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Argentium® Silver 935 PRO

Argentium AG .935% Professional For Casting



ARGENTIUM SILVER

Product Description

Argentium® Silver alloys are premium-quality sterling alloys with exceptional tarnish-resistant and firestain resistant properties that make them particularly suitable for premium jewelry items. Argentium 935 PRO is an antioxidant, grain refined 935/1000 fine silver alloy which offers very white color and high reflectivity. Argentium 935 PRO possesses high as-cast hardness, making items fabricated with this alloy particularly resistant to wearing and scratching. Argentium 935 PRO granules are carefully prepared by using high-purity silver (99.99%) and a special deoxidizing process, a prerequisite for high-quality silver jewelry production.

Physical-chemical properties

Precious metal of reference

Ag 94.0%

Density (g/cm³): 10.3

Temperatures (°C/°F):

Solidus 870°C/1598 °F

Liquidus 910°C/1670 °F

Range 40°C/104 °F

General characteristics:

"As cast" grain size 260

Fluidity (grid filling test) [%] 77

Recommended applications

Argentium® 935 PRO is specifically studied investment casting in open or closed vacuum assisted casting systems. Argentium 935 PRO can be hardened by means of a single- or double-step heat treatment (see Notes; following page).

Mechanical characteristics

Tensile Strength (Rm) [N/mm²] 260

Yield strength (Rp0.2) [N/mm²] 120

Elongation (A) [%] 27

"As cast" hardness [HV 0.2] 72

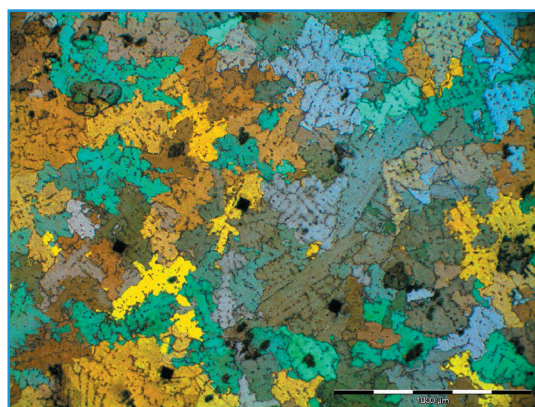
Hardness after 70% red. [HV 0.2] 168

Hardness after annealing [HV 0.2] 72

Hardness after age-hardening 1 [HV 0.2] 130



Tree before pickling



Crystal grain (50x)

800.545.6566

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Instructions for use

Casting

Graining temperature: N/A

Casting Temperatures:

Size of objects	Metal casting (°C/°F)	Flask (°C/°F)
thin from 0.2 to 0.5 mm	1040–1010°C/1904–1850°F	560–600°C/1040–1112°F
medium from 0.5 to 1.2 mm	1010–990°C/1850–1814°F	520–560°C/968–1040°F
thick > 1.2 mm	990–970°C/1814–1778°F	480–520°C/896–968°F

Flask quenching:

Leave flask to cool for 1 minute in the casting chamber, then for a further 20 minutes to air. Quench in water.

Pickling:

Dip in a 10% solution of sulfuric or phosphoric acid for 5 minutes at 40°C/104°F

Recommended age hardening treatment: 300 °C/572°F for 120 minutes

Notes

(F)

Age-hardening procedure: a hardening effect of about 5–10HV can be obtained by means of a heat treatment at 300°C x 120 minutes in air. However, hardening can be significantly increased by:

- 1) A homogenization treatment in static furnace at 750°C/1382°F for 40 minutes under inert (nitrogen or argon) or slightly reducing atmosphere (5–10% max. of hydrogen), immediately followed by water quenching;
- 2) Hardening treatment in static furnace at 300°C for 60 minutes in air. After this last operation, rapid quenching in water is not necessary.

Cleaning recommendations: use slightly alkaline detergents (pH 7–9, 40°C/104) during ultrasonic cleaning. Never use electrolytic degreasing.

Product Technical guidelines

Argentium® Silver 935 PRO Production Guidelines

The purpose of this document is to offer guidance on the best practice for fabricating and finishing Argentium® Silver alloys. Find further information at www.argentumsilver.com.

