



APDIS Laser Radar Drives Automotive Quality



The APDIS Laser Radar is the ultimate measurement and inspection tool for world-class automotive manufacturers seeking faster throughput and exceptional quality control through rapid data acquisition and feedback into the production line.

In every manufacturing sector, quality outcomes are the direct result of quality processes. Within the automotive industry, this imperative takes on even greater meaning. Few manufacturing sectors can match the total consumer value represented by all the new cars rolling out of factories across the globe. There are billions of dollars of revenue on the line, and that's before considering the added financial burdens of recalls or poor consumer word of mouth, both of which can be fatal to brand equity. So, what ensures that the massive investment needed to

compete as a world-class automotive manufacturer stands the best possible chance of being redeemed? Simple: Quality. And quality means getting processes down to a science, in large part by performing accurate inspection quickly and easily. That's where the APDIS Laser Radar system from Nikon Metrology comes in.

AUTOMOTIVE



The specific measurement and inspection challenges faced by automotive manufacturers are numerous, and they arise in the body shop, R&D, and, increasingly, on the line itself. To achieve consistent quality, nearly every automotive OEM of scale within this space must:

- Quickly achieve tooling/model changeovers
- Overcome programming challenges
- Acquire, interpret, and feed data back into the production environment
- Reduce pre-production time
- Increase productivity by measuring more parts throughout the shift
- Eliminate assembly bottlenecks

For decades, traditional fixed CMMs were the metrology tool of choice for automotive OEMs seeking highly accurate data as a traceable reference. However, the limitations of CMMs, specifically a lack of speed and portability, created significant production bottlenecks that failed to address many of these key challenges. That has limited the appeal of CMMs for the OEMs and suppliers in this sector, which is notable for its speed-to-market imperatives. It has also created an opportunity for a better approach that embraces automation, real-time data management, and measurement speed—all in service of greater throughput for automotive manufacturers.

WHY APDIS?

The APDIS Laser Radar addresses throughput while enhancing quality and tightening tolerances; it also supports real-time data acquisition and feedback for in-line applications. The Laser Radar system employs an eye-safe coherent, frequency-modulated laser beam steered by a high-precision pointing mirror onto the tested part. As the light from the laser travels to and from the target, the phase shift is detected as part of a heterodyne interferometer producing the most sensitive radar possible. An onboard reference signal maintains the high accuracy of this distance measurement

across a wide range of operating environments. The precise measurement of the returning laser signal coupled with the accurate mirror position is how the LR system assesses the three-dimensional characteristics of the part under test.

Given appropriate line-of-sight, the noncontact APDIS system has few limitations in terms of the size of the automotive parts and subassemblies to be inspected. It accommodates measurement either on or off the production line due to a wide working temperature range and IP-54 protection, and APDIS integrates nicely with the robotics that define the modern manufacturing industry. In fact, the APDIS Laser Radar can run completely automatically—another big plus from the standpoint of efficiency and time savings.



The APDIS Laser Radar MV430E provides fast, automated, and non-contact inspection; the APDIS is portable and requires minimal setup time.

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Nikon Metrology developed APDIS in large part to address the needs of measurement and inspection professionals within the automotive sector. Many of their measurement applications require the kind of fast, automated, in-line inspection for which the APDIS Laser Radar is particularly well suited, especially since OEMs want to push more and more metrology applications to the production line. To accomplish these tasks requires lots of data, acquired quickly and accurately.

APDIS AUTOMOTIVE APPLICATIONS

There are several discrete applications of the APDIS Laser Radar system for automotive OEMs.

