GENIA185 - (925)

Technical and usage details

Tab.1 PHYSICAL CHARACTERISTICS

Colour	Colour coordinates		Density [g/cm^3]	Melting range [°C] Solidus - Liquidus
SILVER	L* =	95.35	10.32	775 ÷ 894
	a* =	-0.59		
	b* =	6.01		

Tab.2 MECHANICAL CHARACTERISTICS

Condition	Tensile strength [MPa]	Yield strength [MPa]	Elongations [%]	Hardness [HV]	Deep-drawing [mm]
As cast	241	100	50	59	-
Annealed	303	153	23	65	9,5
Hardened	-	-	-	122	-

INVESTMENT CASTING

CASTING

Put the alloy[1] inside a cold crucible. Reach a temperature of 100 ÷ 150 °C more than Liquidus, (as per Tab.1), then pour the metal inside the stabilized flasks at a temperature between 500 ÷ 700 °C. Choose temperatures among this range as a function of the dimension of the castings (for heavy pieces it is advisable a low temperature value, for lighter pieces it is advisable a higher one); each one of these temperatures has to be optimized in function to everyone's own manufacturing cycle.

COOLING

After casting, let the cast flask rest in the casting machine for about 2 ÷ 3 minutes (do not exceed 5 minutes for the heavier flasks) and then quickly quench in water. The choice of the best timing depens on the pieces to be cast: a slow cooling can draw the piece to oxidize; a fast cooling can increase the risk for the piece to break.

CLEANING

Once the tree is obtained, clean it with an high pressured water jet, subsequently dip the tree in a 5 ÷ 10% hydrofluoric acid solution at 50 ÷ 60°C (122 ÷ 140°F), in order to remove investment residues. A stronger action of the hydrofluoric acid can be obtained by using an ultrasonic tank to combine the mechanical and the chemical action together.

SOLUTION ANNEALING

The solution annealing should be carried out on the cast pieces. The aim is to reduce or eliminate all the tensions accumulated by the casting itself, during cooling inside the flask, and consequently to increase the mechanical resistance of the cast pieces. Heat the castings in a furnace (if possible in a protected atmosphere) at a temperature of 85÷ 90% of the Solidus value (as per Tab. 1) for a time between 10 ÷ 20 minutes. Cooling can be done abruptly in these three different ways: in water, oil or alcohol (these last two guarantee a very reduced presence of cooling tensions).

PICKLING

Pickling has to be carried out by using some sulphur less acid solutions or sulphur compounds. Use a 10 % citric solution at 50 ÷ 60°C (122 ÷ 140 °F) for a normal pickling, while a stronger pickling action can be obtained by adding small amounts of hydrogen peroxide (1 ÷ 5 ml/l) to the solution before use. Renew the acid solution frequently.

SCRAPS REUSAGE

The scraps of this alloy can be reused. It is advisable to use a percentage of not more than 50% of scraps and sprues. The choice of the quantity of scraps to reuse depends on their grade of cleanliness, on the casting techniques applied and subsequently to the state of oxidation of the material and the grade of defection tolerated by the items to produce. It is recommended to clean very carefully the sprues from each investment remaining, which presence reduces the number of recasting the scraps can endure.

MOULD CASTING

CASTING

Place the alloy[1] into the crucible. Cover the surface of the metal with boric acid. While heating, protect the metal with a reducing flame (yellow colour) of methane gas or propane (both very suitable for protecting the metal), argon or forming gas. Heat the mould to 250 ÷ 350°C. Heat the metal at 100 ÷ 150°C more than Liquidus (as per Tab.1) and slowly pour the metal into the mould. It is advisable to prefer a hot mould and a slow pouring rather than a cold mould and fast pouring.

COOLING

Right after casting open the mould and cool the metal immediately.

CONTINUOUS CASTING

MELTING

If the alloy[1] is in solid pieces (rolled pieces or drops), continue by putting it inside the cold crucible; if the alloy is liquid then heat the crucible of the continuous casting until reaching the Liquidus temperature (Tab. 1). If the casting machine does not measure the temperature when quenching the metal, please make sure the temperature taken outside the crucible corresponds to the real one of the metal in its inside. In case this should not happen, ask for the casting temperature to the supplier of the casting machine, by giving the Solidus and Liquidus temperatures of the alloy (Tab. 1). While casting, protect the metal with a reducing flame (yellow) of methane or propane gas (both very suitable for the protection of metal), argon or forming gas.

