

## Standard Designations for Selected Noble Metal Alloys

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Precious metals and their alloys have permeated a wide array of engineering applications and market spaces. To ensure delivery of products that conform to a specific set of chemical and/or physical requirements, the most common materials are governed by agreed-upon industrial specifications. The most commonly referenced standard specifications are set by producers and users in accordance with rules set forth by ASTM International, and curated by the same organization.

Standards for nonferrous materials are curated by committees B01 through B10, and can be recognized by the prefix “B.” Selected standards that pertain to pure noble metal elements in their refined and fabricated forms are enumerated in Table 1. Particular attention should be paid to the difference between “refined” and “fabricated” materials: the former is intended to govern pure elements procured as shot or sponge; the latter governs metals wrought into a usable form, such as wire or sheet.

*Table 1: Standards curated by ASTM International that pertain to selected pure noble metals.*

Metal	ASTM Designation		Applications
	Number	Title	
Silver (Ag)	B413	Standard Specification for Refined Silver	Fine silver is commonly used as an alloy constituent or investment vehicle. This specification contains only chemical requirements. (A companion standard for fine silver electrical contacts, B742, was withdrawn in 2019.)
Platinum (Pt)	B561	Standard Specification for Refined Platinum	Pure platinum is used in drawn wires for life sciences research applications, thin foils for fabricated electrodes, as well as controlling the quality of refined metal used in alloying. Only chemical requirements are included in this standard.
Gold (Au)	B562	Standard Specification for Refined Gold	ASTM B562 frequently appears in medical device specifications, despite its original intent to control quality of refined gold. High purity gold materials are used in applications such as X-ray radiopaque fiducial markers, catheter tips, and wires consumed in the fabrication of other medical devices.
Palladium (Pd)	B589	Standard Specification for Refined Palladium	This standard assures the purity of refined palladium. B589 only contains chemical requirements.
Palladium (Pd)	B683	Standard Specification for Pure Palladium Electrical Contact Material	Palladium for electrical contact applications are fabricated from rod/wire and strip/sheet. Fabricated Pd materials have generous impurity tolerances compared to the refined metal (ASTM B589). This standard contains mechanical specifications for various tempers.

Chemical requirements for each element differ between the ASTM standards in Table 1 according to producer capabilities and quality expectations of users. Elemental purities for each element, their respective standard(s), and Unified Numbering System (JNS) identifier(s) are shown in Table 2.

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**Table 2:** Standard purity ASTM International specifications for pure precious metals and corresponding UNS numbers (\* indicates no UNS number assigned at the time of writing)

	Silver (Ag)	Platinum (Pt)	Gold (Au)	Palladium (Pd)
99.5%	—	—	B562 <sup>†</sup>	—
99.8%	—	—	—	B683 <sup>†</sup>
99.9%	B413/P07020	—	—	—
99.95%	B413/P07015	B561/P04995	B562 <sup>†</sup>	B589/P03995
99.99%	B413/P07010	B561 <sup>†</sup>	B562 <sup>†</sup>	—
99.995%	—	—	B562 <sup>†</sup>	—

The aforementioned noble metal elements may be combined with other noble and base metals to create alloys of varied and well-recognized utility. Selected alloys for which ASTM specifications exist are listed in Table 3. (At the time of writing, no UNS designations have been applied to these alloys.) Because these alloys are used in engineering applications, most standards specify multiple tempers with varied mechanical properties.

**Table 3:** ASTM standards that pertain to selected noble metal-containing alloys produced by Deringer-Ney.

Alloy	ASTM/UNS Designations		Applications
	Number	Title	
Neyoro™ 28A	B477	Standard Specification for Gold-Silver-Nickel Electrical Contact Alloy	Relatively soft alloy, highly resistant to corrosion, with low resistivity. Used in low-noise sliding electrical contacts and selected make-and-break applications.
Neyoro™ 69	B522	Standard Specification for Gold-Silver-Platinum Electrical Contact Alloy	Known also as “Western Electric #1,” this platinum-containing alloy boasts higher wear resistance and tarnish resistance than Neyoro 28A. It may be used in low energy make-and-break applications.
Paliney® 7	B540	Standard Specification for Palladium Electrical Contact Alloy	A versatile, age-hardenable palladium alloy that contains 55% noble metal by weight. A number of tempers, from annealed to fully age hardened, are specified. Commonly found in high speed signal slip rings, buckling beam integrated circuit test probes, and as contacts in corrosive environments.
Neyoro™ G	B541	Standard Specification for Gold Electrical Contact	80% noble metal content by weight affords this alloy extreme tarnish and corrosion resistance. A high degree of work hardenability and age hardenability make this an “engineer’s gold.” Found in electrical contact applications where absolute reliability is needed.
Paliney® 6	B563	Standard Specification for Palladium-Silver-Copper Electrical Contact Alloy	A 45% noble alloy that is used in a wide variety of sliding electrical contacts. Some applications include throttle position sensors, slip ring brushes, and fuel level sensors.
Coin Gold	B596	Standard Specification for Gold-Copper Alloy Electrical Contact Material	This soft, gold-10wt.% copper alloy is used in specialty, low-noise sliding electrical contact systems.
Coin Silver	B617	Standard Specification for Coin Silver Electrical Contact Alloy	An alloy of silver and 10wt.% copper, this material offers improved hardness and arc erosion resistance when compared to fine silver.

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Alloy	ASTM/UNS Designations		Applications
	Number	Title	
Platinum-Iridium	B684	Standard Specification for Platinum-Iridium Electrical Contact Materials	Pt-10wt.% Ir and -15wt.% Ir have gained popularity in the medical device field as tissue contacting electrodes, X-ray radiopaque interventional device components, and more. These alloys are employed in low energy make-and-break contact applications, and as electrodes in corrosion-resistant fluid flow sensors.
Ney 75	B780	Standard Specification for 75 % Silver, 24.5 % Copper, 0.5 % Nickel Electrical Contact Alloy	A time-tested, reliable silver alloy used in wire-formed or multifilar slip ring brushes. This alloy is also used to fabricate corrosion-resistant inductors and as a braze alloy in selected applications.

The noble metal alloys specified above may be fabricated in a wide array of physical forms including rod, wire, fine wire, strip, and foil, and are generally used at smaller dimensions than other nonferrous materials. These compositions and properties suit a wide range of applications. Bespoke material tempers may be available from, or developed by, Deringer-Ney on a custom basis for challenging applications, even while adhering to ASTM-standard compositional ranges.

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