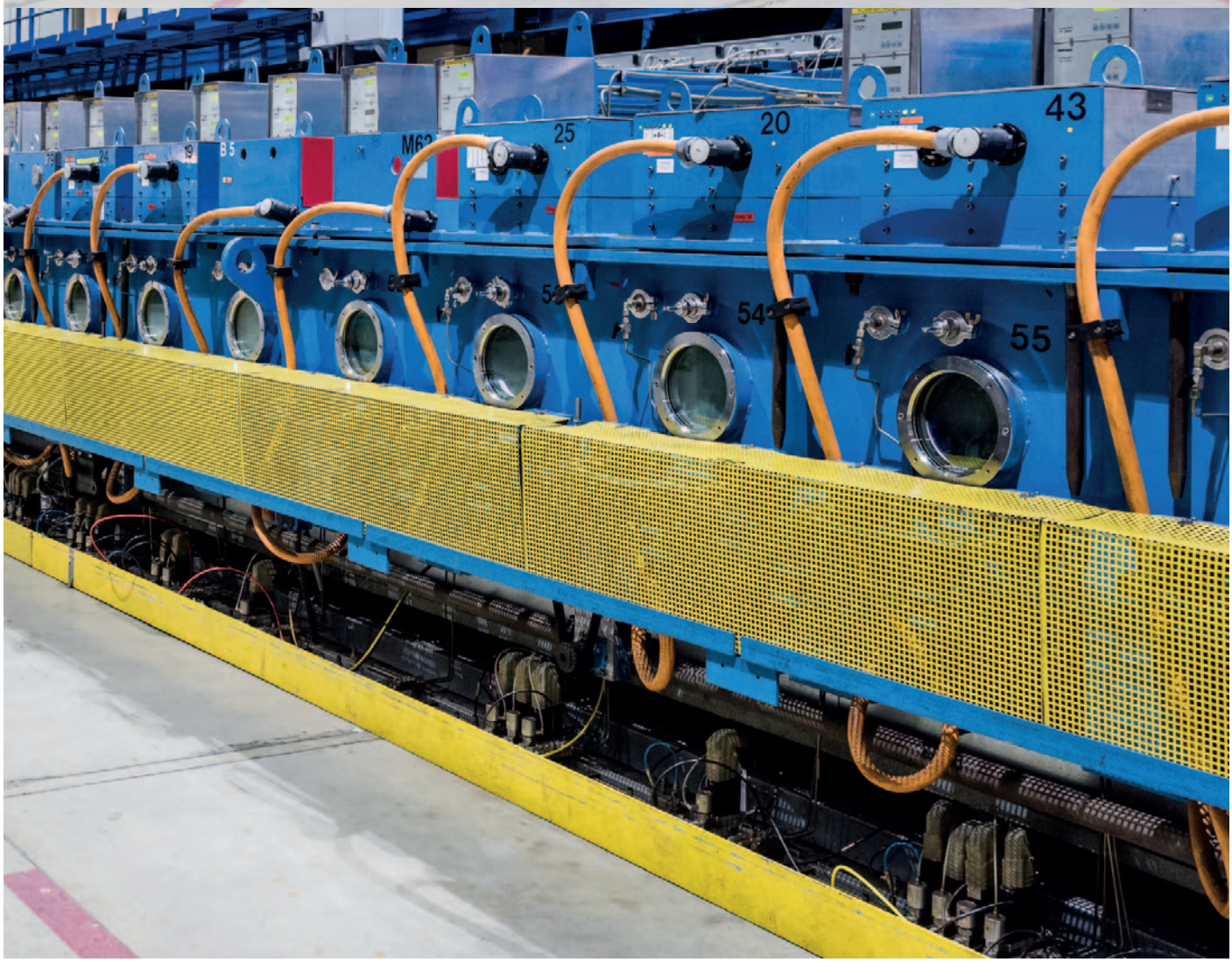
PLASMA TECHNOLOGY SOLUTIONS

Focus on development of INNOVATIVE products, INDUSTRIAL processes & manufacturing equipment to deposit FUNCTIONAL layers on a range of substrates by PLASMA TECHNOLOGY

AGC

Your Dreams, Our Challenge

AGC and Interpane
Your partner to...



...develop and commercialize innovative vacuum plasma coating technologies

AGC Plasma Technology Solutions

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AGC Plasma Technology Solutions brings coating expertise developed in the glass industry to a broad range of industries. Our fields of expertise include magnetron sputtering, plasma-enhanced chemical vapor deposition (PECVD) and ion beam implantation.

