OLYMPUS®

Your Vision, Our Future

Automotive Industry

Testing and Inspection Solutions

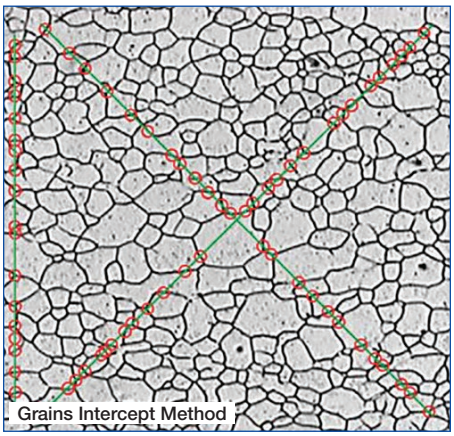
Inspecting Automobiles from the Wheels Up
A Closer Look

A vehicle carries far more than just passengers; it also carries the legacy and reputation of every supplier whose products are involved in its construction. With so much riding on every trip, it's essential to know that every part of a vehicle has been measured, tested, and analyzed to help ensure optimal performance. Olympus offers an industry-leading portfolio

Casting/Forging

Microscopy

Careful control over alloy composition and processing is essential in determining whether a component will hold up over time. Grain structure in metal impacts the integrity and quality of the sample. Olympus industrial microscopes enable inspectors to measure the size and distribution of these grains to assess alloy quality.


Grains Intercept Method

Solution: GX51 inverted metallurgical microscope, OLYMPUS Stream™ image analysis software

Features:

- **Minimal intervention:** use OLYMPUS Stream to accurately and repeatedly calculate grain size
- **Comprehensive reporting:** automatic report generation based on analysis data
- **ASTM E112-compliant:** complies with ASTM E112 and various international standards

NDT

Whether it's a camshaft, crankshaft, gear assembly, or other forged component, small flaws can cause components to fail. It's essential for manufacturers to test for flaws to help ensure the long-term durability of forged parts.

Solution: EPOCH® 650 flaw detector with ultrasonic transducers

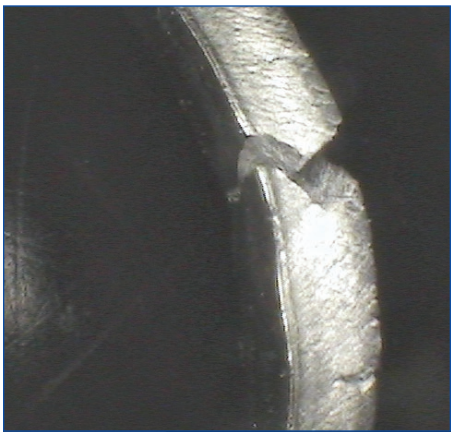
Features:

- **Digital filters:** 30 separate filters for enhanced signal-to-noise ratio
- **Rapid scanning:** 2 kHz PRF provides optimal scanning speed
- **Easy adjustments:** knob and navigation pad configurations simplify on-the-fly adjustments

of innovative testing, measurement, and imaging instruments, including X-ray fluorescence (XRF) analyzers, remote visual inspection (RVI) borescopes, nondestructive testing (NDT) gages and probes, and industrial microscopes for the automotive industry. When your reputation is at stake, trust your testing technology to the experts at Olympus.

RVI

When visibility is limited by small access points, a remote video device is frequently the best option available to an inspection team. Combined with a 2.4–6 mm-diameter insertion tube, Olympus borescopes enable users to inspect tight, difficult-to-access spaces.



Solution: IPLEX® TX, IPLEX RX/RT, IPLEX UltraLite, IPLEX NX videoscopes

Features:

- **Modular scope design:** swap insertion tubes quickly and easily
- **CCD or CMOS (IPLEX TX) technology:** high-resolution images displayed on vivid color monitors
- **High-resolution images:** easily inspect very small spaces

XRF

Material integrity is essential to the casting and forging process. Verifying aluminum, stainless steel, and nickel alloy grades is important for determining the long-term durability of cast parts. Olympus handheld XRF analyzers enable inspectors to quickly determine material chemistry and verify alloy grades.

