

Annex

OCCUPATIONAL EXPOSURE VALUES ¹⁾ TWA¹¹⁾ (mg/m³)

SUBSTANCE [CAS No.] ²⁾	ACGIH ³⁾ TLVs ⁴⁾	OSHA ⁵⁾ PELs ⁶⁾	NIOSH ⁷⁾ RELs ⁸⁾	DFG ⁹⁾ MAKs ¹⁰⁾
Aluminum [7429-90-5] metal and insoluble compounds	1 ¹²⁾	5 ¹²⁾ , [15 ¹⁹⁾	5 ¹²⁾ , [10 ¹⁹⁾	4 ¹³⁾ , [1,5 ¹²⁾
Aluminum [7429-90-5] pyro powders and welding fumes, as Al	---	---	5	---
Aluminum oxide [1344-28-1]	---	5 ¹²⁾ , [15 ¹⁹⁾	---	4 ¹³⁾ , [1,5 ¹²⁾
Boron oxide [1303-86-2]	10	15 ¹⁹⁾	10	---
Barium [7440-39-3] and soluble compounds, as Ba	0.5	0.5	0.5	---
Barium compounds, soluble, as Ba	---	---	---	0.5 ¹³⁾
Calcium oxide [1305-78-8]	2	5	2	1 ¹³⁾
Calcium carbonate [1317-65-3] (NIOSH : includes [471-34-1])	---	5 ¹²⁾ , [15 ¹⁹⁾	5 ¹²⁾ , [10 ¹⁹⁾	---
Cobalt [7440-48-4] and inorganic compounds, as Co	0.02 ¹³⁾	---	---	---
Cobalt [7440-48-4] and inorganic compounds, metal dust and fume, as Co	---	0.1	0.05	---
Hard metals containing Cobalt [7440-48-4] and Tungsten Carbide [12070-12-1], as Co	0.005 ¹⁸⁾	---	---	---
Chromium [7440-47-3] metal	---	1	0.5	---
Chromium [7440-47-3] metal, as Cr(0)	0.5 ¹³⁾	---	---	---
Chromium [7440-47-3] (II) inorganic compounds, as Cr	---	0.5	0.5	---
Chromium (III) [16065-83-1] inorganic compounds, as Cr	---	0.5	0.5	---
Chromium (III) [16065-83-1] inorganic compounds, as Cr(III)	0.003 ¹³⁾	---	---	---
Chromium (VI) [18540-29-9] inorganic compounds, water-soluble, as Cr (VI)	0.0002 ¹³⁾ [0.0005 ^{13) 14)}	0.005	0.0002	---
Chromium (VI) [18540-29-9] inorganic compounds, insoluble, as Cr (VI)	0.0002 ¹³⁾ [0.0005 ^{13) 14)}	0.005	0.0002	---
Copper [7440-50-8], fume, as Cu	0.2	0.1	0.1	---
Copper [7440-50-8], dusts and mists, as Cu	1	1	1	---
Copper [7440-50-8] and its inorganic compounds	---	---	---	0.01 ¹²⁾
Fluorides, as F	2.5	2.5	2.5	1 ¹³⁾
Iron oxide (Fe ₂ O ₃) [1309-37-1]	5 ¹²⁾	---	---	---
Iron oxide (Fe ₂ O ₃) [1309-37-1], fume	---	10	---	---
Iron oxide (Fe ₂ O ₃) [1309-37-1], dust and fume, as Fe	---	---	5	---
Magnesium oxide [1309-48-4]	10 ¹³⁾	---	---	4 ¹³⁾ , [0,3 ^{12) 23)}
Magnesium oxide [1309-48-4], fume, total particulate	---	15	---	---
Manganese [7439-96-5] and inorganic compounds, as Mn	0.1 ¹³⁾ , [0,02 ¹²⁾	5 ²⁰⁾	1, [3 ¹⁴⁾	0.2 ¹³⁾ , [0,02 ¹²⁾
Manganese [7439-96-5], fume, as Mn	0.1 ¹³⁾ , [0,02 ¹²⁾	5 ²⁰⁾	1, [3 ¹⁴⁾	0.2 ¹³⁾ , [0,02 ¹²⁾
Molybdenum [7439-98-7] and soluble compounds, as Mo	0.5 ¹²⁾	5	---	---
Molybdenum [7439-98-7] and insoluble compounds, as Mo	10 ¹³⁾ , [3 ¹²⁾	15 ¹⁹⁾	---	---
Nickel [7440-02-0], elemental	1.5 ¹³⁾	1	0.015	---
