# Methylal

| CAS number: | 109-87-5 |
| --- | --- |
| Synonyms: | Dimethoxymethane, formal, methyl formal |
| Chemical formula: | C3H8O2 |
| Structural formula: | — |

Workplace exposure standard (retained)

| TWA: | **1,000 ppm (3,110 mg/m3)** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **—** |
| IDLH: | **2,200 ppm** |
| **Sampling and analysis:** The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A TWA of 1,000 ppm (3,110 mg/m3) is recommended to protect for eye and mucous membrane irritation in exposed workers.

## Discussion and conclusions

Methylal is used as a special purpose fuel, in perfumes, as a solvent for adhesives and coatings and as an anaesthetic in human surgery.

Critical effects of exposure are eye and mucous membrane irritation.

Very limited human toxicological data are available. In animals exposure causes irritation to the eyes and mucous membranes and at very high concentrations induced anaesthesia (ACGIH, 2018; HCOTN, 2000). The threshold for toxicity in mice is reported to be approximately 11,300 ppm, causing minor irritation and minor incoordination (ACGIH, 2018). A NOAEC of 1,908 ppm was derived from a 13-week inhalation study in rats (DFG, 2003).

A TWA of 1,000 ppm (3,110 mg/m3) is recommended as assigned by all available primary sources. This TWA is considered to be protective of eye and mucous membrane irritation in exposed workers.

## Recommendation for notations

Not classified as a carcinogen according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Not classified as a skin sensitiser or respiratory sensitiser according to the GHS.

There are insufficient data to recommend a skin notation.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 1,000 ppm (3,110 mg/m3) | |
|  |
| ACGIH 2001 TLV-TWA: 1,000 ppm (3,110 mg/m3) |
| TLV-TWA recommended to minimise irritant effects on eyes and mucus membranes of exposed workers. Derivation of the TLV-TWA not provided.  Summary of data:  Human data:   * Used as anaesthetic in surgery, effect slower and more short-lived than diethyl ether.   Animal data:   * Inhalation at ≈154,000 ppm in guinea pigs produced vomiting, lacrimation, sneezing, cough and nasal discharge; anaesthesia in 20 min and death ≈2 h, following respiratory effects * LC50: 18,354 ppm (mice, 7 h, inhalation) * Exposure at 11,300 ppm (15 x 7 h exposures) in mice caused minor irritation, minor incoordination following 3–4 h of exposure and recovery occurred 1 h following removal from exposure. Death occurred in 6 out of 50 mice and it was concluded that threshold for toxicity in mice ≈11,300 ppm * No effects noted in rats exposed at 4,000 ppm (8 x 6 h exposures).   Insufficient data to recommend skin, SEN or carcinogenicity notations or TLV-STEL. |
| DFG 1958 MAK: 1,000 ppm (3,200 mg/m3) |
| MAK based on NOAEC derived from 13 wk inhalation study of rats (cited below).  Summary of additional data:   * Very limited human data and that available from bolus administration not comparable with inhalation exposure * Irritating to airways and eyes at concentrations >18,000 ppm * Liquid form not irritating to skin and moderately irritating to eyes * LD50: 6,415–9,070 mg/kg bw (rats, oral) * LD50: >5,000 mg/kg bw (rabbits, dermal) * NOAEC: 1,908 ppm (rats, 13 wk, inhalation via nose only); doses of 0, 377, 1,908 and 9,652 ppm, 6 h/d, 5 d/wk * Negative results in mutagenic tests with *Salmonella* and *E. coli*, hypoxanthine guanine phosphoribosyl transferase with CHO cells and in micronucleus tests. A reported positive result in *Salmonella* mutagenicity test may have been contaminated with formaldehyde * No data on carcinogenicity of methylal. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2000 TWA: 1,000 ppm (3,100 mg/m3) |
| Derivation of the TWA not provided.  Summary of additional data:   * Based on physical properties dermal penetration rate in human skin is 1.24 mg/cm2/h (applied to 2,000 cm2 of skin) * Due to limited data, no target organ or critical effect for toxicity can be determined. |

### Secondary source reports relied upon

NIL.

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | Insufficient data |
| --- | --- |
| Is the chemical carcinogenic with a mutagenic mechanism of action? | Insufficient data |
| **Insufficient data are available to determine if the chemical is a non-threshold based genotoxic carcinogen.** |  |

## Notations

| Source | Notations |
| --- | --- |
| SWA | — |
| HCIS | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | — |
| DFG | — |
| SCOEL | NA |
| HCOTN | — |
| IARC | NA |
| US NIOSH | NA |

NA = not applicable (a recommendation has not been made by this Agency); — = the Agency has assessed available data for this chemical but has not recommended any notations

### Skin notation assessment

| Calculation |
| --- |
| Insufficient data to assign a skin notation |

### IDLH

| Is there a suitable IDLH value available? | Yes, based on LEL |
| --- | --- |

## Additional information

| Molecular weight: | 76.09 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 3.11 mg/m3; 1 mg/m3 = 0.322 ppm |
| This chemical is used as a pesticide: |  |
| This chemical is a biological product: |  |
| This chemical is a by-product of a process: |  |
| A biological exposure index has been recommended by these agencies: | ACGIH  DFG  SCOEL |

## Workplace exposure standard history

| Year | Standard |
| --- | --- |
| Click here to enter year |  |

## References

American Conference of Industrial Hygienists (ACGIH®) (2018) TLVs® and BEIs® with 7th Edition Documentation, CD-ROM, Single User Version. Copyright 2018. Reprinted with permission. See the [*TLVs® and BEIs® Guidelines section*](http://www.acgih.org/tlv-bei-guidelines/policies-procedures-presentations) on the ACGIH website.

Deutsche Forschungsgemeinschaft (DFG) (2007 and 2003) Dimethoxymethane – MAK value documentation.

Health Council of the Netherlands (HCOTN) (2000) Dimethoxymethane. Health-based reassessment of administrative occupational exposure limits. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/004.

US National Institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life or health concentrations – Methylal.