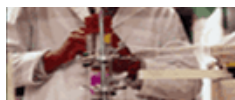




UNITED STATES DEPARTMENT OF LABOR  
OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION

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## Chemical Sampling Information

# Formaldehyde

### Safety and Health Topics

Formaldehyde

### Chemical Sampling Information

#### Formaldehyde

- General Description
- Exposure Limits
- Health Factors
- Monitoring

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## General Description

**Synonyms:** Methylene oxide; Formalin; Diesel Exhaust Component; Rosin Core Solder Pyrolysis Product

**OSHA IMIS Code Number:** 1290

**Chemical Abstracts Service (CAS) Registry Number:** 50-00-0

**NIOSH, Registry of Toxic Effects (RTECS) Identification Number:** [LP8925000](#)

**Department of Transportation Regulation Number (49 CFR 172.101) and Guide:** 1198 132 [27 KB [PDF](#)] - Formaldehyde, solution, flammable; 1198 132 [27 KB [PDF](#)] - Formaldehyde, solutions, (Formalin); 2209 132 [27 KB [PDF](#)] - Formaldehyde, solutions, (Formalin) (corrosive)

**NIOSH Pocket Guide to Chemical Hazards, [Formaldehyde](#):** chemical description, physical properties, potentially hazardous incompatibilities, and more

## Exposure Limits

**OSHA Permissible Exposure Limit (PEL) for General Industry:** [29 CFR 1910.1048](#) -- 0.75 ppm TWA; 2 ppm STEL; 0.5 ppm Action Level

**OSHA Permissible Exposure Limit (PEL) for Construction Industry:** [29 CFR 1926.1148](#) requirements identical to 1910.1048.

**OSHA Permissible Exposure Limit (PEL) for Maritime:** [29 CFR 1915.1048](#) requirements identical to 1910.1048.

### American Conference of Governmental Industrial Hygienists (ACGIH)

**Threshold Limit Value (TLV):** 0.3 ppm, 0.37 mg/m<sup>3</sup> Ceiling; SEN; Appendix A2 - Suspected Human Carcinogen

### National Institute for Occupational Safety and Health (NIOSH)

**Recommended Exposure Limit (REL):** 0.016 ppm TWA, 0.1 ppm Ceiling (15 Minutes); [Appendix A](#) - NIOSH Potential Occupational Carcinogens

## Health Factors

**National Toxicology Program (NTP) carcinogenic classification:** Reasonably Anticipated to be a Human Carcinogen [46 KB [PDF](#)]

**International Agency for Research on Cancer (IARC) carcinogenic classification:** Group 2A, probably carcinogenic to humans

**NIOSH Immediately Dangerous To Life or Health Concentration (IDLH):** [20 ppm](#)

**Potential symptoms:** Eye, nose, throat irritation; lacrimation; burns to eyes, mucous membranes, skin; coughing, difficulty breathing, bronchial spasm, pulmonary edema; contact dermatitis; headache; muscle or joint stiffness. INGES: nausea, vomiting (may be bloody), abdominal pain, diarrhea, hypotension, hypothermia, lethargy, dizziness, convulsions, coma; acidosis, kidney inflammation, liver toxicity (carcinogenic)

**Health Effects:** : Irritation- Eye, Nose, Skin---Marked (HE14); Asthma (HE9); Lung damage (HE11), Membranous nephropathy (HE4); Mutagen (HE2)

**Affected organs:** Respiratory system, eye, skin.

**Note:** OSHA has a Fact Sheet on Formaldehyde. [43 KB [PDF](#)]

**Date Last Revised:** 05/06/2003

**Literature Basis:**

- Sitting, M.: Formaldehyde. Handbook of Toxic and Hazardous Chemical Carcinogens, 3<sup>rd</sup> Ed., Vol. 1, pp. 833-836, 1991.
- (headache, acidosis, membranous nephropathy)  
Wax, P.M.: Antiseptics, disinfectants, and sterilants. In, *Goldfrank's Toxicologic Emergencies*, 6<sup>th</sup> Ed., Goldfrank, L.R., Flomenbaum, N.E., Lewin, N.A., Weisman, R.S., Howland, M.A., Hoffman, R.S. eds. Connecticut: Appleton & Lange, pp.1359-1375,1998.
- (muscle or joint stiffness)  
U.S. Department of Health and Human services, Public Health Services, Agency for Toxic Substance and Disease Registry. Toxicological profile for formaldehyde, pp. 9-165, July 1999.

**Monitoring Methods used by OSHA**

**Laboratory Sampling/Analytical Method:**

- **sampling media:** Coated XAD-2 Tube (150/75 mg sections, 20/60 mesh); coating is 10% (w/w) 2-(Hydroxymethyl)piperidine.

