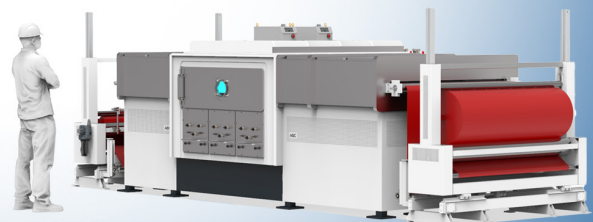
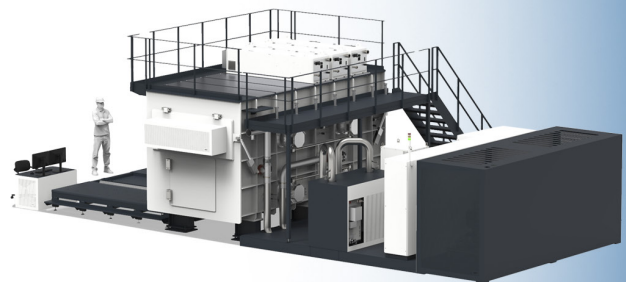
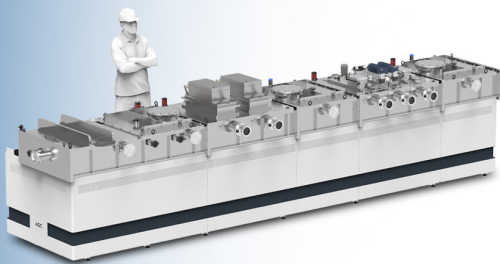
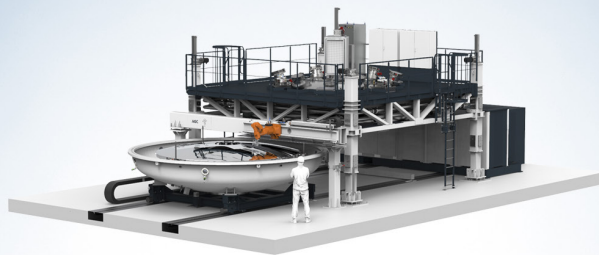


# AGC PLASMA TECHNOLOGY SOLUTIONS

Your partner for industrial  
vacuum coating equipment

**AGC**

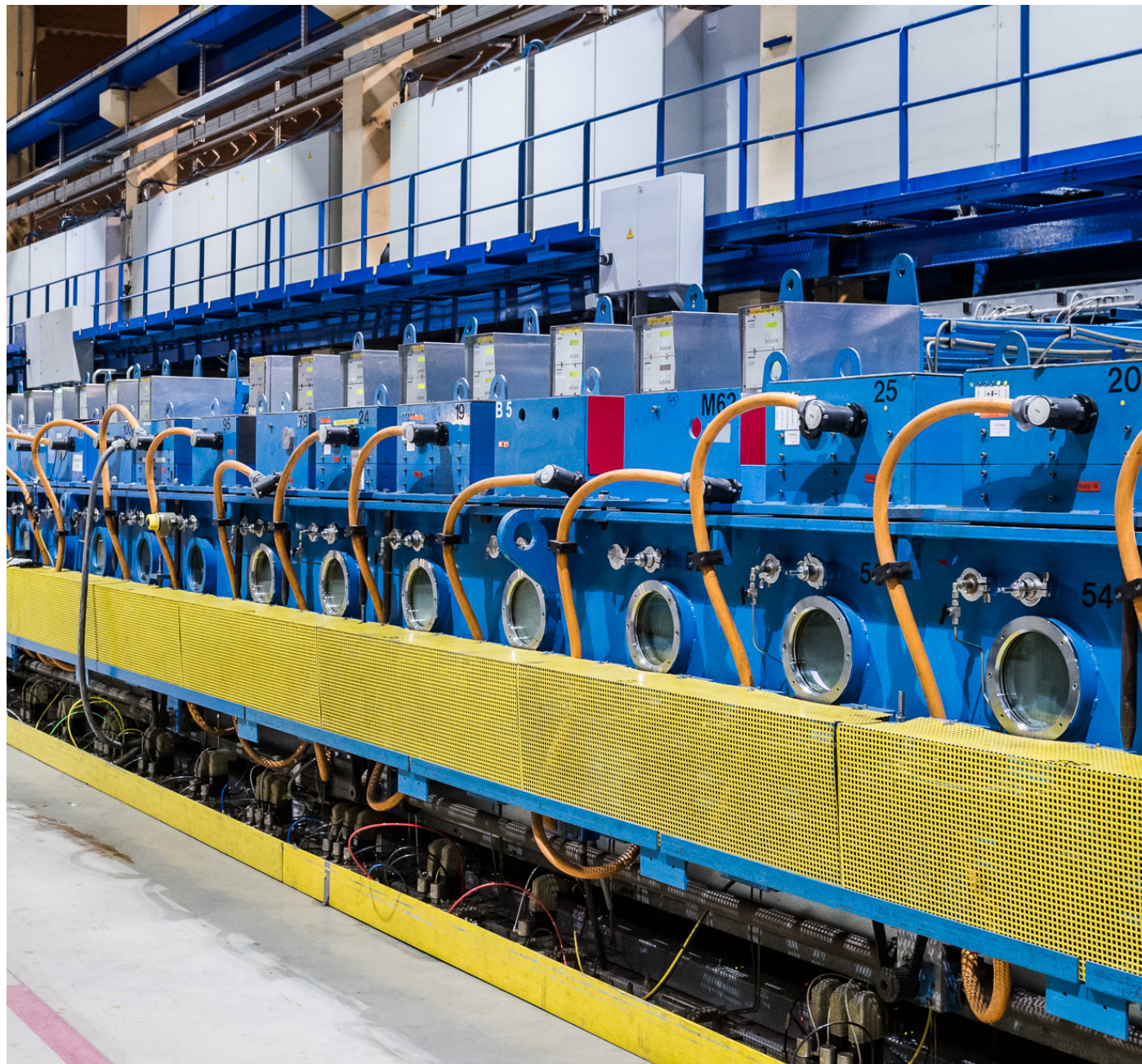
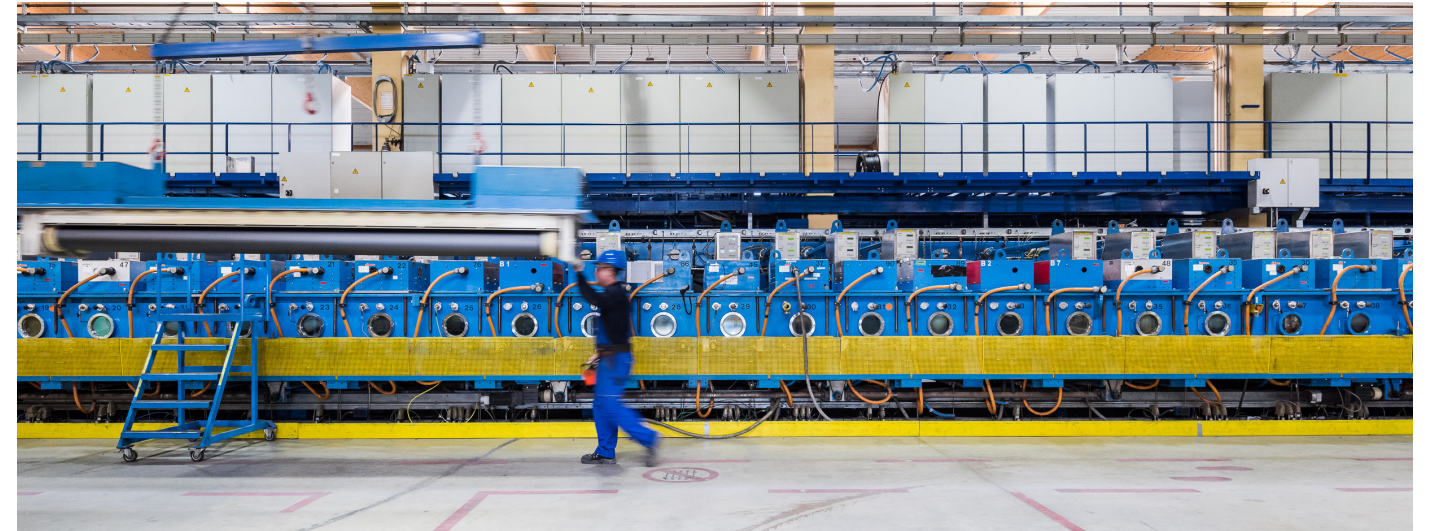