The value proposition of AGC Plasma Technology Solutions is unique in that we are your industrial partner to scale up innovative plasma coating processes and to support our customers until operational excellence is reached.

The team of AGC Plasma Technology Solutions has a customer-focused approach with demonstration and research centers offering pilot coating lines and extensive analytical tools in Lauenförde (Germany) and Gosselies (Belgium) at the service of our customers to make product prototypes and realize proofs of concept.

AGC Plasma Technology Solutions is a one-stop provider of the plasma coating equipment. We take full responsibility for the project management and start-up for turnkey production line including integrated process control.

Asahi Glass Company (AGC)

AGC is a global company using best-in-class technologies developed through a history of technological innovation extending over 100 years. AGC creates value by combining a broad range of its world-leading, cutting-edge technologies in the fields of glass, electronics, chemicals, ceramics, biologics, and new business development.

The AGC Group has 200 companies in over 30 countries with more than 50,000 employees. The global headquarters is in Tokyo, Japan.

AGC Glass Europe

Based in Louvain-la-Neuve (Belgium), AGC Glass Europe is the European branch of AGC, the world's leading producer of flat glass. It develops, produces, processes, and markets flat glass for the building industry (external glazing and interior decorative glass), the automotive industry (OEM and replacement glass), as well as the solar, transport, and high-tech sectors. It has over 100 sites throughout Europe, from Spain to Russia, and employs over 16,000 customer-focused employees.

AGC Interpane

AGC and Interpane, a major European glass processor, have joined forces, resulting in a larger network to distribute our exclusive and diverse product range.

AGC Interpane Demonstration & Research Center, located in Lauenförde, Germany, has pioneered large area coating equipment for the glass industry since 1980, when they first developed physical vapor deposition (PVD) coating equipment. Their track record includes numerous horizontal and vertical magnetron sputtering lines, as well as roll-to-roll coating machines on metal foil for solar thermal collectors.

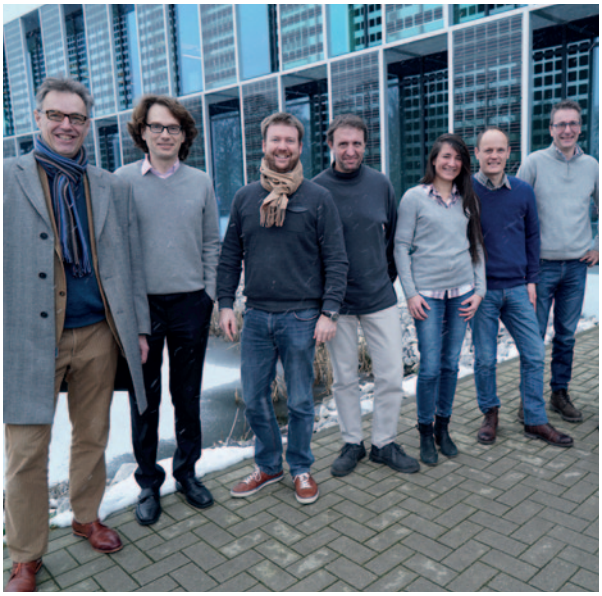
The Team

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.

The team of AGC Plasma Technology Solutions is based at the AGC Interpane Demonstration & Research Center in Lauenförde (Germany) and AGC Technovation Center in Gosselies (Belgium). Our business development team supporting the North American market is based in Atlanta, Georgia (USA).

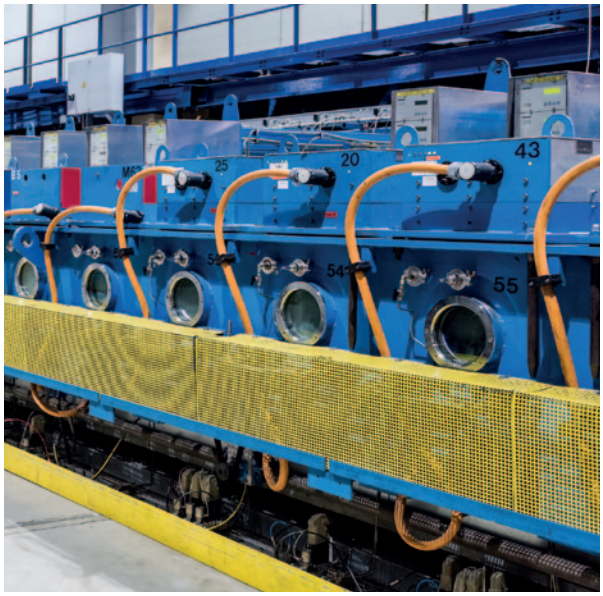
AGC Interpane Demonstration and Research Center in Lauenförde hosts a number of vertical and horizontal test magnetron sputtering coaters for coating and equipment development. The Lauenförde facilities are also used to pre-assemble the coating plants and to qualify the performance of the components before shipment to the final destination. This saves valuable time during final assembly at the customer's site.

