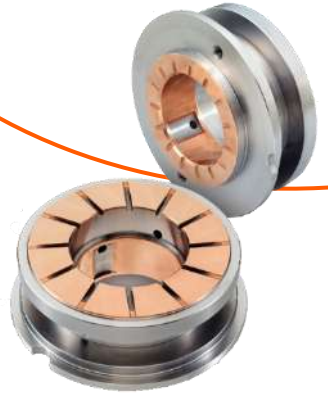
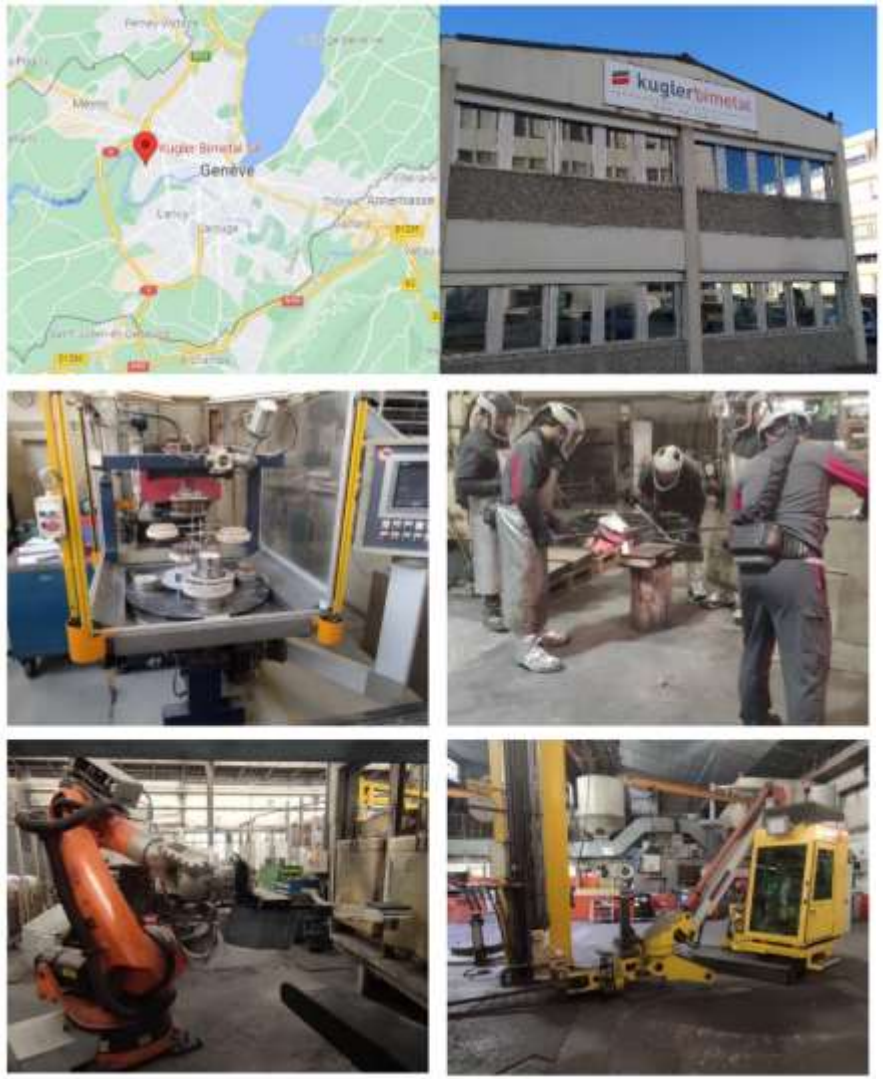
kuglerbimetal

