



Large Volume  
Metrology

LASER RADAR



APDIS  
MV430 / MV450  
MV430E / MV450E

# APDIS, a truly unique measurement system

The APDIS MV430/450 is the 4<sup>th</sup> generation of Nikon's Laser Radar offering high accuracy and productivity at up to 50m range for very large volume measurements.

The APDIS MV430 and MV450 measurement systems are used for fast, automated and non-contact inspection of objects ranging from smaller components such as a car door to complete large assemblies such as commercial aircraft. It achieves this through a unique application of a non-contact, accurate laser based measurement technology overcoming the limitations of traditional monolithic or portable metrology systems.

The ability to measure detail at distance, without the need for handheld probes, targets or surface preparation means APDIS is ideally suited for repetitive, complex, hard to reach, delicate and labor intensive inspection tasks, covering a huge range of manufacturing, industry and research applications.

## APDIS APPLICATIONS:

 **AUTOMOTIVE**

 **AEROSPACE**

 **SPACE**

 **ENERGY**

 **MANUFACTURING**



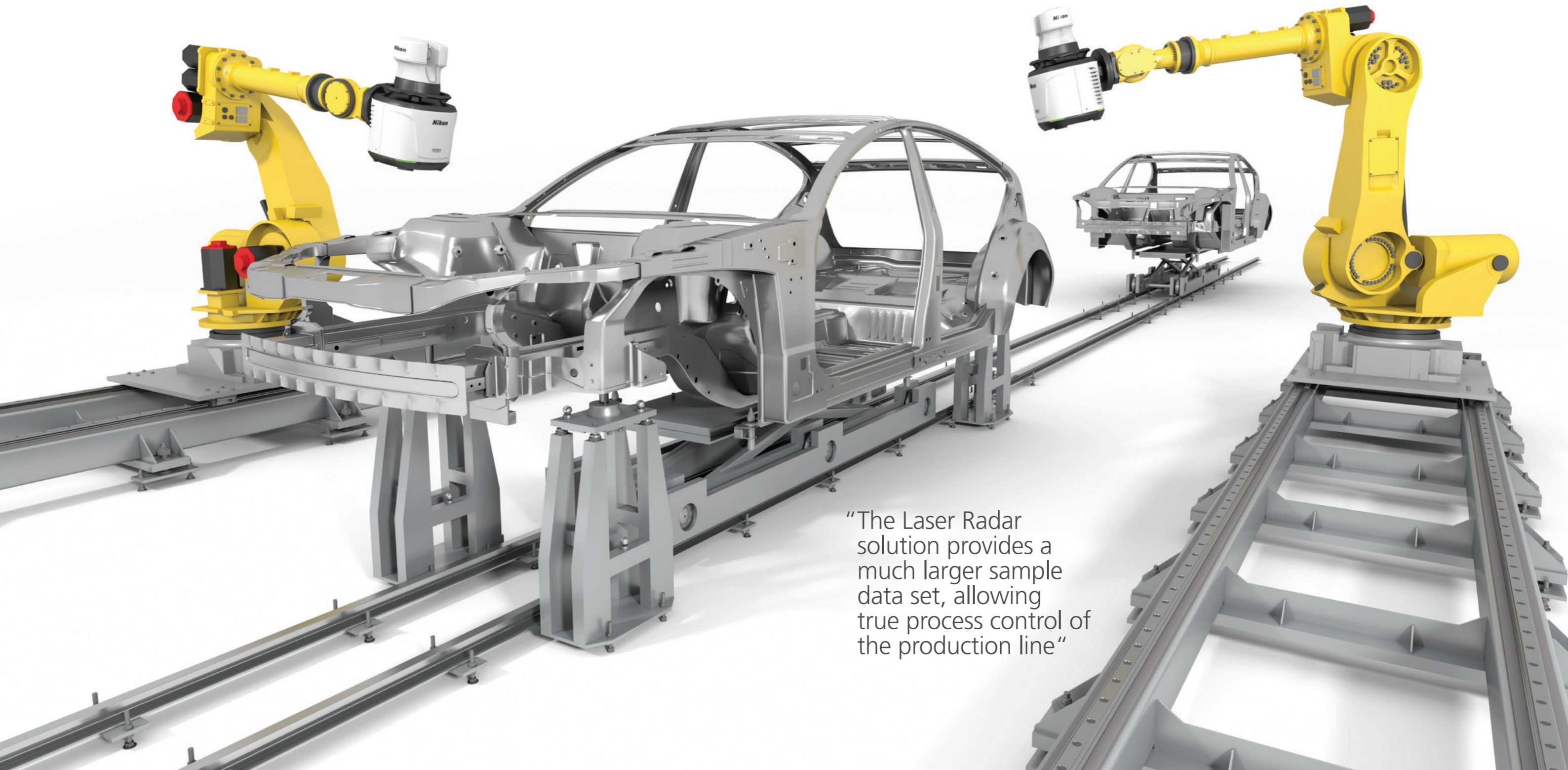
# Measurement room performance on the shop floor

All production lines need to monitor and control process quality to reduce scrap and re-work. Moving measurements onto the shop floor provides a faster feedback loop.