Your Dreams, Our Challenge



# AGC Plasma Technology Solutions

Focus on development of innovative products, industrial processes and manufacturing equipment to deposit functional layers on a range of substrates by vacuum coating technology.



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# Products

Offering innovative and clean solutions to deposit functional nanolayers on a variety of substrates by leveraging our experience in thin film coating technologies



Sheet-to-Sheet Coaters



Roll-to-Roll Coaters

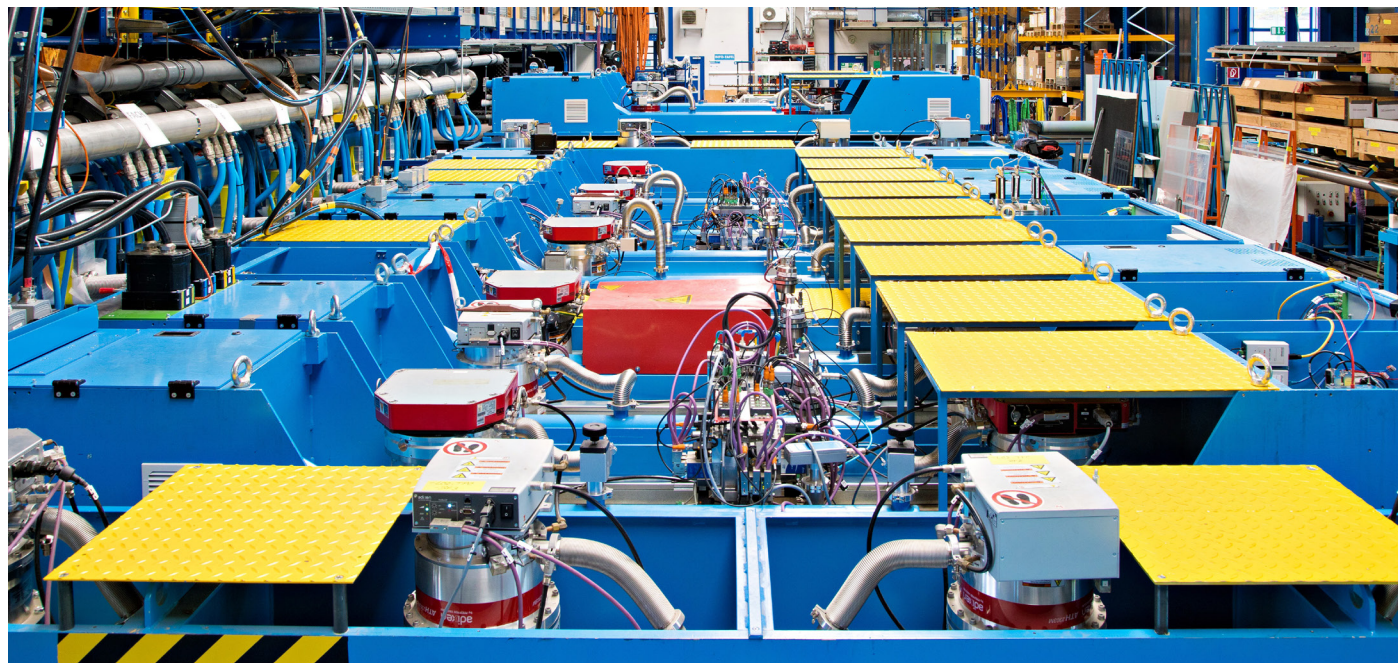


Custom Built Equipment

## Sheet-to-Sheet Coaters

Large area coating of complex layer stacks on sheet material is enabled with AGC's modular coater concept. The coater can combine multiple deposition technologies, based on (reactive) magnetron sputtering, PECVD, or evaporation for the deposition of metals, oxides, nitrides and carbides with unparalleled uniformity over the entire sheet. The coater is equipped with in-house designed linear deposition sources and advanced process control for the coating of flat and curved substrates. Both single-side and double-side coating are possible and depending on the application, either a vertical or horizontal set-up will be the preferred solution.

Our customers use the sheet-to-sheet coater to make high-quality products like architectural and automotive glass, cover screens for displays and LiDAR, touchscreens, and solar modules.