Nickel [7440-02-0] soluble compounds, as Ni (ACGIH: inorganic only)	0.1 ¹³⁾	1	0.015	---
Nickel [7440-02-0] insoluble compounds, as Ni (ACGIH: inorganic only)	0.2 ¹³⁾	1	0.015	---
Nickel [7440-02-0] compounds, as Ni	---	---	0.015	---
Antimony [7440-36-0] and compounds, as Sb	0.5	0.5	0.5	---
Silica, amorphous, fused (DFG: includes [7699-41-4])	---	[C ²¹⁾	---	0.3 ¹²⁾
Silica, crystalline, α-quartz	0.025 ¹²⁾	---	---	---
Silica, crystalline, α-quartz, dust	---	0.05 ¹²⁾ , [A ^{12) 15)} , [B ^{16) 19)}	0.05 ¹²⁾	---
Silicon [7440-21-3]	---	5 ¹²⁾ , [15 ¹⁹⁾	5 ¹²⁾ , [10 ¹⁹⁾	---
Tin [7440-31-5], metal	2 ¹³⁾	2	2	---
Tin [7440-31-5], oxide, as Sn (ACGIH: except Indium tin oxide)	2 ¹³⁾	---	2	---
Tin [7440-31-5], oxide and inorganic compounds, except SnH ₄ , as Sn (ACGIH: except Indium tin oxide)	2 ¹³⁾	---	---	---
Tin [7440-31-5], oxide and inorganic compounds, except oxide and SnH ₄ , as Sn	---	2	2	---
Tantalum [7440-25-7], metal	---	5	5, [10 ¹⁴⁾	4 ¹³⁾
Tantalum [7440-25-7] oxide, dust, as Ta	---	5	5, [10 ¹⁴⁾	---
Titanium dioxide [13463-67-7]	---	15 ¹⁹⁾	---	---
Titanium dioxide [13463-67-7] (ACGIH: nanoscale particles)	0.2 ¹²⁾	---	---	---
Titanium dioxide [13463-67-7] (ACGIH: finescale particles)	2.5 ¹²⁾	---	---	---
Vanadium pentoxide [1314-62-1], as V (NIOSH: except Vanadium metal and Vanadium carbide)	0.05 ¹³⁾	---	0.05 ^{20) 22)}	---
Vanadium pentoxide [1314-62-1] dust, as V ₂ O ₅	---	0.5 ^{12) 20)}	---	---
Vanadium pentoxide [1314-62-1] fume, as V ₂ O ₅	---	0.1 ²⁰⁾	---	---
Ferovanadium [12604-58-9] dust	1, [3 ¹⁴⁾	1	---	---
Ferovanadium [12604-58-9] dust (also applies to Vanadium metal and Vanadium carbide)	---	---	1, [3 ¹⁴⁾	---
Tungsten [7440-33-7] and insoluble compounds, as W	---	---	5, [10 ¹⁴⁾	---
Tungsten [7440-33-7], soluble compounds, as W	---	---	1, [3 ¹⁴⁾	---
Tungsten [7440-33-7] and compounds, in the absence of Cobalt, as W	3 ¹²⁾	---	---	---
Zinc oxide [1314-13-2]	2 ¹²⁾ , [10 ^{12) 14)}	5 ¹²⁾ , [15 ¹⁹⁾	---	0.1 ¹²⁾ , [2 ¹³⁾
Zinc oxide [1314-13-2], dust only	---	---	5 [15 ²⁰⁾	---
Zinc oxide [1314-13-2], fume	---	5	5, [10 ¹⁴⁾	0.1 ¹²⁾ , [2 ¹³⁾
Zirconium [7440-67-7], elemental	5, [10 ¹⁴⁾	---	---	1 ¹³⁾
Zirconium dioxide [1314-23-4, 12036-23-6]	---	---	---	0.3 ^{12) 23)}
Zirconium [7440-67-7] compounds, as Zr (NIOSH: except Zirconium tetrachloride)	5, [10 ¹⁴⁾	5	5, [10 ¹⁴⁾	---
Zirconium [7440-67-7] insoluble compounds (NIOSH: except Zirconium tetrachloride)	---	---	5, [10 ¹⁴⁾	---
Zirconium [7440-67-7] soluble compounds (NIOSH: except Zirconium tetrachloride)	---	---	5, [10 ¹⁴⁾	---

