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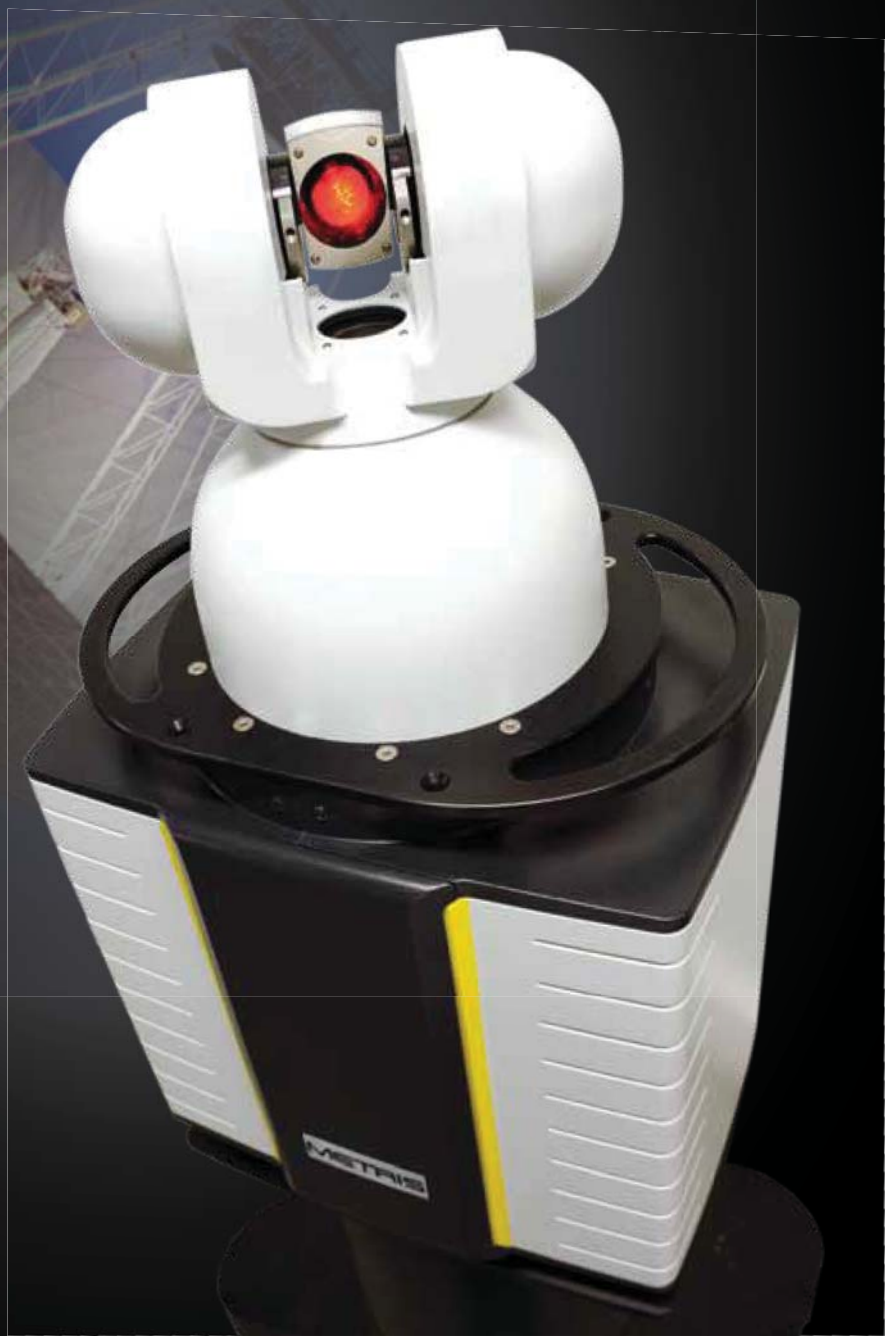
Laser Radar MV330/350

Automated large volume inspection









NIKON METROLOGY | VISION BEYOND PRECISION

Laser Radar is a versatile metrology system that supports non-contact and targetless inspection of supersize objects. As such, it overcomes the limitations of traditional tracker and photogrammetry measurement, speeding up inspection drastically. This revolutionary instrument often replaces large-scale metrology systems that struggle with parts that are too complex, too hard to reach, too delicate or too labor-intensive.

