



CMM laser scanning



High accuracy with  
high resolution

LC15DX



# LC15Dx laser scanner

The LC15Dx is a viable alternative to a tactile probe for an increasing number of high precision CMM applications. Manufacturers gain a better appreciation of the dimensional quality of their products without compromising on cycle times. A wider variety of parts, geometry and materials can be measured more effectively, including many parts too small or fragile for a touch probe.

## **BENEFITS**

### **Closing the accuracy gap**

An LC15Dx is a viable alternative to a tactile probe for high precision CMM applications. The smallest part details can be captured with best-in-class accuracy. Thanks to solid state laser scanner technology and an innovative calibration method, the LC15Dx is closing the gap between laser scanning and tactile probing, achieving accuracies to within microns. Unlike a tactile probe, however, the scanner uses non-contact 3D laser triangulation to measure the surface directly and eliminate probe compensation errors. Full thermal compensation means the maximum accuracy is achieved as soon as the scanner is powered on.

### **Versatile scanning without the hassle**

Nikon's unique ESP3 technology intelligently adapts the laser settings for each measured point in real-time. A wider range and mix of surface materials, finishes, colors and transitions can be measured more efficiently without user interaction, manual tuning and part spraying, including small and fragile parts. Unwanted reflections are neutralised by an advanced software filter while changes in ambient light are absorbed by a high-grade daylight filter.

### **Better appreciation of product quality**

The entire part is checked to the CAD model and any areas of concern can immediately be highlighted on a color map, thus providing a complete 3D visualization of dimensional quality. Further investigation and analysis is possible using fly-outs, sections and a library of Geometric Dimensioning and Tolerancing (GD&T). Inspection reports can be as simple or complex as required with follow-on reports fully automated.

# Closing the gap with tactile probe accuracy

## AUTOJOINT CONNECTION

Automatic scanner and probe change

## ESP3

Automatic laser settings

## THERMAL STABILIZER

Zero warm-up

## REFLECTION FILTER

Neutralizes unwanted reflections

## DAYLIGHT FILTER

Absorbs ambient light

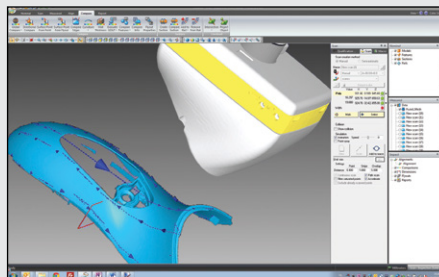
## SOFTWARE

### Intuitive software for every application

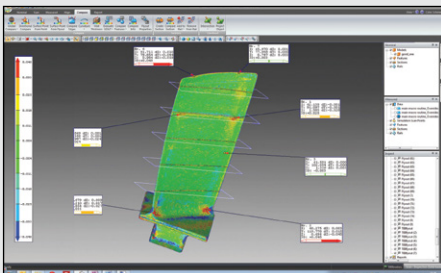
A selection of popular software packages for part-to-CAD and feature inspection are available for the LC15Dx, including Nikon Metrology's own FOCUS software.

Key features include:

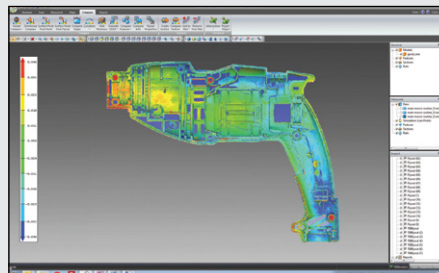
- CAD programming
- Best-fit alignment
- Part to CAD comparison
- Feature inspection
- Blade analysis
- Color reporting
- Multi-sensor CMM
- Offline programming
- Point cloud management
- GD&T library
- Teach & Learn programming
- Full simulation



