Section 9 –PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Colourless Syrupy liquid
Odour	Odorless
Solubility in water	Miscible
Relative Density (H2O=1)	1.12 at 20 °C
Boiling Point °C	244°C - 245.8 °C
Melting Point °C	-6.5 to -10.5 °C
Relative Vapour Density (Air=1)	3.66
Flash point °C	154°C (Closed cup)
Auto ignition °C	364°C
Vapour pressure (kPa) @ 20 °C	0.0003
Molecular weight	106.12
Explosive limits in air % by volume	LEL 1.6% UEL12.2%
pH	NA
Viscosity cP @20 °C	35.7
Pour point	NA
Evaporation rate (water=1)	NA
Octanol/water partition coefficient log Kow	NA
% volatile	NA

Adnan Kahveci Mah.
Sayaca Cad. Ekol Center
Kat 2 No:50 Beylikduzu
Istanbul - Turkey
Tel: +90 212 856 05 01
www.tesport.com
resin@tesport.com

Material Safety Data Sheet
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DI ETHYLENE GLYCOL

Section-1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

1.1 Identification of the substance/preparation:

Commercial name: DI ETHYLENE GLYCOL (DEG)
Chemical name: DI ETHYLENE GLYCOL (DEG) C4-H10-O3
Synonyms: diethylene glycol, glycol ethyl ether, beta, beta'-dihydroxydiethyl ether, 1, 5-dihydroxy-3-oxapentane, bis(2-hydroxyethyl)ether, brecolane NDG, deactivator E, dicol, digenos, diglycol, digol, dissolvent APV, ethylene diglycol

1.2 Use of the substance /preparation:

Used in Unsaturated Polyester Resins, Coolants, Pesticides, Rubber Compounding, Plasticizer, Polyurethane Foams, Textile Auxiliaries, Polyethylene Glycols, Paints, brake fluids, etc. Use in polyester resins and polyurethanes, antifreeze blends, triethylene glycol, morpholine, natural gas dehydration, and in solvents.

Section 2 – HAZARD IDENTIFICATION

2.1 Classification of the substance/preparation: Hazard class and category code.

GHS Category:

Health	Environmental	Physical
Acute Toxicity Category Inhalation: NA	Aquatic Toxicity – Category- NA	Flammable – Category NA

NA: Not available
Data reference: Official Journal of the European Union regarding EU GHS

GHS Category table for reference:

Study/hazard statement	Category 1	Category 2	Category 3	Category 4	Category 5

Acute Oral LD50	≤ 5 mg/kg Fatal if swallowed	> 5 ≤ 50 mg/kg Fatal if swallowed	> 50 ≤ 300 mg/kg Toxic if swallowed	> 300 ≤ 2000 mg/kg Harmful if swallowed	> 2000 ≤ 5000mg/kg May be harmful if swallowed
Acute Dermal LD50	≤ 50 mg/kg Fatal in contact with skin	> 50 ≤ 200 mg/kg Fatal in contact with skin	> 200 ≤ 1000 mg/kg Toxic in contact with skin	> 1000 ≤ 2000 mg/kg Harmful in contact with skin	> 2000 ≤ 5000 mg/kg May be harmful in contact with skin
Acute Inhalation Dust LC50 Gases LC50 Vapours LC50	≤ 0.05 mg/L ≤ 100 ppm/V ≤0.5 mg/L Fatal if inhaled	> 0.05 ≤ 0.5 mg/L > 100 ≤ 500 ppm/V >0.5 ≤ 2.0 mg/L Fatal if inhaled	> 0.5 ≤ 1.0 mg/L > 500 ≤ 2500 ppm/V > 2.0 ≤ 10 mg/L Toxic if inhaled	> 1.0 ≤ 5 mg/L >2500 ≤ 20000 ppm/V > 10 ≤ 20 mg/L Harmful if inhaled	See footnote below this table
Flammable liquids	Flash point < 23 degrees C and initial boiling point ≤ 35 degrees C. Extremely flammable liquid and vapour	Flash point < 23 degrees C and initial boiling point > 35 degrees C. Highly flammable liquid and vapour	Flash point ≥ 23 degrees C≤ 60 degrees C. Flammable liquid and vapour	Flash point > 60 degrees C ≤ 93 degrees C. Combustible liquid	Not Applicable

Note: Gases concentration are expressed in parts per million per volume (ppmV).
NOTE 1: Category 5 is for mixtures which are of relatively low acute toxicity but which under certain circumstances may pose a hazard to vulnerable populations. These mixtures are anticipated to have an oral or dermal LD50 value in the range of 2000-5000 mg/kg bodyweight or equivalent dose for other routes of exposure. In light of animal welfare considerations, testing in animals in Category 5 ranges is discouraged and should only be considered when there is a strong likelihood that results of such testing would have a direct relevance for protecting human health.
NOTE 2: These values are designed to be used in the calculation of the ATE for classification of a mixture based on its ingredients and do not represent test results. The values are conservatively set at the lower end of the range of Categories 1 and 2, and at a point approximately 1/10th from the lower end of the range for Categories 3 – 5.

