METHYL FORMAL

MTF

CAUTIONARY RESPONSE INFORMATION

Common Synonyms
Dimethoxymethane
Dimethyl formal
Formaldehyde dimethylacetol
Methylal
Methylene dimethyl ether

Liquid | Colorless | Mild sweet odor

Mixes with water. Flammable, irritating vapor is produced.

Keep people away.
Shut off ignition sources. Call fire department.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Irritating gases may be produced when heated.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemicals, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

Call for medical aid.

VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, having victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse
Stop discharge

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 41; Ether
2.2 Formula: $CH_2(OCH_3)_2$
2.3 IMO/UN Designation: 3.1/1234
2.4 DOT ID No.: 1234
2.5 CAS Registry No.: 109-87-5
2.6 NAERG Guide No.: 127
2.7 Standard Industrial Trade Classification: 51616

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Self-contained breathing apparatus or all-purpose canister mask; rubber gloves; chemical safety goggles; impervious apron and boots.
3.2 Symptoms Following Exposure: Inhalation causes irritation of respiratory system and depression of central nervous system. Liquid causes irritation of eyes and will irritate skin if allowed to remain. Ingestion causes depression of central nervous system.
3.3 Treatment of Exposure: INHALATION: remove victim from contaminated area and administer artificial respiration and oxygen if necessary. EYES: flush with plenty of water; get medical attention. SKIN: flush with plenty of water. INGESTION: induce vomiting; administer gastric lavage and saline cathartics; subsequent treatment is symptomatic and supportive.
3.4 TLV-TWA: 1,000 ppm
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Grade 1; LD_{50} = 5 to 15 g/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Liver and kidney injury may follow high exposures.
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
3.12 Odor Threshold: Currently not available
3.13 IDLH Value: 2,200 ppm
3.14 OSHA PEL-TWA: 1,000 ppm
3.15 OSHA PEL-STEL: Not listed.
3.16 OSHA PEL-Ceiling: Not listed.
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: 0°F O.C.
4.2 Flammable Limits in Air: 1.6%-17.6%
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
4.5 Special Hazards of Combustion Products: Irritating formaldehyde gas may be present in smoke.
4.6 Behavior in Fire: Not pertinent
4.7 Auto Ignition Temperature: 459°F
4.8 Electrical Hazards: Currently not available
4.9 Burning Rate: 5.5 mm/min.
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: 23.8 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 7.0 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): Currently not available
6.4 Food Chain Concentration Potential: None
6.5 GESAMP Hazard Profile:
Bioaccumulation: -
Damage to living resources: -
Human Oral hazard: 0
Human Contact hazard: I
Reduction of amenities: X

7. SHIPPING INFORMATION

7.1 Grades of Purity: 97+%
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Pressure-vacuum
7.5 IMO Pollution Category: Currently not available
7.6 Ship Type: Currently not available
7.7 Barge Hull Type: Currently not available

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid
8.2 49 CFR Class: 3
8.3 49 CFR Package Group: II
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	2

8.6 EPA Reportable Quantity: Not listed.
8.7 EPA Pollution Category: Not listed.
8.8 RCRA Waste Number: Not listed
8.9 EPA FWPCA List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 76.1
9.3 Boiling Point at 1 atm: 108°F = 42°C = 315°K
9.4 Freezing Point: –157°F = –105°C = 168°K
9.5 Critical Temperature: 419.0°F = 215°C = 488.2°K
9.6 Critical Pressure: Not pertinent
9.7 Specific Gravity: 0.861 at 20°C (liquid)
9.8 Liquid Surface Tension: 21.1 dynes/cm = 0.0211 N/m at 20°C
9.9 Liquid Water Interfacial Tension: Not pertinent
9.10 Vapor (Gas) Specific Gravity: 2.6
9.11 Ratio of Specific Heats of Vapor (Gas): 1.0888
9.12 Latent Heat of Vaporization: 161.5 Btu/lb 89.8 cal/g = 3.76 X 10^5 J/kg
9.13 Heat of Combustion: –10,970 Btu/lb = –6,100 cal/g = –255 X 10^5 J/kg
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: Currently not available
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: Currently not available

NOTES

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9.20 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
34	54.860
36	54.790
38	54.720
40	54.650
42	54.580
44	54.520
46	54.450
48	54.380
50	54.310
52	54.240
54	54.170
56	54.100
58	54.030
60	53.960
62	53.890
64	53.820
66	53.750
68	53.680
70	53.610
72	53.540
74	53.470
76	53.410

9.21 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
10	0.484
15	0.486
20	0.488
25	0.490
30	0.491
35	0.493
40	0.495
45	0.497
50	0.498
55	0.500
60	0.502
65	0.503
70	0.505
75	0.507
80	0.509

9.22 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit inch per hour-square foot-F
51	1.048
52	1.048
53	1.048
54	1.048
55	1.048
56	1.048
57	1.048
58	1.048
59	1.048
60	1.048
61	1.048
62	1.048
63	1.048
64	1.048
65	1.048
66	1.048
67	1.048
68	1.048
69	1.048
70	1.048
71	1.048
72	1.048
73	1.048
74	1.048
75	1.048
76	1.048

9.23 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
35	0.396
40	0.388
45	0.380
50	0.372
55	0.365
60	0.358
65	0.351
70	0.344
75	0.338
80	0.332
85	0.326
90	0.320
95	0.315
100	0.309

9.24 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
60	32.000

9.25 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
35	2.738
40	3.122
45	3.551
50	4.029
55	4.560
60	5.149
65	5.800
70	6.518
75	7.310
80	8.181
85	9.136
90	10.180
95	11.330
100	12.580
105	13.940
110	15.420

9.26 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
35	0.03924
40	0.04430
45	0.04989
50	0.05604
55	0.06281
60	0.07024
65	0.07836
70	0.08724
75	0.09693
80	0.10750
85	0.11890
90	0.13130
95	0.14480
100	0.15930
105	0.17500
110	0.19180

9.27 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	0.294
20	0.301
40	0.309
60	0.317
80	0.324
100	0.332
120	0.339
140	0.347
160	0.354
180	0.362
200	0.369
220	0.376
240	0.383
260	0.390
280	0.397
300	0.404
320	0.411
340	0.417
360	0.424
380	0.431
400	0.437
420	0.444
440	0.450