## Roll-to-Roll Coaters

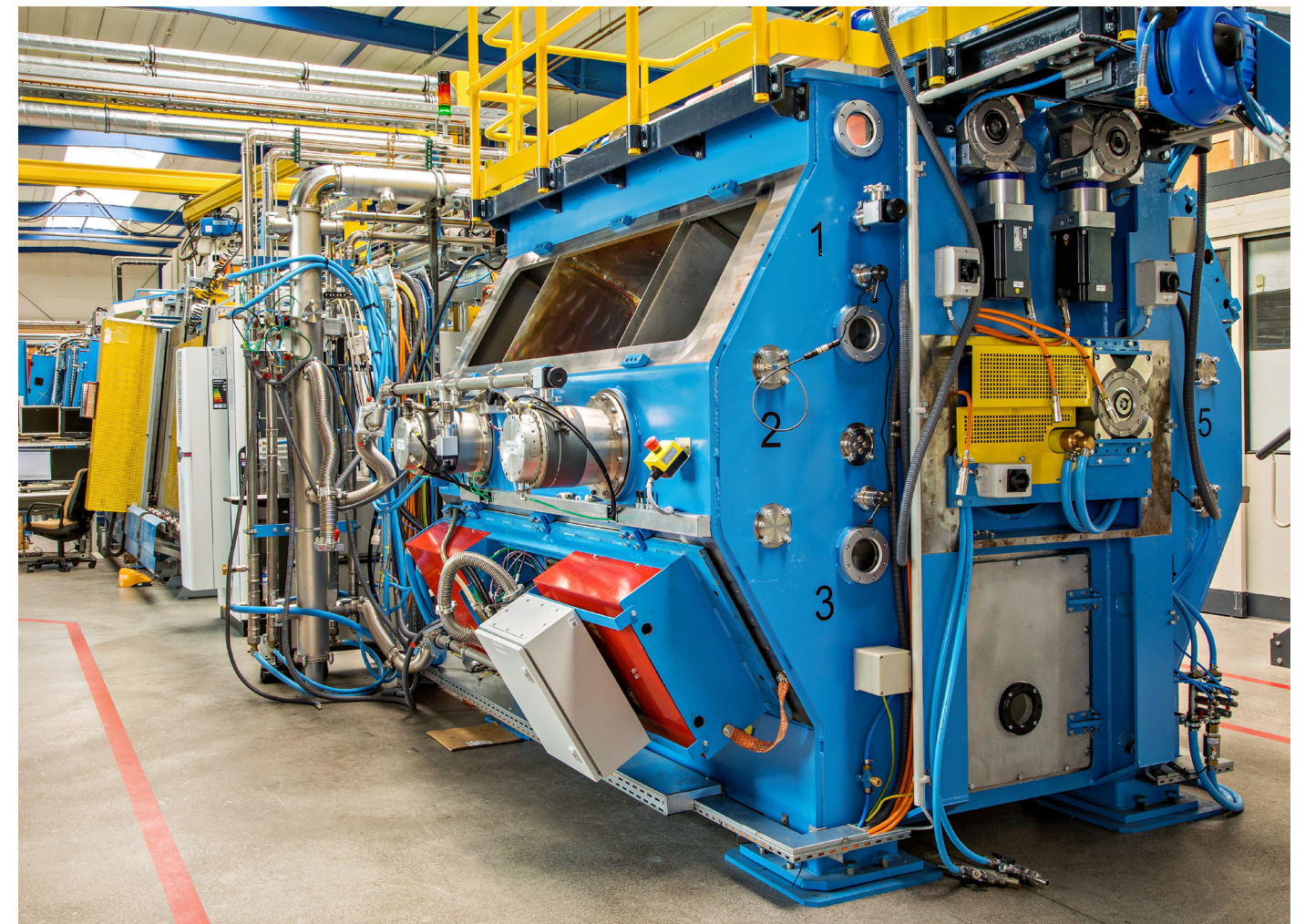
The roll-to-roll (R2R) coater is a versatile tool for thin film deposition on flexible substrates. Our customers are active in textiles, nonwovens, battery, polymer foils, metal coils, and thin glass. The fully-customizable platform enables the combination of magnetron sputtering, PECVD, evaporation, and in-situ metrology up to a substrate width of 3.2 meters.

A wide range of functionalities can be created with the roll-to-roll coater to make flexible substrates water repellent, hydrophilic, heat reflective, or conductive, or to optimize optical properties.

## Custom Built Equipment

Sometimes the most sophisticated coating applications require more than the standard equipment. AGC custom built coaters leverage our expansive in-house network of engineers and designers to offer our customers tailored solutions for the most challenging specifications.

AGC custom built coating equipment is fully configurable and features an advanced range of hardware innovations, process control, and in-situ metrology for maintaining ultra-high vacuum levels. Our customers rely on our custom built coaters for some of the most important projects in the world, including the reflective mirror coatings for the largest optical telescope in the history of astronomy.

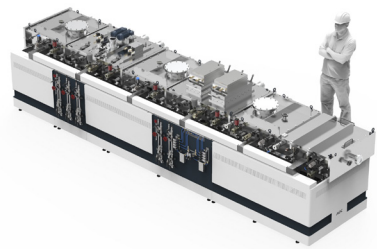




# Products

## SHEET-TO-SHEET COATERS

### R&D tool



The lab-scale Sheet-to-Sheet coating system is a versatile and customizable platform that is designed to meet the diverse needs of researchers in the development of new coating products. The system can accommodate a wide range of substrates and applications, including both flat and curved substrates up to a size of 40 cm x 40 cm.

The system is designed for easy upscaling, using the same key components as the production-scale coating system. This allows researchers to easily transition from lab-scale development to full-scale production without the need for extensive retooling or retraining.

### Semi-industrial line for small series production



The semi-industrial production line is an efficient and reliable platform that is specifically designed for small serial production runs with outstanding reproducibility and process control.

The system features an entry lock that also serves as an exit lock. The process zone is modular and can be easily customized to meet the specific needs of the application. This allows the user to equip the system with the exact number of deposition sources required for the layer stack. The semi-industrial line can grow with the needs of the customer and without requiring a complete system overhaul.

### High-throughput mass production line with advanced automation and process control



A high-throughput mass production line with lowest total cost of ownership is realized with the linear inline system. Substrates are loaded onto holders which move alongside carriers through the coater. Loading and unloading of substrates onto holders is automated or can be performed manually. The line can be delivered with a fully automated carrier return system.

The mass production line is based on proven technology developed by AGC to manufacture advanced optical thin-film coatings for the architectural and automotive glass industries.