GHS Category table for reference: Continued

Study/hazard statement	**Category 1**	**Category 2**	**Category 3**
Eye Irritation	Effects on the cornea, iris or conjunctiva that are not expected to reverse or that have not fully reversed within 21 days. Causes severe eye damage.	2A: Effects on the cornea, iris or conjunctiva that fully reverse within 21 days. Causes severe eye irritation. 2B : Effects on the cornea, iris or conjunctiva that fully reverse within 7 days. Causes eye irritation.	Not applicable
Skin Irritation	Destruction of skin tissue, with sub categorization based on exposure of up to 3 minutes (A), 1 hour (B), or 4 hours (C). Causes severe skin burns and eye damage.	Mean value of ≥2.3 > 4.0 for erythema / eschar or edema in at least 2 of 3 tested animals from gradings at 24, 48, and 72 hours (or on 3 consecutive days after onset if reactions are delayed); inflammation that persists to end of the (normally 14-day) observation period. Causes skin irritation.	Mean value of ≥1.5 < 2.3 for erythema / eschar or edema in at least 2 of 3 tested animals from gradings at 24, 48, and 72 hours (or on 3 consecutive days after onset if reactions are delayed). Causes mild skin irritation.
Environment: Acute Toxicity Category	96 hr LC50 (fish) ≤1 mg/L 48 hr EC50 (crustacea) ≤ 1 mg/L, 72/96 hr ErC50 (aquatic plants) ≤ 1 mg/L Very toxic to aquatic life	96 hr LC50 (fish) >1≤ 10 mg/L 48 hr EC50 (crustacea) >1≤ 10 mg/L 72/96 hr ErC50 (aquatic plants) >1≤ 10 mg/L Toxic to aquatic life	96 hr LC50 (fish) >10≤ 100 mg/L 48 hr EC50 (crustacea) >10≤ 100 mg/L 72/96 hr ErC50 (aquatic plants) >10≤ 100 mg/L Harmful to aquatic life
Flammable Aerosol	Extremely flammable aerosol	Flammable aerosol	Not Applicable
Flammable solids	Using the burning rate test, substances or mixtures other than metal powders: (a) wetted zone does not stop fire and (b) burning time < 45 seconds or burning rate > 2.2 mm/second Using the burning rate test, metal powders that have burning time ≤ 5 minutes Flammable solid	Using the burning rate test, substances or mixtures other than metal powders: (a) wetted zone does not stop fire for at least 4 minutes and (b) burning time < 45 seconds or burning rate > 2.2 mm/second Using the burning rate test, metal powders that have burning time > 5 ≤ 10 minutes Flammable solid	Not Applicable
Flammable gases	Gases, which at 20 degrees C and a standard pressure of 101.3 kPA: (a) are ignitable when in a mixture of 13% or less by volume in air; or (b) have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit. Extremely flammable gas	Gases, other than those of category 1, which, at 20 degrees C and a standard pressure of 101.3 kPA, have a flammable range while mixed in air. Flammable gas	Not Applicable

GHS Label: GHS07: Warning.

Signal word: Warning.

Details of statements:

Hazard Statements	H 302: Harmful if swallowed.
Precautionary Statement Prevention	P102: Keep out of reach of children. P103: Read label before use. P264: Wash exposed *parts of the body* thoroughly after handling. P270: Do not eat, drink or smoke when using this product.
Precautionary Statement Response	P101: If medical advice is needed, have product container or label at hand. P301 IF SWALLOWED: P312 Call a POISON CENTER or doctor/physician if you feel unwell. P330 Rinse mouth.
Precautionary Statement Storage	No storage statements
Precautionary Statement Disposal	Follow local regulation

Data reference: Official Journal of the European Union regarding EU GHS

Hazard ratings:

NFPA HAZARD CODES	RATINGS SYSTEM
HEALTH: 1	0 = No Hazard
FLAMMABILITY: 1	1 = Slight Hazard
INSTABILITY: 0	2 = Moderate Hazard
	3 = Serious Hazard
	4 = Severe Hazard

Data Reference: http://toxnet.nlm.nih.gov/cgibin/sis/search.