CASTING

The die should reach an adequate temperature without overheating the metal inside the crucible, by acting on the water cooling flow or on the number of thermal exchange steps (eventually please contact the machine supplier). Use the highest speed to let the profile result defectless: this advice allows the alloy to cool faster and consequently to have a finer grain. In case there are some resting moments while pulling, the profile which will longer remain inside the die has a bigger grain structure due to a slow cooling, and cause a change in the behaviour during the next cold working.

PLASTIC DEFORMATION

COLD WORKING

After casting the alloy has to undergo cold working, starting with a 50 ÷ 60% section reduction. After an appropriate recrystallization annealing, proceed with 70 ÷ 80% cold section reductions and subsequent annealing stages, until the final size is obtained. It is important to carry out cold reductions of a minimum of 50% to avoid the tendence of the grain growth in the next annealing.

RECRYSTALIZATION ANNEALING

Place the rolled sheets or drafts in a furnace with protective atmosphere heated at a temperature of 85 ÷ 90% of Solidus value (as in Tab. 1). Leave the material in the furnace for an effective time length of 15 ÷ 20 minutes (i.e. starting when the charge has been heated to the required temperature). Cooling must be done quickly and in these three different ways: in water , oil or alcohol (these last two guarantee a very reduced presence of cooling tensions).

PICKLING

Pickling has to be carried out by using some sulphur less acid solution or sulphur compounds. Use a 10 % citric solution at 50 ÷ 60°C (122 ÷ 140°F) for a normal pickling, while a stronger pickling action can be obtained by adding small amounts of hydrogen peroxide (1 ÷ 5 ml/l) to the solution before use. Renew the acid solution frequently.

SCRAPS REUSAGE

The scraps of this alloy can be reused. It is advisable to use a percentage of not more than 50% of scraps. The

choice of the quantity of scraps to reuse depends on their grade of cleanliness, on the casting techniques applied and subsequently to the state of oxidation of the material and the grade of defection tolerated by the items to produce. It is recommended to clean very carefully the sprues from each remaining of oils and greases, which presence reduces the number of recasting the scraps can endure.

HEAT TREATMENTS

SOLUTIONIZING

This heat treatment, which has to be done on the finished pieces, allows to obtain an homogenous solid solution and to prepare the alloy to the next hardening treatment. The pieces are heated at a temperature of 700°C for almost 30 minutes and subsequently abruptly quenched in water, oil or alcohol (these last two grant a very reduced presence of cooling tensions).

HARDENING

Age hardening can be done on finished items, after having taken to conclusion all the deformation steps to produce the piece itself. This heat treatment allows to increase the piece resistance to plastic deformation, which will have, as a consequence, a higher fragility. You have to proceed by heating the pieces to 300°C, keeping them under this temperature for a time between 60 and 90 minutes in function of the hardness value to be reached (please contact Progold to ask for hardness values). Further on proceed by cooling the pieces very slowly inside the furnace (when a furnace with protected atmosphere is available). In case of problems due to oxidation, the heat treatment can be done by quenching the pieces in molten salts or oil.

NOTES

1. In order to guarantee the correct functioning of the product it is advisable to use exclusively 99.99% pure silver. It is necessary, for the finess homogeneity, to do a pre-melting (under protected atmosphere) of the alloy before using by putting inside the crucible, in a sequence, first the master alloy and then pure silver. If the shotmaker is not available it is advisable to put the alloy into the ingot mould, roll and then cut the sheet into small pieces.

2. All the data of this technical sheet refer to 925‰ alloyed silver. If the alloy is used for different finesses from those suggested, please contact Progold for further information. All data presented in this technical sheet have been obtained from samples produced and tested in Progold laboratories, with specific procedures and in compliance with the ASTM standards. Progold preserves the right to rectify the data of this sheet anytime by updating this publishment.