

# TUNGSTEN

(Data in metric tons of contained tungsten unless otherwise noted)

**Domestic Production and Use:** No domestic production of commercial tungsten concentrates has been reported since 2015. Approximately six U.S. companies had the capability to convert tungsten concentrates, ammonium paratungstate (APT), tungsten oxide, and (or) scrap to tungsten metal powder, tungsten carbide powder, and (or) tungsten chemicals. An estimated 60% of the tungsten consumed in the United States was used in cemented carbide parts for cutting and wear-resistant applications, primarily in the construction, metalworking, mining, and oil- and gas-drilling industries. The remainder was used to make various alloys and specialty steels; electrodes, filaments, wires, and other components for electrical, electronic, heating, lighting, and welding applications; and chemicals for various applications. The estimated value of apparent consumption in 2022 was approximately \$800 million.

<b><u>Salient Statistics—United States:</u></b>	<b><u>2018</u></b>	<b><u>2019</u></b>	<b><u>2020</u></b>	<b><u>2021</u></b>	<b><u>2022<sup>e</sup></u></b>
Production:					
Mine	—	—	—	—	—
Secondary	W	W	W	W	W
Imports for consumption:					
Ores and concentrates	4,050	2,760	2,020	1,590	2,000
Other forms <sup>1</sup>	10,400	11,100	8,660	10,400	12,000
Exports:					
Ores and concentrates	284	583	480	441	600
Other forms <sup>2</sup>	3,210	2,780	2,470	2,970	4,200
Shipments from Government stockpile: <sup>3</sup>					
Concentrate	1,180	663	728	1,030	700
Other forms	—	—	34	93	—
Consumption:					
Reported, concentrate	W	W	W	W	W
Apparent, <sup>4</sup> all forms	W	W	W	W	W
Price, <sup>5</sup> concentrate, average in-warehouse Rotterdam, dollars per dry metric ton unit of tungsten trioxide <sup>6</sup>	261	198	172	225	270
Stocks, industry, concentrate and other forms, yearend	W	W	W	W	W
Net import reliance <sup>7</sup> as a percentage of apparent consumption	>50	>50	>50	>50	>50

**Recycling:** The estimated quantity of secondary tungsten produced and the amount consumed from secondary sources by processors and end users in 2022 were withheld to avoid disclosing company proprietary data.

**Import Sources (2018–21):** Tungsten contained in ores, concentrates, and other forms:<sup>1</sup> China, <sup>8</sup> 29%; Germany, 11%; Bolivia, 9%; Vietnam, 6%; and other, 45%.

<b><u>Tariff:</u></b>	<b><u>Item</u></b>	<b><u>Number</u></b>	<b><u>Normal Trade Relations</u></b> <b><u>12–31–22</u></b>
	Ores	2611.00.3000	Free.
	Concentrates	2611.00.6000	37.5¢/kg on tungsten content.
	Tungsten oxides	2825.90.3000	5.5% ad valorem.
	Ammonium tungstates	2841.80.0010	5.5% ad valorem.
	Tungsten carbides	2849.90.3000	5.5% ad valorem.
	Ferrotungsten	7202.80.0000	5.6% ad valorem.
	Tungsten powders	8101.10.0000	7% ad valorem.
	Tungsten waste and scrap	8101.97.0000	2.8% ad valorem.

**Depletion Allowance:** 22% (domestic), 14% (foreign).

## **Government Stockpile:**<sup>9</sup>

<b><u>Material</u></b>	<b><u>FY 2022</u></b>			<b><u>FY 2023</u></b>	
	<b><u>Inventory</u></b> <b><u>as of 9–30–22</u></b>	<b><u>Potential</u></b> <b><u>acquisitions</u></b>	<b><u>Potential</u></b> <b><u>disposals</u></b>	<b><u>Potential</u></b> <b><u>acquisitions</u></b>	<b><u>Potential</u></b> <b><u>disposals</u></b>
Metal powder	—	—	125	—	—
Ores and concentrates	6,000	—	1,360	—	1,130
Tungsten alloys, gross weight <sup>10</sup>	5	—	—	—	—

## TUNGSTEN

**Events, Trends, and Issues:** World tungsten supply was dominated by production in China and exports from China. China's Government regulated its tungsten industry by prohibiting foreign investment in exploration and mining, limiting the number of mining and export licenses and imposing quotas on concentrate production and processing. Production of tungsten concentrate outside China was estimated to have increased in 2022 but remained less than 20% of world production. The increase was from existing operations. Additional production, primarily from reopened mines in Australia, the Republic of Korea, and the United Kingdom, was forecast to begin in 2023. Scrap continued to be an important source of raw material for the world tungsten industry.

