# Methylcyclopentadienyl manganese tricarbonyl (as Mn)

| CAS number: | 12108-13-3 |
| --- | --- |
| Synonyms: | CI-2, Combustion improver-2, MMT, tricarbonyl(methylcyclopentadienyl)-manganese |
| Chemical formula: | C9H7MNO3 |
| Structural formula: | — |

Workplace exposure standard (retained)

| TWA: | **0.2 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 0.2 mg/m3 is recommended to protect for effects on the central nervous system (CNS), liver, kidneys and respiratory tract in exposed workers.

## Discussion and conclusions

2-methylcyclopentadienyl manganese tricarbonyl (MMT) is used in fuels as a smoke abatement additive and combustion improver.

Critical effects of exposure are on the CNS, with the liver, kidneys and respiratory tract also target organs (ACGIH, 2018). Limited evidence about inhalational exposure is available. MMT is reported to cause acute toxicity by all routes of exposure. A case report of a worker suffering from "thick tongue”, giddiness, nausea and headache within three to five minutes after spilling 5 to 15 mL of MMT on their hand. A four hour LC50 of 76 mg/m3 is reported in rats. A NOAEC of 6.2 mg/m3 is reported for degenerative changes in liver and kidneys in rats and mice exposed for 30 weeks (NICNAS, 2003).

The ACGIH (2018) recommends a TWA of 0.2 mg/m3 based on the similar effects to the CNS as tetraethyl lead (TEL). This is also the current SWA TWA value. Exposure at 100 mg/m3 TEL for one hour produced intoxication, irritability, insomnia, psychosis, mania and convulsions in workers.

The current TWA of 0.2 mg/m3 is recommended to be retained; aligning with the recommendation of the ACGIH (2018). Based on the evidence presented, it is considered protective for the reported critical 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 recommended based on evidence in humans and animals.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 0.2 mg/m3 | |
|  |
| ACGIH 2001 TLV-TWA: 0.2 mg/m3 |
| TLV-TWA recommended to minimise the potential for adverse CNS, pulmonary, liver and kidney effects.  Based on toxic similarity of MMT to TEL (TLV-TWA of 0.1 mg/m3 as Pb at time of writing).  Summary of data:  Human data:   * MMT is moderately irritating to the eye * Case report of worker suffering from "thick tongue", giddiness, nausea and headache within 3–5 min after spilling 5–15 mL on their hand * 100 mg/m3 TEL for 1 h produced intoxication, irritability, insomnia, psychosis, mania and convulsions.   Animal data:   * LC50: 247 mg/m3 (rats: 1 h); 76 mg/m3 (rats, 4 h) * LD50: 140 mg/kg (rabbits, dermal) * CNS effects same as TEL * Liver and the kidneys are the principal target organs of MMT exposure; no further information * Normal weight gains and no gross or microscopic changes in 2 dogs exposed at 100 mg/m3 for 100 d.   Insufficient data to recommend a sensitiser or carcinogenicity notation or a TLV-STEL. |
| DFG NA NA |
| No report. |
| 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 |
| --- | --- | --- | --- |
| NICNAS |  | 2003 | * NOAEC of 0.0062 mg/L (6.2 mg/m3) degenerative changes in liver and kidneys in rats and mice; 7 h/d, 5 d/wk, 30 wk * Reported as acutely toxic by all routes; no further details. |

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | No |
| --- | --- |
| **The chemical is not a non-threshold based genotoxic carcinogen.** |  |

## Notations

| Source | Notations |
| --- | --- |
| SWA | Skin |
| HCIS | — |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | Skin |
| 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

| Calculation |
| --- |
| |  |  |  |  | | --- | --- | --- | --- | | Adverse effects in human case study: | yes | 4.00 |  | | Dermal LD50 ≤1000 mg/kg: | yes | 3.00 |  | | Dermal repeat-dose NOAEL ≤200 mg/kg: |  |  |  | | Dermal LD50/Inhalation LD50 <10: |  |  |  | | *In vivo* dermal absorption rate >10%: |  |  |  | | Estimated dermal exposure at WES >10%: |  |  |  | |  |  | 3 | **a skin notation is warranted** | |

### IDLH

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

## Additional information

| Molecular weight: | 218.09 |
| --- | --- |
| 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.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2003) Methylcyclopentadienyl Manganese Tricarbonyl (MMT): Priority Existing Chemical Assessment Report No. 24