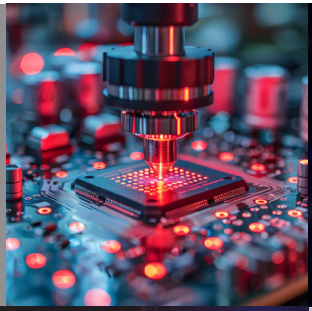
POLYGON PHYSICS

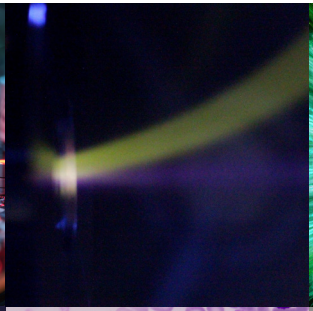
CAMECA
SCIENCE & METROLOGY SOLUTIONS

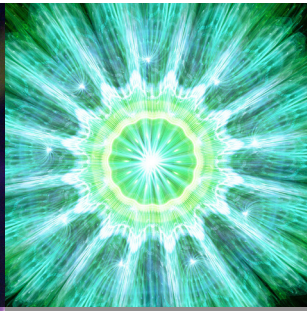
AMETEK

# World Leader in Electron Cyclotron Resonance Sources

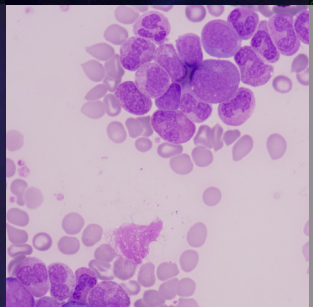
www.cameca.com

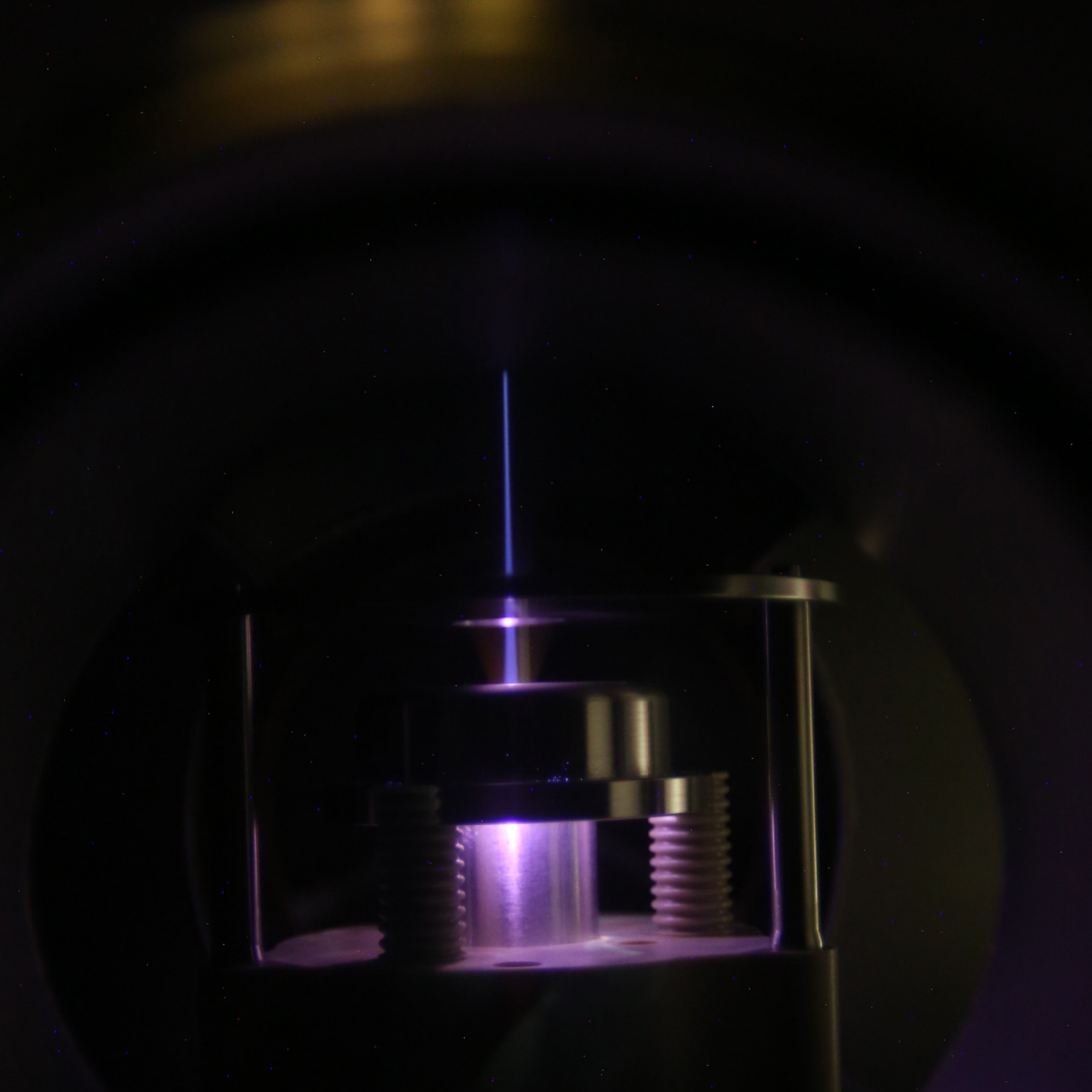












# Compact, No-Cooling and Long-Lasting ECR-Sources

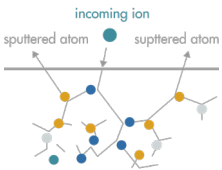
At the core of all CAMECA electron and ion sources products is a patented microwave discharge system that can ignite and maintain an electron cyclotron resonance (ECR) plasma at very low power consumption (~ 1W). This means we can use simple low power transmitters similar to those used in cell phones. The ECR concept, combined with the ultracompact design of the cavities, enables the use arrays of individually controlled cavities in order to create a plasma sheet of any dimension. By adding extraction optics we can transform these plasmas into beams of ions or electrons of any shape and size.

All based on this unique mono-cavity ECR technology, the CAMECA TES ion and electron sources are the smallest microwave plasma sources on the market.