APDIS provides fast, accurate measurements in absolute coordinates. This removes any correlation requirements, enabling measurement room performance on the shop floor, to identify and fix problems far earlier.

Fully automated measurements can be taken without any part preparation. This allows true in-line installations, with a range of mounting options for any application.

Precision measurements keep data sets small, allowing the user to focus on problem areas and optimize the measurement time, increasing throughput and productivity.



"The Laser Radar solution provides a much larger sample data set, allowing true process control of the production line"

# Portable Precision, Direct Surface Scans

## MONITOR, INVESTIGATE, IDENTIFY

The portable nature of the MV4x0 allows users to take the instrument to the measurement, whether that be components, assemblies or fixturing. Pre-set routines can be run to monitor processes, investigate specific issues or identify problems as they arise.

Measurement variability is reduced through automation and non-contact measurements, and simplified through the use of standard software interfaces such as Metrolog, Polyworks and Spatial Analyzer. This allows the user to work with familiar analysis tools and measurement methodologies.

## LASERS, MIRRORS AND ANGLES

The APDIS Laser Radar takes direct surface measurements of an object by using a mirror to move a focussed infrared laser beam.

Range to the object is determined through heterodyne interferometry of the laser, meaning high accuracy even with extremely small surface reflection. Coupled with a precise angular position of the mirror, absolute and accurate 3D measurements on almost any surface are possible.

Precision control of the beam position creates optimized scan paths with minimal data sets from which features, surfaces and points are easily extracted.

Measurements can be taken from 0.5 m up to 50 m depending on the model, with a typical length measurement accuracy of 29 µm at 2 m.



# Improved user experience, enhanced productivity

## IMPROVED USER EXPERIENCE

- An HD camera coupled with NIKKOR optics allows better viewing of what is being measured.
- Shorter minimum standoff provides greater flexibility for installations.
- Indicator LEDs give instant feedback on the current status.
- A smaller and lighter scanner allows for easier handling.
- Standard 3 ½" threaded mount and improved robot adapters make for flexible and easy installations.



## INCREASED PRODUCTIVITY AND FASTER MEASUREMENTS

- Fast warm-up times allow quicker measurements, and swap-out times are reduced.
- Robotic installations with multiple orientations are simplified with Automatic Orientation Compensation (AOC) allowing consistent accuracy, in any orientation, with minimal effort.
- The Enhanced versions (MV430E / MV450E) include Enhanced Feature Scan technology, doubling productivity compared to standard versions with faster scanning and path optimization.



**NIKKOR** inside



# Benefits at a glance



## MEASURE PARTS IN SITU, AT HIGH ACCURACY

Portable and shop floor suitable (IP54), with large measurement volume allows absolute accurate measurements of objects in the production line.



## MEASURE SAFELY, WITH NO PART PREPARATION

Non-contact laser technology allows measurement of almost any surface with a large stand-off meaning no danger to the operator, or part.



## MEASURE CONSISTENTLY WITH LITTLE OR NO LABOR

Automated measurements create high repeatability, and single button operations for deskilling complex metrology operations.



## MEASURE MORE, IMPROVE PRODUCTIVITY

A precision laser beam allowing measurements of features not usually accessible, coupled with fast feature measurements, augmented by an Enhanced high speed option can improve productivity multiple times, versus traditional metrology equipment.



## MEASURE VIBRATIONS DIRECTLY WITHOUT SENSORS

The Enhanced version now introduces the ability to perform direct, non-contact vibration measurement. By pointing the laser beam at any surface, vibration analysis of the object can be made at up to 2000Hz to micron resolution. This allows analysis of machines, tooling or the environment without needing to attach accelerometers or other sensors.

# Features at a glance

## FAST MEASUREMENTS

Enhanced Feature Scan can double measurement speed

## SMALLER AND LIGHTER

25% smaller and 40% lighter than the previous Laser Radar model

## SHORT MINIMUM RANGE

Measure as close as 0.5m with all variants

## IP 54 RATED

Protection for use in shop floor environments

## HD CAMERA AND NIKKOR OPTICS

Clearer view of measurements encompassing Nikon designed lenses

## FAST WARMUP

Accurate measurements in as little as 15 minutes

## AUTOMATIC ORIENTATION COMPENSATION (AOC)

Measure in any orientation with minimal effort

## INDICATOR LEDS

Instant feedback of status for automated installations

## SURFACE VIBRATION MEASUREMENT

Non-contact vibration measurement for equipment and setup analysis up to 2000 Hz



# Applications



## **AUTOMOTIVE** FLEXIBLE ABSOLUTE MEASUREMENTS

The APDIS Laser Radar measures automotive features with absolute accuracy at high speed with no part preparation. This makes it ideally suited for use in automotive process control for components or Body In White.

