Automotive solutions

Driving mobility with innovative and sustainable surface finishing solutions

Electronics & General Metal Finishing

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Automotive capabilities at a glance

Global market leader in electroplating, equipment, chemistry and service

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With a global presence in more than 40 countries, the Atotech brand is the approved choice of OEMs and Tiers worldwide. You can expect nothing less than first-class service and customer support.

>60%

of our R&D projects are devoted to green technologies

Automotive competence
Underlined by a unique automotive industry approach

Leading technologies
R&D is the backbone of our success. We regularly work directly with end customers and OEMs to co-develop new ideas that drive product innovation.

Production know-how
Paired with our broad production know-how, our highly skilled personnel and manufacturing capabilities make us the trusted partner within our industry.

Customer focus
Our outstanding team of highly qualified plating experts is dedicated to ensuring that our customers achieve their goals

Collaboration
We collaborate heavily with the entire value chain to seek new paths and set bench-marks for the development of innovative processes

Patents
Over 2,100 registered active patents, of which 1,700 for chemical processes and 400 for equipment

Surface finishing solutions designed to make mobility more sustainable, sophisticated and intelligent than ever before.

The tightening of CO_2 regulations and the introduction of sustainability roadmaps are leading to an increase in vehicles with alternative drive systems and a focus on sustainable materials and products throughout the automotive supply chain. At the same time, connectivity and autonomous technologies will increasingly continue to transform the car into a platform where both drivers and passengers can experience an array of new features and services while on the road.

Sustainable transformation

Driven by legislation and broader social debates, automotive manufacturers are reducing their carbon footprint in both production and vehicle emissions. The use of alternative drive systems and lightweight construction play an important role in this process. The rapidly advancing development of alternative drive systems is paving the way not only for low-emission mobility, but also for new technologies and advanced materials. At the same time, growing environmental awareness is driving not only the demand for net-zero technologies and recyclable vehicle components, but also new, advanced mobility concepts, such as car sharing. This results in the increased use of individual vehicles, which therefore require longer service lives and components with higher wear and corrosion resistance. Meanwhile, sustainable value chains are becoming increasingly important, with a focus on reusing and recycling resources and eliminating the need for hazardous substances.

Autonomous driving and safety

The future-oriented trend towards autonomous driving, which is associated with more than just e-mobility, has an impact on powertrains of all kind. In combination with connectivity, new technologies ensure the safety of cars and their occupants, providing the features necessary for the effective control of energy consumption. In the future, digital technologies that enhance both safety and connectivity from machine to human, machine to machine, and machine to x, and that are reliable, fault-tolerant, and robust will take the wheel.

The less human influence is required for a vehicle's mobility, the more passengers will perceive cars as radical shifts from the norm, which will, in turn, increase the amount of time they'll want to spend there. For this reason, emphasis will increasingly be placed on in-vehicle information and entertainment features, as well as interior design.