**analytical solvent:** Toluene

**maximum volume:** 24 Liters **maximum flow rate:** 0.1 L/min (TWA)

**maximum volume:** 3 Liters **maximum flow rate:** 0.2 L/min (STEL)

**current analytical method:** Gas Chromatography; GC/NPD

**method reference:** OSHA Manual of Analytical Methods ([OSHA 52](#))

**method classification:** Fully Validated

- **sampling media:** Diffusive Sampler:
  - Assay Technology ChemDisk Aldehyde Monitor 571;
  - SKC UME<sub>x</sub> 100 Passive Sampler; **or**
  - Supelco DSD-DNPH Diffusive Sampling Device

**analytical solvent:** Acetonitrile

**sampling time:** 15 to 240 Minutes

**current analytical method:** Liquid Chromatography/UV detector; LC/IC

**method reference:** OSHA Analytical Method (OSHA 1007)

**method classification:** Fully Validated

**notes:**

1. Store samplers in a refrigerator both before and after sampling.
2. For quantitative sampling results, use an active sampling procedure such as OSHA Method 52 when monitoring exposures resulting from the use of formalin solutions. These diffusive samplers failed SLTC method validation requirements when formalin was the source of formaldehyde. A formalin solution is a solution of formaldehyde in water that is stabilized with methyl alcohol.
3. Do not use these diffusive samplers if the ozone level is greater than 0.5 ppm. (Section 4.9)
4. Do not use these diffusive samplers if the humidity is 10% or less. (Section 4.9)
5. Place samples into manufacturer-supplied aluminized bags immediately after sampling
6. Persons using diffusive samplers to monitor workplace air must ensure that the sampling devices are properly closed before transporting such devices to the laboratory for analysis. The device will continue to sample until properly closed. Diffusive sampler accessories used for analysis of samplers must be included with transported samples. Persons using such

devices must provide sampling-site station barometric pressure and temperature to the analytical laboratory to improve accuracy of sampling results.

#### On-Site Sampling Techniques/Methods:

- **device:** Detector Tube  
**manufacturer:** Matheson-Kitagawa  
**model/type:** 8014-171SB  
**sampling information:** follow manufacturer's instructions  
**upper measurement limit:** 35 ppm  
**detection limit:** approx. 1 ppm  
**overall uncertainty:** unknown  
**method reference:** on-site air secondary (manufacturer)
- **device:** Detector Tube  
**manufacturer:** Matheson-Kitagawa  
**model/type:** 8014-171SA  
**sampling information:** follow manufacturer's instructions  
**upper measurement limit:** 1500 ppm  
**detection limit:** approx. 20 ppm  
**overall uncertainty:** unknown  
**method reference:** on-site air secondary (manufacturer)
- **device:** Detector Tube  
**manufacturer:** Matheson-Kitagawa  
**model/type:** 8014-171SC  
**sampling information:** follow manufacturer's instructions  
**upper measurement limit:** 4 ppm  
**detection limit:** approx. 0.1 ppm  
**overall uncertainty:** unknown  
**method reference:** on-site air secondary (manufacturer)
- **device:** Detector Tube  
**manufacturer:** AUER/MSA  
**model/type:** Formaldehyde-0,1 MSA P/N 497649, AUER P/N 5086-813  
**sampling information:** follow manufacturer's instructions  
**upper measurement limit:** 55 ppm  
**detection limit:** approx. 0.1 ppm  
**overall uncertainty:** unknown  
**method reference:** on-site air secondary (manufacturer)
- **device:** Detector Tube  
**manufacturer:** Gastec  
**model/type:** 91  
**sampling information:** 0.5 to 2 strokes  
**upper measurement limit:** 100 ppm  
**detection limit:** approx. 0.5 ppm  
**overall uncertainty:** 25% for 2 to 6 ppm, 16.4% for 6 to 20 ppm  
**method reference:** on-site air secondary (manufacturer)
- **device:** Detector Tube  
**manufacturer:** Gastec  
**model/type:** 91M  
**sampling information:** 0.5 to 2 strokes  
**upper measurement limit:** 6400 ppm  
**detection limit:** approx. 4 ppm  
**overall uncertainty:** 16.4% for 8 to 200 ppm, 8.2% for 500 to 2000 ppm  
**method reference:** on-site air secondary (manufacturer)
- **device:** Detector Tube  
**manufacturer:** Gastec  
**model/type:** 91L  
**sampling information:** 1 to 2 strokes

**upper measurement limit:** 40 ppm  
**detection limit:** approx. 0.05 ppm  
**overall uncertainty:** 16.4% for 0.1 to 0.5 ppm, 8.2% for 0.5 to 5 ppm  
**method reference:** on-site air secondary (manufacturer)

- **device:** Detector Tube  
**manufacturer:** Gastec  
**model/type:** 91LL  
**sampling information:** 5 strokes  
**upper measurement limit:** 1.0 ppm  
**detection limit:** approx. 0.03 ppm  
**overall uncertainty:** 16.4% for 0.05 to 0.3 ppm, 8.2% for 0.5 to 1 ppm  
**method reference:** on-site air secondary (manufacturer)
  
- **device:** Detector Tube  
**manufacturer:** Dräger  
**model/type:** Formaldehyde 0.2/a, order no. 67 33081  
**sampling information:** 10 or 20 strokes  
**upper measurement limit:** 5 ppm  
**detection limit:** approx. 0.1 ppm  
**overall uncertainty:** 33%  
**method reference:** on-site air secondary (manufacturer)
  
- **device:** Detector Tube  
**manufacturer:** Dräger  
**model/type:** Formaldehyde 2/a, order no. 81 01751  
**sampling information:** 5 strokes  
**upper measurement limit:** 40 ppm  
**detection limit:** approx. 0.5 ppm  
**overall uncertainty:** 33%  
**method reference:** on-site air secondary (manufacturer)

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