



KONICA MINOLTA



NEW

RANGE7

NON-CONTACT 3D DIGITIZER

The Visionary Eye

Creating the Future Style of Manufacturing



Non-contact 3D digitizer suitable for industrial applications requiring high accuracy and reliability

The essentials of imaging

Do you make 2D drawings simply to check your 3D model?

How reliable is your surface profile evaluation, such as checking of distortion in a free-form surface?

Is the evaluation of wall thickness or machining stock inspection for cast parts sufficient?

Do you spend too much time correcting the dies for press parts?

Are the bosses, ribs and holes of plastic parts formed in accordance with the original design?

Is inspection totally dependent on skilled workers?

Non-contact 3D digitizer KONICA MINOLTA RANGE7 can instantaneously digitize the external profiles of various industrial parts, including press parts, machined parts, dies, prototypes, cast parts and injection molded parts, into 3D data. The digitized profile data can then be accurately reproduced on a computer screen. By comparing this data against 3D CAD data with optional application software, you can quickly output measurement reports on overall deviation, cross-sectional deviation, wall thickness distribution and GD&T (Geometric Dimensioning and Tolerance). This allows increased speed and improved quality in the manufacturing process.

In addition to measurement for inspection and quality control, KONICA MINOLTA RANGE7 offers various applications including:

- Reverse engineering
- Rapid prototyping
- Creation of machining data
- Digital mockup



KONICA MINOLTA RANGE7 opens up the future possibilities of non-contact 3D measurement by adding the elements of increased reliability, improved operability and easier transportability to Konica Minolta's accumulated optical technologies and auto-focus function.

■ Principal applications and measurement targets

Quality inspection (confirmation and verification of whether parts are manufactured to specifications) and reverse engineering (quantification of quality and capability of parts, etc.) from development to prototyping phases

- Cast and other formed materials
- Pressed parts
- Injection molded parts
- Various machined parts



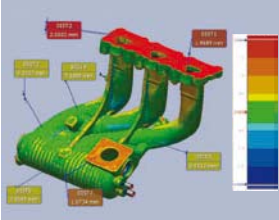
KONICA MINOLTA RANGE7 will change the process of manufacturing.

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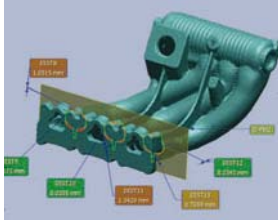
Problems can be solved by using KONICA MINOLTA RANGE7 and 3D CAD data, without the need for 2D drawings.

The direct comparison of 3D scan data against 3D CAD data provides visual and quantitative evaluation of surface distortion and cross-sections of part exteriors, even those with multiple free-form surfaces. By doing this, you can confirm and verify whether parts are manufactured to the design.

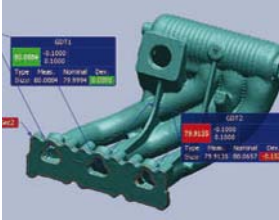
① Contour evaluation



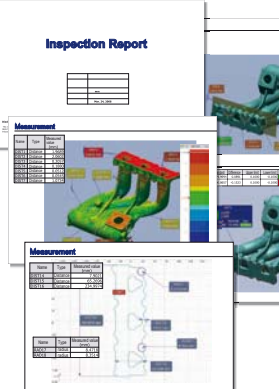
② Cross-section inspection



③ Dimension inspection (GD&T)



④ Report output



* Screen shot examples from optional application software.

Solution 1

Cast parts can be visualized and quantified for the evaluation of wall thickness distribution, enabling inspection for excessively thin walls and lack of machining stock. Early feedback of the results to the design and production processes reduces losses in later processes.

Solution 2

By visualizing the spring-back which occurs during forming trials in press die making, the location and amount of distortion can be pinpointed precisely, leading to improved accuracy of die correction and reduced correction cycles.

Solution 3

By creating 3D CAD data of the dimensions and tolerances for inspection points such as the positions of bosses, ribs and holes of plastic products in advance, you can automatically create dimension inspection reports on GD&T analysis, etc., resulting in the development of a routine and speeding up the inspection process.



KONICA MINOLTA RANGE7 is designed to provide high operability and reliability. It is a user-friendly 3D digitizer that provides easy operation with intuitive GUIs, minimization of erroneous measurements, and always offers high-quality 3D data regardless of the target shape or surface conditions.



Innovative performance offered by a next-generation 3D digitizer

Full of various types of know-how to enable high-quality 3D data to be obtained quickly and easily.

01 Easy-to-carry digitizer with integrated camera and controller

The KONICA MINOLTA RANGE7 is a new 3D digitizer series full of 3D digitizing know-how accumulated from Konica Minolta's over 10 years of experience. The compact and lightweight design integrates the camera and controller in a single body weighing only approximately 6.7 kg, providing high mobility on measurement sites. The two interchangeable lenses allow one digitizer to handle a broad measurement range.



Two types of lenses (TELE, WIDE) are included as standard.

02 Various focusing functions for quick capturing of clear 3D data

The auto-focus (AF) function implements further advances that only Konica Minolta could provide, to offer a multi-focus mode which automatically shifts the focus position in two steps to obtain more accurate and sharper 3D measurement data. This is especially effective for measurement of deep objects. The adjustment of distance and angle of view is also easy by using the point AF function which adjusts the focus to the point specified by the user and the Field of View (FOV) indicator which shows the current measurement area.