Tungsten consumption is strongly influenced by economic conditions and industrial activity. China continued to be the world's leading tungsten consumer. In 2022, China's tungsten consumption by vehicle and other manufacturing industries was negatively affected by lockdowns to control coronavirus disease 2019 (COVID-19) pandemic outbreaks. In the United States, increased oil and gas drilling and a recovery of the aerospace industry resulted in an estimated increase in tungsten consumption. Potential areas of future growth in tungsten consumption include new applications such as powders for additive manufacturing and the use of tungsten in lithium-ion batteries.

**World Mine Production and Reserves:** Reserves for China, Portugal, Spain, and "Other countries" were revised based on company and Government reports.

	Mine production		Reserves <sup>11</sup>
	<u>2021</u>	<u>2022<sup>e</sup></u>	
United States	—	—	NA
Austria	<sup>e</sup> 900	900	10,000
Bolivia	1,563	1,400	NA
China	<sup>e</sup> 71,000	71,000	1,800,000
Portugal	502	500	3,100
Russia	<sup>e</sup> 2,300	2,300	400,000
Rwanda	<sup>e</sup> 1,340	1,100	NA
Spain	<sup>e</sup> 400	700	56,000
Vietnam	4,800	4,800	100,000
Other countries	<u>973</u>	<u>1,400</u>	<u>1,400,000</u>
World total (rounded)	83,800	84,000	3,800,000

**World Resources:**<sup>11</sup> World tungsten resources are geographically widespread. China ranks first in the world in terms of tungsten resources and reserves and has some of the largest deposits. Significant tungsten resources have been identified on every continent except Antarctica.

**Substitutes:** Potential substitutes for cemented tungsten carbides include cemented carbides based on molybdenum carbide, niobium carbide, or titanium carbide; ceramics; ceramic-metallic composites (cermets); and tool steels. Most of these options reduce, rather than replace, the amount of tungsten used. Potential substitutes for other applications are as follows: molybdenum for certain tungsten mill products; molybdenum steels for tungsten steels, although most molybdenum steels still contain tungsten; lighting based on carbon nanotube filaments, induction technology, and light-emitting diodes for lighting based on tungsten electrodes or filaments; depleted uranium or lead for tungsten or tungsten alloys in applications requiring high density or the ability to shield radiation; and depleted uranium alloys or hardened steel for cemented tungsten carbides or tungsten alloys in armor-piercing projectiles. In some applications, substitution would result in increased cost or a loss in product performance.

<sup>e</sup>Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.

<sup>1</sup>Includes ammonium and other tungstates; ferrotungsten; tungsten carbides; tungsten metal powders; tungsten oxides, chlorides, and other tungsten compounds; unwrought tungsten; wrought tungsten forms; and tungsten waste and scrap.

<sup>2</sup>Includes ammonium and other tungstates, ferrotungsten, tungsten carbides, tungsten metal powders, unwrought tungsten, wrought tungsten forms, and tungsten waste and scrap.

<sup>3</sup>Defined as change in total inventory from prior yearend inventory. If negative, increase in inventory.

<sup>4</sup>Defined as mine production + secondary production + imports – exports ± adjustments for Government and industry stock changes.

<sup>5</sup>Source: Argus Media Group, Argus Metals International.

<sup>6</sup>A metric ton unit of tungsten trioxide contains 7.93 kilograms of tungsten.

<sup>7</sup>Defined as imports – exports ± adjustments for Government and industry stock changes.

<sup>8</sup>Includes Hong Kong.

<sup>9</sup>See Appendix B for definitions.

<sup>10</sup>Tungsten-rhenium ingot.

<sup>11</sup>See Appendix C for resource and reserve definitions and information concerning data sources.