# Manganese cyclopenta-dienyl tricarbonyl (as mn)

| CAS number: | 12079-65-1 |
| --- | --- |
| Synonyms: | Cyclopentadienyl manganese tricarbonyl, MCT, manganese cyclopentadienyl tricarbonyl, tricarbonyl-pi-cyclopentadienylmanganese |
| Chemical formula: | C8H5MnO3 |

Workplace exposure standard (retained)

| TWA: | **0.1 mg/m3** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **Sk.** |
| IDLH: | **—** |
| **Sampling and analysis:** The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A TWA of 0.1 mg/m3 is recommended to protect for irritation of the skin and effects on the nervous system and respiratory tract in exposed workers.

## Discussion and conclusions

Manganese cyclopenta-dienyl tricarbonyl (MCT) is commonly used as an antiknock agent, increasing the octane rating in unleaded petrol.

Critical effects of exposure include skin irritation and effects on the nervous system and respiratory tract. No toxicological data from human studies are available. Limited data from animal studies found no deaths at 20 to 40 mg/m3 (two hour exposure) in an inhalation study in rats. This study reported 80 per cent mortality at 120 mg/m3 (ACGIH, 2018; HCOTN, 2002). A sub-chronic inhalation study in rats over 11 months showed that exposure at 1 mg/m3 for four hours a day did not produce visible signs of toxicity except some effects on nervous system (ACGIH, 2018). HCOTN (2002) note difficulty in assessing significance of the results of this sub-chronic study including lack of statistical analysis.

Based on the above, the TWA of 0.1 mg/m3 is recommended to be retained and is considered sufficiently low to minimise the potential for irritant and systemic 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.

There are insufficient data to recommend a skin notation.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 0.1 mg/m3 | |
|  |
| ACGIH 2001 TLV-TWA: 0.1 mg/m3 (as Mn) |
| TLV-TWA is recommended to minimise potential for skin irritation, effects on nervous system and respiratory tract (no further information on derivation of TLV-TWA).  Summary of data:  No human data available.  Animal data:   * Inhalation study in rats, guinea pigs and rabbits caused 80% mortality in rats at 120 mg/m3 (2 h exposure) and no deaths at 20–40 mg/m3 (2 h exposure) * MCT applied as oil emulsion to rabbit skin caused a degree of irritation * LD50: 22 mg/kg (rat, oral) and 14 mg/kg (rat, IP) * Tail immersion study of rats in 1 g of MCT/100 mL gasoline, 2 h/d for 5 d resulted in same death rate as group exposed to gasoline without MCT * effects were therefore likely caused by compounds in gasoline * Lethality of MCT appeared to be greatly increased when dissolved in tetrahydrofuran (used in the manufacture of MCT) * all animals with tails immersed in tetrahydrofuran solution of MCT died within 1 h, whereas no deaths in animals whose tails were immersed in pure tetrahydrofuran * Sub-chronic study of rats inhaling MCT at 1 mg/m3, 4 h/d for 11 mo did not produce outward manifestations of poisoning * an increase in the threshold level of neuromuscular excitability measured by electric stimuli and some renal damage were observed at 7 mo.   A skin notation is recommended based on systemic toxicity and mortality in animals following tail immersion study.  Insufficient data to recommend SEN, TLV-STEL or carcinogenicity notations. |
| DFG NA NA |
| No report. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2002 TWA 8 hours: 0.1 mg/m3 |
| Summary of additional data:   * Acute effects in animals following inhalation exposure include vascular changes (increased permeability of vessels, oedema, haemorrhages, decreased blood pressure), atrophic changes in nerve cells and haematological changes * LD50: 150 mg/kg (mice, oral) * Some limitations and discrepancies highlighted regarding sub-chronic study (1 mg/m3, 4 h/d, 11 mo) presented above (ACGIH, 2001), including lack of statistics * Lung is target organ although convulsions also reported * Committee concluded insufficient information was available to comment on the current occupational exposure limit * No genotoxicity and carcinogenicity studies reported. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| Nordic Council |  | 1982 | * Insufficient data to establish occupational exposure limit * Liquid MCT is easily absorbed from skin indicating a need to limit this form of exposure. |
| US NIOSH |  | 2007 | * TWA 0.1 mg/m3 * Symptoms in animals: skin irritation, pulmonary oedema, convulsions, respiratory system, kidney changes, decreased resistance to infection. |

### 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 | Skin |
| DFG | NA |
| SCOEL | NA |
| HCOTN | Skin |
| 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? | No |
| --- | --- |

## Additional information

| Molecular weight: | 204.1 |
| --- | --- |
| 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.

Health Council of the Netherlands (HCOTN) (2002) Tricarbonyl(eta-cyclopentadienyl)- manganese. Health-based Reassessment of Administrative Occupational Exposure Limits. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/042.

Nordic Expert Group for Criteria Documentation of Health Risks of Chemicals (1982) 30. Manganese and methylcyclopentadienyl manganese tricarbonyl, MMT. 1982:10.

US National Institute for Occupational Safety and Health (NIOSH) (2007) NIOSH Pocket Guide to Chemical Hazards - Manganese cyclopentadienyl tricarbonyl (as Mn).