# Thionyl chloride

| CAS number: | 7719-09-7 |
| --- | --- |
| Synonyms: | Sulfurous oxychloride, thionyl dichloride |
| Chemical formula: | SOCl2 |

Workplace exposure standard (amended)

| TWA: | **—** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **0.2 ppm (1 mg/m3)** |
| Notations: | **—** |
| IDLH: | **—** |
| **Sampling and analysis:** The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A peak limitation of 0.2 ppm (1 mg/m3) is recommended to protect for acute skin, eye, mucous membrane and respiratory tract irritation in exposed workers caused by its decomposition in water.

Given the limited data available from the primary sources, it is recommended that a review of additional sources be conducted at the next scheduled review.

## Discussion and conclusions

Thionyl chloride is primarily used as a chlorinating agent and as a solvent.

The critical effects of exposure are acute and severe skin, eye, mucous membrane and respiratory tract irritation.

Limited data exists from human and animal studies.

No clinical symptoms reported in acute inhalation exposure at 5 mg/m3 in rats (ECHA, 2011). Its vapours have long been recognised as highly irritating. ACGIH (2018) based a TLV-Ceiling based on the formation of hydrogen chloride and sulfur dioxide in reaction with water, with one molecule of thionyl chloride decomposing in water to two hydrogen chlorides and one sulfur dioxide. Hydrogen chloride and sulfur dioxide both cause acute irritation and have ceiling limits to protect for acute effects.

Given the absence of available exposure data, the peak limitation of 0.2 ppm (1 mg/m3) by ACGIH (2018) is recommended to protect for irritant effects based on the production of hydrogen chloride and sulfur dioxide. A review of additional data sources is recommended at the next scheduled review to address the absence of chronic toxicological data.

## 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 Peak limitation: 1 ppm (4.9 mg/m3) | |
|  |
| ACGIH 2010 TLV-Ceiling: 0.2 ppm (1 mg/m3) |
| TLV-Ceiling recommended to minimise the risk of skin, eye and mucous membrane irritation.  Summary of data:  TLV-Ceiling based on the formation of sulfur dioxide (SO2) and hydrogen chloride (HCl) in reaction with water. One molecule of thionyl chloride reacting with one molecule of water produces two molecules of HCl (TLV-Ceiling 2 ppm) and one of SO2 (TLV-Ceiling 0.25 ppm). Therefore TLV‑Ceiling of 0.2 ppm is recommended.  Human data:   * Vapour is highly irritating * Worker exposed at an estimated inhalation concentration of 17,000 ppm following a lithium battery explosion experienced severe respiratory distress: * victim also experienced chemical burns * within 3 h severe pulmonary oedema and death.   Animal data:   * LC50: 500 ppm (rats, 1 h inhalation) * A summary of the limited information available indicated eye mucous membrane and skin irritation effects (this statement was not substantiated).   Insufficient data to recommend a skin, sensitiser or carcinogen notation. |
| DFG NA NA |
| No report. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2001 Ceiling limit: 1 ppm (5 mg/m3) |
| The committee considers the toxicological database too poor to justify recommendation of a HBROEL. There is insufficient information to comment on the level of the present value. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| ECHA |  | 2011 | * LD50: 270-377 mg/kg (rats, oral) * LC50: 2,717 mg/m3 (rats, 4 h): * 5 mg/m3 caused no clinical symptoms. |

### 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 | — |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | — |
| ACGIH | — |
| DFG | NA |
| 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

Insufficient data to assign a skin notation.

### IDLH

| Is there a suitable IDLH value available? | No |
| --- | --- |

## Additional information

| Molecular weight: | 118.97 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 4.87 mg/m3; 1 mg/m3 = 0.206 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.

European Chemicals Agency (ECHA) (2011) Thionyl dichloride – REACH assessment.

Health Council of the Netherlands (HCOTN) (2001) Thionyl chloride. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/028.