K-Series Optical CMM solutions

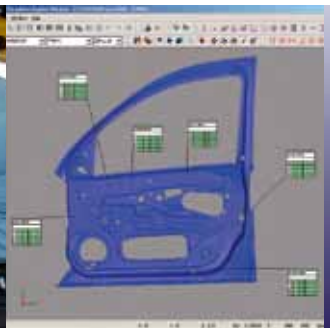
supporting a variety of metrology applications

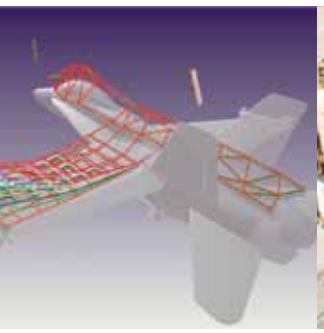
Handheld measurements

Robot metrology

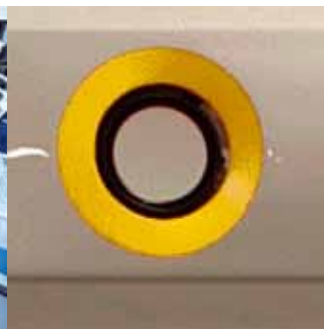
Motion analysis

Optical CMM supporting measuring and tracking





The portable K-Series Optical CMM system forms the core of different metrology solutions. As it faces no mechanical constraints whatsoever, users can freely walk around and take points or scan surfaces as desired. The metrology area activated by the Optical CMM fits an entire vehicle and can be expanded easily. The Optical CMM is also suitable for measuring dynamic motion and researching transient events. Its third use relates to industrial robots. By tracking robot movement in real time, Optical CMM technology drives increased positional accuracy for robotized inspection and manufacturing tasks.

A wealth of applications …

Automotive

K-Series optical measurement solutions have a broad automotive application reach: from design and prototyping up to in-line inspection supporting final assembly.

- Digitizing physical models
- Fixture verification
- Body and trim inspection
- Body closure analysis
- Comfort analysis
- Body & chassis development
- Degradation analysis
- Robotized in-line inspection
- Robot-guided manufacturing

Motorsport

K-Series Optical CMM systems are vital metrology tools in the development, testing and legal verification of sports cars. Nikon Metrology supplies systems to FIA and leading racing teams in Formula 1 and NASCAR. Motion measurement is a key enabler of in-depth chassis development and testing.

Aerospace

In aerospace, Nikon Metrology optical sensors are used to test the kinematics of structures, such as landing gears and wing flaps. By providing highly accurate positional feedback in closed loop, machining stations can operate faster and at higher precision.

Naval engineering

A typical naval engineering application is testing scale model designs of ships in a towing tank. The dynamic motion of these ships is accurately tracked using the Optical CMM system.

Structural engineering

The Optical CMM system is also suitable for deformation analysis of large structures, such as scale models of buildings, steel and concrete structures, and landing gears. The concurrent use of multiple Optical CMMs creates an extended unified measurement volume.

A large international customer base

Airbus, Audi, Benteler Automobiltechnik, BMW, Boeing, Bombardier, Bugatti, Chrysler, Fanuc, Ferrari, FIA, Ford, Gehl, General Motors, Honda, Hyundai, Jaguar, John Deere, Kawasaki Heavy Industries, KUKA, Lockheed Martin, Magneti Marelli, Opel, Plastic Omnium, PSA, Renault, Skoda, Staubli robotics, Toyota, Volkswagen, Volvo Cars, Weidmann Plastics, etc.

Optical CMM technology

A K-Series Optical CMM system can be used for handheld and robotized 3D inspection, motion analysis and robot metrology. Regardless of the application, the measurement principle is the same. Three linear CCD cameras of the Optical CMM localize the infrared LEDs incorporated into the carbon fiber housing of a touch probe or 3D laser scanner.

To make K-Series Optical CMMs fit for purpose, they come in two measurement volumes. The K500 is used for measuring smaller parts and subassemblies. The larger measuring volume of the K600/610 is suited for full-vehicle analysis or measuring larger specimens.

Cost reductions

K-Series Optical CMMs are suitable for multiple applications. Their flexibility and mobility speed up interventions and reduce production stops.

Portable or mobile

The optical K-Series measurement systems are available in both portable and mobile configurations. Whether used at a single plant or at different locations, there is always a system configuration that fits your needs.

Solid state quality

The carbon fiber structure makes the system truly solid state. There are no moving parts that potentially deteriorate accuracy over time.

Dynamic Referencing

The initial alignment of a work piece is monitored by 3 LEDs mounted directly on the part. The camera-to-part position is constantly monitored and updated, avoiding the need for leap-frogging.

Proven competitiveness

K-Series Optical CMMs are set up quickly and offer high measuring flexibility, thanks to features such as dynamic referencing and automatic probe recognition. They outperform articulated arms in terms of accuracy, and span a larger measuring volume without mechanical constraints. Optical CMMs are less sensitive to bright ambient light and shiny part surfaces compared to white light scanning systems.

Ready for scanning and probing

A K-Series Optical CMM excellently supports handheld CMM measurements. It is a flexible system that can be equipped with a digital ModelMaker Dx laser scanner or a SpaceProbe. Users value the fact that they can freely walk around and take points or scans as desired.