The sustainable solution to your tribological problems



05/02/2025

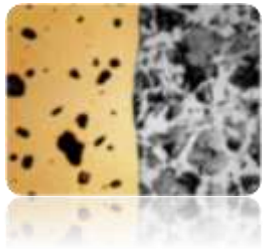
Introduction



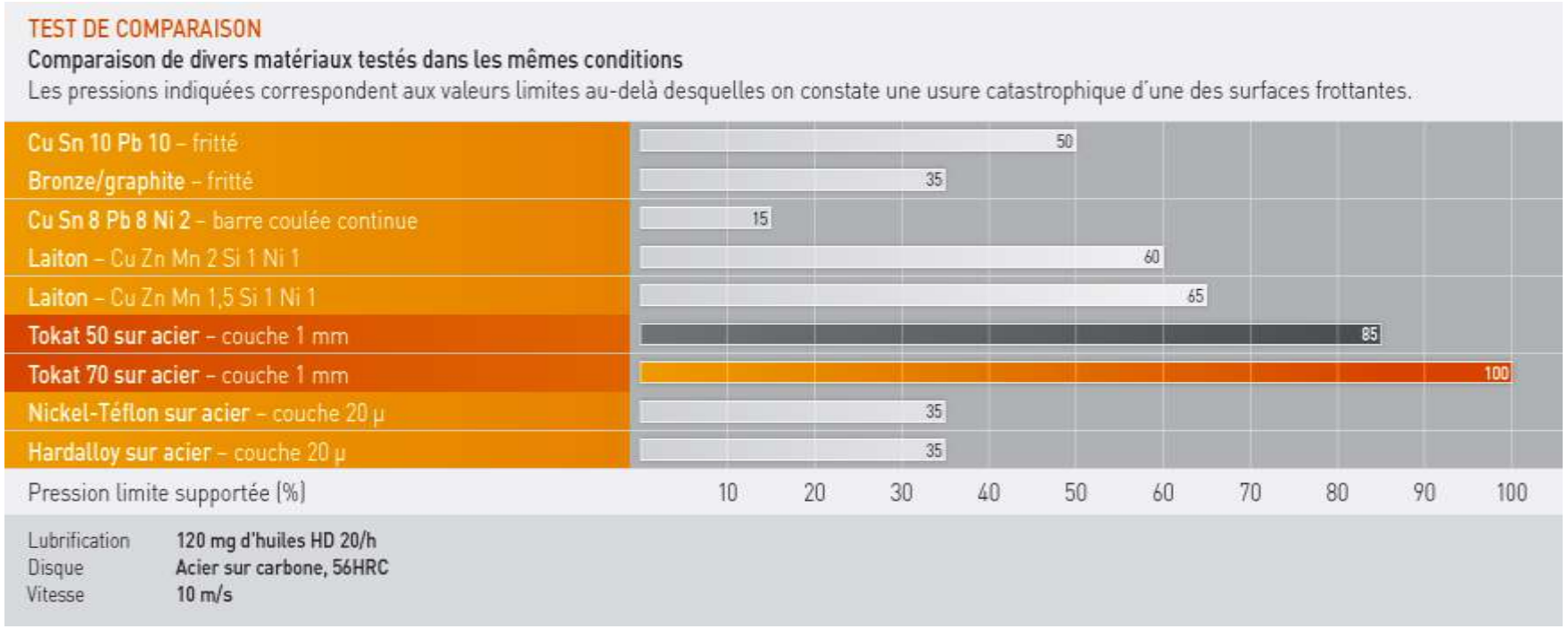
- Based in Geneva, Switzerland since 1854. Same VAT number since 1924.
- Around 60 employees on a production site of 6.000 m²
- A Fully integrated company: foundry, laser cladding, CNC machines, quality control
- Exporting 80 % of our production
- ISO 9001, 9100, 14001
- Production of bimetal components up to 800 mm in diameter (32 “).

Follow us!

Our specific Bimetal technology delivers unique properties



The perfect metalurgical bonding achieved between Tokat alloys and steel enables to withstand maximum pressure, high cavitation resistance and capacity to handle alternate stress under high temperature.



kuglerbimetal

We bring our solutions to different markets

Marine transportation

Wind energy

Hydraulic

Heavy duty systems

Military

Railway

Mining

Aviation

The technology :

Perfect metallurgical bonding of a thin bronze layer on steel in an **inseparable** manner, attending to functional design & performance

A strategic choice :

- Increases reliability, efficiency and lifetime
- Contributes to the outstanding performance of your products
- Reducing total life cycle costs by reducing wear & maintenance
- Increases power density = more power in less space & mass
- Is a powerful lever for your aftermarket exclusivity