Laser Radar fits in the metrology assisted production philosophy of Nikon Metrology, where accurate on-line geometry data are fed back into the process to consistently increase the precision and speed of manufacturing. As large components increase in complexity and cost, first-time-right production is the only valid approach.

"With faster measurement, better quality data and improved usability, MV300/350 offers a superior user experience for automated, non-contact large volume metrology.



Laser Radar serves a wide array of applications

- Quality assurance applications, including part-to-CAD comparison, feature and gap&flush inspection
- Routine and event driven inspection such as first-article inspections, incoming and outgoing inspection, troubleshooting, failure investigations
- In-process applications, such as component alignment and robotic positioning
- Tool building and alignment, including locating and adjusting tool features in real time
- Tool digitalization and documentation of as-built tools and die surfaces
- Model digitalization, including scanning artistic models and performing design layups

Slashing inspection time

Automated, non-contact inspection saves on process and labor overhead

The Laser Radar is a productivity multiplier. It offers non-contact inspection and true single-person operation, and supports off-line programming for completely automated and unattended operation. Laser Radar incorporates patented technology that allows for direct surface and feature measurement at high data rates. As a result, Laser Radar eliminates the tedious use of photogrammetry targets, spherically mounted retroreflectors (SMRs) or handheld probes, slashing inspection time and operator overhead.

Flexibility in measuring surfaces and finishes

Recapturing one billionth of the reflected laser beam is enough for the Laser Radar to perform a measurement. This explains Laser Radar's ability to scan dark diffuse and highly reflective material and surfaces finishes of any color at challenging incident angles. The system's high signal/noise ratio yields repeatable range measurements on composites, the material of choice for today's aerospace applications. The non-contact technology also makes Laser Radar ideally suited to measure soft or delicate surfaces.

Designed for accurate feature inspection

Correctly manufactured geometric features are critical for high-quality assembly and part mating. The Laser Radar performs hundreds of small hole and edge trim measurements in an automated way. As such the inspection of hole positions becomes much faster and a lot easier than traditional methods where manual probing or physical target adaptors are required at every hole. Regarding edges and borders, Laser Radar allows critical sharp edges to be measured with superior accuracy. Existing measuring setups are supported through automated recognition of tooling balls, trihedral, photogrammetry dots or even reflective tape to measure along tape edge for scribe or character lines. The



In addition, Laser Radar's unique ability to precisely measure through mirrors allows it to see around corners and directly measure obscured geometry.

Seamless process integration with large scale metrology software of choice

On the hardware side, the system comes with an easy-to-transport, small-footprint cabinet including a high-performance PC and peripherals. On the software side, the customer can choose from a host of large scale metrology software solutions or use software libraries to specify his own measurement process. Spatial Analyzer, Verisurf and Metrolog software are the most popular to use in conjunction with Laser Radar. This multitude of software tools supports tightly integrated automated measurements to realize true metrology assisted production processes.

MV330/350 - Rich features, absolute benefits



Laser Radar vs. laser tracker and photogrammetry

	Laser Radar	Laser tracker	Photogrammetry
Measuring technology	Frequency-modulated coherent laser radar (FMCLR)	ADM (absolute distance meter)	Digital camera based photogrammetry
Accuracy	High, less than 10ppm	Very high, but dependant upon precision targeting and tooling (SMR + adaptors)	Med-High. Highly operator and setup dependant
Measurement preparation	None required, offline programming possible	Requires SMR be placed at every inspection location	Requires reflective photogrammetry targets be pre-positioned at every inspection location
Inspection speed	Up to 2000 points per second	Operator dependant – only as fast as the operator can move & position the SMR	Fast measurement, but long preparation and cleanup
Number of operators	Single operator or fully automatic, unattended operation	Typically two operators, one manipulating the SMR, one operating PC	Usually single operator when capturing photos, though high labor content during setup
Non-contact measurement	Yes	No, SMR required	No, targets required
Automation capability	Yes, 100% automation possible	Limited, requires operator intervention.	No, due to targeting needs

