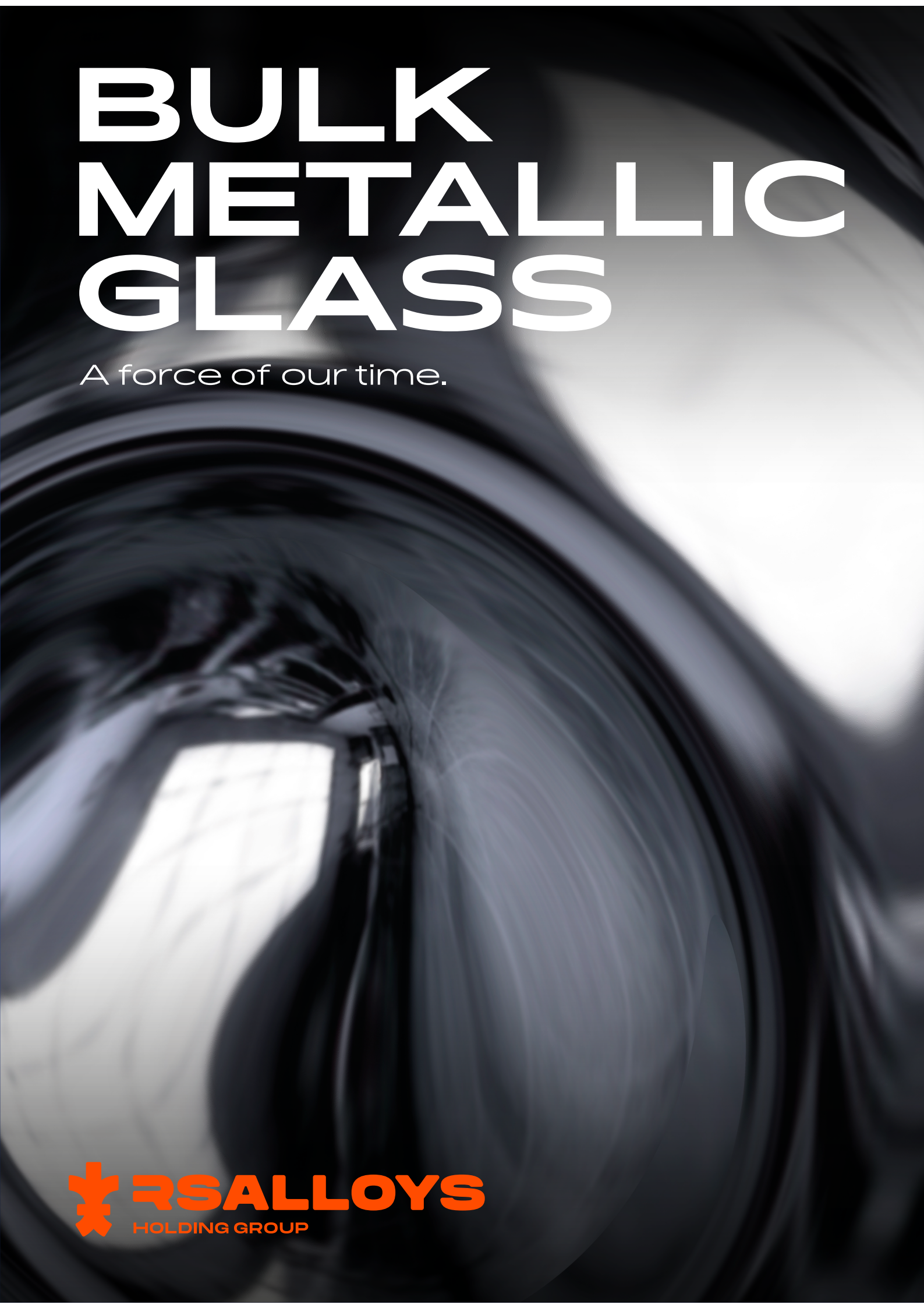
BULK METALLIC GLASS

A force of our time.