Some of our customers :

EDF, Parker Aerospace, ANDRITZ, RENK, Leistritz, SANDVIK, itema, ABB, SULZER, LIEBHERR, SAFRAN, Epiroc, Collins Aerospace, BOSCH, EATON Powering Business Worldwide, VOITH, UAS, GARAVENTA

Some of our industries :




Collaborative Innovation at Heart

Innosuisse - Swiss Innovation Agency

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

- HSLC with blue laser
- High deposition rate of white metal
- New High Performance Bronze Alloy

Federal Ministry
for Economic Affairs
and Climate Action

- DED-LB of polymers
- Lightweight bearings out of Aluminium

LOEWE
Exzellente Forschung für Hessens Zukunft

HESSEN
Hessisches Ministerium
für Wissenschaft und Kunst

- Robot-based process chain

eureka
eurostars

Co-funded by
the European Union

- Lightweight bearings out of Titanium

ETH zürich

EPFL

hepia

HEIG VD

FAU
Friedrich-Alexander-Universität
Erlangen-Nürnberg

Fachhochschule Kiel
University of Applied Sciences

PTW
TU DARMSTADT
Institut für Produktionsmanagement, Technologie und Werkzeugmaschinen

Fraunhofer
IWS

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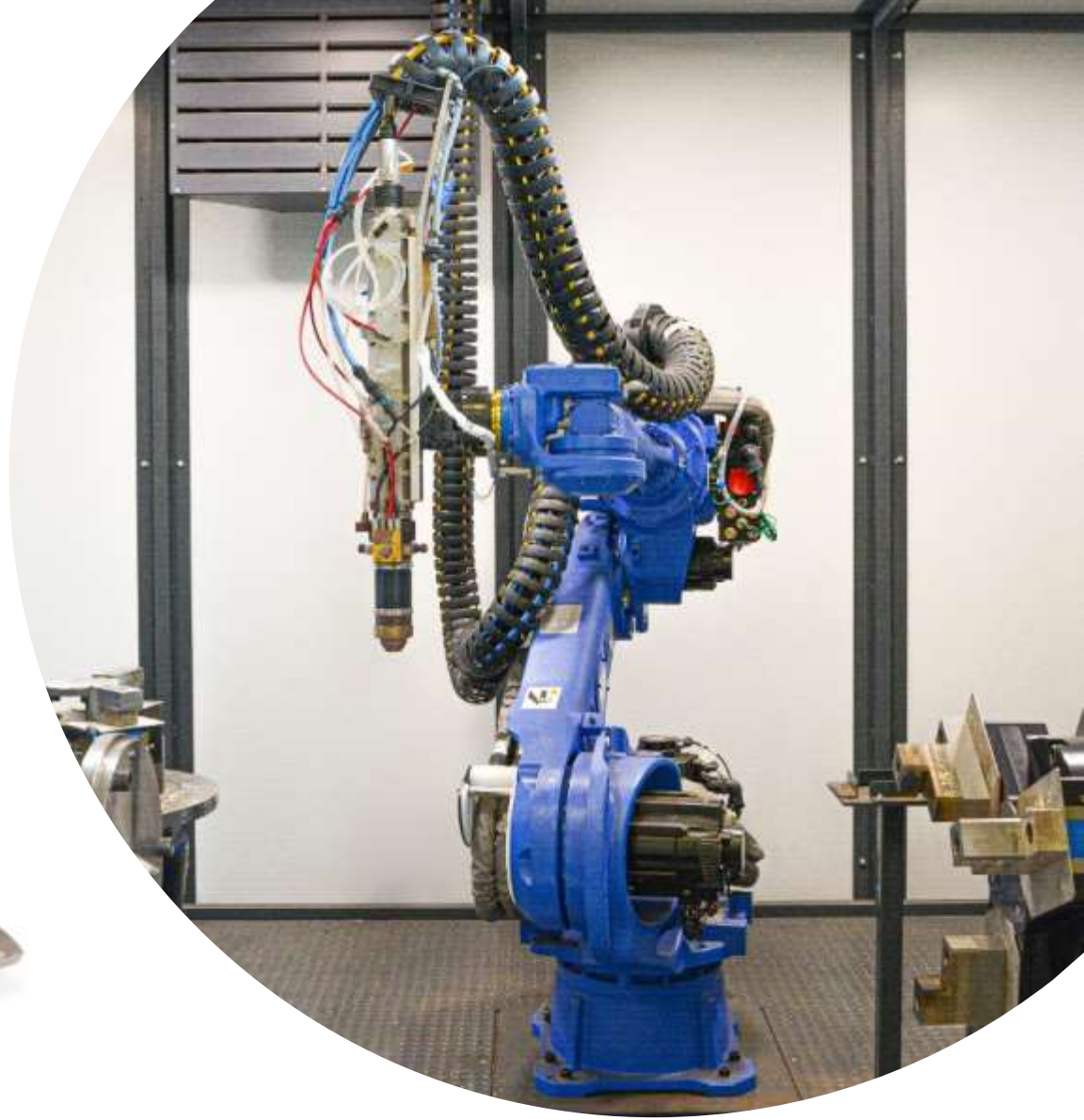
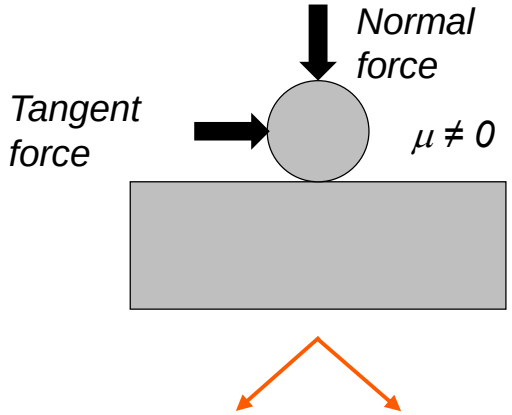
Product examples