# A Wide Range of Applications

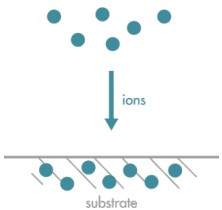
## Ion Beam Sputter Deposition

Ion Beam Sputter Deposition (IBSD) is a physical vapor deposition (PVD) technique that consists in adding a thin film to the substrate surface to improve its material properties. Traditional challenges of IBSD such as high maintenance, high level of complexity, and difficulty to scale up are overcome thanks to CAMECA's unique ECR technology.



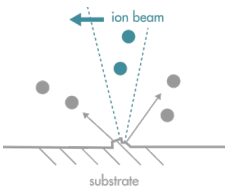

## Ion Implantation

Ion implantation consists in adding ions to the interior of a substrate to change its elemental composition and improve material properties. It is commonly used for steel toughening, medical implants, and semiconductor device fabrication.



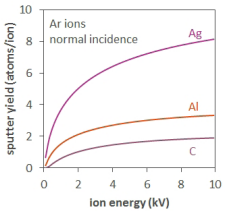

## Ion Beam Figuring

Ion Beam Figuring consists in locally sputtering atoms in order to create a surface with a specified profile. It is a used for precise figuring and finishing of optical elements, such as spheres, aspheres and free forms on lenses and mirrors. CAMECA's ECR technology and ion optics system offer the highest flexibility in beam size, shape, and energy.