2.2 Information pertaining to particular dangers for human:

Irritating if inhaled. Irritating to eyes, skin and respiratory organs.

2.3 Information pertaining to particular dangers for the environment: NA

2.4 Other adverse effects:

Flammable and easily ignitable substance. Mixtures keep above ground and after ignition they spread fast into far distances. Ignition possible when exposed to hot surfaces, sparks, naked flames and by electrostatic discharges too.

Route of entry:

Those with history of lung diseases, or skin problems may be more susceptible to the effects of this substance. Those with history of lung diseases, or skin problems may be more susceptible to the effect of this material.

Skin Contact	Skin Absorption	Eye Contact	Inhalation	Ingestion
Yes	Yes	Yes	Yes	Yes

DATA REFERENCE: http://toxnet.nlm.nih.gov/cgibin/sis/search.

Health hazards:

Source	NTP listed?	IARC cancer review group?	OSHA Regulated?
Carcinogenicity	No	No	No

DATA REFERENCE: Toxic release inventory (TRI) basis of Occupational Safety and Health Administration (OSHA) carcinogen, National Toxicological program (NTP), International Agency for Research on Cancer (IARC), http://toxnet.nlm.nih.gov/cgi-bin/sis/search.

Section 3 – COMPOSITION & INFORMATION ON INGREDIENTS

Ingredients / Hazardous	CAS No.	EC No.	Percentage
Di Ethylene Glycol/Yes	111-46-6	203-872-2	99.80% min.
Acidity (As Acetic Acid) /Yes	64-19-7	200-580-7	0.05% max.
Mono Ethylene Glycol/Yes	107-21-1	203-473-3	0.2% (wt.) max.
Tri Ethylene Glycol/Yes	112-27-6	203-953-2	0.2% (wt.) max.

Data reference: http://ecb.jrc.ec.europa.eu/esis/

Section 4 – FIRST AID MEASURES

4.1 General advice
IMMEDIATE MEDICAL ATTENTION IS REQUIRED AFTER INHALATION OR AFTER SWALLOWING.
In case of health troubles or doubts, seek medical advice immediately and show this Material Safety Data Sheet.

4.2 Inhalation
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

4.3 Skin contact
In case of contact, immediately wash skin with copious amounts of water.

4.4 Eye contact
Contamination of the eyes should be treated by immediate and prolonged irrigation with copious amounts of water. Assure adequate flushing of the eyes by separating the eyelids with fingers.

4.5 Swallowing
If patient is conscious and without convulsion, immediately try to induce vomiting. Never give anything by mouth to an unconscious person, just put patient into a stabilised position. Seek medical advice immediately.
SYMPTOMS AND EFFECTS: nausea, vomiting, convulsions, irregular heartbeat.

Section 5 – FIRE FIGHTING MEASURES

5.1 Suitable extinguishing media
Foam, powder, CO_2. Cool containers with water spray.

5.2 Extinguishing media to be avoided: Water.

5.3 Caution about specific danger in case of fire and fire-fighting procedures: Danger of violent reaction or explosion. Vapours may travel

considerable far distances and cause subsequent ignition. Vapours is heavier than air, may cumulate along the ground and in enclosed spaces – danger of explosion. Do not empty into drains. When burning, it emits carbon monoxide, carbon dioxide and irritant fumes. Containers with the substance exposed to excessive heat may explode.

5.4 Special protective equipment for fire-fighters

Wear full protective fire-resistant clothing and self-contained breathing apparatus.

Section 6 –ACCIDENTAL RELEASE MEASURES

6.1 Person-related safety precautions

Isolate hazard area. Evacuate all unauthorized personnel not participating in rescue operations from the area. Avoid entry into danger area. Remove all possible sources of ignition. Stop traffic and switch off the motors of the engines. Do not smoke and do not handle with naked flame. Use explosion-proof lamps and non-sparking tools. Avoid contact with the substance. Apply recommended full protective personal equipment. When escaping from the contaminated area, wear mask with cartridge against organic vapours. In case of general average, evacuate personnel from danger area.

6.2 Precautions for protection of the environment

Prevent from further leaks of substance.

6.3 Recommended methods for cleaning and disposal

Soak up residues with compatible porous material and forward for disposal in closed containers. Dispose off under valid legal waste regulations.

Section 7 –HANDLING AND STORAGE

7.1 Information for safe handling

Observe all fire-fighting measures (no smoking, do not handle with naked flame and remove all possible sources of ignition). Take precautionary measures against static discharges. Wear recommended personal protective equipment and observe instructions to prevent possible contact of substance with skin and eyes and inhalation. Avoid leak to environment.

