APDIS Automotive

Large Volume Metrology

AUTOMOTIVE

Revolutionizing absolute automotive body inspection with APDIS Laser Radar

A paradigm shift in shop floor inspection

Nikon's APDIS Laser Radar brings absolute, accurate and fast measurements to the shop floor allowing for true process control of automotive body shops and enabling Quality 4.0.

Utilizing non-contact laser based technology, the APDIS Laser Radar can directly measure automotive features without the need for surface preparation or adapters making it ideal for fully automated measurements directly in the production line.

APDIS's long range and large standoff allows for measurements in all areas of the car body in absolute coordinates to HA CMM accuracy. Precision control of the beam creates optimized scan paths for features, keeping data sets small and measurement speeds fast. The new APDIS MV430E 'Enhanced' model delivers the fastest ever Laser Radar, further increasing measurement throughput and productivity.

WHAT CUSTOMERS GAIN

With the need for shorter and more flexible product development cycles, automotive manufacturers are continuously looking to cut time and costs whilst maintaining quality. For automotive inspection, the APDIS Laser Radar offers the ideal capabilities to meet the need for flexible and absolute measurements directly on the shop floor. For automotive manufacturers this results in:

- **Faster tuning of new production line or vehicle model changes:** APDIS provides CMM quality, absolute data on the shop floor from day 1. This allows production ramp up much more quickly with production line, absolute and accurate measurement data available on each body run down the line during pre-series builds.
- **Improved process control:** True dimensional quality control at the Body-in-White assembly line, provided by the APDIS Laser Radar, detects product and process anomalies as they occur in the production process. This helps to control the assembly process in such a way that dimensional tolerance targets are hit consistently. The result is not only better fitting of closures, trim, seating and other components in downstream assembly resulting in less rework, but also a production process that continuously improves.
- **Future proof data:** Measurements in absolute coordinates fit in the digital manufacturing process where big data is used as a reference to compare data over time and enabling enhanced insight, decision making, process automation and to speed up future product development.

APDIS shop floor automated solutions

ABSOLUTE ACCURACY ON THE SHOP FLOOR

Using the APDIS system within a fully automated robotic measurement solution introduces an innovative approach to body-in-white (BIW) inspection. This shop floor system provides accurate, dimensional measurements in the absolute car coordinate system allowing direct comparison to CAD without the need for off-line correlation.

8X FASTER MEASUREMENT IN THE METROLOGY ROOM

Traditional touch probe CMM inspection is very time-consuming taking up to 20 seconds to measure a feature, often needing adapters to be installed. It also requires a dedicated, environmentally controlled metrology room with deep foundations. The APDIS MV330E can typically directly measure features in less than 2 seconds and automatically optimizes scan paths with its Enhanced Feature Scan option giving huge measurement speed improvements over competing technology. This performance is available both off line in a metrology room, or directly on the shop floor.

ROBOT-INDEPENDENT ACCURACY WITH SIMPLIFIED PROGRAMMING

The robot positions the Laser Radar to provide line of sight to the required features; the Laser Radar then automatically realigns to the part by measuring tooling balls on the fixture. As such all measurements are collected in the vehicle coordinate system and feature accuracy is independent of the robots ability to accurately locate the Laser Radar. The long standoff also allows a complete set of features to be measured from a minimal number of static robot positions, simplifying programming and minimizing the potential for collisions with the part.

CMM-QUALITY DATA WITHOUT ADAPTERS

Features such as holes, slots, pins, studs, surfaces and edges can be quickly inspected using the APDIS Laser Radar directly without the need for special feature adapters. The measurement accuracy and repeatability of the Laser Radar is comparable to measurements taken with a traditional horizontal arm touch probe, whilst being many times faster.

NO PART PREPARATION NEEDED

The Laser Radar measurements are surface independent and can inspect almost any material, color or texture so can be used at all stages of the build process. Without any surface preparation or need to apply measurement markers or feature adapters, preparation time is almost zero, further increasing throughput and allowing fully automated inspections to be run.