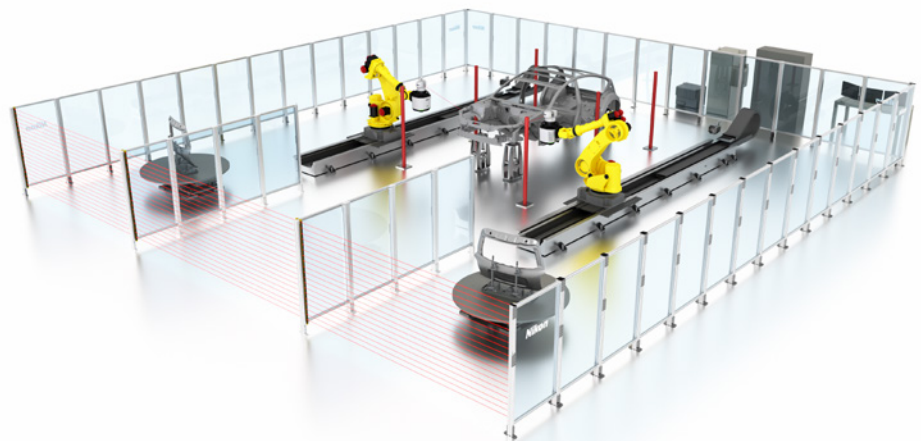
APDIS R-Series and DR-Series Measurement Stations

The APDIS IntelligentQuality (IQ) Stations provide flexible, fully automated inspection with fast setup,

high productivity, and real-time quality results and analysis. The two options for the R-Series panel machines represent ideal solutions for measurement of features on smaller components such as car doors, while the two versions of the DR-Series can accommodate measurement of the underbody, larger components, and/or the entire body in white (BiW) vehicle chassis.

The inspection power and flexibility of the APDIS IQ Stations may be seen from the following off-line/near-line processes:

- Sub-assembly inspection at a near line station, sampling components and measuring efficiently before returning to the production line
- Multiple, full BiW measurement cycles at a near line station, acquiring much more quality data on many more parts than previously possible
- Multiple sub-assembly measurement capability by utilizing 2 turntables allowing full utilization even when swapping out fixturing
- Off-line deep dive investigations into quality issues, acquiring data and solving problems in a fraction of the time of traditional CMMs
- Fully automated measurements without adapters allowing shop-floor installation in addition to the metrology room



The APDIS Laser Radar DR600 IntelligentQuality Station can accommodate complete BiW chassis with fast, flexible, and fully automatic measurement right on the shop floor.



The APDIS Laser Radar R180 IntelligentQuality Station is intended for inspection of smaller components such as car doors and can be installed on the shop floor.

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These applications offer significant savings in setup time as well as measurement time, improving operator utilization while also increasing throughput using a single measurement tool, removing the bottleneck of traditional CMMs. Inspection of many different types of parts are possible, as part fixtures can be loaded onto the table and, in the case of the dual turntable systems, swapped out while simultaneously measuring on the other turntable.

APDIS Gap & Flush System

Panel and closure gap and flush can directly affect a customer's perception of the quality of a vehicle and brand. Reliable measurement of these features allows process feedback and quality control but needs to be done automatically and safely while the vehicle is moving. Operator and part safety is protected by the large stand-off between the vehicle being tested and the APDIS themselves, and the removal of robots in the automation process.

By integrating three APDIS Laser Radars into the cell, this in-line (actually, end-of-the-line) system

offers outstanding coverage of large measurement volumes for a wide range of assembled automobiles.

The APDIS' movements are automatically synchronized with that of the vehicle independent of the conveyor. Therefore, if gap and flush issues are detected, modifications can easily be made off-line, without needing to stop the line.

APDIS MV430E In-Line Inspection

In-line inspection is the area in which the APDIS really shines, by bringing absolute, accurate, and fast measurement to the shop floor, allowing true process control in automotive body shops, and enabling Quality 4.0.

