KONICA MINOLTA

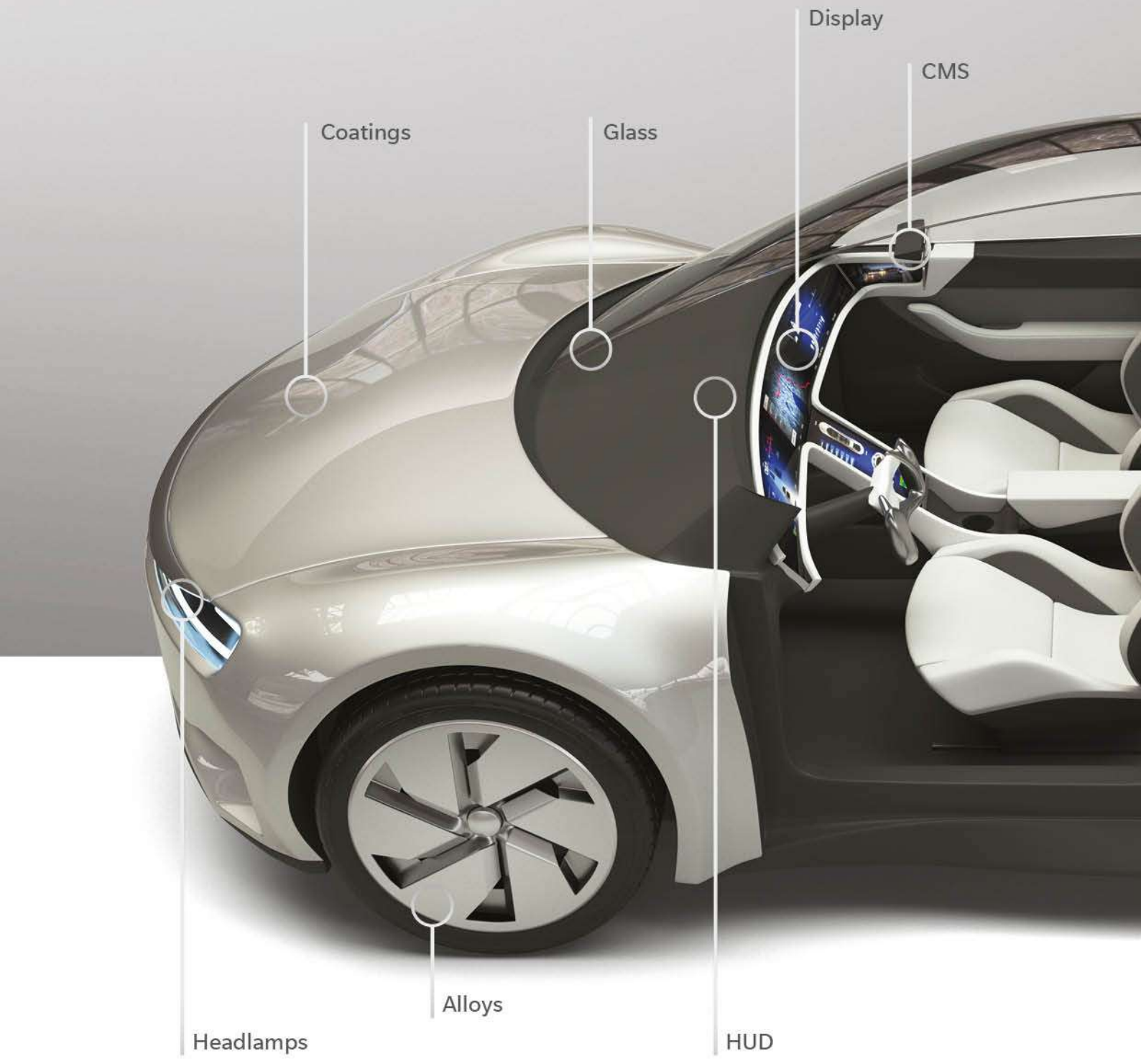
Automotive Industry Solutions

Colour & Light Management Solutions for Quality Control in the Automotive Industry

Giving Shape to Ideas

Contents

Competent Measurement Solutions for Colour, Surface Appearance, Light & Display for Automotive Interior and Exterior.



