# Cyanogen

| CAS number: | 460-19-5 |
| --- | --- |
| Synonyms: | Dicyan, dicyanogen, ethanedinitrile, oxalonitrile, oxalic acid dinitrile, nitriloacetonitrile, carbon nitride. |
| Chemical formula: | (CN)2 |

Workplace exposure standard (amended)

| TWA: | — |
| --- | --- |
| STEL: | — |
| Peak limitation: | **5 ppm (10.6 mg/m3)** |
| Notations: | — |
| IDLH: | — |
| Sampling and analysis: The recommended value is readily quantifiable through currently available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A peak limitation of 5 ppm (10.6 mg/m3) is recommended to protect for acute irritation of the nose and eyes in exposed workers.

## Discussion and conclusions

Cyanogen is used in organic synthesis, fuel gas for welding, propellant (with ozone or fluorine) and as a fumigant.

In a human acute exposure study, immediate eye irritation followed by nasal irritation was observed in subjects exposed at 16 ppm with a NOAEC of 8 ppm (ACGIH, 2018). Sub-chronic animal inhalation exposure at 25 ppm was marginally toxic as evidenced by decreased body weight with a NOAEL of 11 ppm (ACGIH, 2018). Sub-chronic effects of cyanogen are considered to result from its hydrolysis to cyanide (ACGIH, 2018).

The available data suggest irritation immediately following exposure. However, the data are insufficient to conclude whether these effects occur after prolonged exposure or at high concentrations. Consequently, a peak limitation of 5 ppm (rounded from a NOAEC of 8 ppm in humans) is considered sufficiently low to minimise the potential for nasal and eye irritation in acute exposures. This concentration is also protective for sub-chronic effects of cyanogen due to hydrolysis.

## 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: 10 ppm (21 mg/m3) | |
|  |
| ACGIH 2016 TLV Ceiling: 5 ppm (10.6 mg/m3) |
| TLV-Ceiling recommended to minimise the risk of nasal and eye irritation in acute exposures and to protect from sub chronic effects of cyanogen that result from hydrolysis or metabolism to cyanide.  Summary of data:  Human data:   * NOAEC: 8 ppm (6 min), no eye and nasal irritation * LOAEC: 16 ppm (6–8 min), eye and nasal irritation.   Animal data:   * LC50: 350 ppm (rats, 1 h) * 15 monkeys and 90 rats, divided into 3 groups, were exposed 6 h/d, 5 d/wk for 6 mo at 0, 11 or 25 ppm; decreased body weight observed at 25 ppm. NOAEL: 11 ppm * Rabbits exposed to 10,000 ppm (8 h, dermal); no observed effect.   Insufficient data to assign a carcinogen, skin or sensitiser notation. |
| DFG 2003 MAK: 5 ppm (11 mg/m3) |
| MAK recommended by analogy to hydrogen cyanide (MAK value 1.9 mL/m3) as acute toxicity is ~2.5 times less and to minimise the risk of sub-chronic effects observed in rats and monkeys. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2003 TWA: 10 ppm (20 mg/m3) |
| The committee applied an assessment factor of 9 to the NOEC of 25 mg/m3 from the inhalation study in rats and monkeys to derive a health-based recommended OEL. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| ECHA |  | 2013 | * Weakly mutagenic to *Salmonella typhimurium* TA 100 and *E. coli* WP2uvrA (pKM101) * No mutagenic activity was observed with TA 1535, TA 1537 or TA 98. |

### 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 | NA |
| HCIS | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | NA |
| 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 |
| --- |
| |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Conclusion:** |  |  |  |  |  |  |  |  | |  |  | 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? | No |
| --- | --- |

## Additional information

| Molecular weight: | 52.031 |
| --- | --- |
| 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) (2019) Oxalsäuredinitril – MAK value documentation.

European Chemicals Agency Regulation (ECHA) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Health Council of the Netherlands (HCOTN) (2003) Oxalonitrile. Health-based reassessment of administrative occupational exposure limits. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/063.