AGC Technovation Center hosts research, engineering and intellectual property activities of AGC Glass Europe. The center brings together 250 people, of which 180 are researchers, all driven by operational excellence, technological innovation, technical assistance and scientific advice. The R&D center develops the high-tech glass products of tomorrow, while ensuring human well-being and environmental sustainability. In this facility resides our state-of-the-art equipment for sputter coating deposition used extensively for the development of the next generation low-emissivity and solar control coatings.



Our Technologies

A unique technology portfolio allowing our customers to reach operational excellence

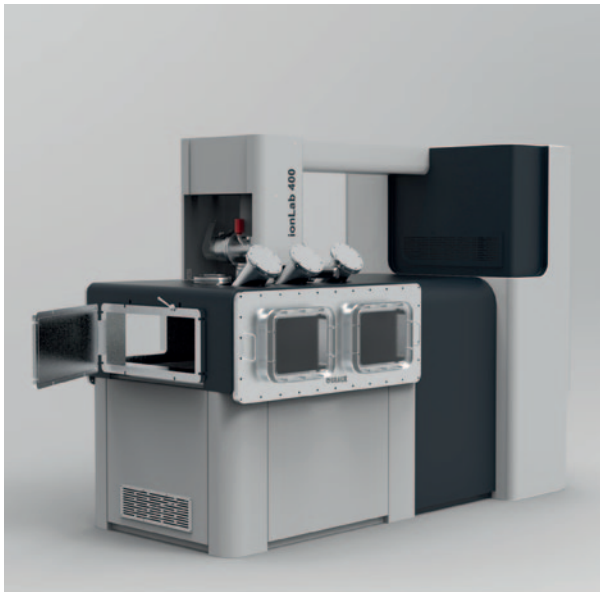


Magnetron sputtering

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.

Plasma-enhanced chemical vapor deposition (PECVD)

AGC Plasma Technology Solutions has successfully scaled up a linear hollow cathode for 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 to deposit silicon oxide based layers for anti-reflective properties or as a barrier layer (anti-corrosion). The integration of the hollow cathode in a standard magnetron sputtering line allows high-rate deposition of many different types of materials by choosing the appropriate monomers.



Ion beam implantation

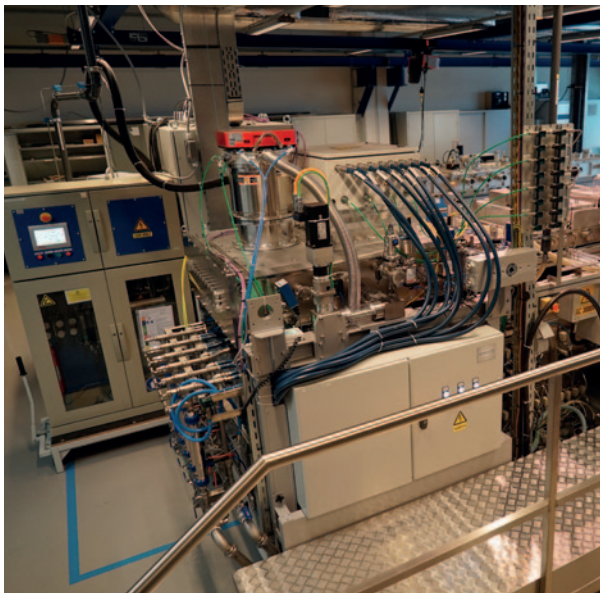
Ion implantation equipment consists of an ion source, where ions of the desired element to be implanted are produced and accelerated, which subsequently bombard the substrate surface. This surface treatment process is used in the semiconductor industry, but also in the metallurgical industry to increase hardness and corrosion resistance. AGC Plasma has now developed this technology as an effective anti-reflective treatment on sapphire glass and has been granted over 30 patents in this field.

Custom-built equipment for vacuum coating

AGC Plasma Technology Solutions' team of physicists and engineers is experienced in scaling up pilot installations "from lab to fab". The industrial equipment will be designed to conform to health and safety requirement standards. Your production will be automated with advanced integrated process controls to assure an efficient operation with stable quality output.

Our Services

Plasma technology experts are at your service to provide product prototypes, process optimization, project management, technical advice, technology upgrades, and thin film services.