Konica Minolta along with group companies Radiant Vision Systems and Eines, and partner Rhopoint Instruments offer leading technology and turnkey solutions for R&D and Quality Control on the production line. Our experienced teams can help you to implement measurement and control solutions for automotive interior and exterior throughout Development, Manufacturing and Quality Control, all supported by a global Sales and Support network.

Portable spectrophotometer CM-25cG

The CM-25cG is a state-of-the-art solution for colour measurement of interior trim in the automotive industry, with excellent correlation to visual assessment and the benefit of a built-in gloss sensor

Automotive interiors combine different materials, textures and levels of gloss with the aim of creating a quality environment for the customer. Each element must be considered as part of the whole assembly where it is viewed at different angles and in real-world lighting. The 45°:0° geometry of the CM-25cG (and its predecessor the CM-2500c/CT) is renowned for providing colour values with excellent correlation to visual perception.

The CM-25cG also features a built-in ISO-compliant 60° gloss sensor to add an extra vital appearance parameter to the data. Colour and gloss are measured simultaneously, saving time during the quality process.

The CM-25cG maintains full data compatibility with its predecessor. The high inter-model agreement between CM-2500c/CT and CM-25cG enables users to keep their historical data for quality and supply chain communications. This allows the CM-25cG to integrate seamlessly into existing supply chain processes, avoiding breaks in communication or re-measuring of master targets.

The CM-25cG achieves even higher levels of accuracy and repeatability due to improved stability. Its portability and shape makes it ideal to specifically measure narrow places such as dashboards. This enables operators to take measurements throughout the interior with greatly reduced impact resulting from tilting the device, thus improving consistency, accuracy and measurement time.

Portable spectrophotometer CM-26dG

Unsurpassed usability for the measurement of all kinds of materials from glossy to mat, curved or flat

Within global supply chains, manufacturers and suppliers have to work hand-in-hand when it comes to Total Quality Assurance. Reliable colour data is essential for flawless colour communication throughout the manufacturing process, from R&D to Production and Quality Assurance. Especially where components may have different surface characteristics, a device that can evaluate or ignore gloss is required.

The 26dG-series is a user-friendly d:8° sphere- based spectrophotometer featuring a built-in ISO-compliant 60° gloss sensor. Its large display shows all required information, from complete graphical and numerical colour information to a simple PASS/FAIL message. The ergonomic design and process-focussed features such as the Job Control (image-based workflow feature) were developed to satisfy all automotive interior quality control applications.

Precise control of sample selection is achieved using the sample viewing port of the CM-26dG, improving measurement time and accuracy.

Like the CM-25cG, the CM-26dG spectrophotometer allows to measure accurately narrow places like dashboard thanks to its shape and portability.

Multi-angle spectrophotometer CM-M6

Portable and reliable colour measurement of metallic or effect coated parts and surfaces

Designed for reliable and repeatable colour measurement of metallic and effect surfaces, the CM-M6 is particularly suitable for measuring small, curved or complex parts. The innovative, patented, multi-angle optical measurement system of the CM-M6 is optimised to give accurate and stable results on all exterior parts, even mirror bodies and door handles.

The patented double-path illumination system with directed 45° illumination uses high-colour rendering white LEDs and 6-angle observation (45°:as15°/as15°/as25°/as45°/as75°/as110°) from two sides to accurately measure effect surfaces on the automotive shop floor (single-sided measurement is also possible).

The user can control the quality of metallic and effect parts with high accuracy in full compliance with ASTM E2194 or DIN 5033-7 geometrical specifications. Car body colour can be checked against a master standard, or the colour harmony of the car body against accessory parts. Using the double-path technology of the CM-M6, operators can be sure that colour differences are caused by application or material, not by inconsistency of measurements.

Close-tolerance glossmeter Rhopoint IQ-S

Designed to exceed automotive Interior and Exterior measurement standards for gloss

The Rhopoint IQ-S measures not only gloss but also additional gloss-related values that affect the surface appearance. Standard glossmeters only measure gloss, meaning that the values obtained do not always match the visual assessment, leaving room for subjectivity and uncertainty.

While standard glossmeters only measure how much light is reflected from a surface, the IQ-S profiles how light is reflected from a surface and characterises effects which dramatically reduce appearance quality, such as reflection haze.

As appearance quality is not just gloss and reflection haze, the Rhopoint IQ-S will also characterise image quality (DOI) and peak reflection behaviour (Rspec) of the surface - all in one measurement.

