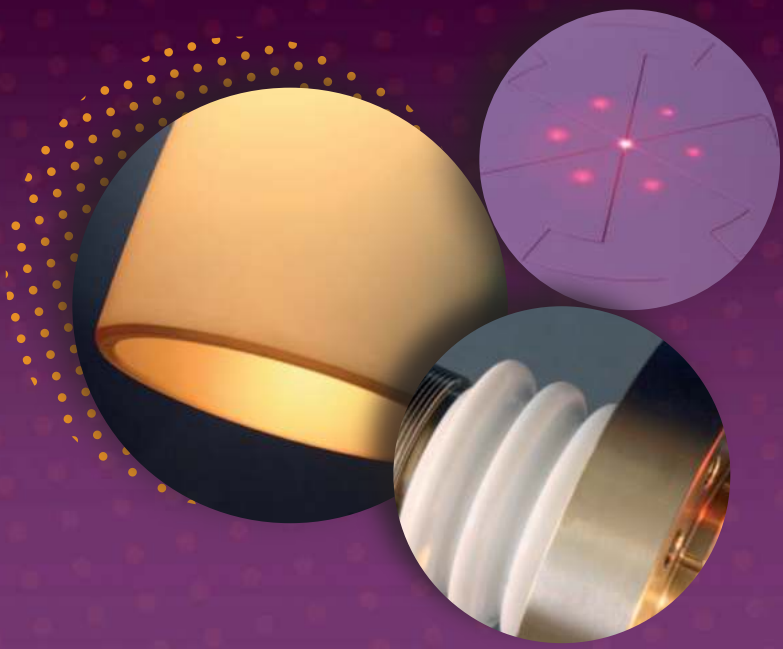
SOLCERA
Advanced Materials



CERAMIC SOLUTIONS GLASS-TO-METAL AND CERAMIC-TO-METAL ASSEMBLIES

SOLCERA
Advanced Materials

With over 200 years of history, **SOLCERA** has been supporting the development of advanced ceramics in France.

Owned during a long period of time by major industrial groups, it is now an **independent company** with its 2 facilities in Evreux and Moissy-Cramayel.

Our strategy relies on an extensive know-how in designing and manufacturing **technical ceramics**, as well as **glass-to-metal** and **ceramic-to-metal assemblies**. Our products and solutions are based on advanced technologies, making use of a wide range of oxide and non-oxide ceramics developed in-house.

Our facilities are both **vertically integrated**, giving us complete control over the entire manufacturing process: powder preparation, shaping, heat treatment, machining, finishing, assembling and inspection. The production of prototypes as well as small and medium-size series is carried out by our specialists, whose broad expertise and know-how have built our company's reputation for excellence.

Our process and materials competencies, combined with the exceptional characteristics of high-performance ceramics, give us a strong presence across a number of **cutting-edge industries** such as aeronautics, aerospace, agriculture, national defense, nuclear power, luxury goods and research.

Remaining attentive to the needs of our customers and focusing on co-development, we design and manufacture products that meet the **most demanding environments**: corrosive or abrasive applications, high temperature, electrical insulation, high pressure, cryogenics, vacuum and ultra-vacuum resistance.

We provide **technical support** right from the system design stage and we are proactive in finding solutions for developing prototypes able to validate working hypotheses.

Our **long-term partnerships** with major public and private sector players, the internal transmission of knowledge and our **R&D** team dedicated to **innovation** are all key elements that ensure the growth of our company and the longevity of its know-how.






ULTRA-VACUUM CERAMICS BRAZING
INNOVATION HIGH-TECH MACHINING
CRYOGENICS TOUGHNESS
INSULATION

Ceramic Solutions

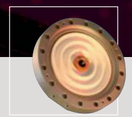
Our vertically integrated Evreux facility, the company's headquarters, houses all the industrial and human resources necessary to design and manufacture high-performance ceramic components as well as an R&D department focused on the development of innovative materials and processes.

Our products are used in very demanding applications such as **infrared and electromagnetic windows**, **armor plates**, **aerospace electrical insulators**, **oxygen sensors** for metal industry, **special crucibles** for laboratories, **ceramic nozzles** for water treatment facilities and upscale **watch industry components**.

Assembly Solutions

Our Moissy-Cramayel facility, formerly Vermetal, uses its long-standing expertise to provide solutions tailored to our customers' specific needs in the field of ceramic-to-metal assemblies, glass-to-metal sealing, high-precision ceramic machining and flash lamps.

Our products are used in high-tech equipment such as electron guns and **X-ray sources** for the medical sector, **vacuum processing machines**, **industrial** and **aeronautical sensors**, **particle accelerators**, **high-power lasers**, **satellites** or **atomic clocks**. Many components are also used for national defense and nuclear applications.