(Continued) OCCUPATIONAL EXPOSURE VALUES ¹⁾ TWA¹¹⁾ (ppm)

SUBSTANCE [CAS No.] ²⁾	ACGIH ³⁾ TLVs ⁴⁾	OSHA ⁵⁾ PELs ⁶⁾	NIOSH ⁷⁾ RELs ⁸⁾	DFG ⁹⁾ MAKs ¹⁰⁾
Phenol [108-95-2]	5	5	5 [15.6 ^{20) 22)}	---
Carbon monoxide [630-08-0]	25	50	35 [200 ²⁰⁾	30
Carbon dioxide [124-38-9]	5000, [30000 ¹⁴⁾	5000	5000, [30000 ¹⁴⁾	5000
Phosgene [75-44-5]	0.02 ²⁰⁾	0.1	0.1 [0.2 ^{20) 22)}	0.1
Hydrogen fluoride [7664-39-3] as F	0.5, [2 ²⁰⁾	3	3 [6 ^{20) 22)}	1
Nitric oxide [10102-43-9]	25	25	25	0.5
Nitrogen dioxide [10102-44-0]	0.2	5 ²⁰⁾	1 ¹⁴⁾	0.5
Ozone [10028-15-6]	---	0.1	0.1 ²⁰⁾	---
Heavy work	0.05	---	---	---
Moderate work	0.08	---	---	---
Light work	0.1	---	---	---
Light, moderate, or heavy workload (≤2 hours)	0.2	---	---	---
Phosphine [7803-51-2]	0.05, [0.15 ²⁰⁾	0.3	0.3, [1 ¹⁴⁾	0.1

- 1) 2022 Guide to Occupational Exposure Values, ACGIH
- 2) Chemical Abstract Service Registry Number
- 3) American Conference of Governmental Industrial Hygienists
- 4) ACGIH Threshold Limit Values
- 5) U.S. Occupational Safety and Health Administration
- 6) OSHA Permissible Exposure Limits
- 7) U.S. National Institute for Occupational Safety and Health
- 8) NIOSH Recommended Exposure Limits
- 9) Deutsche Forschungsgemeinschaft
- 10) DFG Maximum Concentrations at the Workplace
- 11) Time-weighted average exposure concentration for a conventional 8-hour (TLV, PEL) or up to a 10-hour (REL) workday and a 40-hour workweek
- 12) Measured as respirable fraction of the aerosol.
- 13) Measured as inhalable fraction of the aerosol.
- 14) Short-Term Exposure Limit
- 15) A: $\frac{250\text{mppcf}}{\%SiO_2+5}$ or $\frac{10\text{mg}/\text{m}^3}{\%SiO_2+2}$ This standard applies to any operation or sectors for which the respirable crystalline silica standard, 1910.1053, is stayed or is otherwise not in effect.
- 16) B: $\frac{30\text{mg}/\text{m}^3}{\%SiO_2+2}$ This standard applies to any operation or sectors for which the respirable crystalline silica standard, 1910.1053, is stayed or is otherwise not in effect.
- 17) Notice of intended changes
- 18) Measured as thoracic fraction of the aerosol.
- 19) Total dust
- 20) Ceiling limit
- 21) C: 20mppcf or $\frac{80\text{mg}/\text{m}^3}{\%SiO_2}$
- 22) 15-min.
- 23) Multiplied with the material density