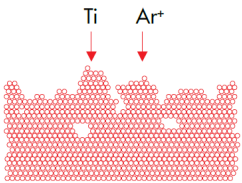
## Etching, Cleaning, Polishing and Milling

Sputter cleaning, ion polishing, milling and cutting are all based on Ion Beam Sputtering. They are used as a surface preparation step before depositing a thin film, before high resolution imaging or surface analysis as well as for nanostructuring a surface. CAMECA's ECR technology delivers stable and reliable beams, eliminating the maintenance required with filament-based technologies.



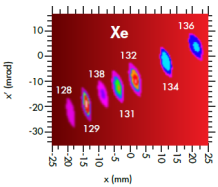

## Ion Assisted Deposition

Ion Assisted Deposition consists in modifing the properties of a growing thin film by directing an ion beam at it. It can also be used to purposely introduce compressive stress in the film to improve its mechanical properties. The stability and reliability of CAMECA ECR technology is attractive for ion assistance applications.




## Nuclear and Atomic Physics

CAMECA high energy single cavity sources are used in various setups for nuclear and atomic physics, ranging from particle injection into electrostatic storage rings or charge boosters, to power testing of future neutron detectors.



TES

# The Smallest Microwave Plasma Sources on the Market

**Highest uptime & reliability**

All TES ion and electron sources based on our patented mono-cavity ECR technology. They operate at very low power (below 5W), eliminating cooling needs and issues. TES sources are extremely stable and have very long lifetime, with some models running over 15,000 hours continuously without human intervention or performance loss. TES operates across a wide pressure range, making it reliable for applications from ultra-high to primary vacuum, even with external gas supply or non-optimized pumping environments.

**Ease of use & automation**

A single button press on the control software starts the source, and nominal stable performance is achieved less than one minute after ignition. Source start-up can also be planned automatically. TES is provided with a graphical interface to control the source, and with an API library allowing for easy integration of the TES source code inside your machine control software. The pulsed beam option ensures precise control of the beam over time.

**Versatility**

All TES sources can be configured to generate ions or electrons. A bipolar mode option is available, allowing them to generate alternatively positive and negative ions, or electrons. The TES product line can thus address a wide range of applications in mass spectrometry, ion implantation, ion beam figuring, nuclear and atomic physics, and more.

# TES-GO

## Mobile ECR source, up to 5kV beam



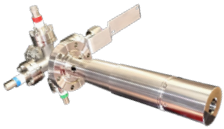
TES-GO is a mobile source under vacuum which can sustain beam energies up to 5kV.

Flexible cables connect TES-GO to a CF40 flange installed on the vacuum chamber. The source design includes a mounting bracket that can be customized on request. The source is meant to be attached on your movement stages (not included) allowing to insulate wide or precisely defined areas.

TES-GO is available in three versions:
The **Ions High Brightness version** often comes along with an Einzel lens and is ideal for sputtering, milling, etching & figuring applications.
The **Ions Broad Beam version** is ideal for cleaning and polishing applications.
The **Electrons version** can be used as a neutralizer to generate a low energy electron beam for charge compensation or plasma chemistry studies up to 5kV.
Adding the bipolar option allows you to alternatively generate ions and electrons, and thus to address various applications with a single source.

# TES-40

## Compact ECR source on CF40 flange, up to 5kV beam



TES-40 is based on a TES cavity mounted on a ConFlat CF40 flange and can sustain beam energies up to 5kV.

TES-40 is available in three versions:
The **Ions High Brightness version** often comes along an Einzel lens and is ideal for sputtering, milling, etching and figuring applications.
The **Ions Broad Beam version** is ideal for cleaning and polishing applications.

The **Electrons version** can be used as a neutralizer to generate a low energy electron beam for charge compensation or plasma chemistry studies up to 5kV.
Adding the bipolar option allows you to alternatively generate ions and electrons, and thus to address various applications with a single source.

# TES-63

## Compact ECR source on CF63 flange, up to 15kV beam



TES-63 is based on a TES cavity mounted on a ConFlat CF63 flange and can sustain beam energies up to 15kV.