### Features

- Development of complex stacks using a dynamic deposition process
- Planar and rotatable cathodes for magnetron sputtering with possibility of co-sputtering
- Load lock available for faster process cycling time
- PECVD module with chemical cabinet and exhaust gas treatment available
- Small footprint allows installation in most labs
- Base pressure down to 10<sup>-7</sup> mbar
- Substrate heating available

### Features

- Flexible tool for prototype realization for market evaluation and small-scale production
- Minimal footprint on manufacturing floor
- Substrate can move in both directions under the deposition sources enabling complex layer stacks with minimal capital investment
- In-vacuum metrology available
- Horizontal and vertical coating set-ups
- Expandable for higher throughput

### Features

- Relies on AGC's industry-proven PVD and PECVD technology with superior process stability and reproducibility
- Highest-quality coatings with low particle pollution
- Coating uniformity unmatched in industry with AGC iOSMB magnet bar technology
- Modular and flexible equipment design enables easy future system upgrades
- Quick switch-over times between different coatings maximizes machine uptime
- User-friendly operating system and easy maintenance
- Remote access for quick troubleshooting by AGC support team

# Products

## ROLL-TO-ROLL COATERS

### R&D tool



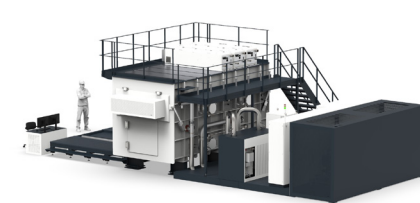
Suitable for the development of new layer systems and coating technologies, and for performing proof of concept and feasibility studies. The web coater is used to test and coat customer-specified polymer substrates, flexible metal foils, and textiles.

The R&D tool is designed for universities and R&D centres active in flexible electronics, transparent conducting electrodes, new battery materials, and other fast-growing industries. Its compact footprint ensures an easy installation into most labs.

### Features

- Easy scale-up of coating technologies to large web widths and high web speeds
- Combination of different coating technologies for wide range of coatings
- In-situ metrology for contactless layer resistance measurement and spectral reflectometry
- Residual gas analysis (RGA) and plasma diagnostics ensure optimal process control and reproducibility
- Substrate width between 100 mm and 300 mm and coating speed between 0.1 and 100 m/min

### Semi-industrial line for small series production



The semi-industrial Roll-to-Roll platform is capable of producing a broad range of coatings on flexible substrates with a combination of rotatable and/or planar magnetrons and PECVD sources. Additional deposition technologies like thermal evaporation can also be easily integrated into the system.

The machine can be used as a pilot coater or a small-scale manufacturing tool to produce Low-E and solar control coatings for window films, conductive ITO films, thin-film solid state battery materials, and even flexible printed circuits.

### Features

- Coating speed between 0.1 and 25 m/min
- Plasma pre-treatment and IR-heating for accelerated de-gassing
- Temperature-controlled coating drum (-15 to +80°C)
- Turbomolecular pumps and cold traps for high-vacuum processes
- Compact footprint for minimal floorspace requirement
- Low particle generation and superior thickness uniformity
- Cooled drum prevents film degradation during coating deposition

### High-throughput mass production line with air-to-air winding and unwinding



An air-to-air coating system enables fully continuous roll-to-roll process capability for high-volume manufacturing with a series of entry and exit locks to bring the foil from atmosphere to vacuum and back up to atmosphere.

The system enables continuous coating of large volumes of material without breaking the vacuum conditions within the process chamber. In this case production throughput is substantially increased without the need to vent the chamber after each production cycle to remove the roll of coated material.

### Features

- Customized to various applications by selecting and adding modules
- Highest production throughput available for a Roll-to-Roll vacuum coating process
- Excellent gas separation and enhanced sputtering process enable rapid production of high-grade films
- Capable of processing rolls up to 2.2 m wide
- Advanced tension control prevents wrinkling and web misalignment

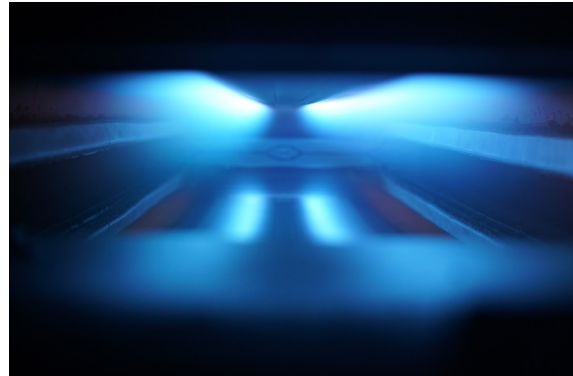


# Technologies

A unique technology portfolio allowing our customers to reach operational excellence

## Magnetron sputtering

Our magnetron sputtering technology offers an industrially proven solution for large area coatings. AGC and Interpane have widely implemented this technology in their coaters all over the world. The main application is low-emissivity and solar control coatings on glass substrates up to 3.2 m wide for the building sector. High throughput and superior coating uniformity are key to obtain the best color uniformity at the lowest cost of ownership. The team of AGC Plasma has extensive expertise in the development of planar and rotatable cathodes and with ensuring the best coating uniformity by optimization of the magnet bars inside the cathodes.

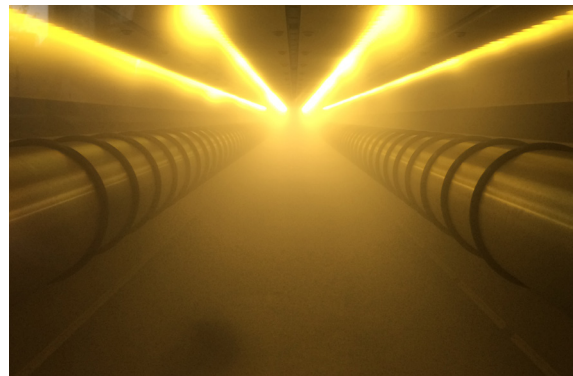


### Features

- Reduces the tuning time for complex multi-stack coatings or coatings on complex parts like curved 2D or 3D objects
- Allows the local adjustment of magnetic field during the production without the need to switch off the plasma or to vent the coater to adjust the deposition rate and correct for non-uniformities
- An integrated tuning wizard shows the effects of changes to magnet yoke settings on resulting layer profile uniformity to guide the operator in making the right decisions. An easy-to-use graphical interface allows the operator to control the settings of the individual yokes of the iOSMB by graphical sliders
- It is possible to transfer a magnetic field between different iOSMBs. This allows replacing magnet bars easily without changing the magnetic field strength distribution

## PlasmaMAX™ PECVD

PECVD is achieved by introducing reactive gases between parallel electrodes. By applying a medium frequency or pulsed voltage between the electrodes, the reactive gases are excited into a plasma and chemical reaction is initiated. This low temperature process can be used for ultra-high rate deposition of silicon oxide-based layers for anti-reflective properties, as a barrier layer, or for corrosion protection. A range of coating materials is possible through a combination of process conditions and precursor selection. Ultra-high dynamic deposition rates can be reached with PlasmaMAX™ PECVD technology developed by AGC Plasma Technology Solutions.