Solution: DELTA® handheld XRF

Features:

- **Fast, sensitive, and accurate light element analysis:** optimized electronics, stable X-ray tube, and large-area silicon drift detector (SDD) enable high-performance PMI
- **Extensive library:** customizable alloy library includes over 500 commonly used grades
- **Simple interface and reporting capability:** intuitive user interface and fast report generation

Automotive Inspection from the Wheels Up
A Closer Look

A car's overall quality is equal to the sum of its parts, and it's incumbent upon every auto manufacturer to maintain rigid standards of excellence for every component of every vehicle. With reliable inspection standards a must, trust your testing to the experts at Olympus.

Interior Elements

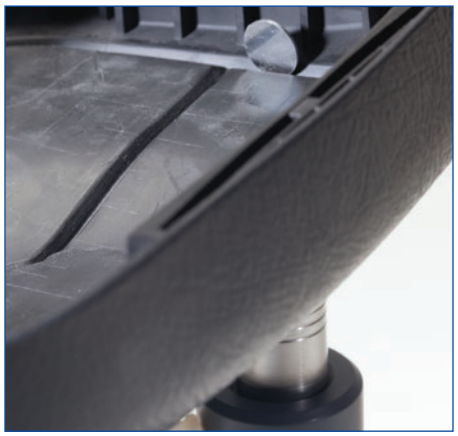
NDT

Ensuring proper material thickness can reduce manufacturing costs, so precisely measuring molded parts is an essential part of the inspection process.

Solution: Magna-Mike® 8600 thickness gage

Features:

- **Easy-to-use:** simple user interface expedites training
- **Replaceable chisel wear cap:** cost-effective cap replacement
- **Multiple target designs:** improves accessibility to smaller spaces such as molding grooves



XRF

The fit and finish of a car's interior are important to consumers' impressions of overall vehicle quality. DELTA® handheld XRF analyzers help provide proper process control and material compliance for floor mats, dashboards, handles, vents, and other components.

Solution: DELTA handheld XRF

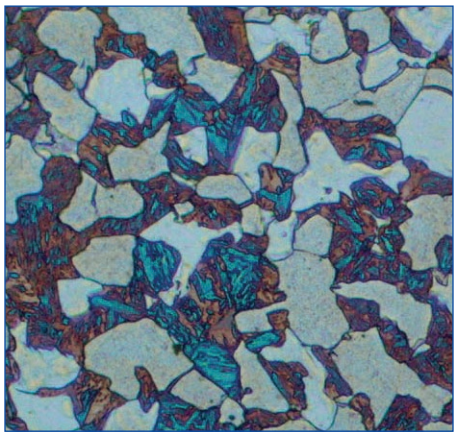
Features:

- **Nondestructive:** measure components when installed or when they arrive at your dock
- **RoHS calibration:** screen for hazardous materials
- **Halogen calibration:** dedicated halogen-free mode to screen for bromine (Br) and chlorine (Cl) in plastics

Heat Treatment

Microscopy

Passenger safety is paramount and underlies every aspect of automotive design. Analyzing cast iron for graphite nodularity, size, form, and distribution parameters, as well as the ferrite-to-pearlite ratio, contributes to building the safest possible frame.



Solution: DSX510i inverted metallurgical microscope, OLYMPUS Stream™ image analysis software

Features:

- **Report generation:** dedicated workflow with automatic report generation
- **ASTM A247 compliant:** meets ASTM A247 and other international microscopy standards
- **Touch-screen interface:** easy for all users to operate

XRF

Measuring alloy composition, confirming alloy grades, and performing positive material inspections are important for maintaining quality standards. Whether producing components, receiving alloy materials, or simply confirming process systems, swift material analysis can quickly identify material mix-ups and improve control processes.