TES-63 is available in three versions:
The **Ions Broad Beam version** can address various applications such as sputtering, milling, cleaning, and polishing.
The **Ions High Brightness version** can come single-handed or include an Einzel lens to increase brightness and modulate the beam shape. It is ideal for mass spectrometry, milling, etching, and beam line applications.

The **Electrons version** can be used for various applications requiring electron beams up to 15kV (electrons chemistry, cleaning, defects correction).
TES-63 is the only TES model offering a scanner option, which allows you to precisely deflect the beam and browse over a given surface. The beam trajectory can follow a raster scan or an arbitrary curve thanks to a waveform generator.
Adding the bipolar option allows you to alternatively generate ions and electrons, and thus to address various applications with a single source.

# TES-100

## Compact ECR source on CF100 flange, up to 30kV beam



TES-100 is based on a TES cavity mounted on a ConFlat CF100 flange and can sustain beam energies up to 30kV.

We offer two versions of TES-100:
The **Ions High Brightness version** can include an Einzel lens to further increase brightness and modulate the beam shape. It is ideal for mass spectrometry, milling, etching, beam line, and ion implantation applications.

The **Electrons version** can be used for various applications requiring high energy electron beams up to 30kV (electrons chemistry, evaporation).
Adding the bipolar option allows you to alternatively generate ions and electrons, and thus to address various applications with a single source.

# HEXAR

## Broad Beam ECR source for surface processing in vacuum



**HEXAR** is composed of an hexagonal arrangement of mini microwave cavities that each operate an ECR discharge at ultra low RF power (a few Watts per cavity at 2.45 GHz).

This approach is successful because of the reliability and stability of the ECR plasma, and the fact that the source has no consumables.

In addition, it enables control over the current density profile of the beam, in a way inaccessible to standard broad beam sources. The current density profile can be varied both in shape and in amplitude through the combination of gas flow, optics, and applied RF power.

**HEXAR** is a scalable concept that enables the fabrication of sources adapted to the treatment of a wide range of surface sizes. Typical applications are ion beam etching, surface cleaning, ion assisted deposition and ion beam sputter deposition.

# Choose the TES Model that Best Suits Your Needs

| PRODUCT vs PROCESSES | Neutralization | Electron chemistry | High power electron beam | Etching | Sputtering | Surface activation | Beam line | Accelerator | Mass spectrometry | Figuring | Surface modification |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **TES-GO** | | | | | | | | | | | |
| TES-GO-electrons | x | x | | | | | | | | | x |
| TES-GO-ions broad beam | | | | x | x | x | | | | x | x |
| TES-GO-ions high brightness | | | | x | x | x | x | | | x | |
| **TES-40** | | | | | | | | | | | |
| TES-40-electrons | x | x | | | | | | | | | x |
| TES-40-ions broad beam | | | | x | x | x | | | | x | x |
| TES-40-ions high brightness | | | | x | x | x | x | | | x | |
| **TES-63** | | | | | | | | | | | |
| TES-63-electrons | | x | x | | | | | | | | x |
| TES-63-ions | | | | | x | | x | x | x | | x |
| TES-63-ions high brightness | | | | x | | | x | x | x | | |
| TES-63-ions scanner | | | | x | | | | | | x | x |
| **TES-100** | | | | | | | | | | | |
| TES-100-electrons | | x | x | | | | | | | | x |
| TES-100-ions | | | | | x | | x | x | x | | x |
| TES-100-ions high brightness | | | | x | | | x | x | x | | |