### Features

- Dynamic deposition rate (DDR) up to 10x higher than traditional PVD processes
- Largest substrate widths possible in industry for PECVD coatings with proven scalability to four (4) meters
- Low internal coating film stress
- Wide process stability range enables in-line interoperability with most pre-existing PVD and CVD coaters
- Environmentally sustainable dry alternative to traditional resource-intensive wet processes
- Easy manipulation of pressure, precursor mixture, gas input ratio, and plasma power to precisely control properties like refractive index, optical clarity, film stress, adhesion, flexibility, hardness, and density
- Plasma pre-treatment (without precursor) for promotion of subsequent coating adhesion

## Ion Beam Implantation Systems

Ion implantation equipment consists of an ion source where ions of the desired element are produced, accelerated, and subsequently bombard and penetrate the substrate surface. This surface treatment to incorporate foreign elements into a surface is well known in the semiconductor industry for doping silicon, but also in the metallurgical industry to increase hardness and corrosion resistance. AGC Plasma Technology Solutions has developed ion implantation equipment dedicated to the surface treatment of a range of materials (glass, sapphire, metals, polymers) and has been granted over 30 patents in this field. This ion implantation equipment can be used to increase surface hardness or to create anti-reflective properties.



AGC utilizes an ion gun developed by the IONICS Group in the framework of the WALIBEAM project that employs Electron Cyclotron Resonance (ECR) technology. ECR technology enables the generation of multi-charged ions by dissociating molecules and producing ions with up to four positive charges. ECR ion guns operate using high-frequency microwaves (approximately 10 GHz) and strong permanent magnets to confine the plasma.

The advantage of ECR technology is that it enables the formation of high-energy ions using lower voltages compared to ion guns that generate mono-charged ions. The kinetic energy of an ion is the product of its charge and the applied voltage. With multi-charged ions, higher energies can be achieved with lower voltages. For example, to obtain N4+ ions with an energy of 160 keV, a voltage of 40 kV is required.

## Upscaling Innovative Plasma Technologies

AGC Plasma Technology Solutions supports inventors at universities, research institutes, and small businesses to scale up and industrialize their innovative plasma technology. By working together and leveraging our engineering expertise in industrial installations and operational excellence, we can bring your concept to industrial scale. We advise you in the design and optimization of the right equipment with the right specifications at the right cost to allow a reliable, cost-efficient and high-quality mass production.

By partnering with inventors, AGC Plasma Technology Solutions provides access to its extensive resources, including advanced plasma equipment, process development expertise, and manufacturing capabilities. This collaboration allows inventors to leverage AGC's knowledge and infrastructure to refine their plasma technology, optimize manufacturing processes, and ensure scalability.

Through this collaboration, AGC Plasma Technology Solutions aims to accelerate the industrialization of innovative plasma technologies, enabling inventors to realize the full potential of their inventions and contribute to advancements in various industries.





# Solutions

## Optical Coatings

Optical coatings are thin layers of dielectric or metallic materials that are deposited onto optical components, such as lenses, mirrors, and filters, to control the transmission, reflection, or absorption of light within a specific range of wavelengths from ultraviolet (UV) to infrared (IR). These coatings are designed to manipulate the behavior of light by reducing glare, enhancing contrast, or improving overall optical performance. Optical coatings are typically composed of multiple thin layers of dielectric materials with varying refractive indices, which are carefully selected and stacked to achieve the desired optical properties.



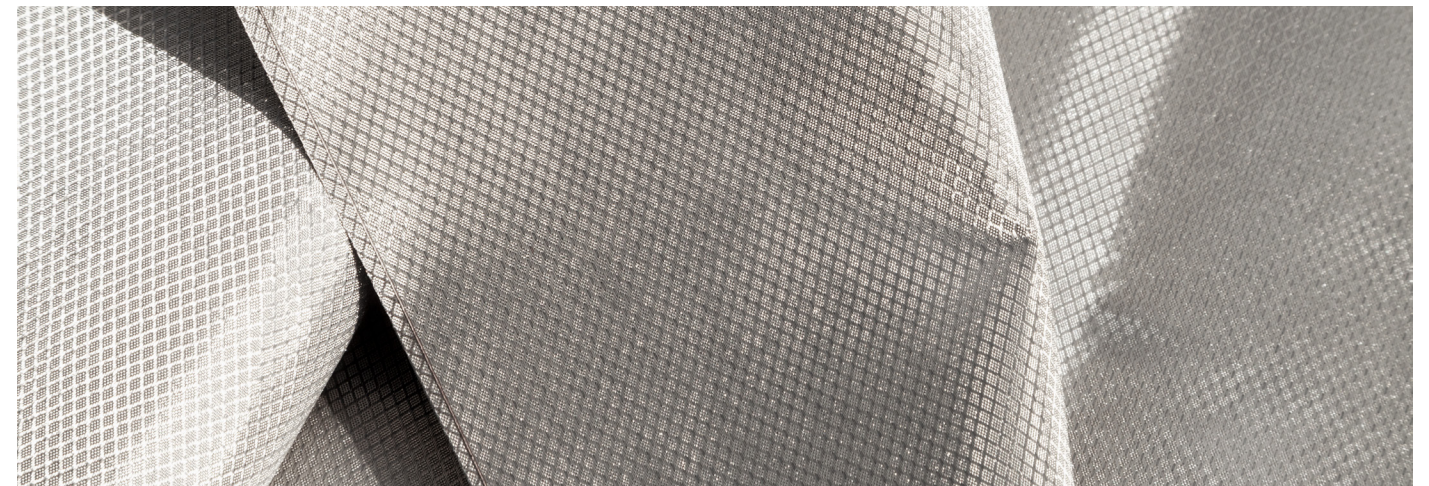
## Liquid Repellancy

AGC Plasma Technology Solutions achieved a significant breakthrough in the development of a fluorine-free liquid repellent coating using its PECVD technology to apply hydrophobic nanolayers on various substrates, such as textiles and papers, without compromising breathability or feel. This innovative treatment imparts hydrophobic properties to textiles for outdoor clothing, packaging materials, and filtration media.