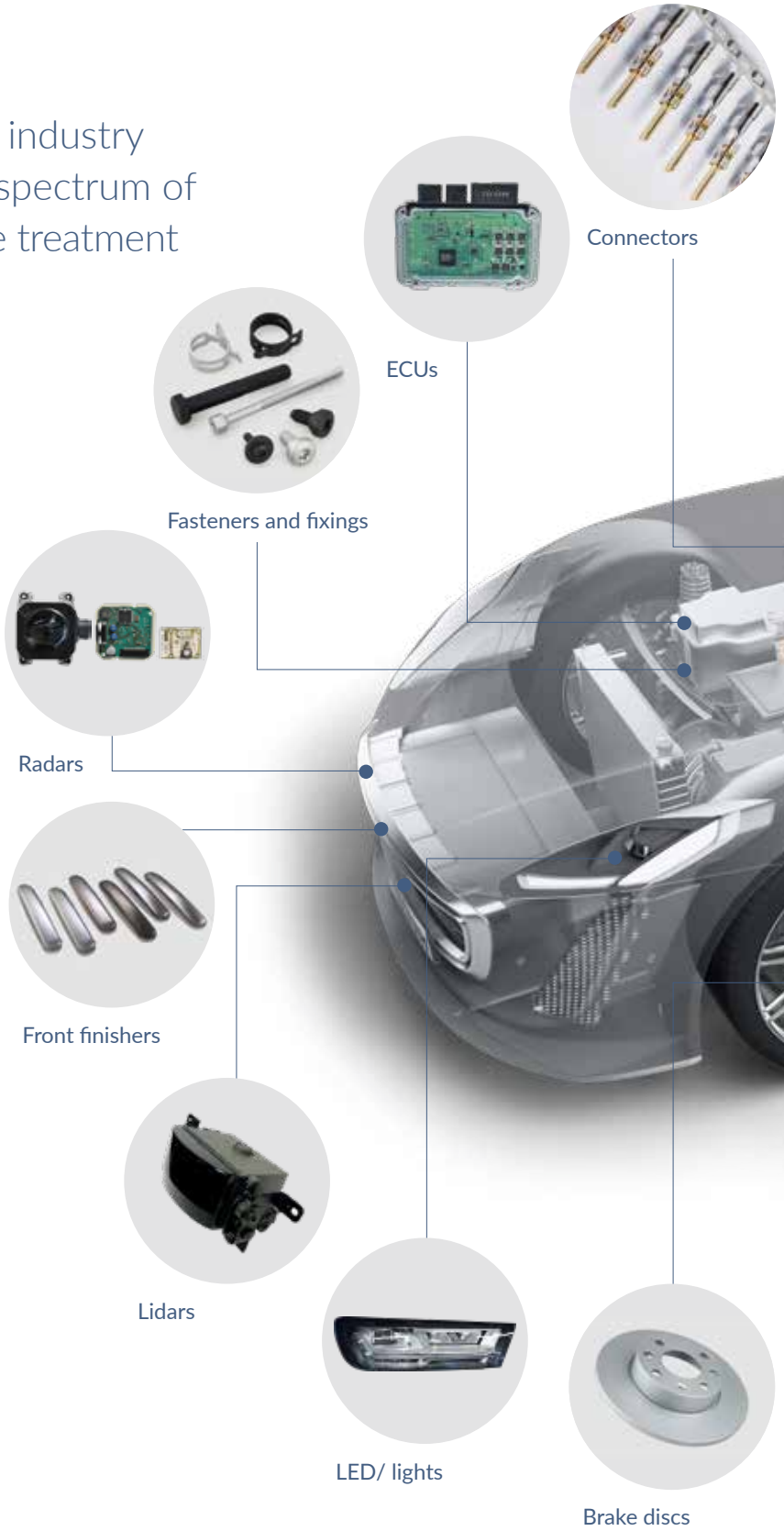
MKS' automotive competencies

At MKS, we have a nuanced understanding of the requirements of automotive manufacturers, OEMs, and their suppliers. This, combined with our expertise in surface finishing, enables us to provide customized solutions that meet the industry's stringent performance and quality requirements. So, whether it's providing the right surface finishes for new car exterior and interior materials, or improving comfort, safety, and entertainment, we help complete the driving experience. Our products, wet chemical process solutions, equipment, software, and services are designed to use water, energy, and raw materials with high efficiency, reusing and recycling wherever possible. We've made an uncompromising commitment to eliminating harmful substances from our products and processes, such as CMR and toxic chemicals, heavy metals, and allergenics.

For a mobile tomorrow that's more sustainable, sophisticated, and smarter than ever.

Atotech automotive solutions

Our portfolio for the automotive industry includes solutions for the entire spectrum of decorative and functional surface treatment for all drive technologies.



Decorative coatings

Plastic pre-treatment
Copper/nickel/chrome coatings

Wear resistant coatings

Functional chrome coatings
Electroless nickel coatings

Corrosion protection coatings

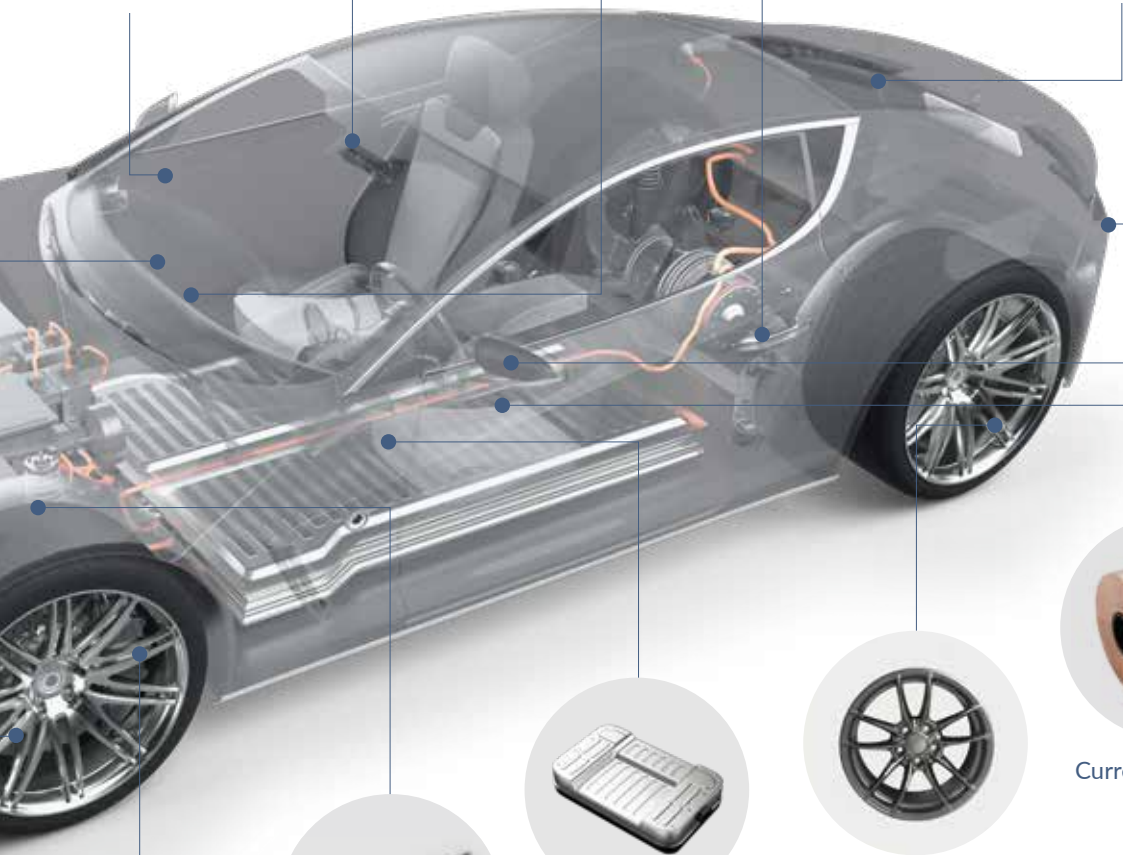
Zinc and zinc alloy coatings
Zinc flake coatings