Solution: DELTA® handheld XRF

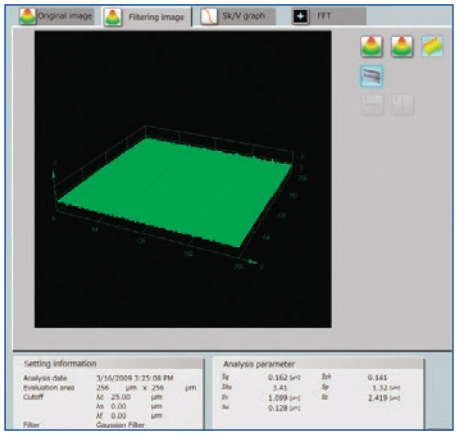
Features:

- **Powerful 4 W X-ray tube:** for optimized beam settings
- **Heat resistant:** test parts as hot as 480 °C
- **Floating point processor:** performs more calculations in less time

Automotive Inspection from the Wheels Up
A Closer Look

Machining & Assembly

Microscopy - Roughness



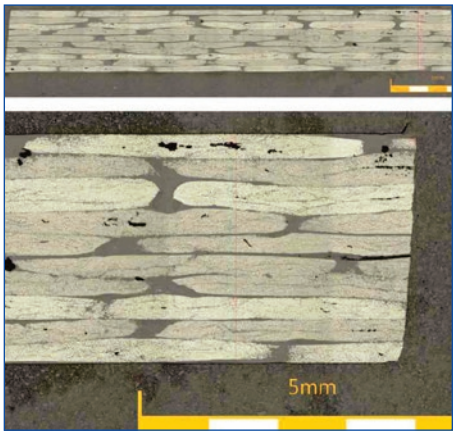
In critical systems, friction can cause parts to fail. Surface wear on machined components can cause premature failure if the surface finish does not meet tolerance standards. A thorough inspection of machined parts at the microscopic level helps ensure the surfaces of machined parts are within tolerances.

Solution: LEXT® OLS4100 laser scanning microscope

Features:

- **Non-contact measurement:** line and area roughness measurements keep samples from getting damaged
- **10-nanometer resolution:** provides detailed surface visibility
- **Accuracy:** traceable accuracy and repeatability for all three axes

Microscopy - Braking Systems



The surface finish of brake rotors must be inspected to help ensure optimal performance. Since there's no room for compromise when it comes to passenger safety, quality control and failure analysis of the braking system are crucial.

Solution: LEXT OLS4100 laser scanning microscope

Features:

- **Dual confocal:** precise 3D microscope images
- **Repeatable:** delivers consistent measurement data

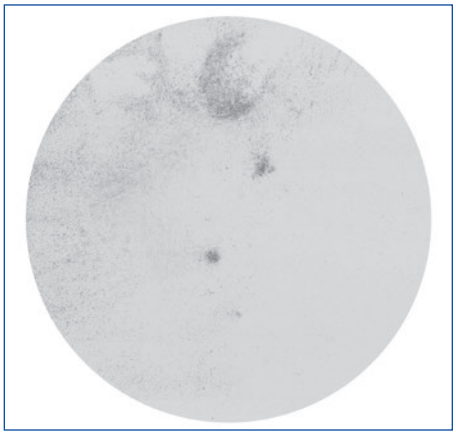
Microscopy - Cleanliness Analysis

By counting, measuring, and classifying microscopic contaminants and particles, manufacturers can determine the cleanliness of parts and fluid that individually and together impact the performance, lifetime, and reliability of their product.