Fit for any large volume inspection job

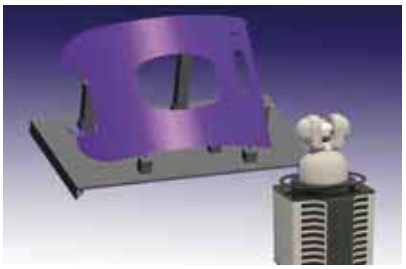
Fast inspection of giant aircraft parts

Laser Radar's capability to accurately and efficiently measure supersize parts is a key asset at many leading aircraft manufacturers. Aviation metrology applications include fuselage, wing, wing/body connection, landing gear door and jet engine inlet cowling.



Ideal for composite inspection

Laser Radar serves as an award-winning metrology component in the production of right-first-time composite parts. Laser Radar is integrated into innovative composite manufacturing methods to increase composite part production quality and throughput.



Optimizing wind turbine geometry for maximum return

To speed up geometry verification, Laser Radar accurately characterizes the geometry deviation of giant wind turbine blades in a single production shift. In this limited time period, the system is able to acquire many thousands of individual inspection locations on the blade's pressure and suction sides.

Solar mirror inspection to increase output

In the fast-growing concentrated solar energy business, Laser Radar checks the geometric integrity of flat and parabolic mirrors. Critical in this regard is its capability to accurately and efficiently trace incorrect bending and misalignment.

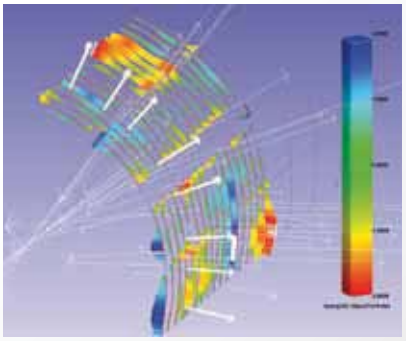


Measuring antennae in a single inspection run

The size of parabolic communication antennae reduces the number of metrology systems that are fit for the job. Automated non-contact measurement offered by Laser Radar captures the data that are needed to make a judgement on the geometric quality of these large-scale communication devices with only a fraction of the labor required using photogrammetry or more traditional methods.

Verifying space telescopes' sensitive hardware

Laser Radar's unique non-contact technology enables to measure space telescopes' mirror features and large mechanical structures holding sensitive flight hardware. Thanks to its ability to measure both highly reflective and dark material surfaces at large stand-off distances, the Laser Radar is able to make critical geometric verifications without the risk of accidental damage to sensitive, high-value components.



Measuring at different shipbuilding steps

Laser Radar time-efficiently captures the geometry of large ship hull parts as well as complete hull structures. Also large ship propellers can be inspected automatically using Laser Radar and compared to nominal.

Measuring heated surfaces near blast furnaces

The non-contact technology of Laser Radar is perfectly capable of measuring hot part surfaces. Laser Radar performs geometry quality-related inspection in the various production steps that occur from the blast furnace to base sheet metal and other intermediary products.



Specifications

Single point 3D measurement uncertainty (U=2)[1]

Measurement distance		Azimuth	Elevation	Range	3D uncertainty	
m	ft	µm	µm	µm	µm	in
2	6.6	13.6	13.6	15	24	0.0010
5	16.4	34	34	22.5	53	0.0021
10	32.8	68	68	35	102	0.0040
15	49.2	102	102	47.5	152	0.0060
20	65.6	136	136	60	201	0.0079
30	98.4	204	204	85	301	0.0118
50	164.0	340	340	135	499	0.0197

[1] Accuracy (2σ) defined by measurement of a tooling ball target (grade 25 or less) under stable environmental conditions.

Measurement performance

Distance	
Sample rate	4000 points/sec
Resolution	1µm
Uncertainty (U=2)	10µm+2.5µm/m

Angle	
Resolution	Azimuth: 0.018mm Elevation: 0.039asec
Uncertainty (U=2)	6.8µm/m
Measurement range	Azimuth: 360deg Elevation: +/-45deg

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