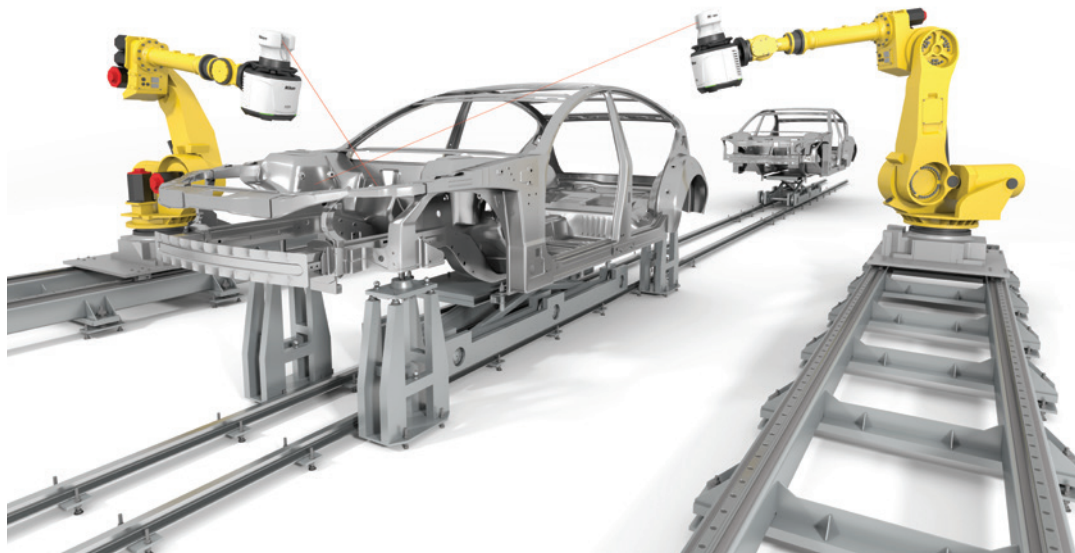
With an impressive measurement speed of up to six times that of a fixed CMM, the APDIS MV430E provides the fastest Laser Radar feature measurement speed. This speed allows the efficient inspection of critical features in the takt time of the line, or a sampling strategy to cover more features over a set of car bodies, or even a bypass line for



The APDIS Laser Radar Gap & Flush System employs three APDIS Laser Radars to cover a large volume and inspect gap and flush on a moving line; operator and product safety is enhanced with the system's large stand-off.



In the Gap & Flush System, APDIS movements are synchronized with conveyor movement; necessary modifications can then be made safely and easily off-line without slowing normal production speed.



Every BiW chassis can be measured on the line with these two APDIS Laser Radar mounted on facing robots; the system allows feedback on issues immediately for true process control.

detailed in-line inspection. It all adds up to true process control.

Even better, inspecting complete cars on the assembly line provides exceptional data and trend analysis. The APDIS MV430E automatically inspects the cars and provides a wealth of high-quality, accurate data to feed back into the production environment. This permits increasingly tight tolerances, which equals greater quality throughout production. This data can also be incorporated into real-time scoreboards showing trends for even greater in-process quality control, issue alerts regarding out-of-tolerance conditions, and filter outlying data. Manufacturers can thereby track not only out-of-tolerance data, but also trends that may be within tolerance to really understand what is happening within a particular process in real time.

THE FUTURE IS QUALITY PLUS

As demonstrated by the data-acquisition and data-application power of the APDIS MV430E, quality inspection in and of itself has become just one part of the way these systems improve automotive manufacturing.

Long term, excellence in this hyper-competitive industry will come down to who can acquire, interpret, and apply the information about their manufacturing processes most easily and efficiently. When that raw data is captured in real

time and immediately applied to the work being done on the line, it represents quality of a different sort—an anticipatory, strategic kind of quality as opposed to a quality that is reactive and tactical. Think of it as quality plus.

This is the opportunity offered by APDIS to today's world-class automotive manufacturers and suppliers. Whether off-line, near-line, or in-line, the ability of the APDIS system to adjust to the client's unique inspection requirements and deliver improved quality via actionable data is second to none.

With factories becoming increasingly driven by automation and real-time analytics, the feedback loop will grow in reducing production time and cost, thereby creating significant added value for consumers and manufacturers alike. The result will transform the automotive industry and enable faster integration of the new features and technologies demanded by the market.

APDIS is a powerful metrology tool helping to manifest these improvements for the automotive manufacturers of today as well as tomorrow. This surface is only now being scratched. The forthcoming evolution of APDIS applications will create its own feedback loop of industry improvements, leading to an exciting future of production excellence in the years to come.