Research and Development Design

R&D

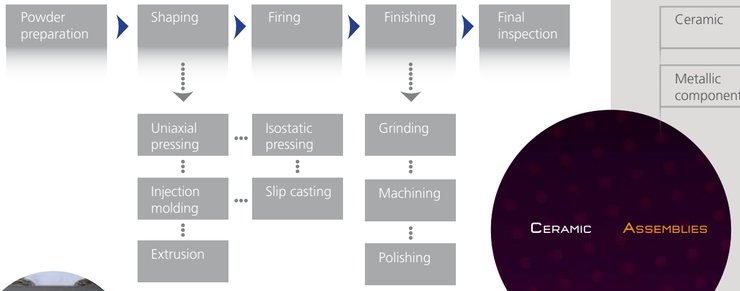
- Materials
- Processes

Design, Development

- Design of technical solutions
- Co-development
- Prototyping and validation

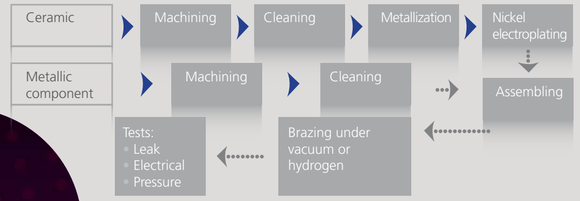
Advanced technologies serving the needs of our customers

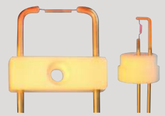
Ceramic manufacturing process



Ceramic-to-metal brazing

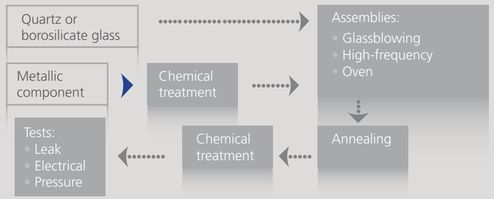
Brazing is the process of fitting two parts together permanently by melting a filler metal between them. This technology ensures a leak-proof seal and vacuum resistance, and is of particular interest compared to other joining methods such as welding, gluing or screwing.

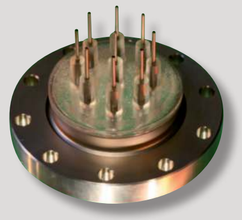




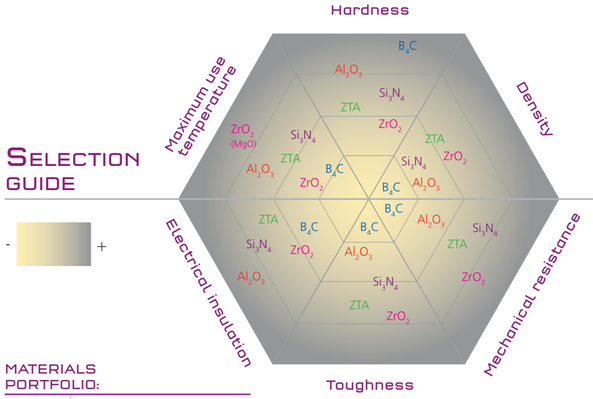
Glass-to-metal sealing

Assembly process resulting from glass fusion onto metal at high temperature.
The glass-to-metal technology has the advantage of allowing for complex shaping.





Selection guide



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Materials portfolio:

Material	Benefits in application		
Al_2O_3	Hardness, low cost, metallizable	SiO_2	Electromagnetic transparency
B_4C	Extreme hardness, low density	$MgAl_2O_4$	Impact and corrosion resistance, transparency
HfO_2	Extreme temperature refractory	ZnS	Infrared transparency up to 12 µm
MgF_2	Infrared transparency up to 8 µm	ZrO_2 (Y_2O_3)	Fracture toughness, bending strength, colors
MgO	Extreme temperature refractory	ZrO_2 (MgO)	Thermal insulation, mechanical resistance
Si_3N_4	Mechanical and wear resistance	ZTA	Fracture toughness, hardness