## Metallization

AGC Plasma Technology Solutions developed a coating process that includes an adhesion promotion layer and a protective top-coat layer for metallizing surfaces. The coating stack is designed to substantially enhance mechanical properties, including hardness, scratch resistance, wear resistance, and adhesion, as well as the environmental resistance of the metallic layer.



## Transparent Conductive Oxides (TCOs)

AGC Plasma Technology Solutions offers planar and rotatable cathodes for sputtering of Transparent Conductive Oxide (TCO) materials. These processes can be supported with optical emission spectroscopy (OES). OES is a technique that involves analyzing the emission spectra of the plasma during the sputtering process. By monitoring the wavelengths and intensities of the emitted light, OES provides information about the composition and behavior of the plasma, which in turn can be used to fine-tune and optimize the deposition process to ensure highest-quality TCO coatings.





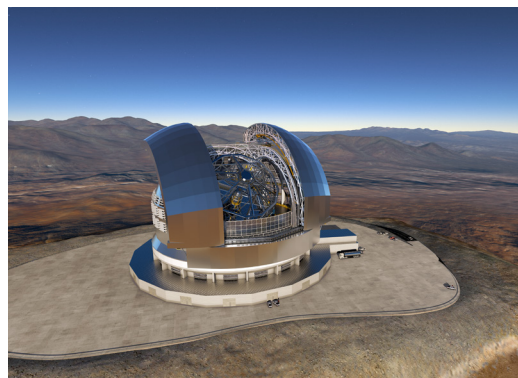
# Industries

Creating new value by bringing our know-how in vacuum coating technology to a broad spectrum of industries outside the glass world



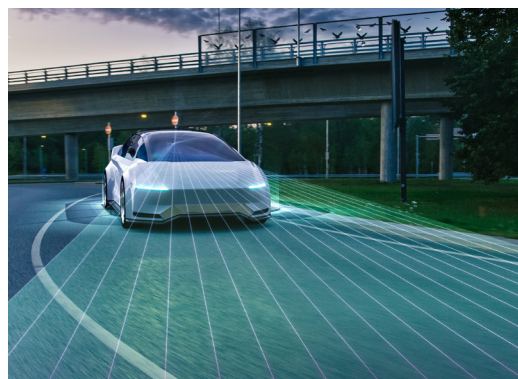
## Architectural & Automotive Glass

AGC Plasma Technology Solutions has been a pioneer in the field of glass coating equipment since deploying the first architectural glass coaters for the Interpane group in the early 1980s. Dozens of installations have been put into operation worldwide since then. The alliance between Interpane and AGC in 2012 brought together an expansive team of passionate PVD coating experts well experienced in the development of functionalized glass products, innovative PVD processes and manufacturing equipment, and in ensuring the operational excellence in multiple coating production plants.



## Astronomical Mirrors

AGC Plasma Technology Solutions understands well the importance of customized coater designs to meet the unique requirements of different telescope systems. By offering both batch and linear inline coating systems, we provide flexible solutions that are both technically reliable and operationally efficient. This ensures that mirror segments of varying sizes and geometries can be coated effectively and efficiently, without compromising on quality. Straightforward upgradeability of AGC coater systems allows telescope programs to easily adapt their coater system for new astronomical science targets.



## Display & LiDAR Cover Screens

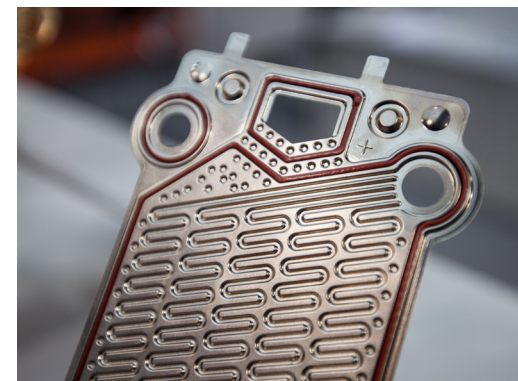
AGC's comprehensive range of thin-film coating equipment and solutions, including anti-reflective (AR) coatings and protective coatings, optimizes LiDAR system performance in harsh environments. AR coatings reduce surface reflection and increase the amount of light that reaches the sensor, while protective coatings can help to shield the sensor from rain, debris, and other environmental factors that could compromise its performance. By offering a complete range of coating solutions, AGC Plasma Technology Solutions supports LiDAR system manufacturers to optimize LiDAR system performance and ensure that they are well-protected in challenging operating conditions. Our expertise in PVD equipment design and optical coatings enables us to provide high-quality solutions that meet the demanding requirements of LiDAR applications.



## Textiles

Vacuum coating technology supports the textile industry in its evolution towards increased sustainability. One of the main advantages of vacuum coating is that it can be used to apply functional coatings to textiles without the use of harmful chemicals, which significantly reduces the environmental impact of textile production.

By using vacuum coating technology, it is possible to produce textiles with advanced properties like water resistance, stain resistance, heat reflection, and even antimicrobial resistance. Vacuum coating technology can be used to produce coatings that are highly uniform and reproducible, which allows more efficient use of materials and reduced waste. Vacuum coating technology for textile functionalization supports the textile industry to meet the increasing standards for sustainability and to produce textiles that meet both consumer and environmental standards.



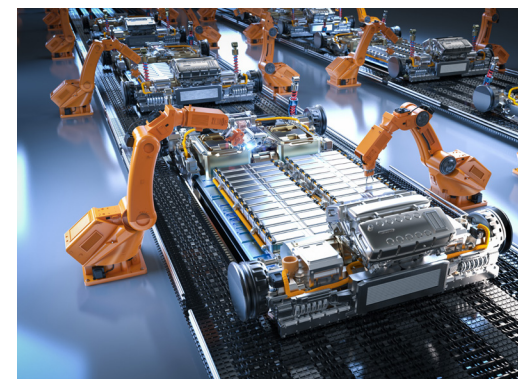
## Fuel Cells & Electrolyzers

In fuel cells and electrolyzers, the components in contact with the electrolyte, gases, or catalysts are exposed to harsh electrochemical environments that cause corrosion and degradation over time. Magnetron sputtering processes are used to address this issue by depositing protective coatings on these components, such as the bipolar plate. Magnetron sputtering coatings provide a range of benefits, such as improved resistance to corrosion, wear, and chemical attack. Coatings are tailored to meet specific performance requirements, such as high conductivity, low friction, or high wear resistance, which improves overall efficiency and performance of the electrolyzers and fuel cells.