Paint support technologies

Paint overspray treatment, pretreatment, stripping

Electronics

Wet chemicals and production technologies for printed circuit boards, semiconductors and functional electronics



Sensors

Info- & Entertainment

Door handles

Decorative trims

eEngines

Leadframes

Cameras

Current collectors

Wheel rims

Bus bars / battery plating / battery housings

Shock absorber rods

Brake calipers

Plated components in combustion engine

Piston rods and piston rings

Fuel rails

Body

Paintwork

Transitioning away from solvent-based paints means implementing more environmentally friendly waterborne paints, which can lead to foaming and unpleasant odors as a result of elevated concentrations of organics and biochemical oxygen demand (BOD). Atotech paint overspray technology offers the ideal solution for treating waterborne and solvent-based paints, as well as mixed paint systems for superior, simplified treatment with improved sludge reduction. Our product range also includes a sustainable in-house paint removal alternative.

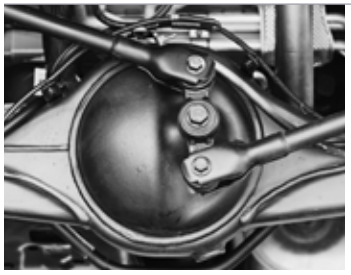
Wheels

For cast and forged wheels, we have developed long-life, low-temperature cleaners that reduce the amount of water and energy required to remove organic and inorganic soils, as well as zirconium conversion coatings that provide a corrosion-resistant barrier and improve paint adhesion. Wheel bolts – mounted multiple times and exposed to harsh road conditions – require the stable friction values provided by our coating systems, which include alkaline zinc nickel electrolytes, passivates, and zinc flake technology (top coats).

Chassis

Aluminum parts

Lightweighting encourages the use of aluminum parts that require surface treatment and corrosion protection in order to extend the vehicle's service life. Atotech sustainable pretreatment solutions, including low-temperature cleaning, nitric acid-free activation and aluminum passivation, provide a superior approach to creating a durable, corrosion resistant coating for underbody and structural components. Our sustainable paint removal processes also preserve the substrate's structural integrity for high-value part reclamation.



Fasteners and fixtures

The fasteners and fixtures connecting structural components must meet increasing durability standards. Our sustainable, innovative corrosion protection systems include zinc, zinc nickel, zinc iron electrolytes, passivates, and lubricated sealers, as well as zinc flake systems that combine a base and lubricated top coat. All systems exhibit outstanding corrosion protection with defined coefficient of friction windows, fulfill requirements for color stability and multiple mounting on a range of materials and have wide OEM standard approval.

Shock absorbers

Countering the subtle deterioration caused by constant action and fluid friction, shock absorber rods require very high wear resistance in order to maintain the safe roadability of a car. We offer hard chrome solutions that provide excellent wear resistance and corrosion protection for shock absorber rods. Combining high-performance process chemistry and plating line technology, our system has revolutionized shock absorber rod plating. The result is excellent quality and flexibility that offers environmental, economic, and resource benefits.

Brakes

A properly functioning brake system is essential. Components are exposed to harsh road environments and prone to corrosion. Our acid zinc and zinc nickel processes provide the highest possible corrosion protection and chemical resistance for brake calipers and pad backing plates. Our zinc flake coating systems prolong the service life of brake discs and drums and ensure continued safety. Trivalent hard chrome plating solutions and mid-phosphorus electroless nickel processes provide corrosion protection and wear resistance for brake pistons.

Mounting frames and arms

In spite of exposure to loose stones, water, and de-icing salt, engine mounting frames and suspension arms cannot deteriorate or lose stability and load-bearing capacity. Atotech innovative finishes, including zinc flake coatings for complex frame structures, exhibit excellent stone-chipping resistance and corrosion protection. Our sustainable paint pre-treatments, used in conjunction with our acid zinc nickel systems, yield minimized contact corrosion, a requisite for parts like connecting rods and axle handlebars.

Powertrains

ICE vehicles

For highly stressed internal combustion engine parts such as piston rods and piston rings, our leading hard chrome technologies provide excellent wear resistance and a high level of corrosion protection. Likewise, our medium phosphorus electroless nickel coatings provide a similar level of corrosion protection and wear resistance for moving transmission parts such as shafts and forks.

Our range of electrolytic-deposited zinc and zinc alloy coatings as well as zinc flake coating technologies offers excellent corrosion protection and stability for applications exposed to constant high temperatures. The same level of corrosion resistance, combined with a defined coefficient of friction, is provided by our environmentally friendly fastener coating systems, which also fulfill multiple mounting demands on various materials.

Our trivalent chromium decorative coatings lend a sleek metallic look to exhaust pipes and offer a wide range of colors for car concepts of all kind.

Electric vehicles

For electric powertrains, ensuring that the e-axle functions flawlessly requires surfaces to be free of defects. We offer sustainable long life, low temperature cleaning solutions for thorough cleaning, as well as phosphate-free coating pretreatments that yield improved paint adhesion. Our sustainable paint removal processes not only facilitate in-house solutions for fast component reclamation, but support environmentally friendly production in the process.

