

AMORPHOUS ALLOY

**AMLOY-ZR02**

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## ENHANCE YOUR PRODUCT PERFORMANCE.

Amorphous alloys, also known as amorphous metals or metallic glasses, are undercooled frozen metallic liquids. They show material properties which normally exclude each other, i.e. high hardness and strength with high elasticity at the same time.

Amorphous alloys enable extended product lifetime through reduced abrasion and corrosion resistance. Through the high strength of the material, they also play an important role in miniaturization. Isotropic behavior enables the simplification of specifications and product designs.

At Heraeus AMLOY, amorphous alloys are processed by injection molding and 3D printing into near-net-shape components at industrial scale.

The zirconium-based alloy **AMLOY-ZR02** is an allrounder material. Whether in additive manufacturing or injection molding, both near-net-shape process technologies enable the production of components in tight tolerances and with high surface qualities. Due to the versatile use of this alloy, large component dimensions can be produced in small to medium series in 3D printing as well as in large series with efficient automation in injection molding.

Let's work together to drive your sustainable improvements and solve previously unsolved problems!



## CHEMICAL COMPOSITION

Element	Concentration (wt%)
Zr	balance
Cu	16
Ni	12
Al	4
Ti	3

## MAJOR MATERIAL PROPERTIES

- High strength combined with excellent elasticity
- High surface quality
- High hardness and low abrasion
- High corrosion resistance
- Biocompatibility
- Isotropic properties

## INDUSTRIES & APPLICATIONS

- Aerospace
- Consumer Electronics
- Industrial
- Lifestyle
- Medical Technologies
- Robotics
- Sensors
- Tool Inserts

## PHYSICAL PROPERTIES

Properties	Typical Value
Density (g/cm <sup>3</sup> )	<b>6.65</b>
Liquidus temperature (°C)	<b>830</b>
Solidus temperature (°C)	<b>781</b>
Glass transition temperature T <sub>g</sub> (°C)	<b>403</b>
Crystallization temperature T <sub>x</sub> (°C)	<b>469</b>
Crystallization enthalpy ΔH (J/g)	<b>-47</b>
Young's modulus (GPa)	<b>89</b>
Poisson's ratio	<b>0.37</b>
Bending yield strength (GPa)	<b>2</b>
Tensile yield strength (GPa)	<b>1.7</b>
Compressive yield strength (GPa)	<b>1.6</b>
Vickers hardness (HV5)	<b>540</b>
Vickers hardness (HV5)	<b>~ 1%</b>
Thermal conductivity (W/mK)	<b>~ 2,5</b>
Thermal expansion coefficient (1/K)	<b>10 - 12 x 10<sup>-6</sup></b>
Specific heat capacity (J/kgK)	<b>250 – 350</b>

## ADDITIVE MANUFACTURING

### Ideally suited for:

- Production of small to medium quantities
- Complex geometries and large component dimensions

### Advantages:

- Use of the material properties of amorphous alloys for weight-optimized design
- Heraeus AMLOY's unique process competence through in-house material production and printing process development

## INJECTION MOLDING

### Ideally suited for:

- High quantities
- Manufacturing within tight tolerances (± 10 μm)

### Advantages:

- Automated production process (24/7 possible)
- Very good surface quality (Ra 0.05 μm)
- Low shrinkage < 0.5%
- Alternative to machining or Metal Injection Molding

