# Hydrogen Chloride

| CAS number: | 7647-01-0 |
| --- | --- |
| Synonyms: | Hydrochloric acid, Muriatic acid, Spirits of salt, Chlorohydric acid |
| Chemical formula: | HCl |
| Structural formula: |  |

Workplace exposure standard (amended)

| TWA: | **—** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **2 ppm (2.98 mg/m3)** |
| Notations: | **—** |
| IDLH: | **50 ppm (74.56 mg/m3)** |
| Sampling and analysis: | Multiple analytical methods and real-time instrument sensor options available at the determined concentration |

## Recommendation and basis for workplace exposure standard

A peak limitation of 2 ppm (2.98 mg/m3) is recommended to protect for the respiratory tract irritation in exposed workers.

## Discussion and conclusions

Hydrogen chloride is a well-studied chemical with evidence of health effects available from animal studies, human volunteers and case studies. The toxicity is defined by creating an acidic environment upon dissolution.

Human evidence including studies on young adult asthmatics (assumed to be higher risk) indicates that atmospheric concentrations less than 2 ppm (2.98 mg/m3) will not cause irritation and respiratory system damage. Animal inhalational studies suggest that at 2 ppm (2.98 mg/m3), upper respiratory tract irritation will not be significant. A reduction of the current peak limitation for hydrogen chloride is recommended based on results from human studies indicating NOAEL at 1.8 ppm (2.68 mg/m3).

## 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.

Sufficient data is not available to warrant a skin notation as there is no indication of systemic effects resulting from skin absorption.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 Peak Limitation: 5 ppm (7.5 mg/m3) | |
|  |
| ACGIH 2003 TLV Ceiling: 2 ppm (2.98 mg/m3) |
| TLV-Ceiling intended to minimise acute irritation associated with vapours exposure.  Summary of data:  Human data:   * Ceiling recommendation for minimising acute irritation/corrosion * 0.77 ppm odour threshold * Primary irritation responses assessed in one case report; indicated bronchospasm associated with unstated exposure with long term asthma response * NOAEL for acute exposures at 1.8 ppm observed in young asthma subjects (significant weighting applied to this study for determining the TLV).   Animal data:   * LC50: 4,701 ppm and 5,666 ppm (rats, 30 min, gas and aerosols); primary target: respiratory tract * Moderate to severe impact alveolar emphysema and oedema of the lung, with severe irritation of the upper respiratory tracts and severe damage of nasal and tracheal tissues. * Little observed difference between gas and aerosol application.   Not classified as human carcinogen based on IARC review.  Insufficient data to recommend a sensitiser notation. |
| DFG 2004 Peak Limitation: 2 ppm (3.026 mg/m3) |
| MAK assigned to prevent hyperplasia effects observed on larynx and trachea.  Summary of additional data:   * Affects attributed to strong acidic properties. * Predominant impact on nose and respiratory tracts in humans * No data determined for reproductive toxicity or genotoxicity in humans * Not designated a skin or sensitisation notation. |
| SCOEL 1994 TWA: 5 ppm (8 mg/m3); STEL: 10 ppm (15 mg/m3) |
| TWA recommendation to protect for serious irritating effects.  Summary of additional data:   * Calculated STEL applied to limit peaks of exposures causing irritation * No skin notations identified. |
| OARS/AIHA NA NA |
| No Report. |
| HCOTN NA NA |
| No Report. |

### 

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| HSE |  | 2014 | * TWA: 1 ppm STEL: 5 ppm. |
| NICNAS |  | 2018 | * Tier II assessment: Not considered to cause serious damage to health from repeated inhalation exposure. * Local irritation effects are expected due to the corrosivity of the chemical. |
| IARC |  | 1992 | * Not classifiable as a Carcinogen (Group 3). |
| US EPA |  | 1989 | * Not classified as a carcinogen. |

### Carcinogenicity — non-threshold based genotoxic carcinogens

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

## Notations

| Source | Notations |
| --- | --- |
| SWA | — |
| HCIS | — |
| NICNAS | — |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | — |
| DFG | — |
| SCOEL | — |
| HCOTN | NA |
| IARC | Carcinogenicity – Group 3 |
| 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: |  |  |  | | 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: | 36.46 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 1.49 mg/m3; 1 mg/m3 = 0.67 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.

DFG (2004) Deutsche Forschungsgemeinschaft (DFG) (2004) Hydrogen Chloride – MAK value documentation.

Scientific Committee on Occupational Exposure Limits (SCOEL). *Recommendation on occupational exposure limit for Hydrogen chloride* (1994).

UK Health and Safety Executive (HSE) (2014) Hydrogen chloride: health effects, incident management and toxicology.

International Agency for Research on Cancer (IARC) (1992) Hydrogen chloride. IARC Monographs on the evaluation of the carcinogenic risk to humans.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2018) Hydrochloric acid: Human health tier III assessment – IMAP report.

US Environmental Protection Agency (US EPA) (1989) Hydrogen chloride.

US National Institute for Occupational Safety and Health (NIOSH) A summary of health hazard evaluations: issues related to occupational exposure to fire fighters 1990-2001.

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