Solution: Olympus Inspector Series

Features:

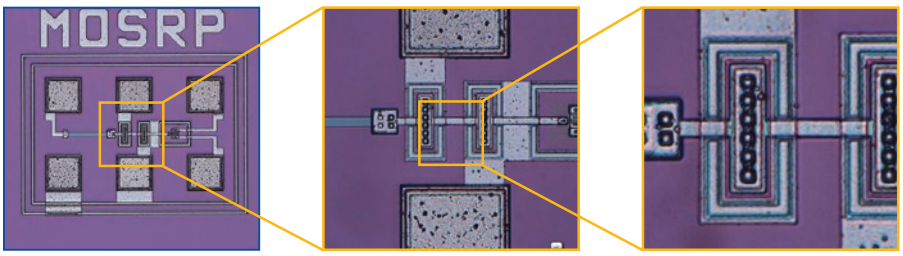
- **Accurate and reproducible:** have confidence in your measurement data
- **Robust archiving:** data is secure for future use



Microscopy - Electronics

Modern vehicles have complex electronic systems managing everything from engine conditions to collision mitigation systems. With electronic components getting smaller and flaws becoming increasingly difficult to detect, electrical components must be thoroughly inspected for adherence to industry standards.

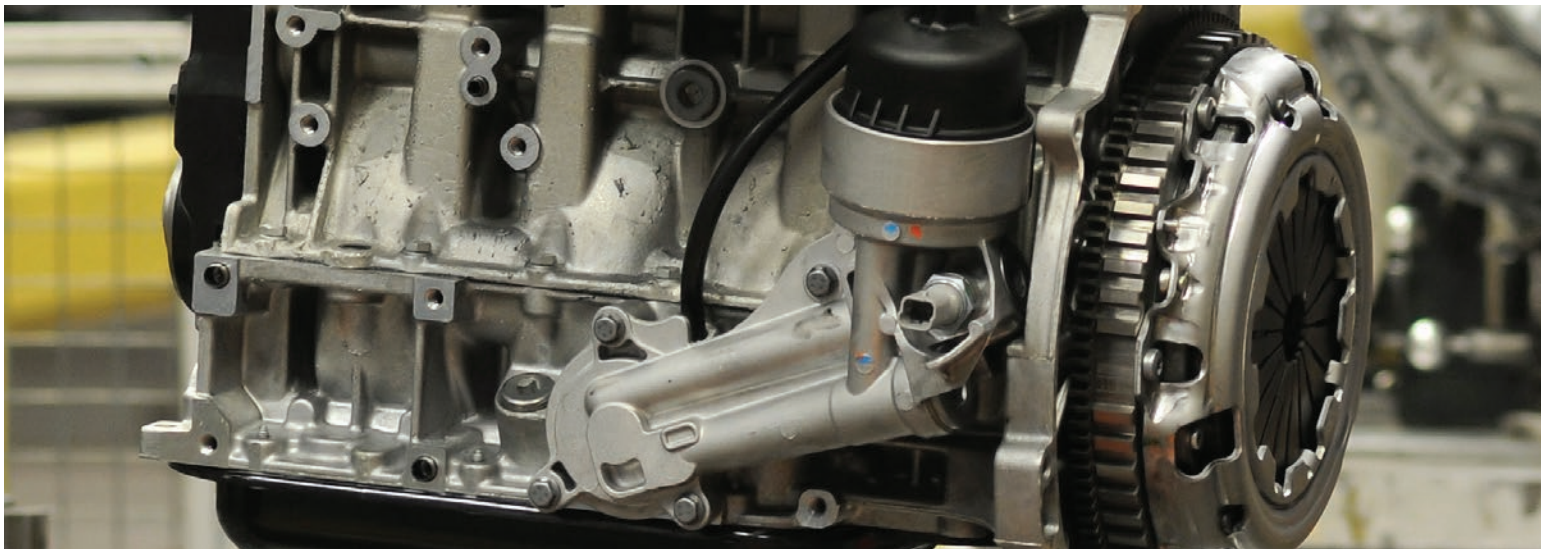
Solution: DSX510 digital microscope



Features:

- **Fast:** save time by selecting the best image
- **3D images:** automatically display 3D images and measurement data with the report function