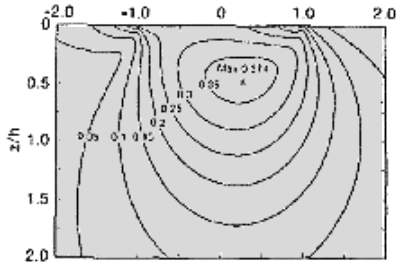


The theory behind it

- Friction
- Tangent force
- Two materials
- Nomaliszed ratios

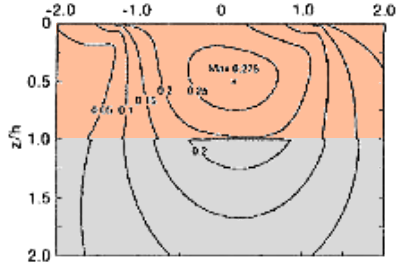


Reference
Single material



τ_0 = 100%

Soft surface material



τ_H = 74%

Tokat® bronze : an interface close to the surface will reduce and transfer the « hot-spot » into the steel substrate thanks to it capacity to handle the shear stress.

In Practice

- Cylindrical bearing
- Load: 10.000 kN (250 MPa!)
- Bearing envelope:
  - Shaft 200 mm diameter
  - Housing width 200 mm
- Harsh environment: abrasive particles, impact load
- Grease lubricated

- Roller bearing – double row
- Not good with abrasive particles
- Not good with impact

- 100% Bronze
- Hard bronze alloy, to reach the required compressive strength
- Expensive shaft (heat treat to 50 – 60 HRC)
- Not good with abrasion nor in boundary lubrication

- Kugler Tokat Bimetal
- Combine a soft, lubritious bronze layer with a strong steel backing
- Shaft hardness – 30 – 40 HRC
- Excellent wear life, excellent emergency running conditions