7.2 Information for storage

Storerooms should meet the requirements for the fire safety of constructions and electrical facilities and should be in conformity with valid regulations. Store in cool, well-ventilated place with effective exhaust, away from heat and all sources of ignition. Store in tightly closed container. Do not store together with oxidizing agents.

Take precautionary measures against static discharges. Avoid leak to environment.

7.3 Information for specific use: NA.

Section 8 –EXPOSURE CONTROL & PERSONAL PROTECTION

8.1 Occupational Exposure Limits:

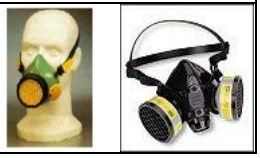
Material	Source	Type	ppm	mg/m3	Notation
DI ETHYLENE GLYCOL (DEG)	ACGIH	TWA	NA	10	
	ACGIH	STEL	NA		
	ACGIH	SKIN_DES TWA	NA		
	NIOSH	IDLH	NA		
	OSHA	TWA	NA		

NA: Data not available
DATA REFERENCE: http://toxnet.nlm.nih.gov/cgi-bin/sis/search.

8.2 Occupational exposure controls

Collective protection measures: General and local ventilation, effective exhaust.
Individual protection measures: Personal protective equipment (PPE) for the protection of eyes, hands and skin corresponding with the performed labour has to be kept at disposition for the employees. In cases, where the workplace exposure control limits cannot be observed with the help of technical equipment or where it is not possible to ensure that the respiratory system exposure does not represent a health hazard for the personnel, adequate respiratory protection have to be kept at disposition. In the case of continuous use of this equipment during constant work, safety breaks have to be scheduled, if the PPE-character requires this. All PPE have to be kept in disposable state and the damaged or contaminated equipment has to be replaced immediately.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE):

HANDS	EYES	BODY	RESPIRATORY
			

Respiratory protection: If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-face piece respirator, airline hood, or full face piece self-contained breathing apparatus. protective mask with canister A (brown coloured, protecting against organic vapours), self-contained breathing apparatus.

Eye protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Hand protection: Wear gloves of impervious material.

Body protection: Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Protective coverall antistatic design recommended, impervious when handling big amounts (nitrile rubber), sealed leather footwear (free from synthetic adhesives)

Hygiene Measures: Wash hands, forearms and face thoroughly after handling. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

8.3 Environmental exposure controls

Proceed in accordance with valid air and water legislative regulations.

Engineering measures: Use only with adequate ventilation. If user operations generate dust, fumes, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended limits. The engineering controls also need to keep vapor or

dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Section 9 –PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Colourless Syrupy liquid
Odour	Odorless
Solubility in water	Miscible
Relative Density (H2O=1)	1.12 at 20 °C
Boiling Point °C	244°C - 245.8 °C
Melting Point °C	-6.5 to -10.5 °C
Relative Vapour Density (Air=1)	3.66
Flash point °C	154°C (Closed cup)
Auto ignition °C	364°C
Vapour pressure (kPa) @ 20 °C	0.0003
Molecular weight	106.12
Explosive limits in air % by volume	LEL 1.6% UEL12.2%
pH	NA
Viscosity cP @20 °C	35.7
Pour point	NA
Evaporation rate (water=1)	NA
Octanol/water partition coefficient log Kow	NA
% volatile	NA

NA: NOT AVAILABLE
DATA REFERENCE http://toxnet.nlm.nih.gov/cgi-bin/sis/search

Section 10 –CHEMICAL STABILITY AND REACTIVITY INFORMATION

10.1 Conditions to avoid
Prolonged exposure of containers or tank cars to heat or fire may cause the material to expand with possible container rupture
10.2 Material to avoid
AIR AND WATER REACTIONS:
Oxidizes readily in air to form unstable peroxides that may explode spontaneously [Bretherick, 1979 p.151-154, 164]. A mixture of liquid air and diethyl ether exploded spontaneously, [MCA Case History 616(1960)]. Water soluble.
A violent explosion occurred when lithium aluminum hydride was being used to dry diethylene glycol dimethyl ether. The ignition may have occurred due to the presence of large amounts of water or perhaps peroxide formed in the ether. About 75% of the ether had been removed when the explosion occurred, [MCA Case History 1494 (1968)].
REACTIVE GROUPS: Ethers, Very dangerous fire hazard when exposed to oxidizers
10.3 Hazardous decomposition products
Thermal decomposition generates carbon monoxide and carbon dioxide.
Polymerization: Polymerization occurs if heated in sunlight or presence of air; reaction is exothermic.