Automotive Inspection from the Wheels Up
A Closer Look



Machining & Assembly

RVI – Fuel Systems

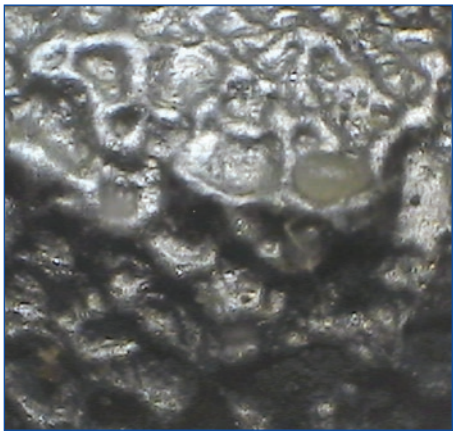
Clogged or failing fuel systems can keep cars off the road, so fuel-bearing elements must be closely inspected. Since fuel runs through a closed system, inspectors need access to flexible tools with high-resolution imaging capabilities.

Solution: IPLEX® UltraLite, IPLEX RX/RT, IPLEX NX videoscopes

Features:

- **Interchangeable scope (IPLEX NX):** enables the user to switch between scopes of different lengths and diameters
- **CMOS technology (IPLEX TX):** high-resolution images displayed on vivid color monitors
- **2.4–6 mm-diameter insertion tube (IPLEX TX):** delivers bright illumination for enhanced visibility in small spaces

RVI – Cylinder Casting



The engine is the heart of every automobile, so it's important that there are no flaws when casting cylinders. Since visibility is limited, a remote video device is frequently the best option available to an inspection team to look for casting defects.

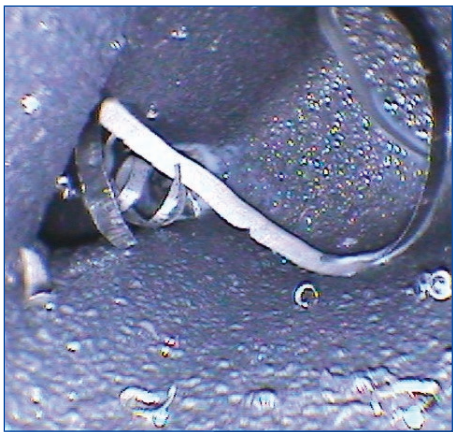
Solution: IPLEX TX, IPLEX RX/RT, IPLEX UltraLite, IPLEX NX videoscopes

Features:

- **Interchangable tips:** whether using near focus direct view or swapping to side view, you get the correct viewing angle to match your application
- **Tungsten braid:** the smooth, durable insertion tube can withstand the rigors of repeat inspections

RVI – Assembled Doors

With dozens of moving parts hidden behind their panels, foreign contaminants and loose materials can damage vehicle door assemblies. Inspecting the mechanisms behind the panel is often hindered by limited accessibility, requiring the use of a remotely-controlled visual inspection tool.



Solution: IPLEX® TX, IPLEX RX/RT, IPLEX UltraLite, IPLEX NX videoscopes

Features:

- **Articulated maneuverability:** the curved nature of door frames makes it difficult to direct a scope to the inspection area, but articulation makes maneuvering quick and easy
- **High-resolution:** the clarity and resolution of IPLEX videoscopes enables identification and detail of any findings, helping prevent doubt or false detection

XRF

Measuring alloy composition, confirming alloy grades, and performing positive material inspections are important for maintaining quality standards. Whether producing components, receiving alloy materials, or simply confirming process systems, swift material analysis can quickly identify material mix-ups and improve control processes.

