# Propylene glycol dinitrate

| CAS number: | 6423-43-4 |
| --- | --- |
| Synonyms: | PGDN, 1,2-propanediol dinitrate, propylene dinitrate, 1,2-propylene glycol dinitrate; Otto fuel |
| Chemical formula: | C3H6N2O6 |

Workplace exposure standard (amended)

| TWA: | **0.01 ppm (0.069 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 0.01 ppm (0.063 mg/m3) is recommended to protect for adverse cardiovascular effects resulting in headaches in exposed workers.

## Discussion and conclusions

Propylene glycol dinitrate (PGDN) is used in propellants in torpedo manufacture.

Critical effects of exposure are to the cardiovascular system.

Vasodilation and subsequent decrease in blood pressure and headaches in human volunteers are reported at levels greater than 0.03 ppm (DFG, 2017). A NOAEC of 0.01 ppm for the onset of headaches with a corresponding LOAEL of 0.03 ppm are reported for workers exposed to nitroglycerine (DFG, 2017). No substance-specific carcinogenicity studies are available. PGDN is expected to be non-genotoxic by analogy to the structurally related nitroglycerine, which has similar toxic effects (DFG, 2017).

The TWA of 0.01 ppm (0.063 mg/m3) by DFG (2017) is recommended based on a weight of evidence from analogous nitroglycerine data, which indicate adverse cardiovascular effects are not expected below this concentration.

## 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 for dermal absorption and adverse systemic effects in humans and animals.

# AppendIX

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 0.05 ppm (0.34 mg/m3) | |
|  |
| ACGIH 2001 TLV-TWA: 0.05 ppm (0.34 mg/m3) |
| TLV-TWA recommended to minimise potential for headaches due to vasodilation and subsequent reduced blood pressure.  Summary of data:  TLV-TWA based on human case studies, primarily from workers employed in a torpedo manufacturing industry and by direct analogy to the ethylene glycol dinitrate (EGDN). TLV-TWA expected to be protective of effects from vasodilation observed >0.2 ppm.  Human data:   * Volunteers inhaled 0.2 ppm experienced headaches and disruption in visual evoked response tests * Tolerance to headaches acquired from repeated exposure (8 h) at 0.2 ppm * Exposures to 0.5 ppm for >6.5 h produced balance impairment * Ocular irritation occurred with 40 min exposures at 1.5 ppm * No biochemical or haematological effects observed in male volunteers exposed at   0.3–1.5 ppm   * No chronic neurotoxicity effects noted in torpedo industry workplace that maintained peak exposures ≤0.1 ppm (90% of the time) * One case study suggests dermal absorption from liquid spill lead to headache.   Animal data:   * Limited acute animal inhalation data * NOAEC 10 ppm inhaled 7h/d 5d/w (rats, 30 d) * LD50: >1,200 mg/kg (mouse, subcutaneous) * Subacute dermal toxicity indicates skin irritation leading to cyanosis and profound dyspnoea at 2g/kg (rabbits, 20 d) * No ADME, mutagenicity or carcinogenicity data presented.   Insufficient data to recommend a TLV-STEL or notations for carcinogenicity and sensitisation.  Due to case studies and analogous link to EGDN a skin notation is warranted due to systemic effects observed following skin absorption. |
| DFG 2017 MAK: 0.01 ppm (0.069 mg/m3) |
| MAK based on analogy to nitroglycerine and EGDN, which have the same mechanism of action and with NOAEC of 0.03 ppm in volunteers exposed. True NOAEC expected to be near 0.01 ppm due to potential dermal absorption (skin and respiratory tract) and is supported by analogy to NOAEC of 0.01 ppm in workers exposed to nitroglycerine.  Human data:   * Vasodilation identified as the critical effect: * as indicated by headache after 8 h exposure at 0.1 ppm * headache in most volunteers after 4 h exposure at 0.2 ppm * no effects at 0.03 ppm * Assigned as pregnancy risk (Group C) based on analogy to nitroglycerine and EGDN only, with no studies identified * No data available for genotoxicity or carcinogenicity.   Animal data:   * Limited animal data suggests sensitisation is not expected. |
| 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 |
| --- | --- | --- | --- |
| NTP |  | 1990 | * Nomination Summary for Propylene glycol dinitrate (N91217) * Nominated by private individual - suspicion of neurotoxicity observed in employees of an incineration plant (no further information available). |

### 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 | Skin |
| HCIS | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | Skin |
| DFG | H (skin) |
| 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 |
| --- |
| |  |  |  |  | | --- | --- | --- | --- | | Adverse effects in human case study: | yes | 4.00 |  | | 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%: | yes | 2.00 |  | |  |  | 2 | **a skin notation is warranted** | |

### IDLH

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

## Additional information

| Molecular weight: | 166.11 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 6.79 mg/m3; 1 mg/m3 = 0.147 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) (2018) Propylenglykoldinitrat – MAK value documentation.

National Toxicology Program (NTP) (1990) Nomination Summary for Propylene glycol dinitrate (N91217)