## Polymer Films

Depositing metals or dielectrics onto thin polymeric substrates for complex multi-stack coatings requires advanced manufacturing systems with tight process control. The linear PlasmaMAX™ PECVD deposition source developed by AGC Plasma Technology Solutions is a proven solution for ultra-high rate deposition of optical silicon oxide (SiOx) layers on polymer films with low internal stresses. PECVD sources can be combined in-line with magnetron sputtering in a single vacuum coater to enable production of complex multi-stack coatings. The combination of PECVD and magnetron sputtering creates enhanced capabilities for producing multi-functional coatings on thin polymeric substrates, offering exciting possibilities for various applications in the fields of optics, electronics, and other advanced industries.

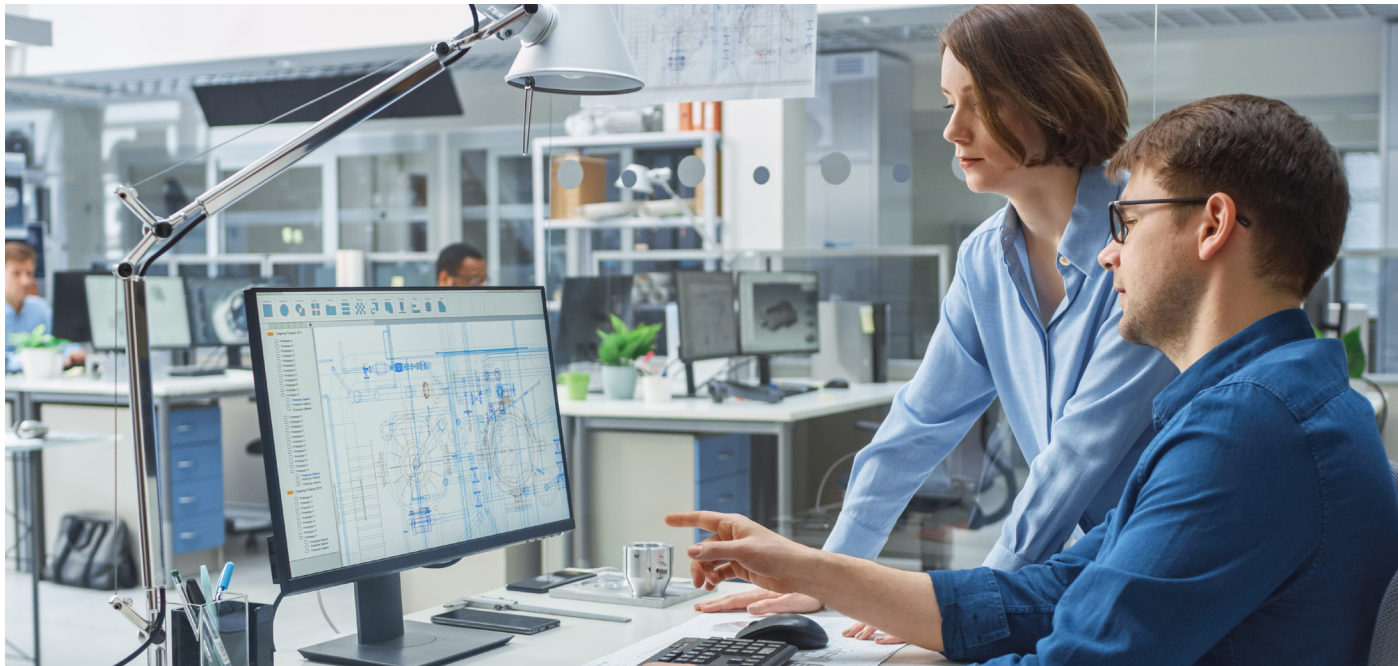


## Battery Materials

AGC Plasma Technology Solutions provides high-volume manufacturing equipment for the most advanced battery materials using its patented thin-film coating technologies like ultra-high rate PlasmaMAX™ PECVD, magnetron sputtering (PVD) and evaporation sources. Thin-film coating technology is used to create or functionalize a wide range of innovative thin-film materials for the anode, cathode, current collectors, electrolyte, and separator. Flexible substrate rolls of polymer films or metal foils can be efficiently coated with lithium, amorphous silicon or solid state electrolytes using AGC's Industrial Roll-to-Roll coater platform.







## Our Services

### Proof of Concept & Prototyping

By working together and leveraging our coating expertise, AGC Plasma Technology Solutions validates your innovative product concept by supporting prototypes and initial series production before bringing it to an industrial scale. AGC Plasma Technology Solutions is an excellent partner for co-developing new coating solutions for optical, energy storage, and many other applications. A team of AGC coating experts is at your service to support the technology selection and process development.

**Accelerate your time to market and reduce financial and technical risk by**

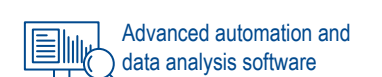
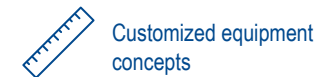


### Engineering

We do not design standard products, but provide you with tailor-made solutions. You are provided the exact engineering services your project requires.

Are you looking for a designer and manufacturer of tailor-made vacuum coating machines? The engineers and designers of AGC Plasma Technology Solutions ensure the highest degree of quality and functionality. The results are tailor-made solutions based on proven technology.

**Aim for the lowest cost of ownership of your industrial manufacturing equipment through**

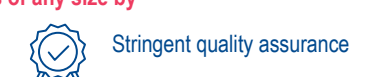
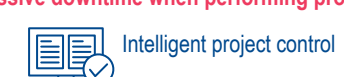


### Manufacturing, Installation and Start-Up

Turn-key and custom manufacturing and project execution.

AGC Plasma Technology Solutions has extensive experience in planning and executing large industrial construction projects. We provide expert management and supervision of all personnel and sub-contractor disciplines. Our approach is to closely partner with our clients to ensure that the project meets or exceeds their requirements and expectations for cost, safety, quality, and schedule.