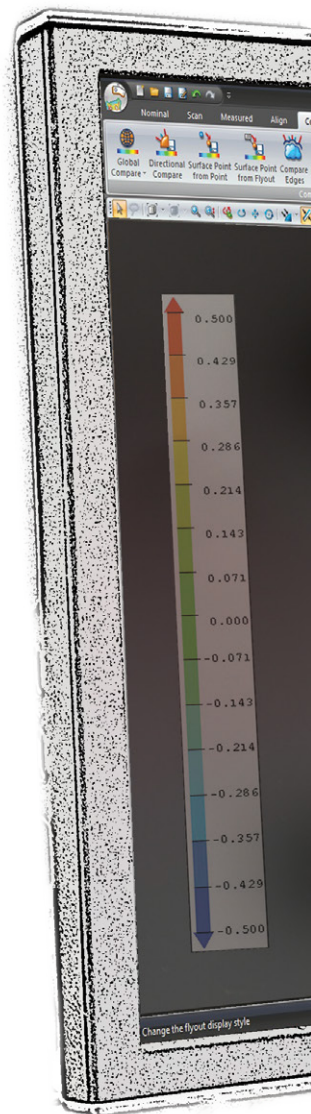
Intuitive programming and offline simulation reduces preparation time



Blade section analysis combined with full 3D comparison



3D visualization of dimensional quality







## FULLY INTEGRATED

Laser signal routed via probe interface

## STATUS LEDS

Laser diagnostics and status

## RANGE FINDER

User guide for manual operation

## HIGH QUALITY NIKON LENS

Improves accuracy and data quality

## EYE SAFE LASER

Class 2 visible light laser

## FEATURE INSPECTION

Feature measurement and GD&T library

## SECTIONS AND PROFILES

2D section and profile analysis

## CAD COMPARISON

Direct comparison of measured part to CAD

## BEST-FIT ALIGNMENT

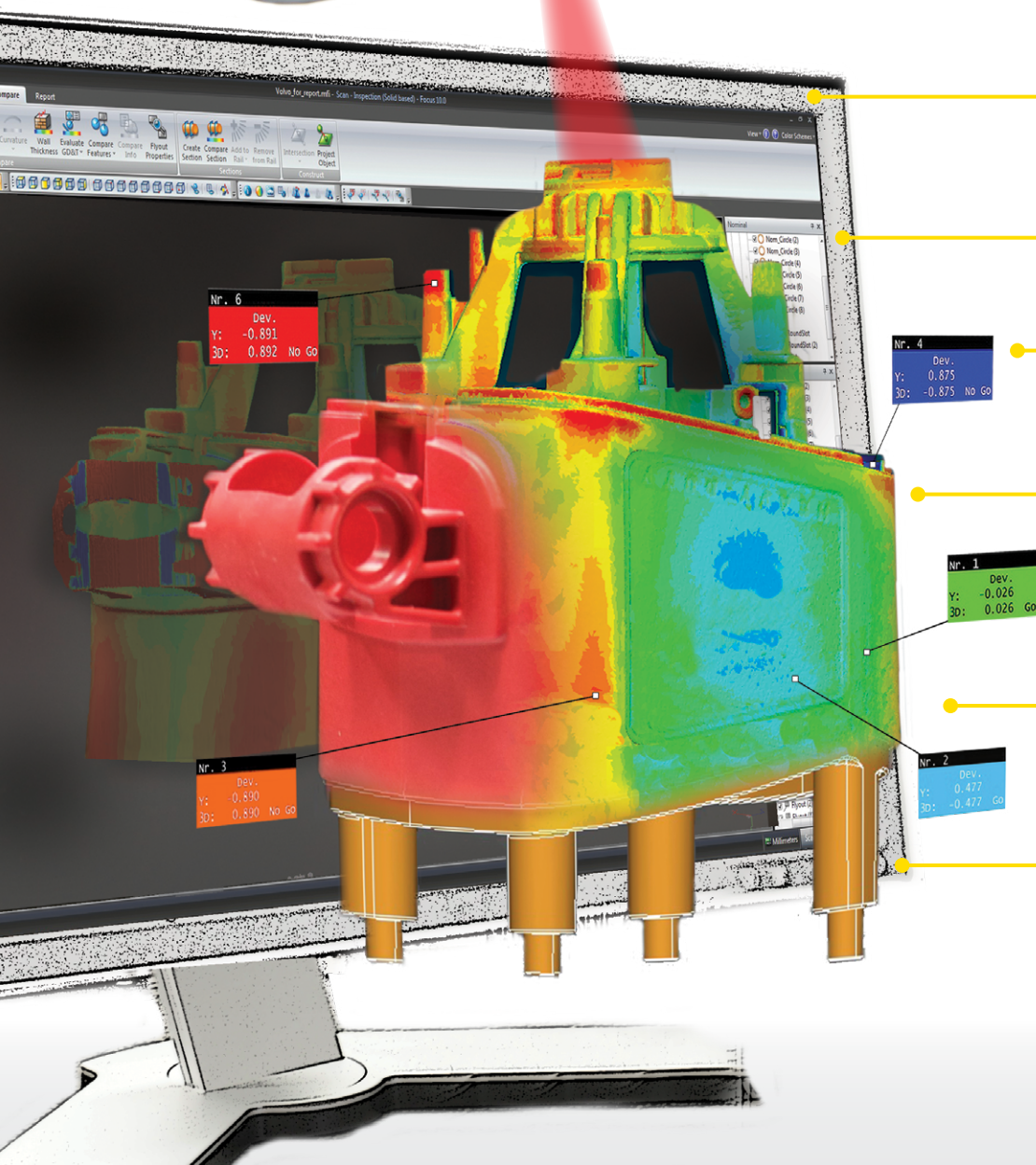
Best-Fit alignment of measured part to CAD