Fuel cell vehicles

We have developed high corrosion resistant electroless nickel plating solutions for hydrogen fuel cell-focused applications, specifically for cells, pipes, and hydrogen diffusion barriers, where hydrophobic surfaces are needed. Our zinc nickel electrolytes provide corrosion protection to bipolar plates and pipes, as well as to fasteners and fixtures that require a high corrosion performance level combined with a defined coefficient of friction.

Engine control unit (ECU)

The ECU is the heart of the automobile's modern engine control system. The electronic components within the ECU need to be highly reliable and heat resistant while simultaneously increasing engine performance. We offer products that can endure heat and high voltage while maintaining high reliability. These include extremely reliable electroless and electrolytic Cu solutions for HL count and HDI any-layer PCBs, which provide excellent Cu to Cu inter-connectivity and signal transmission, even under severe thermal shock conditions.

Bus bars and connectors

Reliability is paramount for bus bars and connectors. Electrical connections, be they bolted bus bars, press fits, or spring contacts need to withstand tough environmental conditions like high temperatures, humidity, and vibration without losing their excellent electrical conductivity. We offer a variety of surface finishes from tin to hard gold deposits that meet exactly these needs: tin deposits with low whisker propensity for press fits, wear-resistant hard gold de-posits for connectors with low abrasion and high reliability, and anti-tarnishes that preserve layer properties like conductivity, solderability, and more.

Batteries for electro and hybrid vehicles

Battery cell

Connectors and busbars

Connectors and busbars transmit high current loads and resist attrition caused by permanent motion during a journey. Therefore, high conductivity and wear resistance are essential. As the leading supplier of nickel silver and nickel tin plating processes, as well as anti-tarnishes for connectors and busbars, We offer complete processes from pretreatment, to nickel barrier and subsequent hard silver plating, to Cr(III) based layers for protection and, alternately, from pretreatment, to nickel barrier and subsequent MSA based pure tin plating, to heat and humidity resisting anti-tarnishes.

Anode lead tabs

Perfect sealing is necessary to prevent the formation or emergence hydrofluoric acid. The insulation material must therefore firmly adhere to the anode lead tab. We offer the complete coating process, from pretreatment, to nickel processes for barrier layer or conductive layer plating, to the adhesion promoting and corrosion resistant trivalent chromium based top layer for improved adhesion between the insulation and lead tab.

Cathode and anode current collector

Advanced battery technology, especially high-capacity active materials on the current collectors, requires adhesion improvement for the highest reliability through adjusted adhesion promoters. We provide adhesion promotion, from tailor made molecules, to formulating adhesion promotion products, to application expertise for the best results in the manufacturing process. Our range of copper and aluminum foil treatments improves adhesion to resins and polyimide.

Thinner copper foils, characterized by lower stress, more even surfaces, and new material combinations for manufacturing current collectors, facilitate weight reduction. Copper plating on top of alternative materials also promotes enhanced conductivity, while surface treatment of the deposited copper layers improves adhesion and corrosion protection. We offer the complete process for copper plating on various base materials, as well as copper surface treatment for corrosion resistance and adhesion promotion.

Battery module

Battery and cell management

As an integral part of the battery, it is essential that a battery management system has a long lifetime, high reliability, and high productivity.

The Atotech portfolio of electronic solutions ensures reliability through corrosion resistance and adhesion promotion, efficient power transmission through highly conductive surfaces, and a reduction in weight through the synergy of low-density base materials combined with innovative surface coatings and treatments. These solutions are applicable to virtually all components including wires, bus bars, and lead frames.

Battery housing and fasteners

Battery housings manufactured from aluminum or steel require protection against corrosion. Subsequent coatings, both electrolytic and paint, best adhere to clean surfaces. We offer a full range of sustainable cleaners and zirconium based cleaner coaters for battery pack housings.

Steel battery housing components are best protected against corrosion with our high efficiency electrolytic based coatings, which provide unmatched corrosion resistance.

With Atotech electrolytic- and zinc flake-based coatings, fasteners and fixings for battery assembly meet the high demands for reduced contact corrosion and improve conductivity for corrosion performance and defined coefficients of friction.

Electromagnetic shielding

Modern cars include convenience features and safety features. All of these emit and may be affected by electromagnetic radiation based interference. With electrified vehicles we exhibit additional sources, such as power converters, electric motors, traction batteries, or chargers. As source and victims are placed near to each other, electromagnetic interference between them needs to be safeguarded by shielding.

For a wide range of applications we offer pre-treatments to plate directly on molding resins for components, PCBs, or highly engineered plastic housings to protect the electronics systems. With our portfolio of highly conductive and soft magnetic electroplated layers we support high shielding effectiveness for low frequency electromagnetic radiation.

Info- and entertainment

Displays

As the car's central control unit, the digital display will become increasingly important in the future. It typically provides links to navigation, entertainment, and various infotainment options. Display design and functionality is becoming more complex, as the industry moves towards displays that are larger, curved, and/or 3D.
At the same time, there is a focus on miniaturization and new display technologies. Our solutions include electrolytic as well as electroless copper, immersion tin, and ENIG and ENEPIG solutions for printed circuit boards, package substrate, and semiconductor applications.