Product development and prototyping

Pilot coater lines for magnetron sputtering, plasma-enhanced chemical vapor deposition, and ion implantation are available at our demonstration and research centers in Lauenförde, Germany and Gosselies, Belgium to develop new coating stacks for any substrate type. Our team of material scientists characterize the coatings with the most advanced material characterization techniques (SEM, ToF-SIMS, XPS, IR, fluo X, X-ray diffraction, DSC, TGA, AFM,…) and evaluate their functional requirements and durability (mechanical, chemical, accelerated aging).

Process development and optimization

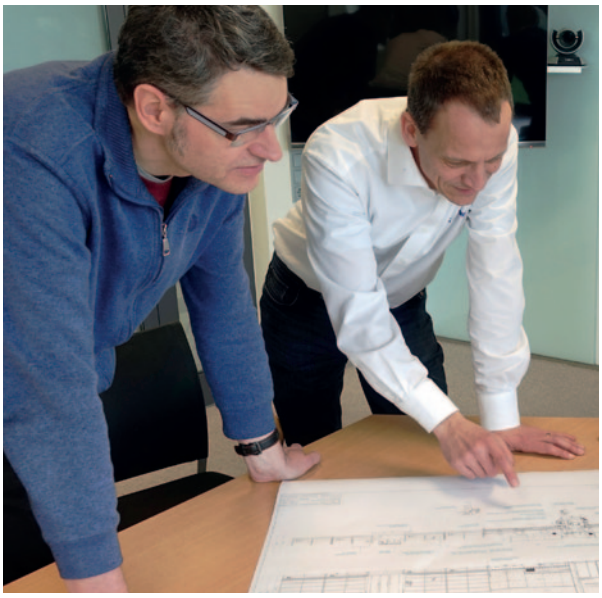
We are ready to take the challenge to scale up your pilot plasma installation toward an industrial installation. The engineering team has access to in-house software packages for process simulation, e.g. magnetic field simulation, which is key to assure uniformity and homogeneity of the surface treatment. Total cost of ownership, maintainability, quality assurance, manufacturability, and highest performance level are what drive AGC Plasma.

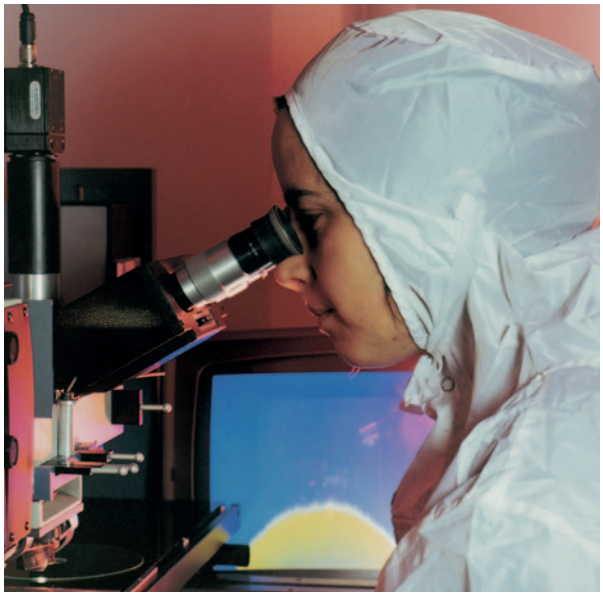
Engineering, procurement, construction and commissioning contracts

We take full responsibility for the project management, including the design, selection, purchase, assembly, commissioning, and start-up of a turnkey vacuum plasma process line with integrated process controls.

Upgrade and retrofits

We provide technical consulting and advise our customers on technology upgrades to their installation. The main focus of the upgrades and retrofits is to assure the operational reliability of the plant, to increase the productivity, and to reduce the total cost of ownership. We are available to discuss preventive maintenance contracts as well as “hotline services” to minimize downtime of your installation.





Thin film coating services

Plasma diagnostics

Magnetic field simulation software

Uniformity optimization

Expert systems (advanced process control)

Coating defect analysis and material characterization

Vacuum checking (leak checking of end blocks, process chambers)

Our Target Markets

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

The development of low-emissivity and solar control coatings to improve the energy efficiency of buildings is the core of our business. The equipment to deposit the coatings on large area glass substrates are engineered, manufactured, and put into service by AGC Plasma Technology Solutions.