## POINT CLOUD MANAGEMENT

Trim and filter point clouds

## CAD EXPORT

Reverse Engineering and data storage



# Multi-sensor applications

## COMBINE LASER SCANNING WITH A TACTILE PROBE

In some cases a single sensor technology is insufficient for measuring all of the features. The LC15Dx can be combined with an optional tactile probe to create a versatile multi-sensor CMM. Depending on the application both technologies can be used independently or together in the same inspection program. Fully automatic sensor changing is possible with the addition of an optional change and storage rack which is mounted on the table of the CMM.



## HIGH PRECISION PARTS AND SMALL GEOMETRY

The LC15Dx provides significant benefits for a wide variety of high precision parts and geometry, including small details, semi-rigid parts and the more demanding materials:

**PROCESS**  
**METHOD**  
**MATERIAL**  
**FINISH**  
**STRUCTURE**  
**FEATURE**

Production - R&D - reverse engineering  
Machined - moulded - stamped - cast - forged  
Metal - plastic - rubber - clay - ceramic - composites  
Machine - polished - plated - paint - mixed colors  
Ridged - soft - flexible - fragile  
Surface - geometric feature - profile - section



Precision moulding  
Measure small, soft and fragile parts



Medical implants  
Inspect complex freeform geometry



Turbine blades  
Eliminate probe tip compensation errors

## ENHANCE THE CAPABILITY OF YOUR CURRENT CMM

Retrofitting your current CMM with an LC15Dx is a cost-effective solution. The retrofit integrates with the existing CMM controller hardware and compatible probe system to provide a versatile multi-sensor CMM offering both non-contact and touch probe inspection.