Our materials

		Alumina				Zirconia		Nitrides	Boron carbide	Transparent materials		
Properties	Unités	AF950	TS150	AF980	AF997	ZFME	ZFYT	Kersit	HP B4C	MgF2	Spinelle	ZnS
Composition (mass %)		95 % Al_2O_3	97,6 % Al_2O_3	98 % Al_2O_3	99,7 % Al_2O_3	97 % ZrO_2	95 % ZrO_2	91 % Si_3N_4	95 % B_4C	100 % MgF_2	100% $MgAl_2O_4$	100% ZnS
Density	g/cm³	3,60	3,75	3,89	3,89	5,70	6,00	3,20	2,50	3,18	3,58	4,09
Hardness - Vickers	GPa	15	15	15	18	11	13	16	28	6	13	2,9
3-point bending strength / biaxial (b)	MPa	250	280	280	310	600	900	900	425 (4 pts)	130	390	95 (b)
Elastic modulus	GPa	250	330	330	310	210	220	315	440	140	270	90
Fracture toughness	MPa (m)$^{1/2}$	3,8	3,8	4	4,8	8,5	10	7,5	3-4		2,2	0,6
Coefficient of thermal expansion	x10^{-6}	8,5	8,5	8	8,5	9,5	10	3,1	5	10	7,8	7,3
Thermal conductivity (20° to 100 °C)	W/mK	22	30		29	1,9	3	19	--		15,3	12
Thermal shocks resistance		++	++	+	+	+++	++	+++	+	++	+	+
Maximum use temperature	°C	1500	1700	1500	1700	2000	1000	1400	--	600	1500	200
Electrical resistivity	Ohm.cm	>10^{12}	>10^{14}	>10^{14}	>10^{12}	>10^{7}	>10^{7}	>10^{10}	>10^{7}	>10^{7}		

This chart is intended to illustrate typical properties of a selection of SOLCERA.
Property values vary with method of manufacture, size and shape of part and may not be used as absolute values.

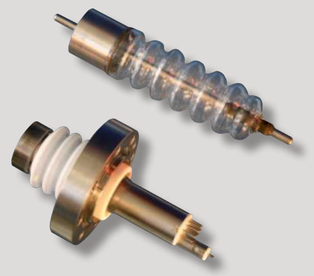
Ceramic-to-metal or glass-to-metal assembly?

Technical specifications	Ceramic	Glass
High-pressure applications	good	excellent
Metallic materials compatibility	wide	narrow
Lifetime	excellent	excellent
Helium leak-proof	10^{-12} mbar.l/s/cm²	10^{-12} mbar.l/s/cm²
Insulation and electrical performances	excellent	good
Temperature resistance	excellent	good
Geometric accuracy	excellent	good
Corrosion resistance	excellent	good
Assembly mechanical strength	good	excellent

Solcera has a strong know-how in both assembly technologies.
Our experts will guide you in chosing the solution that better meets your needs.

Examples of products:

- Ultra-vacuum and high-voltage feedthroughs (ceramic-to-metal or glass-to-metal assemblies)
- Multi-pin and coaxial connectors (ceramic-to-metal or glass-to-metal assemblies)
- Machined ceramics
- Windows
- Gauges
- Filaments for leak detectors
- RX tubes
- Flash lamps



SOLCERA provides quality products and services while operating in a manner that responsibly protects the environment and safety of its customers, employees, suppliers and service providers:

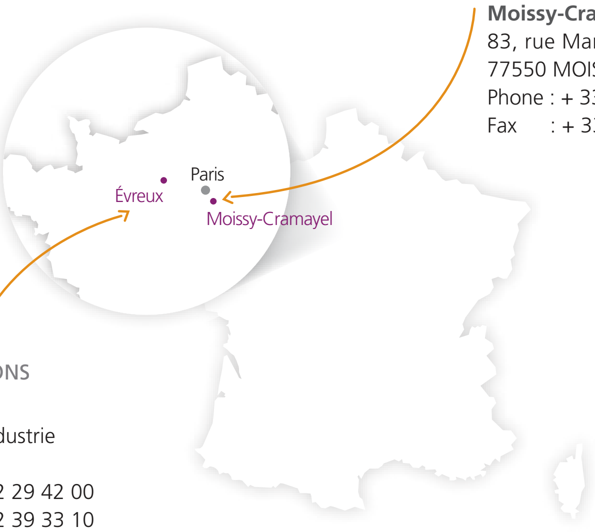
- Quality assurance
- Respect for the environment
- Priority on health and safety

You have a development project, wish to establish a partnership, are looking for technical expertise:

FRANCE

With the support of

RÉGION NORMANDIE



ASSEMBLY SOLUTIONS

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CERAMIC SOLUTIONS

Evreux facility:
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27000 EVREUX
Phone : + 33 (0)2 32 29 42 00
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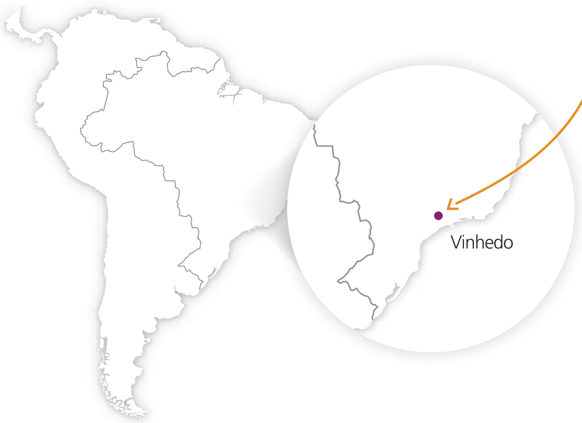
BRAZIL



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