K-Scan MMDx

The K-Scan MMDx is a walk-around scanning solution combining the digital ModelMaker Dx laser scanner with the portable K-Series Optical CMM. K-Scan is ideally suited for on-site 3D digitizing tasks requiring minimum setup and fast results. Operating the scanner with a laser stripe width up to 200mm is as easy and efficient as a paintbrush job. The 6m working range of the Optical CMM is more than sufficient to take measurements in and around a full vehicle. The dense point clouds that are acquired can be graphically analyzed in Focus Inspection or Focus RE Basics software, or in 3rd party packages.

- Portable ModelMaker Dx laser scanner
  - Minimum setup time
  - On-site scanning
  - Ergonomic design
- Optical tracking of laser scanner
  - Effortless measurements
  - Walk-around scanning without mechanical constraints
- Non-contact scanning
  - Full digital copy of parts
  - Suitable for flexible or fragile parts
  - No gauge fixtures needed

SpaceProbe

The ergonomic SpaceProbe is used for traditional touch trigger or analog scanning measurements. Automatic tip detection supports a variety of ball and point probes and extensions.

- Robust, lightweight design
- Ergonomic position of trigger buttons to control measurements
- Sound and LED measurement feedback
- Wireless kit available
- Multiple probe tip extensions for cavity measurement, for example
- Analysis in CMM-Manager or 3rd party tactile measurement software

Robot metrology

Robot metrology accelerates repetitive inspection and assembly tasks. With K-Series Optical CMM, Nikon Metrology ensures that robots operate accurately and reliably all the time. Some customers use the metrology system to calibrate robots up-front, or monitor one or more robots in real time to optimize robot precision. In any case precision is guaranteed, delivering predictable results all the way through.

- Absolute robot accuracy through calibration or continuous robot tracking
- Improved accuracy for repetitive inspection and assembly tasks
- Better economics by combining metrology with industrial robots
- Quick metrology setup and smooth system integration

Robotized part-to-CAD inspection

As the ModelMaker Dx laser scanner is being tracked accurately, K-Robot obsoletes cyclic robot calibration and eliminates the influence of robot warm-up, drift and backlash.

Adaptive Robot Control (ARC)

Adaptive Robot Control combines off-the-shelf robot and metrology technology to establish a closed feedback loop that firmly increases the precision of industrial robots. Regardless whether deployed for machining, inspection, applying beads or manipulating objects in a cell, robotized tasks are consequently executed with 0.1mm absolute accuracy. This is because on-line robot tracking obsoletes the impact of degrading phenomena such as play, mechanical flexibility, backlash or thermal effects.

Impact of metrology on robot accuracy

	Absolute accuracy (full payload)	Eliminates influences of drift, backlash, etc.
Standard robots	2-5 mm	No
Off-line robot calibration	0,4 mm	No
On-line robot tracking (ARC, K-Robot, etc)	0,1 mm	Yes

High scanning accuracy is guaranteed, as K-Robot eliminates the influence of robot warm-up, drift and backlash.

Continuous robot monitoring and adaptation through Adaptive Robot Control yields highest absolute accuracy.

Metrology in motion

Validating simulation models using physical prototypes and pre-series parts is a critical activity in automotive, aerospace, naval and civil engineering. K-Series DMM (Dynamic Motion Measurement) combines high-speed optical sensors and modular software applications to respond to these challenging motion analysis tasks.

K-Series DMM eliminates cumbersome setup work because the sensors can be mounted and calibrated in minutes, instead of hours. The use of infrared LED markers allows for more accurate measurement of high-frequency macro motions by adding only a few grams of instrumentation mass to the test piece.

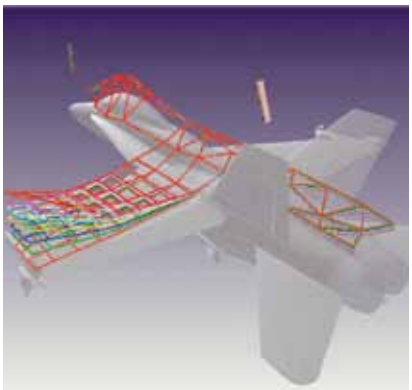
Dynamic motion measurement

K-Series DMM (Dynamic Motion Measurement) is the perfect solution for motion and deformation measurement and evaluation. It is a digital metrology system that accurately tracks the point coordinates of infrared LED markers attached to the objects under investigation.

- Quick and easy transducer setup
- Limited instrumentation mass
- Sampling rate up to 1000Hz
- Measure up to 256 3D or 85 full-motion markers
- Direct data-stream interfaces to HBM, National Instruments, Dewetron, etc.

To maintain high quality standards, car manufacturers run door slam tests to acquire motion and displacement data of various door, lock and body points. This is critical information in the assessment of the dynamic loading conditions that occurs during a door slam sequence.

K-Series DMM can also be used to capture the wheel motion and displacement of a car on a test bench. Such rig tests efficiently and realistically simulate the changing loading conditions the vehicle undergoes during normal use.



Specifications

Optical CMM

	Measurement volume (m^3)	Measurement distance (m)	Volumetric accuracy (µm)	Temperature range (°C)
K500	11	5	up to 90	10-35
K600	17	6	up to 90	10-35
K610	17	6	up to 60	10-35

* Full specifications are available in product data sheets

K-Scan MMDx

	K-Scan MMDx100
Max. stripe length	100mm
Scanning speed	Up to 150 stripes/s (80.000 pts/s)
Laser class	2M

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