Touch screens

Touch screen displays need to be reliable and readable in all light conditions. Systems that are easy to use and have quick response times provide access to information directly from the vehicle, other smart devices, and external sources such as smart street cells, objects, and other vehicles via voice connectivity and voice recognition. These systems are vital for safe driving conditions. Atotech wet chemical processes enable increased interconnectivity, processing power, and miniaturization via plating solutions for electroless nickel, palladium, gold for ENEPIG and immersion tin, and electroless and electrolytic copper.

Smart surfaces

Smart surfaces combine innovative interior design with functional technologies to create a unique passenger experience. Features are seamlessly integrated into the concept as a whole, enabling practical interaction with controls, lighting, heating, and info display. This creates an aesthetic interior that moves towards a fully-autonomous experience. The Atotech solution portfolio for flex PCBs, HDI, semiconductor applications, and functional electronics ensures that components run smoothly and effectively. These include ENIG, EPAG, and ENEPIG solutions as well as electroless copper and a range of pre- and post-treatments.

ADAS

Cameras

The use of Vision Systems in cars is increasing rapidly. Today, cameras are the main components in these systems and belong to the fastest-growing sensor category in advanced safety. These cameras must comply with the highest reliability standards and offer maximum resolution – a necessity for next-generation autonomy. We offer solutions that cater to these needs, such as advanced graphite processes for flex PCBs, nickel-gold processes for connectors and bus bars, adhesion promoters, and electrolytic Cu plating for flex-rigid and multilayer PCBs.

Lidar

Lidar systems for detecting and ranging are one of the fastest developing technologies in automotive advanced safety. These systems are critical for driving safety and have become a next generation requirement to support fully autonomous driving. Here, miniaturization and cost effectiveness are key. We offer processes for reliable and cost-effective solutions for multilayer, flex and HDI PCBs, lead frames, connectors, package substrates, and QFNs. These range from surface treatment, metallization, and copper plating to immersion tin and NiPdAu over EMI shielding solutions and low-roughness solder resist pretreatments.

Radar

Radar systems are another advanced safety system crucial for the development of fully autonomous driving. They often feature in the advanced safety systems of most new vehicles, from collision warning and blind spot detection to automatic emergency braking. For vehicle radar systems, miniaturization, top-notch reliability, and unique substrates in the hardware are key. Our latest advanced graphite and electroless copper solutions as well as our bonding enhancement technologies, as just two examples, enable the use of the latest dielectric materials needed to achieve the high signal speeds critical safety systems require.

Central computer

The central computer is the heart of the vehicle of the future. It coordinates car-wide system information, from under the hood to the outside environment, and executes commands. Speed, processing power, and reliability are paramount for safety. Atotech products, from surface treatment, metallization, and copper plating to immersion tin, nickel-gold and nickel-palladium-gold plating on multilayer, flex and HDI PCBs, lead frames, connectors, and package substrates help ensure these electronic components function as reliably and efficiently as possible, while also enabling plating on ever-finer features, key for miniaturization.

LED/ lights

Optimal lighting is a significant factor in ensuring the safety of all road users. Style and sustainability are also increasingly important. LED lighting leads to savings in energy and increased options in terms of design. We offer a broad portfolio of functional electronic coatings for LED lead frames ranging from anti-tarnishes that prevent brightness degradation for bright acid copper on smooth surfaces to high-speed and high-brightness silver spot plating processes for bright silver deposits.

Connectivity

Over-the-air updates

Connected cars generate data that specifies location, engine status, door lock status, speed, and much more. Information travels both ways thanks to over-the-air (OTA) updates, which means that a car's electronic components can be updated without having to visit a garage. Electronic components such as HDI, MLB and flex PCBs and semiconductors must be highly reliable and have fast response times and ever-increasing functionalities. We offer solutions for reliable stacked via buildup, high-purity electrolytic copper for Cu flash and micro via filling, and systems for horizontal electroless and electrolytic copper plating.

Data transfer and communication

Data transfer and communication to other vehicles, surroundings, and the manufacturer is crucial for important features such as emergency assist. A reliable smartphone terminal combining inductive charging, near-field communication, and wireless antenna coupling is also a must. The Atotech portfolio includes solutions for manufacturing electronic components for high-voltage devices requiring consistent surface preparation, plating processes, and finishes such as our immersion tin solutions with high tin thickness and anti-whisker additive or electrolytic and electroless copper processes for reliable copper traces.

Cockpit controller

Thanks to improved software and hardware as well as increased operational security, the cockpit controller of the future will ensure the rapid, efficient implementation of functions such as voice assistance, real-time information, location-triggered marketing, smartphone integration, and much more. Atotech products ensure increased functionality, quick response time, top-notch reliability, and the potential for further miniaturization. These include pre- and post-treatments for better dielectric to copper adhesion, electrolytic tin and tin-silver solutions for HDI, MLB and flex PCBs, IC substrate, sensors, and power chips.

Interior and exterior design

Decorative coatings

Atotech decorative chrome solutions for plastic and metal-based applications provide durability and attractiveness for heavily used interior and exterior automobile components. Our sustainable series of Cr(VI)-free solutions from plastic pretreatment to nickel plating, plus trivalent chromium decorative coatings and sealers, offer a wide range of colors and designs for matt, satin, or lustrous surfaces, creating cohesive car interior and exterior aesthetics that are in line with established design concepts.