All IQ-S devices are close-tolerance, selected for maximum accuracy and comparability in all gloss and reflection haze applications to match and exceed automotive requirements and standards for "normal" gloss applications. IQ-S data are compatible with historical data so operators can easily evaluate the finish of a surface and analyse the effectiveness of the polishing process.

Remote-head glossmeter Rhopoint IQ Flex 20-S

Designed for the gloss and appearance measurement of small, curved or complex-shaped parts and surfaces of automotive exterior

Rhopoint IQ Flex 20-S allows operators to measure gloss for parts that would have previously been impossible, facilitating quality control of small and complex parts such as door handles or anodised brand emblems to check that these fulfil the requirements of the manufacturer.

Featuring the same technology as the Rhopoint IQ-S, the small footprint of the IQ Flex 20-S remote sensor head brings this technology to a new format, specifically designed for difficult surfaces or small parts.

For improved performance and repeatability on even the smallest parts, the Rhopoint IQ Flex 20-S can be customised with magnetically attached adaptor plates, which can be tailored for almost any shape and application. IQ Flex 20-S measurements are fully compatible with Rhopoint IQ-S gloss and appearance parameters (e.g. Rspec or DOI).

Total Appearance Measurement System Rhopoint TAMS™

Rhopoint TAMS™ (Total Appearance Measurement System) is the first device to quantify the visual quality perception of the complete vehicle finish "as the eye sees"

Rhopoint TAMS™ is a new way of quantifying surface appearance quality, developed in collaboration between Rhopoint Instruments, Volkswagen AG and AUDI AG. This innovative new technology models the human perception of surface appearance quality, analysing a range of measurements (contrast, sharpness, waviness and dominant structure size) to characterise "QUALITY" and "HARMONY". Rhopoint TAMS™ revolutionises the understanding and communication of visual appearance information relating to automotive paint finishes.

For maximum impact, an automotive paint finish must instantly produce an appealing visual sensation for the customer. This can only be achieved if the overall surface finish displays both high "QUALITY" and "HARMONY" (assessed across panels, planes and materials). Whereas a QUALITY value of 100% indicates a smooth finish with perfect image-forming characteristics, based on extensive human perception research, the HARMONY value indicates the acceptability of adjacent car parts.

Rhopoint TAMS™ captures surface data for mid-gloss and high-gloss surfaces. Operators can measure and analyse data for all surfaces throughout the automotive manufacturing process – raw materials such as steel and aluminium, E-coat, as well as filler, base and top-coat.

Rhopoint TAMS™ offers a major advantage over existing methods that produce complex results and rely on the user to interpret the values to provide a judgement-based evaluation of the visual experience.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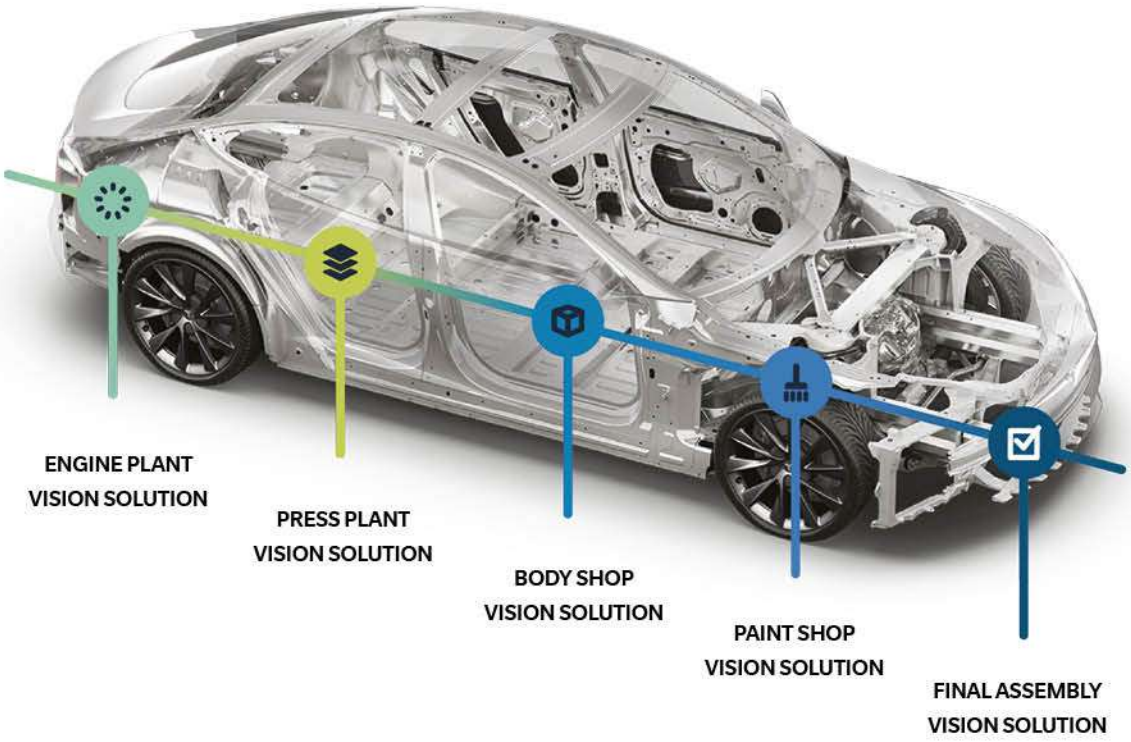
Eines Vision Tunnel System Solutions

