation.
Tetrahydrofuran:	Eye Irritation - Category 2 EU Harmonised Classification No data.
Polymer of Epichlorohydrin (Phenol-Formaldehyde Novolac)	Eye Irritation - Category 2 No data
Ethyl methyl ketone	Eye Irritation - Category 2 Irritating to eyes. (rabbit) (OECD 405)
Respiratory or skin sensitization	Skin Sensitizer - Category 1: May cause an allergic skin reaction.

Polymer of Epichlorohydrin (Phenol-Formaldehyde Novolac)	Skin Sensitizer - Category 1 Allergic contact dermatitis (Pontén, A et al, 1999)
Germ cell mutagenicity	Based upon the available data, the classification criteria are not met.
Carcinogenicity	Carcinogenicity - Category 2: Suspected of causing cancer.
Tetrahydrofuran:	Carcinogenicity - Category 2 EU Harmonised Classification NOAEC 1800 ppm Suspected carcinogen (Unnamed, 1998)
Reproductive toxicity	Based upon the available data, the classification criteria are not met.
STOT - single exposure	Specific target organ toxicity — single exposure - Category 3: May cause respiratory irritation. May cause drowsiness or dizziness.
Tetrahydrofuran:	Specific target organ toxicity — single exposure - Category 3 Central nervous depression (Malley, L.A. et al, 2001)
Ethyl methyl ketone	Specific target organ toxicity — single exposure - Category 3 Harmonised Classification Rats at all dose levels: gait and/or posture abnormalities. Higher dose groups some rats were comatose or prostrate within a few hours of dosing, with some animals being unconscious for 24 hours. (OECD 423)
STOT - repeated exposure	Based upon the available data, the classification criteria are not met.
Aspiration hazard	Based upon the available data, the classification criteria are not met.
Other information	None known.

SECTION 12: ECOLOGICAL INFORMATION

Toxicity	Aquatic Chronic 2; Toxic to aquatic life with long lasting effects. Estimated Mixture LC50 > 1 to ≤ 10 mg/l. (Fish)
Polymer of Epichlorohydrin (Phenol-Formaldehyde Novolac)	Aquatic Chronic - Category 2 Aquatic acute: EC50 1.6 mg/l 48hr (Daphnia magna) (Wyness LE et al, 1993) Aquatic chronic: No data
Persistence and degradability	Part of the components are poorly biodegradable.
Bioaccumulative potential	The product has low potential for bioaccumulation.
Mobility in soil	The substance is predicted to have high mobility in soil. Miscible with water.
Other adverse effects	None known.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods	Dispose of this material and its container as hazardous waste. Send after pre-treatment to a appropriate hazardous waste incinerator facility according to legislation. Send after pre-treatment to a appropriate hazardous waste incinerator facility according to legislation.

SECTION 14: TRANSPORT INFORMATION

		ADR/RID	IMDG	IATA/ICAO
14.1	**UN number**	UN 1133	UN 1133	UN 1133
14.2	**UN proper shipping name**	ADHESIVES containing flammable liquid	ADHESIVES containing flammable liquid	ADHESIVES containing flammable liquid
14.3	**Transport hazard class(es)**	3	3	3
14.4	**Packing group**	II	II	II
14.5	**Environmental hazards**	Environmentally hazardous substance	Classified as a Marine Pollutant.	Environmentally hazardous substance
14.6	**Special precautions for user**	Not applicable.		
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	See Section: 2		

SECTION 15: REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations

CEPA, Domestic Substances List	Tetrahydrofuran: Yes Polymer of Epichlorohydrin (Phenol-Formaldehyde Novolac): Yes Ethyl methyl ketone: Yes
CEPA, List of Toxic Substances (Schedule 1)	Tetrahydrofuran: VOC - Item 65 Ethyl methyl ketone: VOC - Item 65
CEPA, National Pollutant Release Inventory	Tetrahydrofuran: Threshold Category: Part 5, Mass Threshold: 1 tonnes of 10 tonnes Total VOC air release, Concentration threshold: N/A Ethyl methyl ketone: Threshold Category: Part 1A, Mass Threshold: 10 tonnes Concentration threshold: 1%; Threshold Category: Part 5, Mass Threshold: 1 tonnes of 10 tonnes Total VOC air release, Concentration threshold: N/A

Non-Regional

IARC Monographs**,** List of Classifications	Tetrahydrofuran: 2B – in preparation

SECTION 16: OTHER INFORMATION

The following sections contain revisions or new statements: Not applicable – V1.0

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References:
Existing Safety Data Sheet (SDS).
EU: Harmonised Classification(s) for Tetrahydrofuran (CAS No. 109-99-9) and Ethyl methyl ketone (CAS No. 78-93-3). Existing ECHA registration(s) for Tetrahydrofuran (CAS No. 109-99-9) and Ethyl methyl ketone (CAS No. 78-93-3), and the Classification and Labelling Inventory for Polymer of Epichlorohydrin (Phenol-Formaldehyde Novolac) (CAS No. 28064-14-4).

Literature References:

1. Smith R & Mayers MR, 1944, Study of poisoning and fire hazards of butanone and acetone, Industrial Hygiene: 23, 174-176
2. Pontén, A. and Bruze, M. (1999), Occupational allergic contact dermatitis from epoxy resins based on bisphenol F. Contact Dermatitis, 41: 235. doi:10.1111/j.1600-0536.1999.tb06149.x
3. Malley, L.A., Christoph G.R., Stadler, J.C., Hansen, J.F., Biesemeir, J.A. and Jasti, S., 2001, Acute and subchronic neurotoxicology evaluation of tetrahydrofuran by inhalation in rats, Drug Chem. Toxicol., 24(3): 201-219
4. Wyness LE, Cheeman H, Lad DD and Baldwin MK (1993), EPIKOTE 862: Acute toxicity to Oncorhunchus mykiss, Daphnia magna and Selenastrum capricornutum; SBGR.92.237

LEGEND

LTEL: Long Term Exposure Limit	STEL: Short Term Exposure Limit
DNEL: Derived No Effect Level	PNEC: Predicted No Effect Concentration
PBT: Persistent, Bioaccumulative and Toxic	vPvB: very Persistent and very Bioaccumulative
ACGIH: American conference of Governmental Industrial Hygiene	BEI: Biological Exposure Indices (ACGIH)
TLV: Threshold Limit Value (ACGIH)	TWA: Time Weighted Average
OSHA = Occupational Safety and Health Administration	NIOSHTIC: National Institute for Occupational Safety and Health Technical Information Center
IARC: International Agency for Research on Cancer	CEPA (Canadian Environmental Protection Act)
VOC: Volatile Organic Compound	EU: European Union

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