NI1811-03 750‰

LOW NICKEL RELEASE MASTER ALLOY FOR CASTING OF 750‰ (18 KT) WHITE GOLD

GENERAL INFORMATION

General information	
Typology	Master alloy for gold
Color	White, low nickel release
Color shade	Standard white
Production process	Casting
Grain refinement level	Very high
Deoxidation level	Low

Commercial composition (%)	
CU	69.0
NI	19.0
ZN	12.0

Melting Temperatures	
Solidus [°C]	890.0
Liquidus [°C]	920.0
Melting range [°C]	30.0

FULL CHARACTERIZATION DATA

Color coordinates

L *	a*	b*	c*	Yellow Index
87.9	2.4	11.6	12.0	24.0

Mechanical characteristics	
As cast hardness [HV 0.2]	180.0
Hardness after 70% area red. [HV 0.2]	305.0
Hardness after annealing [HV 0.2]	185.0
Single step age-hardening hardness [HV 0.2]	285.0
Tensile strength (Rm) [Mpa]	560.0
Yield strength (Rp0.2) [MPa]	400.0
Elongation at rupture (A) [%]	34.0

Physical characteristics	
Density [g/cm³]	14.6

General characteristics	
As cast grain size [µm]	110.0
Ni release, maximum value [µg/cm	0.1

Product applications

Stone-in-place casting
Casting in closed systems
Casting without stones
Age hardening

13/04/2023

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CASTING PROCESSING PARAMETERS

Pre-melting temperature

Temperature [°C] 1040

POURING TEMPERATURES	Flask from [°C]	Flask to [°C]	Metal from [°C]	Metal to [°C]
< 0.5 mm	650	700	1010	1050
0.5 - 1.2 mm	580	650	990	1010
> 1.2 mm	460	600	970	990

Trees without stones

Let the flask cool down for 10-15 minutes, then quench it in water.

Stone-in-place casting trees

Let the flask cool down for 30-45 minutes, then quench it in water.

Pickling

Dip in RADIAL solution (50 g/l conc. at 60°C) for 2 minutes, or in sulphuric acid (10% concentration at 50°C) for 5 minutes.

AGE HARDENING PROCESSING PARAMETERS

SINGLE STEP	Temperature [°C]	Time [min]	Quenching
AGE HARDENING	275.0	90.0	In air or in furnace

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Preliminary checks

A preliminary check on the process and on the kind of items to be produced has to be done, in order to identify possible critical steps. Some kinds of production processes or of finishing are incompatible with nickel release reduction: they have to be eliminated or at least limited and measured,
even when using a low nickel release alloy. In order to minimize nickel release, it is important to obtain objects as much as possible without porosity, shiny, with homogeneous microstructure and with the minimum amount of soldered joints.

Pre-mixing

It is advised to pre-mix materials, by granulation or by casting of a semi finished item (bar, wire). This in order to optimize title and homogenization of the elements in the alloy.

Material re-usage

The maximum amount of reused metal allowed is of 50% in weight. The material should be clean, deoxidized and without inclusions. It's anyway advisable to not exceed 30% re-used metal.

Process temperatures

Strictly respect process temperatures indicated in the technical chart. Preferably use casting systems that provide an easy measurement of the metal temperature.

Flask temperatures and cooling times

For casting processes do not exceed 700°C for the investment flask. Use high quality investment in order to reduce reactivity between metal and flask.
For casting without stones, quench within 20 minutes after pouring. For casting with stones quench within 45 minutes after pouring.

Item microstructure

The item before finishing, or at least the composing items before soldering should be thermally homogenized (760°C x 40' followed by quenching) or annealed (680°C x 30').
Thermal treatments must be done in furnace providing temperature control and protective atmosphere.

Surface porosity

An item without porosity generates on average a lower nickel release than a porous object.

Parts assemblies

Mechanical assemblies of items constituted by the same alloy at 750‰ title are to be preferred. Items of other compositions are allowed for assembly (mechanical or by soldering), provided that they are nickel-free.

Soldering

Soldering techniques that give a good process control are to be preferred:
a. Furnace soldering (with or without soldering pastes)
b. Laser soldering with or without external material (same composition of the alloy at 750‰ title).
Note: although not forbidden, torch soldering is not advised.

Finishing and cleaning

Only mirror-finish, shiny surfaces are allowed; surface before plating should have the minimum roughness compatible with that accepted for goldsmithry finishing, after using polishing wheels with fine polishing pastes.

Ear studs for pierced skin

Legor Group policy is that for post assemblies and parts in contact with pierced skin, nickel based alloys should be avoided ; this because skin elicitation to nickel ions can occur even for release values that are compliant to the standards.

Plating treatments

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An item with low nickel release, on which a plating layer at guaranteed thickness is deposited, allows to pass the accelerated wear test prescribed by the UNI EN 12472:2009 standard.
Below, two preferred alternative methods to obtain wear resistant plating layers are described:

a. Thick Palladium + thick Rhodium (Pd 0,5 µm + Rh 0,20 µm)
b. Thick Rhodium (Rh >0,25 µm)

Using these plating layers, Legor Group tests have shown reduction on nickel release values of approximately 5 times in comparison with the same item without plating.
Preferred plating products:
RH2M (Ready to use Rhodium plating solution for thick deposits)
PDXW or PDFE (Palladium for bath larger than 40 liters)
PD3-ECO or PD4-FE (Palladium for bath smaller than 40 liters)

Controls on final result

Nickel release depends on very wide range of factors: it is necessary to obtain statistics that are based on one's specific objects, making frequent release tests, if necessary on several models.
This approach is valid also for low nickel release compositions; when starting to use these alloys, they should be frequently tested for nickel release.
Nickel release test is as a matter of fact mandatory, because it is needed to obtain a statistical database on the items of a customer. This is the best way to monitor the correct functioning of the final product.

Final notes

The jewelry manufacturing company is the only and sole responsible in front of the end user for what concerns the compliance of UNI EN 1811:2015 standard on a jewelry item.

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