Functional decorative coatings

For automotive interior fasteners, electrolytic deposited coatings and/or zinc flake coating technologies offer both corrosion protection and an attractive appearance. These have small coefficient of friction windows and fulfill complex OEM requirements for functionality and optics. Exterior components exposed to sunlight, rain, and pollution while in frequent motion are best protected with our electroless nickel coatings, which have excellent wear resistance and corrosion protection, yet preserve streamlined aesthetics.

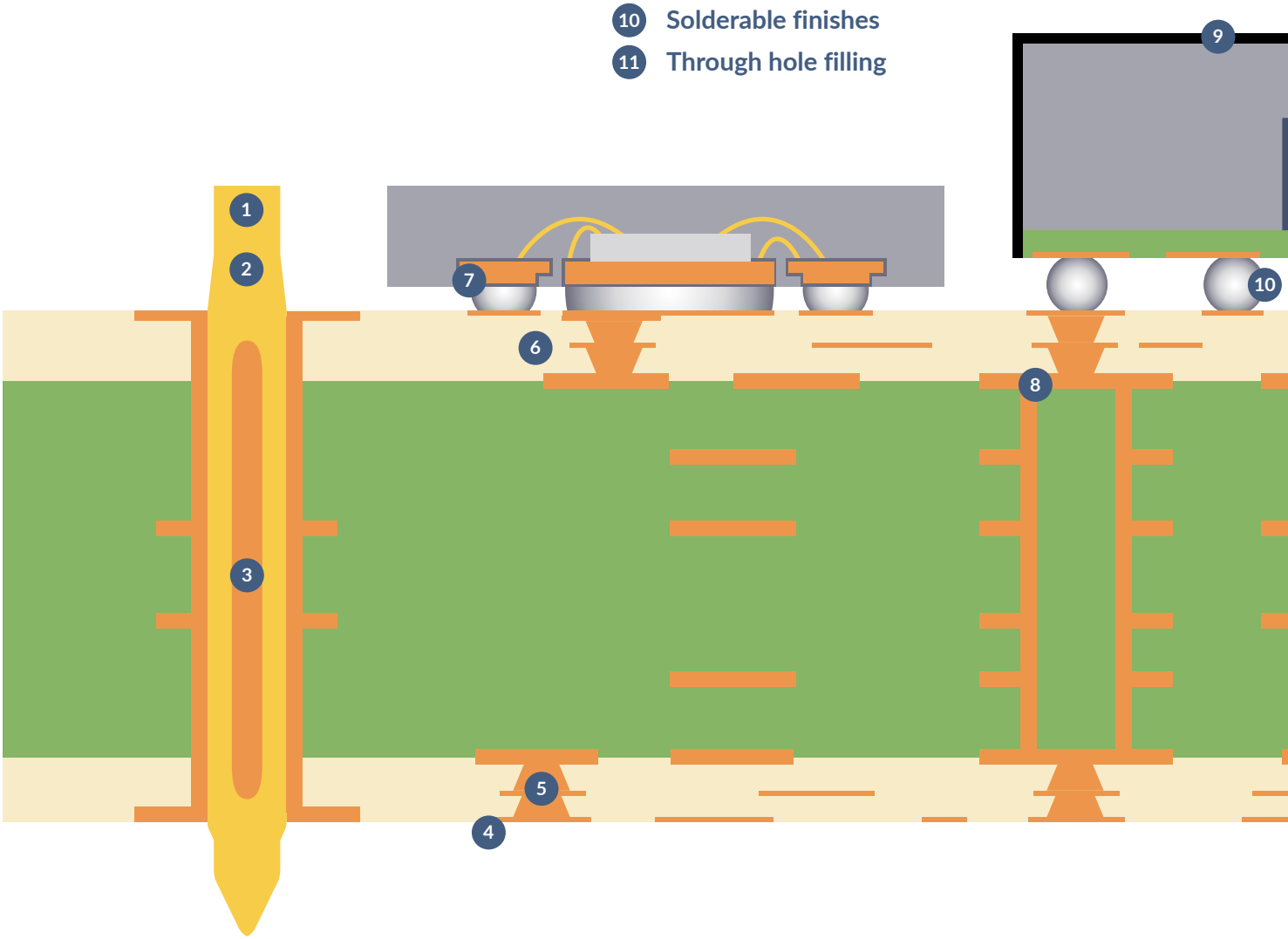
Electronic solutions – creating connections