LC15Dx retrofit kits are available for the most common CMM controller systems.  
Contact Nikon for details on exact versions of the controllers

# Specifications

Probing error (MPE <sub>p</sub> ) <sup>1</sup>	1.9 µm (0.000075")
Ball bar length (MPE <sub>E</sub> ) <sup>2</sup>	A+4 µm +L/350 mm (A+0.00016 +L/13.78")
Multi-stylus test (MPE <sub>AL</sub> ) <sup>3</sup>	3.9 µm (0.00015")
ISO Probing form error <sup>4</sup>	7 µm (0.00027")
ISO Probing size error all <sup>5</sup>	15 µm (0.000591")
ISO Probing dispersion value <sup>6</sup>	7.6 µm (0.000299")
ISO Cone angle <sup>7</sup>	100°
Scanning speed (approx.)	70,000 points/sec
Resolution (point spacing)	22 µm (0.00087")
Points per line (approx.)	900
Measuring temperature range	18-22°C (64.4-71.6° F)
Operating temperature range	10-40°C (50-104° F)
Weight	370 g (0.82 lbs)
Ingress protection	IP30
Laser safety	Class 2
Enhanced Scanner Performance	ESP3
Daylight filter	Yes
Probe head compatibility	PH10M(i)(Q), CW43, PHS

All accuracy specifications valid for a CMM with an accuracy of 2µm + L/350 or better using manufacturer supplied test sphere

<sup>1</sup> Nikon Metrology test comparable to EN/ISO 10360-2 MPE<sub>p</sub> using 1σ sphere fit.

<sup>2</sup> Nikon Metrology test comparable to EN/ISO 10360-2 MPE<sub>E</sub> where A is equal to the CMM MPE<sub>E</sub> first term value.

<sup>3</sup> Nikon Metrology test comparable to EN/ISO 10360-5 MPE<sub>AL</sub>

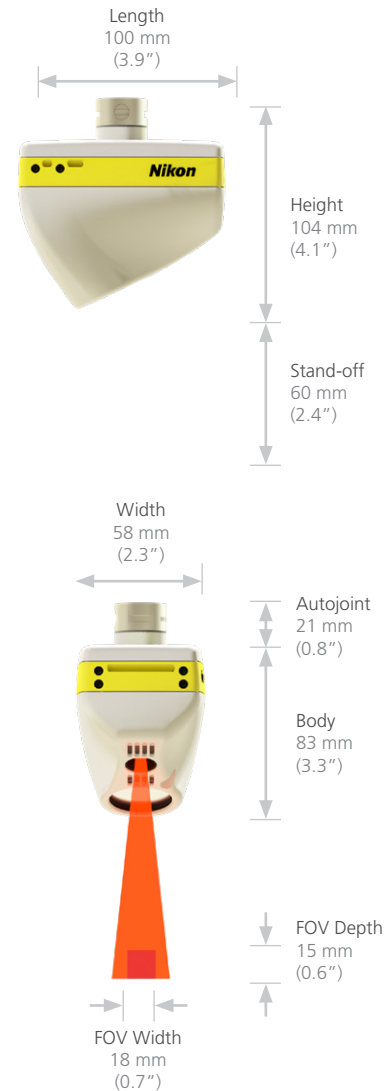
Accuracy specifications according ISO 10360-8:2013:

<sup>4</sup> P<sub>Form.Sph.1x25-Tr.ODS,MPE</sub> : "Maximum probing form error" using 25 representative points in translatory scanning mode

<sup>5</sup> P<sub>Size.Sph.All-Tr.ODS,MPE</sub> : "Maximum probing size error using All" measured points in translatory scanning mode

<sup>6</sup> P<sub>Form.Sph.D95%-Tr.ODS,MPL</sub> : "Maximum probing dispersion value" using 95% of the measured points in translatory scanning mode

<sup>7</sup> Cone angle : Region of sphere on which the measured points are selected



**LASER RADIATION**  
DO NOT STARE INTO THE BEAM  
**CLASS 2 LASER PRODUCT**  
Max output = 4.9 mW 660 nm  
1.0 mW 635 nm  
IEC 60825-1 Edition 3.0 2014  
Read instruction manual before use

Complies with 21 CFR 1040.10 and 1040.11, Laser Notice No. 56 dated May 8, 2019  
Due to the diverging beam, viewing the laser output with optical instruments (for example, eye loupes, magnifiers and microscopes) within a distance of 100 mm may pose an eye hazard.

## LC15Dx

Closing the gap with touch probe accuracy



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