

ETHYL FORMATE

EFM

CAUTIONARY RESPONSE INFORMATION

Common Synonyms Ethyl formic ester Ethyl methanoate Formic acid, ethyl ester Formic ether	Liquid Colorless Pleasant odor Floats and mixes with water. Flammable, irritating vapor is produced.
<p>Evacuate. Keep people away. Avoid inhalation. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.</p>	
Fire	<p>FLAMMABLE: Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>
Exposure	<p>Call for medical aid.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>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, have victim drink water or milk.</p>
Water Pollution	<p>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.</p>

1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse
Stop discharge

2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: HCOOC_2H_5
- 2.3 IMO/UN Designation: 3.1/1190
- 2.4 DOT ID No.: 1190
- 2.5 CAS Registry No.: 109-94-4
- 2.6 NAERG Guide No.: 129
- 2.7 Standard Industrial Trade Classification: 51374

3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister gas mask; goggles or face shield; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation of vapor causes slight irritation of the eyes and rapidly increasing irritation of the nose. High concentrations cause deep narcosis within a few minutes followed by death within a few hours. Contact with liquid causes moderate irritation of eyes and mild irritation of skin. Ingestion causes irritation of mouth and stomach; may cause deep narcosis and death if not treated.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; begin artificial respiration if breathing has stopped; call physician. EYES: wash with water for 15 min.; call physician if needed. SKIN: wash with water for 15 min.; call physician if irritation persists. INGESTION: do NOT induce vomiting; get medical attention at once.
- 3.4 **TLV-TWA:** 100 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 1,850 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 1,500 ppm
- 3.14 **OSHA PEL-TWA:** 100 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:** 10°F O.C. -4°F C.C.
- 4.2 **Flammable Limits in Air:** 2.8%-16.0%
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel long distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 851°F
- 4.8 **Spectral Hazards of Combustion Products:** Currently not available
- 4.9 **Burning Rate:** 3.6 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 16.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N_2 diluent: 10.4%

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):** 30%, 10 days; 0.5 lb/lb, 10 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95+%
- 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)	0
- 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:** 74.1
- 9.3 **Boiling Point at 1 atm:** 129.6°F = 54.2°C = 327.4°K
- 9.4 **Freezing Point:** -110°F = -79°C = 194°K
- 9.5 **Critical Temperature:** 455.0°F = 235°C = 508.2°K
- 9.6 **Critical Pressure:** 686 psia = 46.6 atm = 4.73 MN/m²
- 9.7 **Specific Gravity:** 0.922 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 28 dynes/cm = 0.028 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** 2.6
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1014
- 9.12 **Latent Heat of Vaporization:** 176 Btu/lb = 98 cal/g = 4.1 X 10⁵ J/kg
- 9.13 **Heat of Combustion:** -9,500 Btu/lb = -5,300 cal/g = -220 X 10⁶ J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -50 Btu/lb = -28 cal/g = 1.2 X 10⁵ J/kg
- 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

ETHYL FORMATE

EFM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	60.850	0	0.439	30	1.163	0	0.633
5	60.610	10	0.442	35	1.157	10	0.586
10	60.370	20	0.445	40	1.151	20	0.544
15	60.130	30	0.447	45	1.144	30	0.506
20	59.880	40	0.450	50	1.138	40	0.473
25	59.640	50	0.453	55	1.132	50	0.443
30	59.400	60	0.456	60	1.126	60	0.415
35	59.160	70	0.459	65	1.119	70	0.391
40	58.910	80	0.461	70	1.113	80	0.369
45	58.670	90	0.464	75	1.107	90	0.348
50	58.430	100	0.467	80	1.101	100	0.330
55	58.180	110	0.470	85	1.094	110	0.313
60	57.940	120	0.472	90	1.088	120	0.297
65	57.700			95	1.082		
70	57.460			100	1.076		
75	57.210			105	1.069		
80	56.970			110	1.063		
85	56.730			115	1.057		
90	56.490			120	1.051		
95	56.240			125	1.044		
100	56.000						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
71	9.100	0	0.556	0	0.00835	0	0.270
		5	0.652	5	0.00969	25	0.278
		10	0.763	10	0.01121	50	0.286
		15	0.889	15	0.01293	75	0.293
		20	1.033	20	0.01486	100	0.301
		25	1.196	25	0.01704	125	0.308
		30	1.381	30	0.01947	150	0.316
		35	1.590	35	0.02219	175	0.324
		40	1.826	40	0.02523	200	0.331
		45	2.091	45	0.02860	225	0.339
		50	2.388	50	0.03234	250	0.347
		55	2.720	55	0.03648	275	0.354
		60	3.090	60	0.04104	300	0.362
		65	3.502	65	0.04608	325	0.369
		70	3.960	70	0.05161	350	0.377
		75	4.468	75	0.05768	375	0.385
		80	5.029	80	0.06432	400	0.392
		85	5.648	85	0.07158	425	0.400
		90	6.330	90	0.07950	450	0.408
		95	7.081	95	0.08812	475	0.415
		100	7.904	100	0.09749	500	0.423
		105	8.806	105	0.10760	525	0.430
		110	9.792	110	0.11870	550	0.438
		115	10.870	115	0.13050	575	0.446
		120	12.040	120	0.14340	600	0.453
		125	13.320	125	0.15720		