Solution: DELTA® handheld XRF

Features:

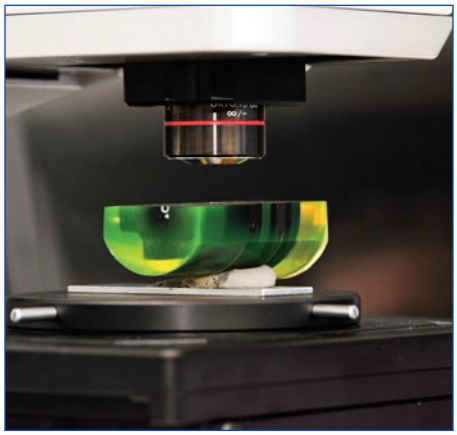
- **Touch screen:** that is clear and readable in any light
- **DELTA PC software**: for enhanced analysis and calibration modeling
- **USB interface:** for high-speed data downloads

Final Assembly and Inspection
Safeguarding Excellence

A final inspection of a vehicle's major components and interior is the final step before shipping to customers. Since your reputation is on the line with each car shipped, don't settle for anything less than the best from your inspection instruments.

Interior & Molding

Microscopy



Dashboards and other airbag deployment zones incorporate a microscopic mesh underlayment designed to destruct during a collision. Since these systems play a critical role in protecting passengers, precise inspection of the geometric features of the mesh helps ensure airbags deploy properly.

Solution: DSX110 digital microscope with OLYMPUS Stream™ image analysis software

Features:

- **3D imaging:** provides improved visibility of microscopic samples
- **Reproducibility:** offers uniform results among multiple operators
- **Simple user interface:** intuitive interface speeds up the inspection process

NDT

Ensuring proper material thickness can reduce manufacturing costs. Consequently, precisely measuring molded parts is an essential part of the inspection process.

Solution: 38DL PLUS® thickness gage

Features:

- **Easy-to-use:** simple user interface expedites training
- **Wide thickness range:** 0.08 mm (0.003 in.) to 635 mm (25 in.) depending on material and transducer selection
- **THRU-COAT® technology and Echo-to-Echo:** measurements on painted and coated surfaces

XRF

Per national and international regulatory and safety guidelines, ensuring interior polymer/plastic parts are free of lead (Pb) and other elements of interest is imperative for consumer safety and product quality.

Solution: DELTA® handheld XRF

Features:

- **Optimized to detect hazardous elements:** identify lead (Pb), cadmium (Cd), arsenic (As), mercury (Hg), chromium (Cr), and other toxic elements in metals, plastic, and mixed materials
- **Small spot collimator:** the optional collimator helps users isolate small features from the background
- **Simple interface and reporting capability:** intuitive user interface and fast report generation

Final Assembly and Inspection
Safeguarding Excellence

Final Assembly & Inspection

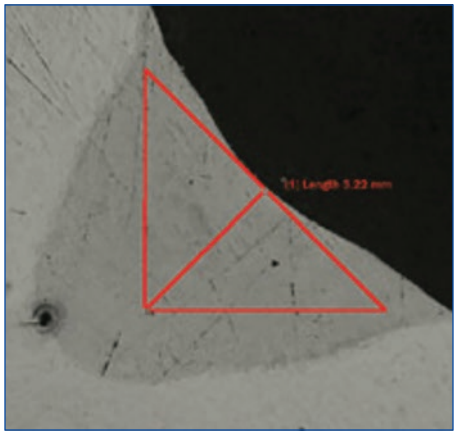
Microscopy

A car's durability and safety are only as good as the quality of its weld-points. Manufacturers inspect the cross section and throat thickness of welds to look for defects that are not visible to the naked eye.