Small footprint inline vision inspection solutions for the automotive industry to provide efficient machine vision multi-error proofing throughout assembly or coating processes



Eines offers a global quality control solution throughout the entire manufacturing process with comprehensive machine vision solutions for gap and flush, paint quality or multi-error proofing provided in a small footprint without the need for robots and without increasing cycle time.

An Eines system is purpose developed for the needs of automotive producers, monitoring, analysing and even correcting production in real-time. The system generates big data that is essential to boosting production efficiency, 3D mapping and categorising paint, body or assembly errors throughout assembly or coating.

Multi-error proofing systems are available in a range of sizes and configurations for part or body inspections depending on your needs and, as a complete solution, an Eines Vision Tunnel is easy to install, requiring no major construction or shutdowns.

Eines Multi-Error Proofing End-of-Line Solution

Versatile, cabinet and tunnel based Multi-Error Proofing systems for the inspection of finished automotive assemblies such as doors, dashboard assemblies, mechanical assemblies and more

Detect presence and absence, alignment, and orientation of components, identify surface defects, perform Electrical Check-Out, collect and analyse data for compliance/conformity reporting, QA and defect root cause analysis. Error proofing helps automotive manufacturers to eliminate known errors, providing rich data that improves quality by identifying and analysing defects, reducing takt times and improving the consistency of production.

An Eines system can work in unison with an operator, providing pick and place guidance and even utilise AI to improve operator ergonomics, thereby improving speed, efficiency, and safety of assembly processes.

Eines systems are developed specifically for the automotive industry, providing a cost-effective quality solution for high value and high complexity parts. Cabinet or tunnel based systems, these solutions are designed with a small footprint and to require minimal shutdown or downtime for installation and servicing. Each system can connect remotely to Eines for technical support, ensuring maximum uptime and return on investment.

· Automatic **door panel** inspection system – customisable and configurable to customer requirements for one or more model designs. Working in combination with connected assembly station and pick to light system to boost efficiency and eliminate defects.

· Automatic **headliner** inspection system – inspect any number of headliner designs whilst the operator assembles in place validating and error proofing in real-time throughout assembly.

· Automatic **instrument panel** inspection system – EOL inspection with presence absence, surface anomaly identification and inspection of stitching configured to customer specification.

· Automatic **tunnel-type** inspection system – all-in-one inline machine vision inspection system capable of measuring larger parts or modules for error proofing, process improvement and quality assurance.

Radiant Vision Systems ProMetric® Imaging Photometers & Colorimeters

ProMetric® photometers and colorimeters from Radiant Vision Systems are the world's fastest and most accurate high-resolution imaging solutions

New Light & Display technologies present new challenges to automakers and suppliers, who must quickly adapt them for in-car use. Radiant offers leading automated visual inspection systems for automotive lighting, displays, and illuminated controls and indicators, with turnkey test solutions to help manufacturers accelerate development, control costs, and ensure that these critical components reflect brand quality.

ProMetric® Y imaging photometers and ProMetric® I imaging colorimeters are high-resolution CCD cameras with specialised software, designed as fully integrated solutions for improving R&D, quality control, and production operations.