WHAT INDUSTRY RESEARCH COMPANY "FROST & SULLIVAN" REPORTS ON QUALITY 4.0 IN BODY-IN-WHITE INSPECTION:

Quality 4.0 deals with the paradigm shift of making dimensional inspections move from being a mere qualifier of quality compliance to one that controls and regulates the manufacturing process.

"As Body-in-White inspection moves in the direction of Quality 4.0, it will become a fully automated, non-contact, absolute measurement process integrated into the production line. Traditional inspection approaches, such as horizontal arm CMMs, are being replaced by newer, automated approaches like Laser Radar systems."

Frost & Sullivan.

Scan the QR code to download the Frost & Sullivan white paper: Quality 4.0: A Paradigm Shift of Inline Inspection in Body-in-white

APPLICATIONS

Metrology room

BOOST INSPECTION PRODUCTIVITY IN THE METROLOGY ROOM

Using APDIS in the metrology room as a replacement for traditional CMMs, the off-line facility ceases to be a bottleneck due to faster measurements allowing quicker problem investigation.

- 8 x faster than traditional column CMM.
- Non-contact measurements allow for faster setup and modification to part programs.

- Minimal setup required - no targets or adapters.
- Long range measurement for access to difficult to reach areas.

CMM-QUALITY MEASUREMENTS

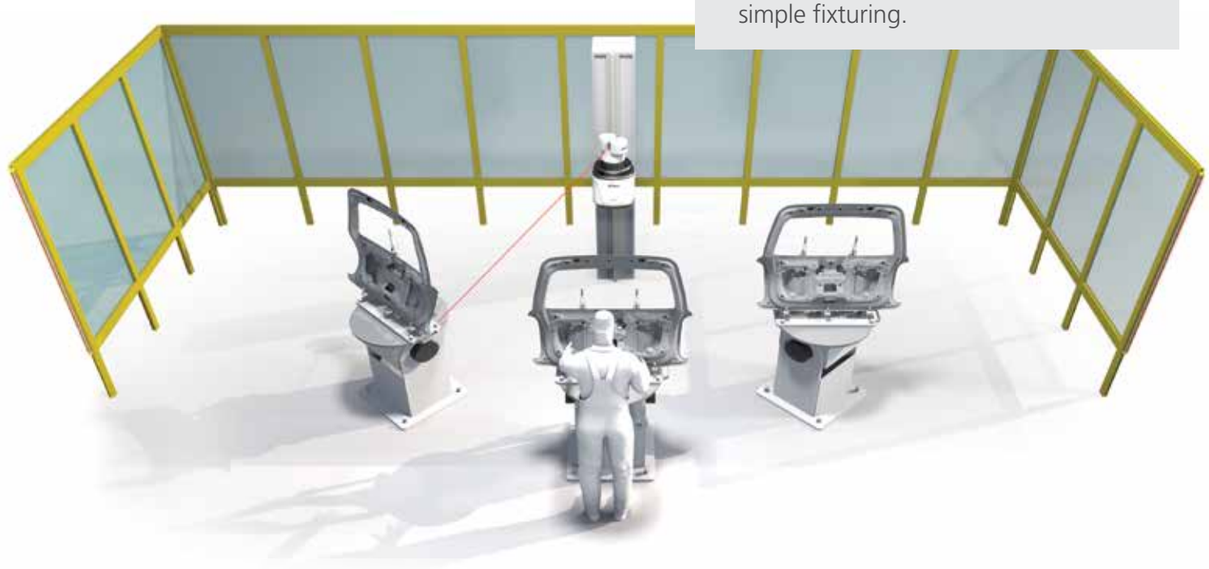
Robot mounted Laser Radars supersede traditional offline CMMs in dedicated metrology rooms. Holes, slots, studs, surface points and edges are measured to CMM comparable accuracy in just a fraction of the time using common software interfaces such as Polyworks or Metrolog. This meets the needs of automotive manufacturers in reducing scrap, improving data fidelity and improving product quality.