Solution: BX53M upright microscope, OLYMPUS Stream™ software

Features:

- **1000× magnification:** view images with high resolution
- **Geometric distortion measurement:** OLYMPUS Stream software measures geometric distortion that occurs during welding
- **Panoramic imaging:** image cracks outside of the normal field of view by simply moving the manual stage



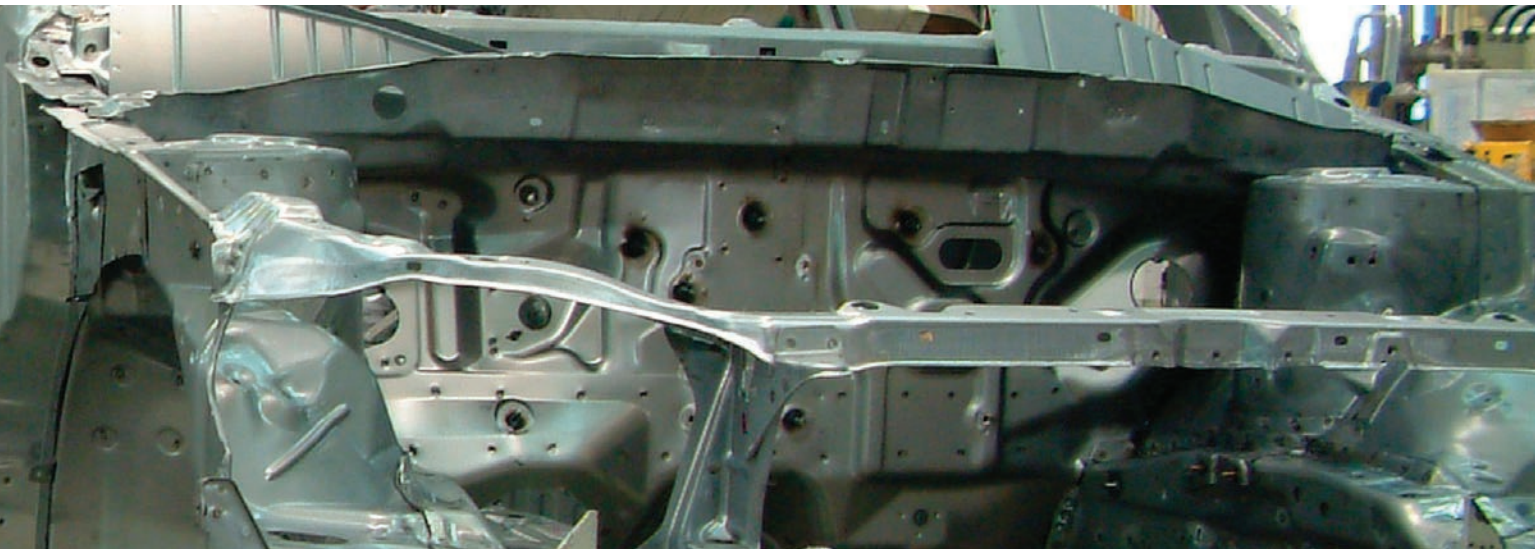
NDT

Spot-welds represent a significant potential for frame failure, making inspection of these areas critical. Specifically designed to provide optimal performance during nondestructive testing, spot-weld transducers are integral to the inspection process and are available in varying sizes to fit each application.

Solution: EPOCH® 650 flaw detector

Features:

- **Template storage and peak hold:** enables operators to outline and overlay waveform to the live A-scan, making comparison much easier
- **Advanced file type database:** saves a large amount of data in a comprehensive file system
- **Easy adjustments:** knob and navigation pad configurations simplify on-the-fly adjustments



RVI

A vehicle's frame is joined together by multiple weld points, most of which are hidden behind panels or compartments. Since many of these areas have limited accessibility and visibility, using a remotely-controlled visual inspection tool may be required.

Solution: IPLEX® RX/RT, IPLEX UltraLite, IPLEX NX videoscopes

Features:

- **PulsarPic™ processing:** automatically optimizes the balance of light and exposure for the best color reproduction to identify heat-affected zones
- **TrueFeel™ articulation:** enables the scope tip to maneuver to all sides and angle of a given weld
- **Wide view tip adaptors:** facilitates fields of view as large as 220 degrees to efficiently inspect an entire tube weld or spot weld