Headlamps and Exterior Lighting

A ProMetric® system allows users to inspect headlamps and tail lights for luminance and colour uniformity and for luminous intensity distribution to evaluate individual LED performance and identify failures. The system captures the illumination distribution in a single measurement, then analyses multiple criteria using the PM-HL™ headlamp evaluation module, designed specifically for headlamp evaluation. PM-HL functions include:

- Light source illuminance distribution measurement
- Evaluation of ECE and SAE Regulation test points
- Evaluation of custom test points
- Evaluation of beam pattern cut-off gradients
- Conversion to luminous intensity distribution
- Conversion to roadway illumination distribution

In-vehicle displays

Radiant's ProMetric® imaging photometers and colorimeter provide the most accurate solution for testing embedded LCD and OLED displays and the latest HUD technologies. Instrumentation, information, navigation, and entertainment systems are all moving to display technology. Consumer expectations for colour and clarity of these displays are high, while stringent performance requirements must still be met. Automated visual inspection with ProMetric® imaging colorimeters and TrueTest™ software helps to detect quality issues during the design or production process, allowing manufacturers to identify potential process improvements, improve yield, and prevent flawed products from reaching customers. With a built-in library of tests for luminance, chromaticity, uniformity, contrast, mura, pixel defects, display sparkle and image sticking, TrueTest™ is easily configured to meet specific needs, or test to established standards such as the German Automotive Black Mura Standard.

HUDs pose unique measurement challenges for manufacturers. ProMetric® imagers feature an electronically controlled lens that is highly effective at identifying and focusing on an image projected into infinity. Our analysis software provides accurate luminance and chromaticity measurements at any working distance, and can test in night-time, normal, and daytime settings to ensure consistent legibility. High-resolution ProMetric® cameras allow alignment of the HUD optical assembly and photometric measurements within the same test setup.

Instrument Cluster, Controls, Tell-Tales, & Indicators

A ProMetric® solution is a simple and accurate way to test illuminated characters. Our software features a powerful tool (Auto-POI) that allows users to automatically select points of interest based on location or colour and luminance values (L_V and CIE x,y thresholds). You can run calculations on a single character, or a group of like characters, to ensure uniformity within or between symbols regardless of location, shape, size or colour. The Auto-POI system provides comprehensive data, including average luminance across characters, points of minimum and maximum luminance, colour value and dominant wavelength.

Radiant Vision Systems FPD Conoscope Lens

Radiant's FPD Conoscope Lens enables high-resolution photopic measurement of the angular distribution of colour, luminance, and contrast for displays and display components

View angle measurements are critical to automotive displays, which must be flawless when viewed at an angle. Radiant's FPD (flat panel display) conoscope lens provides angular resolution of 0.05 degrees per CCD pixel for high-precision measurement of luminance, radiance, angular contrast, CIE chromaticity coordinates and correlated colour temperature (CCT) at all viewing angles up to ±70 degrees.

The lens is designed to mount directly to a ProMetric® imager, which together can be purchased for a fraction of the cost of alternative solutions. The solution offers a compact form factor and reduced complexity compared to goniometric measurement systems for R&D applications. Because of its speed, the FPD conoscope lens solution is also ideally suited for in-line inspection of displays during production. It provides real-time pass/reject results, eliminating poor-quality components from the line and identifying quality trends before significant material loss. Radiant's cameras can be used in both R&D and production environments to capture identical measurements of view angle data for seamless evaluation of displays throughout an entire product life cycle.

Spectroradiometer CS-3000 / CS-3000HDR

A high-end spectroradiometer for light sources and displays that measures spectral data, luminance and chromaticity

Many recent FPD models are designed for better black level representation or better contrast in order to provide higher-quality images and improved visibility/legibility. The CS-3000 / CS-3000HDR is a spectroradiometer which enables accurate luminance/chromaticity measurement even of blacks (from a low luminance of 0.0001 cd/m²).

The CS-3000 and CS-3000HDR can be used for luminance and chromaticity measurement of various optical devices such as displays, for example LCDs, PDPs, organic ELs and FEDs, as well as light sources such as LEDs and lamps.

Development of the CS-3000 has further improved the measurement speed and accuracy from the CS-2000 with innovative features such as emission frequency detection, intelligent dark mode and powered measurement angle switching. The CS-3000/HDR also utilises CIE 170-2:2015 colour matching functions to more closely reproduce the human visual experience, particularly with wider gamut displays.

Low-luminance measurement: From 0.0001 cd/m² (Measuring angle: 1°)

Measurement accuracy: ±2% (Luminance)

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