

CASTING WITH GOLD ALLOYS

Fluidity and Shrinkage Porosity

- 24k gold has a melting temperature of 1,064°C (1,947°F). Adding alloying elements typically lowers those temperatures by a few hundred degrees and also introduces a liquidus/solidus range (since not all alloys have the same melting temperature).
- The more pure and yellow an alloy (that is, the closer it is to 24k), the more fluid it will be and the better it will fill. However, 24k itself is difficult to cast due to its rapid solidification.
- 24k is also prone to *shrinkage porosity* (depressions or holes within a cast piece that occur when solidifying metal interrupts the flow of molten metal to those spaces that haven't yet fully filled or solidified).
- The addition of alloy materials can change pure gold's properties:
 - The more red or white an alloy (i.e., the more copper, silver, palladium, or nickel it contains), the more viscous the molten metal. Viscosity will vary with every alloy. For example, a molten 14k palladium-white gold is very viscous, especially as compared to a 14k red. The greater the viscosity, the more difficult it is to achieve a proper fill, especially when dealing with intricate designs.
 - You can avoid viscosity issues by working with a higher karat yellow gold—18k to 22k. (Note that high karat titanium alloys can be cast only with special equipment.)
- If higher karat yellows are not an option and you're considering an alloy with a wider temperature range (i.e., a greater liquidus–solidus interval) to improve flow, keep this in mind:
 - An alloy with a wider temperature range may be a plus for keeping the metal molten and flowing as long as possible. (The addition of zinc or silicon to low-karat alloys can help to extend that range.)
 - However, an alloy with a wider temperature range may not solidify evenly, which can contribute to shrinkage porosity.
 - Discuss alloys and temperature-range recommendations with your manufacturer or supplier. Proprietary variations and the specifics of your equipment and process have just as much if not more of an impact on the success of the casting.

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Gas Porosity

- When metal is solidifying, absorbed gases that cannot remain in solution are released. The bubbles of gas can easily be trapped in the solidifying metal, making the casting porous. This causes problems such as surface defects, finishing issues, and potential weakening of the metal.