Final Assembly and Inspection
Safeguarding Excellence

Paint

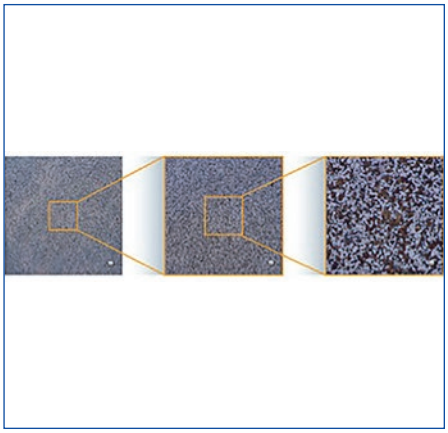
Microscopy

Automotive coatings are designed to withstand everything from rain and snow to salt and hail. To keep a car's shine from dulling or flaking over time, inspectors must measure the coating's thickness to check for uniformity.

Solution: BX53M upright microscope and OLYMPUS Stream™ image analysis software

Features:

- **Superb image quality:** Olympus optics provide clear, bright images
- **Reproducible:** seamless interface between microscope settings and software
- **Dedicated workflows:** materials solution modules make it easy to obtain data and create reports



RVI

Before a chassis moves on to final assembly, it receives a thorough coating of rust-resistant, UV-reactive protective coating from the paint shop. Manufacturers must inspect chassis to make sure that the entire area is covered, especially small areas where the coating may not easily penetrate. Remote inspection tools are ideal for checking the uniformity of rust-resistant coatings because they enable inspectors to check areas they otherwise would be unable to access.

Solution: IPLEX® RX/RT, IPLEX UltraLite, IPLEX NX videoscopes

Features:

- **Interchangeable scope (IPLEX NX):** enables the user to switch between scopes of different lengths and diameters
- **Optimized optical adaptors:** enables users to change to UV-filtered tip or best-field view for a given chassis

Your Reputation is Riding on It

- **Nondestructive Testing (NDT)**
  - **Ultrasonic testing (UT)** is used to detect internal defects and imperfections such as cracks, inclusions, and delamination inside a variety of products made from steel, aluminum, carbon fiber, plastic, and other materials.
  - Based on technology used in medical ultrasound scans, **phased array ultrasonic instruments** are used in industrial applications to create highly-detailed cross-sectional imagery, to visualize weld sites, and for in-service crack detection.

- **Microscopy**
  - With a core technology in high-resolution optics, **Olympus microscopes** yield sharp, high-contrast images of material science samples providing clear information. Comprehensive material science application software coupled with high-resolution digital cameras record images for analysis and documentation for even the most challenging imaging applications.

- **X-ray Fluorescence (XRF)**
  - Olympus' easy-to-use **X-ray fluorescence (XRF)** analyzers provide quantitative and qualitative positive material identification (PMI) of pure metals and alloys for quality control. Olympus analyzers combine accuracy with a rugged design for precise on-site sample analysis and maximum uptime.

- **Remote Visual Inspection (RVI)**
  - Testing teams rely on **remote visual inspection (RVI)** when distance, angle of view, or limited lighting impair direct visual examination, or where visibility is limited by small access points or atmospheric hazards. RVI is used as a predictive or regularly scheduled maintenance tool to assess the condition and operability of fixed and portable assets using Olympus videoscopes, rigid borescopes, or fiberscopes.

Solving Inspection Challenges

Service, Rental, and Leasing Options

In a deadline-driven environment downtime can be costly. Having the right tool available when you need it is important. Olympus can help protect your investment and maximize instrument uptime through a range of services including preventive maintenance, calibration, software up-dates, and training.

Sometimes, though, bearing the full expense of purchasing an inspection tool isn't cost-effective. That's why Olympus offers flexible rental, rent-to-own, and leasing programs for many of our products. Our customers are supported by a factory-trained team of service professionals who help ensure every rented or leased product meets our factory standards prior to delivery.*

*Rental and service programs differ by region. Please consult your local Olympus representative.

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OLYMPUS®

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