Automotive glass

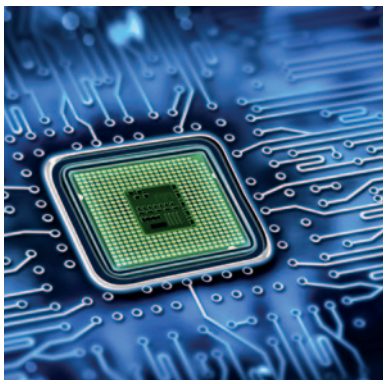
The driving experience has been changing rapidly over the last years with the development of autonomous, electric, and connected vehicles. Magnetron sputtered coating technology is contributing greatly to these new developments by providing anti-fog or heating function in the windshield, integrated antennas in the backlight, and the anti-reflective treatment of the display screen inside the car to improve readability with strong ambient light.

Displays, touchscreens and wearable electronics

Touchscreens have forever changed the way we interact with devices. However, scratches, reflections, and fingerprints can distract our attention and reduce the user experience dramatically. Over the last decade AGC has developed several plasma processes to tackle these inconveniences. Anti-scratch, anti-reflective, anti-glare, and anti-smudge coatings for glass and sapphire are available for the display market. In addition, some of these coatings can change the touch sensation and create "a paper like feeling".

Electronics and optical materials

Sapphire glass is increasingly used for electronic devices for the manufacturing of touch sensors and rear camera glass. AGC Plasma Technology Solutions has developed a patented anti-reflective treatment based on ion beam implantation that reduces reflectance down to 2 %, while maintaining excellent scratch resistance.

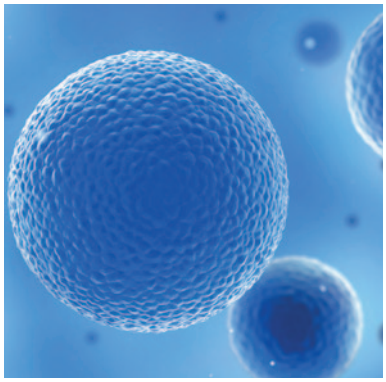


Chemicals

The creation of multifunctional surfaces such as hydrophobic and/or hydrophilic properties, durable corrosion resistance, adherence, aesthetic optical appearance, and reflectivity can be obtained in an environmentally sustainable way through efficient processing by plasma polymerization.

Medical & life sciences

Medical implants (e.g. hip, knee, shoulder and ankle) can be coated by sputtering or PECVD to improve their biocompatibility and/or increase the wear resistance and lubricity. In places, where strict hygiene is crucial the antibacterial action of silver ions can eliminate bacteria to be formed and propagated on its surface. Thin film coating technology can be used to treat the walls of sterilization rooms in clinics orimprove the liquid-repellency of mobile devices.



Powders, fibres and filters

Powders and fibres are used in a wide variety of applications like filtering, pigments for dispersion in paints, and additive manufacturing (e.g. 3D printing). Powders and fibres can be treated by PVD processes to upgrade their decorative aspect (e.g. chrome-like appearance) or to alter their wettability to give them hydrophobic (water-repellent) or hydrophilic (water-attracting) properties. It is feasible to control opto-energetic properties of powders to allow better processing in subsequentmanufacturing processes.

Energy

AGC has been active in the solar glass business for more than a decade. As the world leader in glass production, AGC benefits from the latest glass technologies to make renewable energy a success. We are eager to support you to engineer and upscale innovative plasma coating processes in order to manufacture photovoltaic modules on allsubstrate types.

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.

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.

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 capabilities to assist in:

Proof of concept 01

Evaluation and validation 02

Design, development and prototyping 03

Installation and start-up 04

Optimization of productivity 05

Preventive maintenance and additional services 06

What are the benefits of working together?

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 commercialization.

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

01 Decades of experience in coating production

02 Latest developments and innovations

03 Access to demonstration lab of coating development and prototyping

04 In-house engineering experience and turnkey solutions

05 International team of plasma experts at your service

Visit www.agc-plasma.com for more information.

AGC GLASS NORTH AMERICA
AGC Business Development Americas
11175 Cicero Drive, Suite 400
Alpharetta, GA 30022, USA

CAMERON R. GOTTLIEB
Business Development Manager, North America
Mobile: +1 678 381 3276
E-mail: cameron.gottlieb@us.agc.com

AGC GLASS EUROPE
AGC Technovation Centre
Rue Louis Blériot 12
6041 Charlroi, Belgium

JEROEN SCHOTSAERT
Marketing, Sales & Business Development Manager
Mobile: +32 499 99 30 09
E-mail: jeroen.schotsaert@eu.agc.com

HUGUES WIAME
General Manager
Mobile: +32 473 55 24 14
E-mail: hugues.wiame@eu.agc.com

INTERPANE GLAS INDUSTRIE AG
AGC Interpane Demonstration & Research Centre
Sohnreystra e 21
37697 Lauenförde