Incoming part inspection

REDUCING ASSEMBLY BOTTLENECKS

Incoming part inspection is critical to avoid assembly issues further down the production line. The APDIS Laser Radar allows for fast, non-contact feature and surface inspection on components from doors to bodysides, to have an instant quality report on components from external suppliers.

- No part preparation, no feature adapters, no probes.
- Flexible setup for multiple parts with simple fixturing.



- Single Laser Radar services multiple inspection stations for increased throughput.
- Measurements taken in absolute coordinates with CMM-comparable accuracy.

FLEXIBLE ABSOLUTE MEASUREMENTS

The Laser Radar automatically realigns to the part by measuring alignment features or tooling balls on the component or fixture. As such all measurements are collected in the part coordinate system no matter the size of the part with simple fixturing and no part preparation.

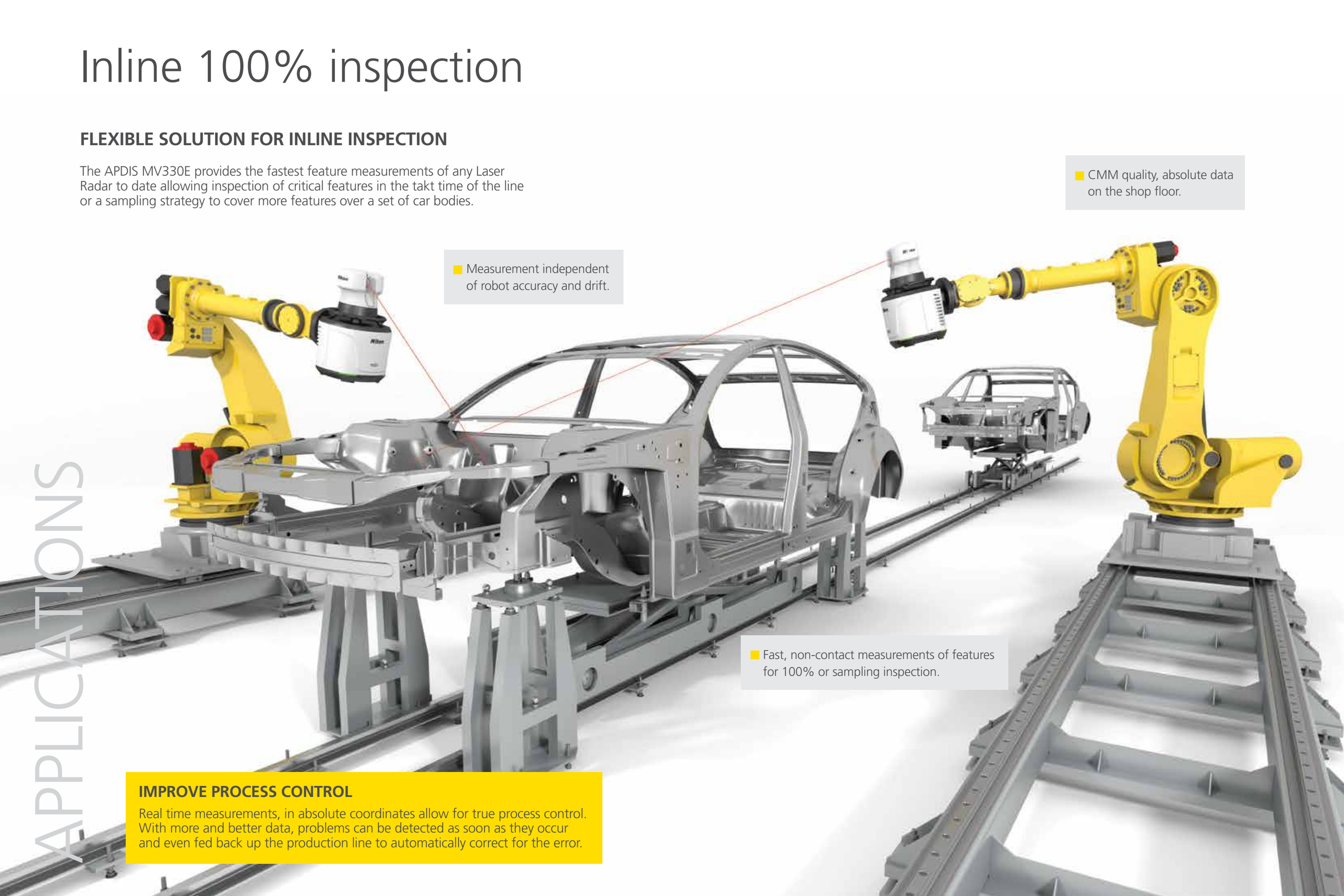
Inline 100% inspection

FLEXIBLE SOLUTION FOR INLINE INSPECTION

The APDIS MV330E provides the fastest feature measurements of any Laser Radar to date allowing 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.

- CMM quality, absolute data on the shop floor.

- Measurement independent of robot accuracy and drift.



- Fast, non-contact measurements of features for 100% or sampling inspection.

IMPROVE PROCESS CONTROL

Real time measurements, in absolute coordinates allow for true process control. With more and better data, problems can be detected as soon as they occur and even fed back up the production line to automatically correct for the error.

Bypass inspection

INNOVATING NEXT-TO-THE-LINE CAR BODY INSPECTION

By automatically removing a car body from the line, detailed inspection is possible on vastly more components than previously possible. Single or dual APDIS installations allow for the highest inspection productivity to CMM accuracies. After inspection the body is automatically re-inserted into the production line for seamless integration.