Kugler's Tokat® - Microstructures & their properties

		TOKAT 30	TOKAT 50	TOKAT 70	TOKAT 110	TOKAT 225	TOKAT 300	TOKAT 325
		(Pb) 26 - 31 (Sn) 0.5 – 1.0 (Ni) 1.0 – 1.5 (Cu) to 100%	(Pb) 20 - 23 (Sn) 4.0 - 5.5 (Ni) 1.5 - 2.3 (Cu) to 100%	(Pb) 13.5 - 16.5 (Sn) 6.0 - 8.0 (Ni) 1.0 - 2.3 (Cu) to 100%	(Pb) 8.0 – 11.0 (Sn) 9.0 – 11.0 (Ni) max 2.0 (Cu) to 100%	(Pb) max 1.0 (Sn) 11.0 - 12.5 (Ni) 1.5 – 2.5 (Cu) to 100%	(Bi) 2.0 – 6.0 (Sn) 9.0 – 11.0 (Ni) max 2.0 (Cu) to 100%	(Sn) 11.0 - 12.5 (Ni) 1.5 – 2.5 (Cu) to 100%
Solid bronze Tokat / Steel	HB	30 50	50 70	70 90	90 120	120 150	80 120	120 150
Tensile strength	Rm MPa	64 - 80	160 - 205	220 - 260	220 - 270	280 - 320	320 - 350	280 - 320
Elastic limits	Rp 0.2 MPa	39 - 48	90 - 120	110 - 150	110 - 165	160 - 200	180 - 220	160 - 200
Elastic limits under compression	T 0.2 MPa	- 60	90 - 115	130 - 150	120 - 150	150 - 200	180 - 220	150 - 200
Chalmers resistance	MPa	- 70	140	235	250	280	-	280
Moduls of elasticity	E MPa	- 60'000	- 68'000	- 72'000	- 75'000	- 90'000	- 105'000	- 90'000
Coefficient of linear expansion	-	20.5	18.0	18.5	18.5	17.5	18	17.5
Thermal conductivity	% of Cu	- 9	- 10	- 10	- 12	- 20	- 37	- 20
Electrical resistance	P Ω mm²/m	- 0.105	- 0.110	- 0.118	- 0.125	- 0.155	-	- 0.155
Cross reference with the closest standart alloys	DIN	-	G-Cu Pb 20 Sn	G-Cu Pb 15 Sn	G-Cu Pb 10 Sn	G-Cu Sn 12 Ni	Cu Sn 9B i3	G-Cu Sn 12 Ni
	VSM	-	G-Cu Pb 20 Sn 5	G-Cu Pb 15 Sn 8	G-Cu Pb 10 Sn 10	G-Cu Sn 12 Ni	-	G-Cu Sn 12 Ni
	SAE	-	SAE 794	SAE 67	SAE 64	SAE 65	-	SAE 65
	AFNOR	-	A 53 751	A 53 751	A 53 751	A 53 707	-	A 53 707
		TOKAT 30	TOKAT 50	TOKAT 70	TOKAT 110	TOKAT 225	TOKAT 300	TOKAT 325

Kugler’s alternative solution

- Less material consumption
- Lower machining time
- Lower energy consumption
- Repairable!

ECO FRIENDLY 100%

YouTube

kuglerbimetal

Performance Comparison

Full bronze vs Tokat Bimetal



	Existing Solution 1 (UNS C95520 HT)	Existing Solution 2 (UNS C86300)	Kugler's Bimetal Tokat 325 + 42CrMo4 steel	Conclusion
Yield strength	620 MPa	425 MPa	930 MPa	50% more load capacity
Relative Wear life	1.2	1	1.7	Kugler Bimetal lasts 40% more
Friction	0.2	0.18	0.15	-25% power consumption
Mating material hardness	60 HRC	50 HRC	30-40 HRC	No need for expensive heat treatment of the pins
Repairable?	No	No	Yes	Parts can be remachined and a new bronze layer deposited
Savings	+	++	+++	Total cost of ownership is lower
Environmentally friendly	+	+	++	Repairable solution can save hundreds of pounds of expensive material

Technical Recommendations

Counterface / Assemblying

Surface finish:

- Ra 0.1 – 0.2 µm (~8 µin)
- Chrome plating only recommend if a fine turning/grinding is performed after plating

Hardness:

- 30 – 40 HRC, for Tokat 325

Lubrication:

- Keep the existing lubrication intervals and grease being used.

Thank you for your attention !