# Acetic Anhydride

| CAS number: | 108-24-7 |
| --- | --- |
| Synonyms: | Ethanoic anhydride |
| Chemical formula: | C4H6O3 |
| Structural formula: |  |

Workplace exposure standard (amended)

| TWA: | **0.5 ppm (2.1 mg/m3)** |
| --- | --- |
| STEL: | **1 ppm (4.2 mg/m3)** |
| Peak limitation: | **—** |
| Notations: | **—** |
| IDLH: | **200 ppm** |
| Sampling and analysis: | The recommended value is readily quantifiable through currently available sampling and analysis techniques. |

## Recommendation and basis for workplace exposure standard

A TWA of 0.5 ppm (2.1 mg/m3) and STEL of 1 ppm (4.2 mg/m3) are recommended to protect for irritation of the respiratory tract and eyes in exposed workers.

## Discussion and conclusions

Data in humans is inconclusive. Irritation of the upper respiratory tract and eyes is reported at concentrations above 5 ppm. However, symptoms of eye irritation such as conjunctival irritation, reddening and lacrimation were also reported at concentrations below 5 ppm (ACGIH, 2018).

A NOAEC of 1 ppm was established based on a 90-d inhalation study in rats (ACGIH, 2018; DFG, 2018). The DFG (2018) used this point of departure to derive the recommended MAK of 0.1 ppm.

The recommended TWA applies an uncertainty factor of 2 to the NOAEC in rats of 1 ppm to account for the deficiency of the database and lack of clearly defined data in humans. Based on the evidence of acute irritant effects associated with short-term exposures to 5 ppm in humans and the NOAEC of 1 ppm in rats, a STEL of 1 ppm (4.2 mg/m3) is recommended to protect for these effects.

## 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.

A skin notation is not warranted as there is no indication of systemic effects resulting from skin absorption.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA Year Peak limitation: 5 ppm (21 mg/m³) | |
|  |
| ACGIH 2011 TLV- TWA: 1 ppm (4.2 mg/m3); TWA-STEL 3 ppm (13 mg/m3) |
| TLV-TWA and TLV-STEL recommended to reduce upper respiratory tract and eye irritation in exposed workers.  Summary of data:  Human data:   * Irritating to eyes, mucous membranes and skin * Vapour concentrations >5 ppm result in immediate, acute irritation of the eyes and upper respiratory tract. * Reports of conjunctival irritation, reddening of the eye and lacrimation at <5 ppm * Odour threshold reported between 0.13–0.81 ppm.   Animal data:   * NOAEL: 1 ppm; with irritation threshold at 1–5 ppm (rats, inhalation, 90 d) * LD50: 4,000–4,320 mg/kg (rabbits, dermal) * No evidence of mutagenic effects in bacterial reverse mutation assays.   Not classifiable as a human carcinogen.  Limited data available to assign a Skin notation as acetic anhydride rapidly hydrolyses at site of contact to acetic acid and is not distributed systemically.  Insufficient data available to assign a Sensitiser notation. |
| DFG 2018 MAK: 0.1 ppm (0.42 mg/m3) |
| MAK value recommended to prevent irritation of mucous membranes and inflammation in humans.  Summary of data:   * PoD based on NOAEC of 1 ppm (90-d inhalation rats as per ACGIH) with application of uncertainty factor: * 3 for extrapolating animal data * 2 for chronic exposure considerations * rounded to 0.1 ppm using the DFG Preferred Value Approach * Absorption via the skin is unlikely * Not genotoxic. |
| SCOEL NA NA |
| No report |
| OARS/AIHA NA NA |
| No report |
| HCOTN NA NA |
| No report |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| HSE |  | 2018 | * TWA of 0.5 ppm and STEL of 2 ppm * Information on reasoning not identified. |
| NICNAS |  | 2018 | * Limited information. |
| OECD |  | 1997 | * Suggested revision of OEL based on NOAEC from 90 d inhalation study in rats (1 ppm) * LC50: 1,680 mg/m3 (≈402 ppm) (rat, inhalation study, 6 h) * Same study used by DFG (2018) in the derivation of the MAK and noted by ACGIH (2011). |
| US NIOSH |  | 1994 | * IDLH: 200 ppm based on acute inhalation toxicity data. |

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | No |
| --- | --- |

## Notations

| Source | Notations |
| --- | --- |
| SWA | NA |
| HCIS | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | Carcinogenicity – A4 |
| DFG | NA |
| SCOEL | NA |
| HCOTN | NA |
| 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 |
| --- |
| |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  | Adverse effects in human case study: | no |  |  |  |  |  |  | |  |  | Dermal LD50 ≤1000 mg/kg: | no |  |  |  |  |  |  | |  |  | Dermal repeat-dose NOAEL ≤200 mg/kg: |  |  |  |  |  |  |  | |  |  | Dermal LD50/Inhalation LD50 <10: |  |  |  |  |  |  |  | |  |  | *In vivo* dermal absorption rate >10%: |  |  |  |  |  |  |  | |  |  | Estimated dermal exposure at WES >10%: |  |  |  |  |  |  |  | |  |  |  |  |  | **a skin notation is not warranted** | | |  |  | |  |  |  |  |  |  |  |  |  |  | |

### IDLH

| Is there a suitable IDLH value available? | Yes |
| --- | --- |

## Additional information

| Molecular weight: | 102.09 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = Number mg/m3; 1 mg/m3 = Number 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) (2018) Acetic Anhydride [MAK value documentation, 2018].

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2018). Acetic anhydride: Human health tier I assessment – IMAP report.

Organisation for Economic Cooperation and Development (OECD) (1997). Acetic anhydride: SIDS Initial Assessment Report for 6th SIAM.

UK Health and Safety Executive (HSE) (2018) acetic anhydride – EH40/2005 Workplace exposure limits.

US National institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life and health concentrations – acetic anhydride.