# Comparative Characteristics

| | TES-GO | TES-40 | TES-63 | TES-100 |
|---|---|---|---|---|
| **Discharge** | ECR filament free | | | |
| **Gas** | $H_2$, He, $N_2$, $O_2$, noble gas, molecular gas | | | |
| **Microwave power typ. (2.45 GHz)** | 0.5 to 5 W | | | |
| **Maximum Energy** | 5 kV | 5 kV | 15 kV | 30 kV |
| **Maximum power beam** | 200W | 200W | 1 kW | 3 kW |
| **Diameter in vacuum** | 36,5 mm | 36,5 mm | 62 mm | 96 mm |
| **Flange type** | Mobile under vacuum. CF40 for HV, HF & gas feedthroughs | CF40 | CF63 | CF100 |
| **Cooling** | None | | | |
| **Cable length** | 2 m (option: 5m) | | | |
| **Electronics** | Two 19" rack mount (4U) | Two 19" rack mount (4U) | Two 19" rack mount (4U or 6U) | Two 19" rack mount (6U) |
| **Hardware control** | Microcontroller | | | |
| **Communication protocol** | Ethernet UDP, RS232 | | | |
| **User interface** | Labview executable (ethernet UDP only) | | | |
| **Source gas control** | Mass-flow controller (or micro-leak valve) | | | |

# Worldwide Service & Customer Support

To serve customers at the level required by demanding environments, CAMECA has developed a worldwide customer support organization. Our service offer is part of an innovative and comprehensive program - AMECARE Performance Services - designed to ensure peak performance and extend the life of your analytical instrumentation.

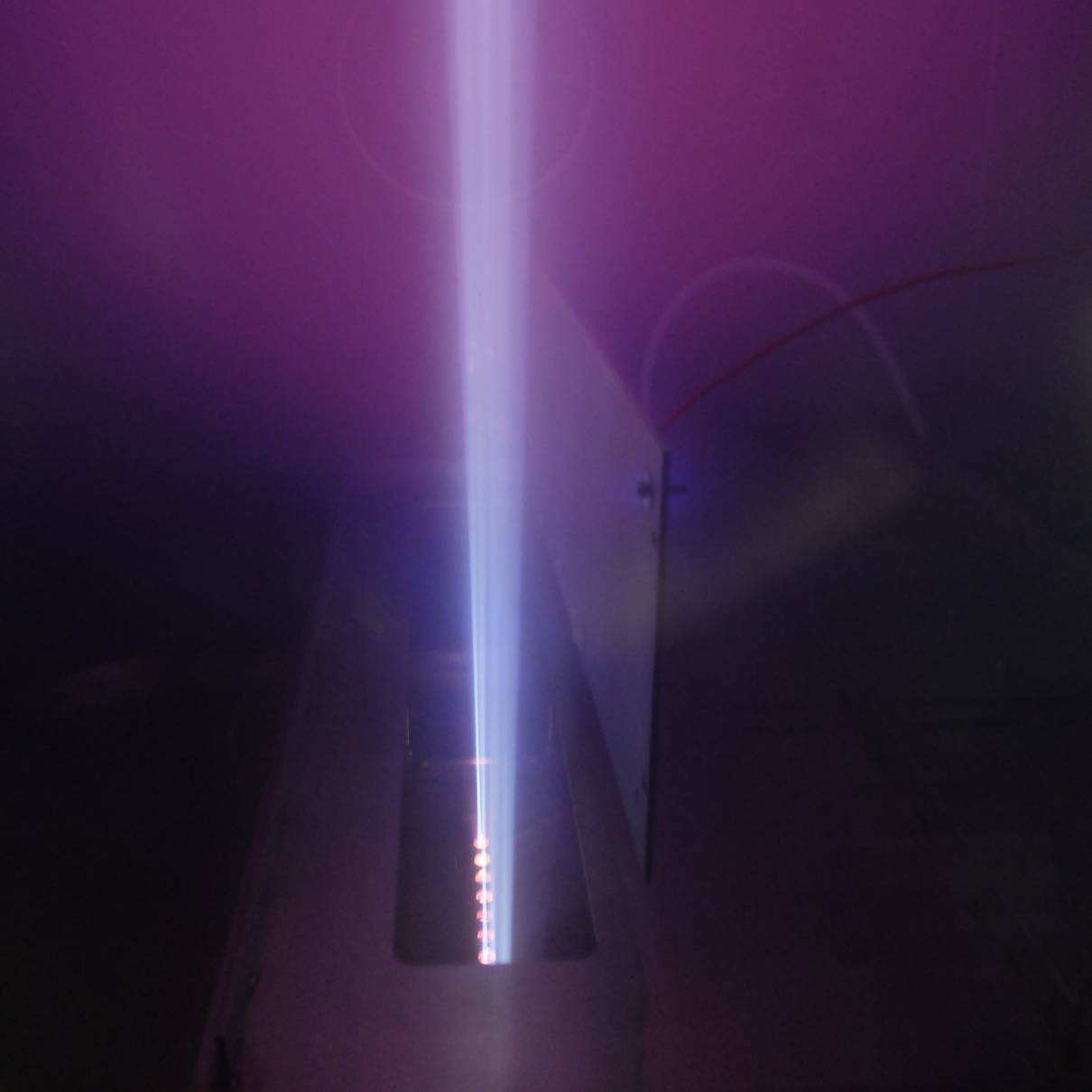
A comprehensive range of service contracts are available, allowing our customers to focus on their core activity and leave their maintenance needs to us. All CAMECA's Field Service Engineers are specialists offering the highest level of support. They are certified through advanced training at our factories.