Annealing Operations

With Argentium silver alloys it is the ability of the germanium on the surface of the alloy to form a protective germanium oxide which gives the alloy its firestain and tarnish resistance. When carrying out a conventional annealing operation in a furnace using a protective atmosphere it is very important that the furnace gas, although protective, does not deplete the surface layer of germanium oxide, as this will reduce the tarnish resistance of the alloy and its resistance to 'firestain'. For this reason a furnace atmospheres that are inert (i.e. nitrogen or argon) or which contain max. 5-10% hydrogen in nitrogen are to be preferred to higher hydrogen atmospheres. The annealing temperature should be within the range 600–650°C/1112°–1202°F for times between 20 and 45 minutes, depending on the thickness of the material being annealed.

Alternatively the sheet, strip or wire can be torch annealed in the traditional silversmithing manner using a gas and air torch. Care must be taken not to overheat the Argentium silver which at its annealing temperature has an orange colour rather than the red colour typical of traditional sterling silver alloys. Once the Argentium silver has reached the correct temperature, allow it to cool slightly until the orange colour disappears and then it can then be quenched into water.

Pickling Operations

Due to their firestain resistance any discoloration of Argentium silvers is limited to the surface and can be removed by pickling in a 10% solution of sulfuric or phosphoric acid for 5 minutes at 40°C/104°F, followed by a water rinse.

Hardening Argentium Silver

Argentium silver can be hardened without high temperature heat treatment. The clean item should be placed in an oven with an air atmosphere, heated to 300°C/572°F and held at temperature for 2 hours. After heat treatment the piece should be removed from the furnace and allowed to cool to room temperature. Argentium silver can also be hardened using a traditional two stage heat treatment. The piece should first undergo a homogenization treatment in at 750°C/1382°F for 40 minutes under inert (argon or nitrogen) atmosphere followed by water quenching. The hardening stage involves the homogenised piece being heated to 300°C/572°F for 60 minutes in air. After this last operation, rapid quenching in water is not necessary.

Enameling Operations

Argentium silvers are suitable for enameling, however great care must be taken not to overheat the Argentium silver and cause it to sag. The use of the lower melting point enamels and the use of longer heating times at lower temperatures are recommended.

Polishing Operations

The polishing and cleaning operations are of critical importance in producing a quality product. This is particularly important with Argentium silver alloys which because of their high degree of tarnish resistance will in most cases be sold without having undergone a silver or rhodium plating operation.

The initial stage of the polishing process is the cutting operation which removes metal from the surface of the piece and smoothes the surface. This can either be a mechanical polishing operation involving the use of ceramic or plastic media in accordance with the media manufacturer's recommendations or it can be the more traditional hand polishing process involving the use of abrasive wheels and emery paper. The final stage of the polishing process is the finishing operation which gives the piece its deep lustrous surface finish. Where this final polishing stage is a mechanical operation it usually involves the use of a media such as crushed walnut shells in accordance with the media manufacturer's recommendations. Where manual polishing involving the use of polishing compounds and polishing buffs is used this is operator-dependent and strict quality control is required. In addition, the use of separate polishing buffs for all Argentium products is recommended to prevent cross-contamination of another alloy type onto the surface of the Argentium pieces.

Cleaning Operations

Between each polishing stage the pieces should be cleaned using an ultrasonic tank using an alkaline, aqueous cleaner at a temperature of between 40-60°C and a pH in the range 7 to 9. The pieces should be immersed for 2-3 minutes to remove oils, greases and loose particles before rinsing in tap water, drying and progressing to the next polishing stage. With all cleaning tanks it is important that the cleaning solution is not allowed to develop a surface layer of oil or grease which the cleaned pieces are then withdrawn. If this occurs this surface layer of oil or grease will discolour in air, turning yellow, and giving the false impression of a tarnishing reaction.

De-Ionized Water and Electrolytic Cleaners

It is important that deionised water is not used to rinse the pieces at any stage as its reactivity can affect the final tarnish resistance of the Argentium alloy. Electrolytic cleaning systems should not be used to clean this alloy as they may strip the germanium from the surface of the Argentium.

Passivation Operation

Passivation is the treatment of a metal to minimize the chemical reactivity of its surface. After cleaning, Argentium 935 PRO pieces can be submitted to a passivation treatment by submitting pieces to a heat treatment at 100°C/212°F for 6 to 16 hours in clean air. The passivation will be rapidly developed by means of the heat within few hours.