RSALLOYS
HOLDING GROUP

BULK METALLIC GLASS

A force of our time

Which materials can offer:

- The yield strenght of high end steels
- The elasticity of plastics
- Corrosion resistance like precious metals
- ISO 10993-5 compatibility
- The hardness of a tempered steel
- 6.0 in density

And which material gives you the possibility to:

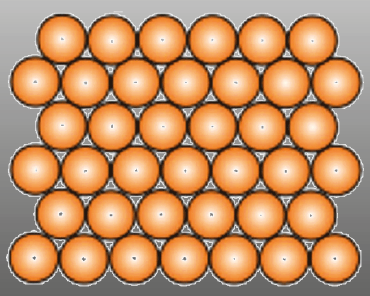
- Being injected in a mold as a finished piece, with a timing reduced by 70% compared to the MIM metallurgy (Metal Injection Molding)
- Being hot printed adapting perfectly the final shape

BMG

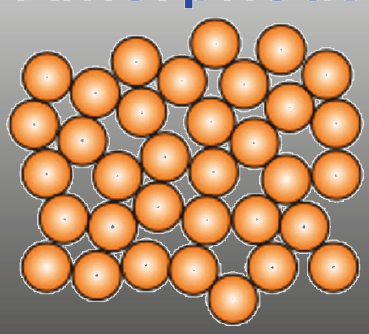
A new class of solid not-crystalline materials, including amorphous metals, commonly called "metal glasses". The **BMG** has been studied and used for a long time in the military sector and in space research. The zirconium and copper **BMG** alloys have an irregular not-crystalline structure, really hard and elastic (also titanium, iron and platinum alloys will be avaiable in the future as **BMG** components).

Today **BMG** and his unique mechanical and physical features is in everyone's reach.

Crystalline



Amorphous



BULK METALLIC GLASS

A force of our time

BMG structure has some important features.

Let's start with the structure: being amorphous allows the material to avoid dislocations, typical problem for the crystalline ones. Compared to the crystalline alloys **BMG** increases 4 times endurance, decreases stifness, giving an high level of resilience (the capacity to keep energy for plastic deformation and to release it).

A test that can show easily these features is to let fall spheres on a stainless steel surface and a metal glass surface. The spheres that will bounce on the **BMG** surface will last much longer (on our website the testing video).
The stainless one is plastically deformed and this causes a worse bounce due to lost of kitetic energy of the sphere.

Another **BMG** feature is the presence of glass transition temperature like the traditional glasses, in fact it's impossible to check the viscosity of **BMG** and model or work it between 280°C. and 320°C. degrees.

Bulk Metallic Glass

- Complex shaping "in one step"
- Elasticity/spring properties
- High Strenght (1500 MPa)
- Tight tolerances (like CNC)
- High reflectivity (polishes surfaces)
- High Hardness (HRc 53)
- Corrosion resistance
- Bio compatibilità
- CNC machining possible

Tolerance in production Injection Molding

BMG ±8 µm CNC ±8 µm MIM ±75 - 125 µm

BULK METALLIC GLASS

A force of our time

BMG - Liste

Alloys

Vit 1b	Zr	67,0 %	Cu	10,6 %	Ni	9,80 %	Ti	8,80 %	Be 3,80 %
Vit 601	Zr	62,5 %	Cu	31,0 %	Ni	3,20 %	Al	3,30 %	Be 0,10 %
Vit 105	Zr	65,7 %	Cu	15,6 %	Ni	11,8 %	Al	3,70 %	Ti 3,30 %
Vit 106a	Zr	70,1 %	Cu	13,0 %	Ni	9,90 %	Al	3,60 %	Nb 3,40 %
GMT	Ni	76,0 %	Cr	8,50 %	Nb	5,20 %	Pb	9,40 %	Si 0,30 % B 0,60
Pt850	Pt	85,24 %	Cu	7,10 %	Ni	2,36 %	P	5,30 %	
JPL	Zr	41,0 %	Cu	7,00 %	Al	3,00 %	Ti	43,0 %	Be 6,00 %

Properties

Alloys

Parameter	Units	Vit 1b	Vit 601	Vit 105	Vit 106a
Yield strenght	MPa (ksi)	1800 (261)	1795 (260)	1850 (268)	1800 (261)
Elastic modulus	GPa (10^6psi)	95 (13.8)	91 (13.3)		95 (13.8)
Fracture Toughness	MPa √m (ksi √in)	55 (50.0)	70 (63.7)	75 (68.3)	30 (27.3)
Density	g/cc (lbs./in^3)	6.0 (0.217)	6.9 (0.249)	6.6 (0.238)	6.7 (242)
Glass transition (Tg)	C (F)	352 (665)	420 (788)	403 (757)	395 (743)
Crystallization (Tx)	C (F)	466 (871)	495 (923)	469 (876)	499 (930)
Mel temp (Tm)	C (F)	644 (1191)	753 (1387)	805 (1481)	837 (1539)

RS Acciai Srl
Via dello Stagnaccio Basso 46/a
50018 Scandicci (FI)
Tel +39 055 7318818 ra
Fax +39 055 7311083

RS Acciai Srl
Centro Servizi
Viuzzo di Porto, 61
50018 Scandicci (FI)
mail : rsalloys@rsalloys.eu

RSALLOYS HOLDING GROUP