Mounting the MV430E on a robot allows for flexibility in creating line of sight to features not normally accessible or difficult to measure such as studs or threaded holes. Automated measurements mean that systems can be installed in a metrology room, or directly in the production line providing equivalent CMM quality data wherever it is needed.

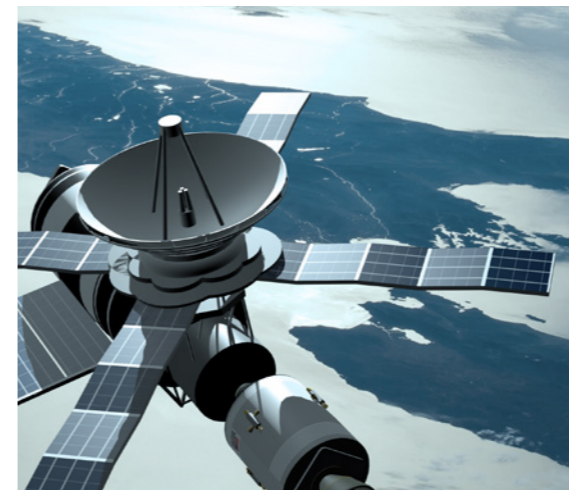


## **AEROSPACE** LARGE VOLUME AUTOMATION

The ability of APDIS to accurately measure very large parts automatically makes the Laser Radar a key asset for many major aerospace manufacturers worldwide.

Automating measurements in situ makes APDIS the ideal instrument for barrel joins, predictive shimming and engine cowling inspection with minimal labor.

The technology is also used as part of an award winning composite manufacturing system inspecting the parts whilst still in the mold. The non-contact nature of APDIS coupled with the large standoff makes inspection of composite parts and molds quick and simple.



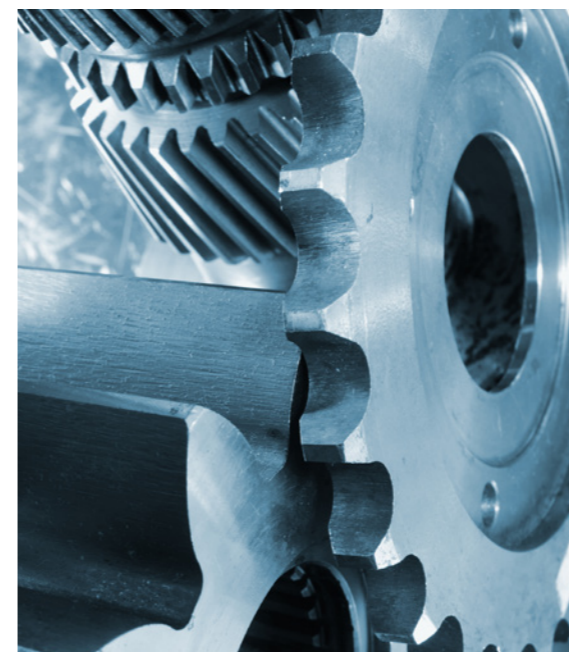
## **SPACE** DELICATE SURFACE INSPECTION

Materials used in satellite manufacture can be delicate, expensive and difficult to measure. Laser Radar is used in the measurement of the highly reflective antennae used in space satellites without the need to touch or prepare the surface to be measured. Meshes and other difficult materials can be measured quickly and accurately with the APDIS Laser Radar system for truly unique inspection applications.



## **ENERGY** POSITIONING AND CONTROL

Renewable energy generation relies on efficient and accurate systems and components many of which involve large scale manufacturing or precise setup. The APDIS Laser Radar can be deployed directly on the shop floor to perform automated measurements of these large structures such as wind turbines, ensuring manufacturing accuracy is achieved. The Laser Radar is also used in the alignment and positioning of solar reflectors allowing fast and straightforward setup for efficient energy generation.



## **MANUFACTURING** SAFETY AND FLEXIBILITY

Within manufacturing there is a need to be able to measure parts, components and materials during the production process. Often these parts can pose a safety concern due to heat, sharp edges or general inaccessibility. With large standoffs, and no part preparation APDIS maintains operator safety and removes the need for platforms or lifts to manually probe parts.

Automating measurements on the shop floor helps to improve process capability and APDIS has the flexibility to measure a wide range of features, materials and parts to high accuracy, with semi or fully automated setups.

# Specifications

## VARIANTS

	MV430	MV450	MV430E	MV450E
Range	0.5 m to 30 m	0.5 m to 50 m	0.5 m to 30 m	0.5 m to 50 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
Optics	NIKKOR	

### 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) = $2\sqrt{(2(20 + 5R_{Ave})^2 + 2(13.6R_{Ave})^2)}$		
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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