Connector solutions

1. Connector
2. Press-fit contact
3. Flexible press-fit zone

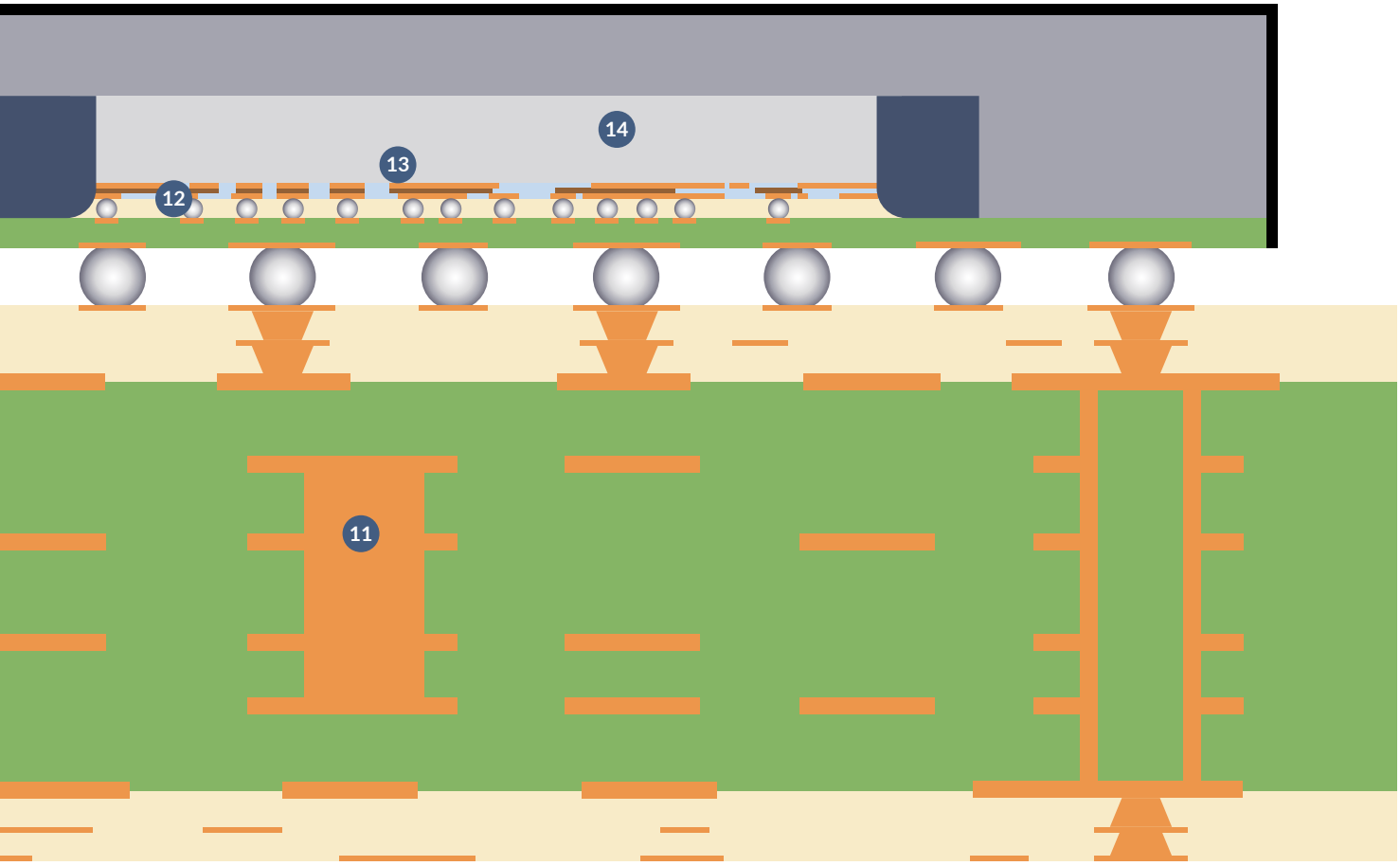
Circuitry solutions

4. Full build copper plating
5. Copper via plating
6. Surface processing
7. QFN with wettable flanks
8. Through hole metallization
9. Electromagnetic shielding
10. Solderable finishes
11. Through hole filling



Semiconductor solutions

12 **Solder bonding/wire bonding**
13 **Redistribution layers/pillars**
14 **Die interconnects**



Technology Challenges – Key areas of development

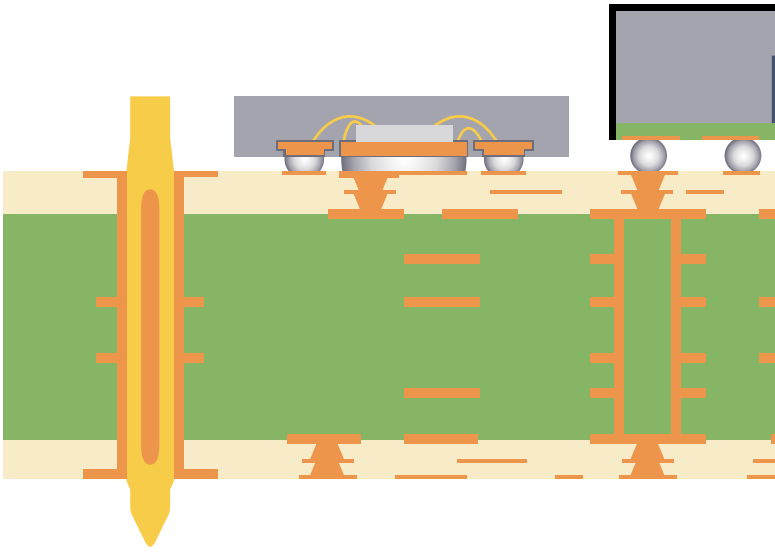
HDI

Surface processing

Surface treatment to ensure excellent adhesion for inner and outer layer PCB build-up is essential. Recent developments in the automotive industry require surface treatments that are not only suitable for high frequency applications, but also high voltage operation. Our high-end inner layer bonding and surface treatment products ensure optimal adhesion, great signal integrity, and thermal reliability under any condition.

QFN with wettable flanks

To assure that cars meet today's demand for safety and high reliability, false-free QFN solutions are needed. We offer state-of-the-art solutions for the production of quad flat no lead (QFN), such as thick immersion tin processes which produce three-dimensional solder joints, thereby assuring best reliability and yield. They are applicable for vertical as well as horizontal and barrel plating modes.