- Real time measurements give fast feedback of issues for small or large feature sets.

- Minimal disruption through completely automated measurements.

- Measurements inside and outside the car body are possible, even hard to reach locations.

- Global feature measurements give true position variations in absolute coordinates.

CAPTURE ISSUES EARLIER AND FASTER

Measuring at the production line with APDIS provides absolute and accurate data without the need for correlation. This means issues are captured earlier and faster with more car bodies able to be measured. This reduces scrap, downtime and re-work.

APPLICATIONS

Specifications

VARIANTS

	MV430	MV430E
Range	0.5 m to 30 m	0.5 m to 30 m
Data Rate	4,000 Hz	
Scanning Speed*	500 pts/sec 2 sec/cm²	1,000 pts/sec 1 sec/cm²
Feature Measurement	Standard Feature Scan	Enhanced Feature Scan**
Vibration Measurement	n/a	2,000 Hz Max ; 1µm/m resolution
Environmental	IP54	

*Default settings – stacking 4, points spacing 0.1mm, line spacing 1mm
**Feature measurement up to twice as fast as standard variant. Exact speed depends on settings

TECHNICAL SPECIFICATIONS

ENVIRONMENTAL

	Operational	Storage
Temperature	5° C to 40° C	-20° C to 60° C
Altitude	-400 m to 3,000 m	-400 m to 11,000 m
Humidity	10-90 % (non-condensing)	

LASER

	Measurement Laser (infrared)	Pointing Laser (red)
Wavelength	1,550 nm	645-665 nm
Power	< 10 mW	< 1.0 mW
IEC Class	Class 1	Class 2

MEASUREMENT

	Range	Azimuth	Elevation
Working limit	0.5 m – 30 m / 50 m	± 180°	± 45°
Accuracy (MPE)	20 µm + 5 µm/m	13.6 µm/m	

	2 Point Length Measurement Accuracy* MPE (µm) = $\sqrt[2]{(2(20 + 5R_{Ave})^2+2(13.6R_{Ave})^2}$						
Average Range (m)	0.5	1	2	5	10	20	30
MPE (µm)	33	40	57	115	216	420	625
Typical (µm)	17	20	28	58	108	210	313

* Accuracy given as Maximum Permissible Error (MPE) in accordance with ASME B89.4.19 – 2006 verified in vertical orientation at 20°C.
Typical accuracy shown is half MPE. All measurements taken in stable environment with ½" grade 25 or better tooling ball.

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