Our high-quality products along with an expansive support network result in many years of dependable, high-performance operation. Spare parts inventories are maintained at our factories and subsidiaries, ensuring speedy delivery. Upgrades & Accessories offer our users the benefits of the latest improvements, maintaining high levels of instrument performance.

To help customers make the most efficient use of their instruments, CAMECA offers various types of training, ranging from general operation to solving specific scientific problems. Training can be given on site or at our facilities.

## Innovation & Quality

At the core of our operation lies a dedicated research & development team of scientists and engineers who strive to design and develop innovative ways of meeting the needs of our users. Our instruments are well known for their unbeatable analytical capability, ease of use, reliability, and low cost of ownership.



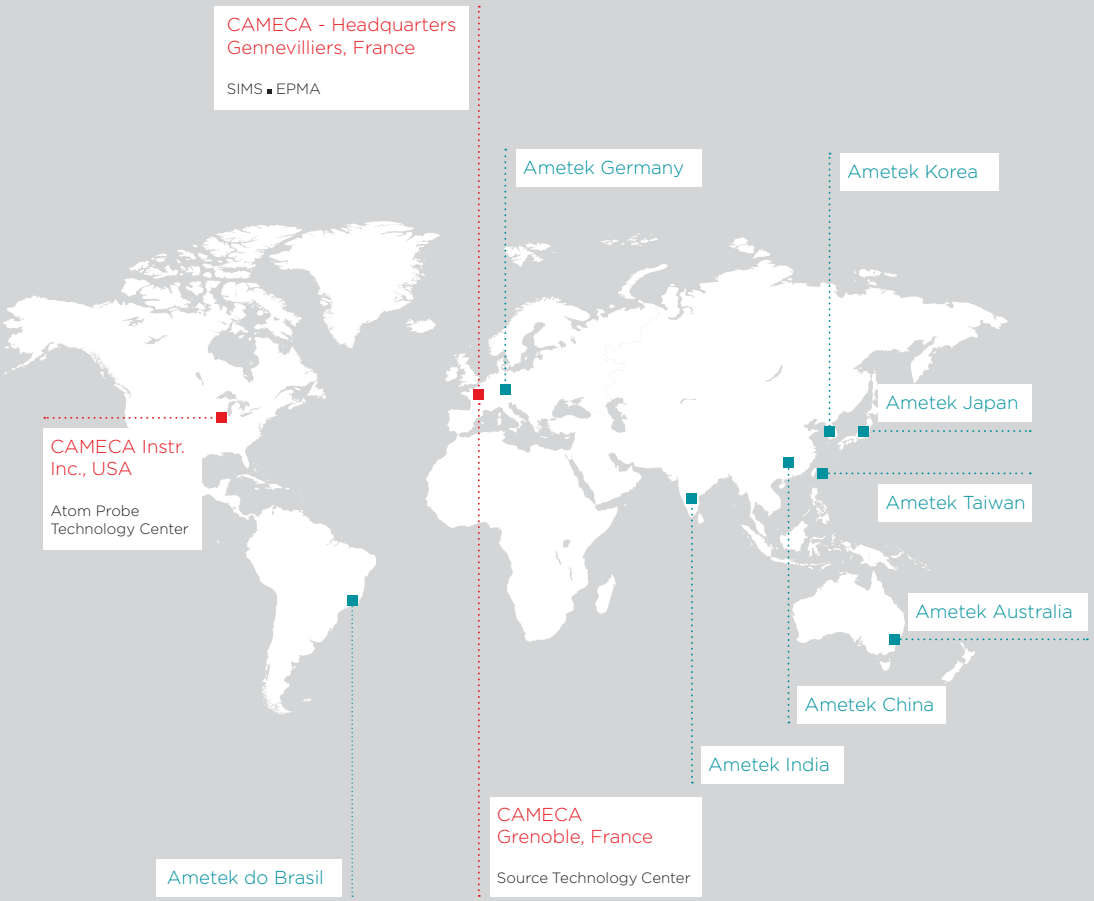
# About CAMECA

CAMECA started in France in 1929 as a manufacturer of movie theater projectors, before rapidly evolving into a provider of scientific instrumentation for the international research community and in-fab / near-fab metrology solutions for the semiconductor manufacturing industry. From its inception, CAMECA has been renowned for its precision mechanics, optics and electronics.

Since pioneering Electron Probe MicroAnalysis (EPMA) in the 1950's and Secondary Ion Mass Spectrometry (SIMS) in the 1960's, CAMECA has remained the undisputed world leader in these techniques while achieving numerous breakthrough innovations in complementary techniques such as Atom Probe Tomography (APT). In 2024, CAMECA acquired Polygon Physics, enhancing its leadership in ion source technology.