Section 11 –TOXICOLOGICAL INFORMATION

11.1 Acute effects

Product irritates eyes and skin. High vapour concentrations irritate respiratory system and eyes and may lead to fast coma and death

Acute toxicity data:

Parameter	Route	Species	Values	Exposure period
LD50	Oral	Rat	15600 mg/kg	Not applicable

Data Reference: http://toxnet.nlm.nih.gov/cgi-bin/sis/search.

11.2 Repeated dose toxicity: Chronic effects cause irritation

11.3 Sensitisation: May cause skin irritation.

11.4 CMR effects (carcinogenity, mutagenicity, toxicity for reproduction)

Not a CMR

11.5 Toxicokinetics, metabolism, distribution: NA.

Section 12 –ECOLOGICAL INFORMATION

12.1 Ecotoxicity data:

Parameter	Route	Species	Values	Exposure period
LC50	Inhalation	Daphnia magna	>10000 mg/L	24 Hours

12.3 Persistence and degradability : Substance is biodegradable

12.4 Bioaccumulative potential: NA.

12.5 Results of PBT assessment Persistence and Degradation: NA

12.6 Other adverse effects: NA

Environmental Fate: Di Ethylene Glycol is expected to have high mobility in soil, Volatilization from water surfaces is expected.

Section 13– DISPOSAL CONSIDERATION

Local Legislation: Disposal should be in accordance with applicable regional, national, and local laws and regulations. This product should not be dumped, spilled, rinsed or washed into sewers or public waterways.

13.1 Recommended disposal methods for the substance / preparation

Product reuse or disposal in accordance with valid waste legislative regulations.

13.2 Recommended disposal methods for contaminated packaging

Product is transported in tank-vehicles.

13.3 Waste management measures that control exposure of humans and environment

Proceed in accordance with valid health, air and water legislative regulations.

13.4 Waste regulation: Follow local regulation.

Section 14– TRANSPORT INFORMATION

International Transport Regulation:

ADR/RID (Road/Rail), IMDG (Sea) and ICAO/IATA (Air)
The product is not regulated
14.1
Proper Shipping Name: Not classified
Hazard Class: Not classified
UN Number: Not classified
Emergency Action Code: Not classified
14.2 Special transport precautionary measures
Not applicable.

Section 15– REGULATORY INFORMATION

MSDS format on a 16 Section based on guidance provided in:

Indian Regulation:
Manufacture, Storage and Import of Hazardous Chemicals Rule, 1989.
The Factories Act 1948

International Regulations:
European SDS Directive
ANSI MSDS Standard
ISO 11014-1 1994
WHMIS Requirements
United States
Hazard Communication Standard
Canada
Hazardous Products Act and Controlled Products Regulations
Europe
Dangerous Substance and Preparations Directives
Australia
National Model Regulations for the Control of Workplace Hazardous Substances

The Globally Harmonized System of Classification and Labeling of Chemicals endorsed by The UN Economic and Social Council

* Risk phrases: R22 Harmful if swallowed.

*Safety phrases: S2 Keep out of reach of children, S46 If swallowed, seek medical advice immediately and show the container or label.

*These standard risk and safety phrases for use when interpreting Material Safety data Sheets are derived from the European Union Regulation, CHIP Regulations - Chemicals (Hazard Information and Packaging for Supply). They are required to be used in Materials Safety Data Sheets to identify potential hazards and offer safe handling advice.

Section 16 – OTHER INFORMATION

Training instructions

Personnel handling the product has to be acquainted demonstrably with its hazardous properties, with health and environmental protection principles related to the product and first aid principles.
Tremcard details/Reference: Refer Section 14
Local bodies involved (Applicable only with in India): Local District Authorities and Local Crisis Group

Sources of data used to compile the Material Safety Data Sheet
Data compilation reference: National Institute for Occupational Safety and Health guide to chemical hazards and International Chemical Safety Cards (WHO/IPCS/ILO) and http://toxnet.nlm.nih.gov/cgi-bin/sis/search, http://webnet3.oecd.org/eChemPortal/Results2.aspx?SubstanceId=169630, . http://ecb.jrc.ec.europa.eu/esis/index.php?PGM=ein, http://www.cdc.gov/niosh/npg/npgd0049.html, Data reference: Official Journal of the European Union regarding EU GHS

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Date of Revision	Revised Sections	Supercedes
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Sep. 01, 2011	Section 4 (4.3)	Sep. 01, 2009
Aug. 01, 2013	Section 2 NFPA Hazard statement	Sep. 01, 2011

This MSDS is issued by the Centre for HSE Excellence, Reliance Industries Limited

End of MSDS