Through hole metallization

The increasing concern of the industry over stacked BMV (blind micro via) reliability has led us to investigate into nano voids. The result is a series of products which assure nano void-free interfaces between the target pad and the electroless copper itself. Ideal for high-tech applications, these products ensure good throwing power and excellent coverage in even the most challenging of via geometries.

Copper via plating

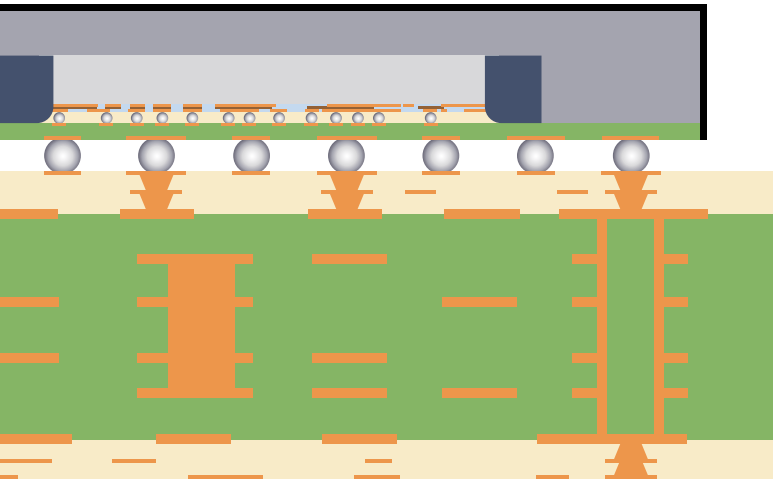
With the increasing requirements of high reliability industries such as automotive, We have developed a set of BMV and through-hole filling processes which are ideally suited for conformal copper plating and the needs of IC substrate manufacturing. All assure high productivity, excellent filling performance and crystal structures, and are ideal for vertical and horizontal equipment.

Solderable finishes

Immersion tin and OSP are the predominant surface finishes used for automotive electronics and need to meet critical application demands. We offer a market leading immersion tin which provides excellent solder joint reliability combined with outstanding corrosion resistance. Our OSP solutions offer a solderable environmentally friendly finish for fabricators and a stable organic coating even with more than five reflow cycles. They are suitable for SIT applications and work best in combination with Atotech ENIG processes.

Electromagnetic shielding

Electromagnetic interference between different electronic components needs to be prevented by shielding. We offer a set of solutions which provide a stable composition of NiFe alloys, that are key to ensure shielding properties and an even distribution of NiFe.



Solder bonding

We have solutions for the different kinds of solder bonding technologies. For solder applications we offer processes to deposit pure Sn and SnAg solder bumps which fulfill the high reliability requirements of next generation advanced packaging applications. High CoP uniformities, long bath life-times, and high-speed plating are key, while simultaneously ensuring highest purity and void-free results.

For copper pillars, our solutions enable the deposition of highly pure and uniform Cu pillars at high deposition speed. They also meet new technological requirements such as mega pillar (tall pillar) plating with precise control over pillar shape (flat, concave or convex), as well as plating of pillars of different dimensions in the same die.

Wire bonding

For pad metallization, process solutions are needed which ensure high reliability. Atotech solutions allow pad metallization with Ni/Pd and Ni/Pd/Au for an excellent contact and bond properties of wire to chip bonding. Our purest Pd solutions allow high reliability and stress-reduced deposits with an excellent process stability, while withstanding even high temperature budgets of up to 450 °C during chip processing.

Redistribution layers

The industry's need for faster and better performance requires the newest materials and processes. Atotech solutions enable higher throughput, exceptional reliability performance, and optimal yield. Our Cu processes allow the deposition of highly pure and uniform Cu for RDL and via applications and hence significantly increase the reliability of the Cu structures. The high purity chemistries significantly reduce the level of additive incorporation and minimize the risk of microvoid formations.

Die interconnects

For die interconnects, damascene copper solutions are needed, which allow void-free and reliable fill through. We provide solutions which assure optimum fill performance at tailorable and highest Cu purity. They provide protection of the increasingly thinner seed layers and are designed for use on all mainstream ECD Cu platforms. These cost-effective solutions can be highly tailored to maximize yield and performance across a wide range of applications.

MKS offers a full range of sustainable functional and decorative surface treatments

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Automotive competency

Reliable, high-quality processes, equipment, and chemistry for the entire spectrum of functional and decorative surface treatments, which meet the needs and demands of the automotive industry.

Global presence

Sales and service for our Atotech products in more than 40 countries enable us to provide efficient customer support worldwide. Many of our products are approved by numerous OEMs worldwide.

Best local service

Our unique global TechCenter network allows us to offer an unmatched spectrum of services, from pilot production, chemical and materials science investigations to comprehensive training for customers and business partners.

Leading technologies

We collaborate heavily with the entire value chain to seek new paths and set benchmarks for the development of innovative surface finishing processes.

Production know-how

We provide customers with complete factory design concepts. Our production systems guarantee the highest level of quality and efficiency in wastewater treatment solutions, all at a reduced cost.

Sustainable solutions

We use less hazardous chemicals whenever possible, eliminate waste water to the greatest extent possible, as well as reduce our carbon footprint.