Operating under ISO 9001 certification, CAMECA controls not only the technology, but all aspects in the designing, manufacturing, installation and servicing of products. Located near Paris and Grenoble, France, as well as in Madison, Wisconsin, USA, our plants are state of the art facilities, using the best practices for clean room production, computer networking, electron and ion optics simulation and advanced CAD.

CAMECA is a business unit of AMETEK, Inc., a leading global provider of electronic instruments and electromechanical devices, as part of the AMETEK Materials Analysis Division.




R&D and production center, Sales and service

Sales and service

# World Leader in ECR Sources


Geochemistry


Planetary Science


Environmental Science


Life Science


Material Science


Metals & Alloys


Nuclear Science


Nanotechnology


Semiconductor


**CAMECA (Corporate Headquarters)**
29 Quai des Grésillons
92622 Gennevilliers - France
Tel: +33 1 43 34 62 00
cameca.info@ametek.com

**CAMECA Source Technology Center**
19 rue de Sassenage
38600 Fontaine - France
Tel: +33 4 80 42 09 06

**CAMECA Atom Probe Technology Center**
5470 Nobel Drive
Madison, WI 53711 - USA
Tel: +1 608 274 6880

**www.cameca.com**


WORLD PREMIER PROVIDER OF SCIENCE & METROLOGY SOLUTIONS FOR ELEMENTAL & ISOTOPIC MICROANALYSIS.

WE DELIVER CUTTING-EDGE SCIENCE AND METROLOGY SOLUTIONS, AND OFFER OUR CUSTOMERS UNPARALLELED SUPPORT AND MAINTENANCE SERVICE THROUGH THE COMPREHENSIVE AMECARE PROGRAM.


PP 2025.05 - Non-contractual document. CAMECA reserves the right to alter the specifications of its products without notice. All mentioned trademarks are registered by their respective owners.


POLYGON PHYSICS
CAMECA
SCIENCE & METROLOGY SOLUTIONS
AMETEK