**Avoid excessive downtime when performing projects of any size by**



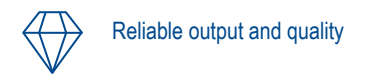
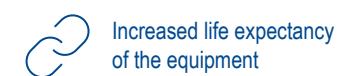
### After Sales Services

Preventative maintenance contracts and remote support to minimize downtime of your installation.

AGC Plasma Technology Solutions offers a Service Level Agreement (SLA) after commissioning the equipment. The SLA can include additional training for machine operators to reduce the risk of equipment failure due to improper use or maintenance. By offering remote support,

AGC Plasma Technology Solutions helps customers troubleshoot issues quickly and efficiently, minimizing downtime and maximizing productivity. Smart glasses are provided, enabling remote assistance to support your frontline workers with real-time feedback and information from a distant expert.

**Optimize machine reliability with preventative and corrective maintenance services for**





# About us

## AGC Plasma Technology Solutions

AGC Plasma Technology Solutions is a world-class provider of low-pressure plasma coating technology and equipment. We are an expansive team of plasma coating experts specialized in innovative PVD and PECVD applications from R&D and new product development all the way through to equipment manufacturing and operational management of mass production coating plants.

AGC Inc. (Asahi Glass Company) is a global materials company using best-in-class technologies developed through a history of innovation extending over 100 years. AGC creates value by integrating a wide range of cutting-edge technologies in the business areas of glass, electronics, chemicals, ceramics, and biologics. The global headquarters is in Tokyo, Japan.

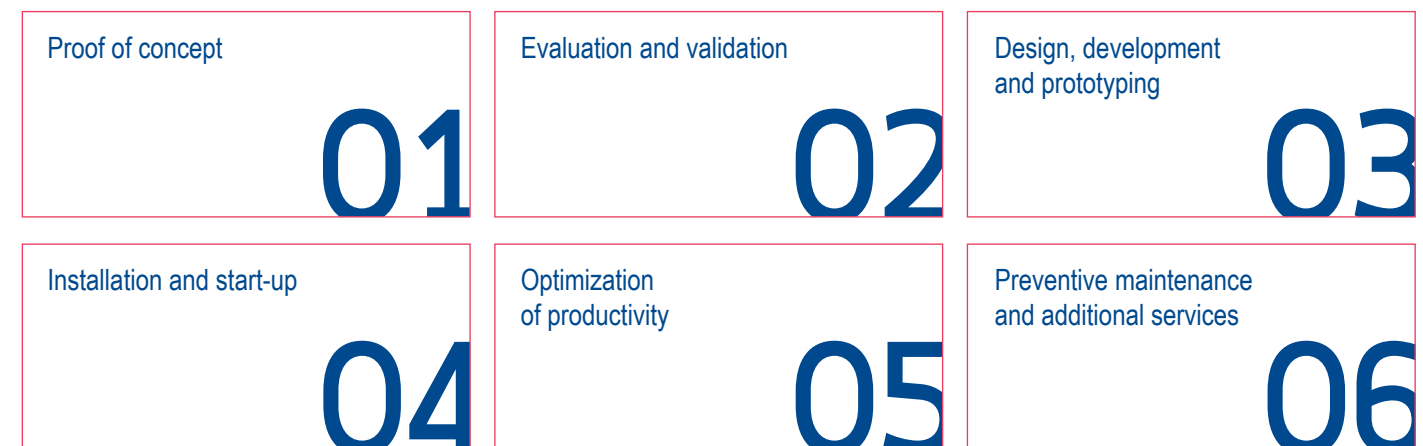
For more information visit [www.agc-plasma.com](http://www.agc-plasma.com)

## Let's innovate together

AGC Plasma Technology Solutions is supporting inventors at universities, research institutes and small businesses to scale up and commercialize their innovative plasma technology.

We typically start with a joint development agreement (JDA) and define the goals of the project and what success will look like. Together we verify the financial feasibility and the business case, create a timeline, and define criteria for key milestones.

AGC Plasma Technology Solutions has the capability in:



## Our locations

### AGC Technovation Centre

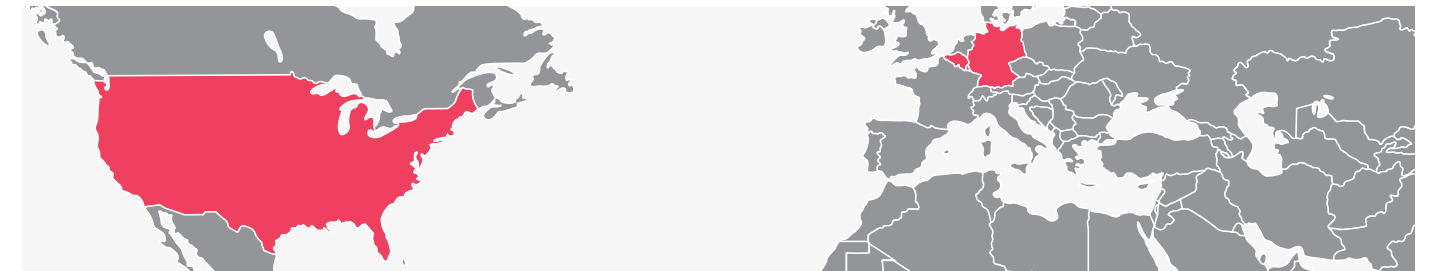
Rue Louis Blériot 12  
6041 Charleroi, Belgium

### AGC Demonstration & Research Centre

Sohnreistraße 21  
37697 Lauenförde, Germany

### AGC Sacramento Research Facility

9881 Horn Road, Suite F  
Sacramento, CA 95827



## What are the benefits of working together?

Developing industrial processes and building the equipment to deposit functional layers on a variety of substrates by plasma technology is our mission.

The team of AGC Plasma Technology Solutions is a group of passionate PVD and PECVD coating experts who are experienced in the development of products with new functionalities, innovative PVD and PECVD processes and manufacturing equipment, and in assuring the operational management in several coating production plants.

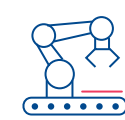
With our experience in mass production of thin film coated glass products, we can help you make a quick and smooth transition from research to industrialization.



Long-term experience  
in coating production



Latest developments  
and innovations



Access to demonstration lab  
for coating development  
and prototyping



In-house engineering  
experience and turn-key  
solutions



International team of plasma  
experts at your service



Lifetime service  
and upgrades support





[www.agc-plasma.com](http://www.agc-plasma.com)

#### AGC Glass Europe

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