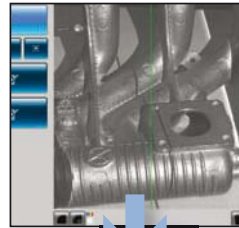


The FOV indicator shows the current measurement area.

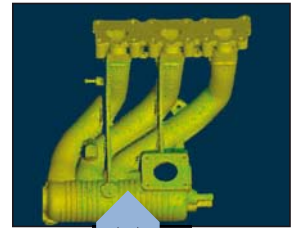
03 The 3D preview function reduces erroneous measurements

The 3D preview function allows users to predict measurement results quickly. With a pre-scan of only 0.4 seconds, users can check for measurement area depth, dead angles, scan problems due to surface conditions, etc. beforehand to greatly reduce erroneous measurements.

Check the focus on the monitor screen.



Measurement results



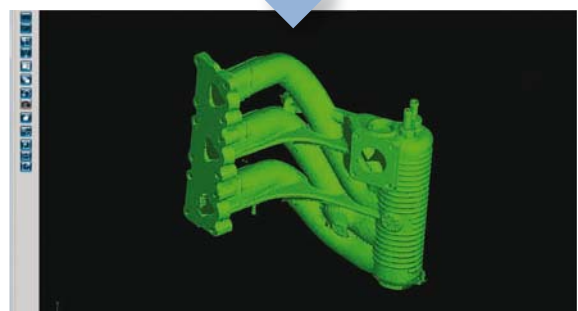
Preview is displayed in 0.4 seconds.



04 Excellent ability to measure glossy surfaces, surpassing normal assumptions regarding optical 3D digitizers

The new sensor and original measurement algorithm ensure a wider dynamic range. Even glossy objects, such as metallic surfaces, can be measured reliably.

Measurement of the machined surface of a cast part

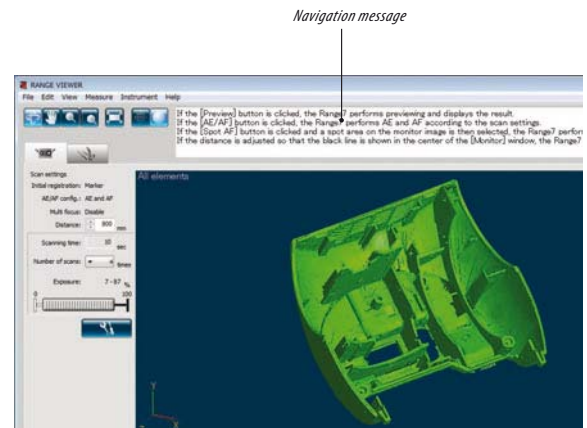


The newly developed software RANGE VIEWER allows comfortable scanning operations.

The software, designed specifically for KONICA MINOLTA RANGE7, makes the process from scanning to data integration quick and easy.

01 User-friendly software with navigation messages

"RANGE VIEWER" is newly developed 3D data processing software included as standard. It provides various editing functions from scanning control of the instrument to alignment of measured data and data merging. Easy-to-see icons and a flexible GUI allow scanning and data editing to be done seamlessly. The navigation messages which show instructions or the next step allows beginners to easily and quickly learn operation.



02 Supports 64-bit editions of Windows® Vista to allow large-volume data processing

RANGE VIEWER supports 64-bit editions of Windows® Vista, enabling large volumes of data to be processed. It does not require a dedicated computer but can be operated with a commercially-available laptop computer*, keeping the mobility of the RANGE7 intact. It also allows quick data transfer to optional application software via IPC (Inter Process Communication) without the need to save files.

* For detailed specifications, refer to the Operating Environment of RANGE VIEWER in this catalog.



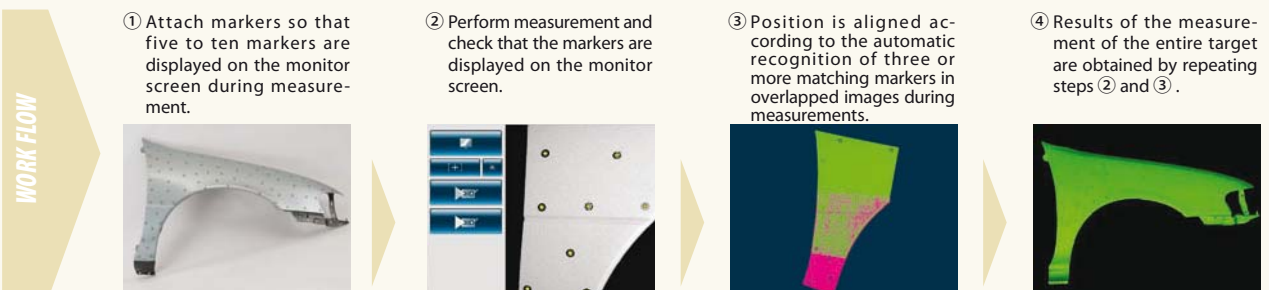
03 Easy operation and high processing ability for reduced total operation time

The total operation time from the setting of distance and angle of view, through scanning, to data integration is about 35 minutes* to measure Konica Minolta's standard sample from 30 directions. High operability and a processing ability of approximately 1 minute/cycle on average has been achieved.

* Measurement using markers (optional accessory).

Other conditions are according to Konica Minolta Sensing standards.

Measurement procedure with KONICA MINOLTA RANGE7 (measurement using markers)



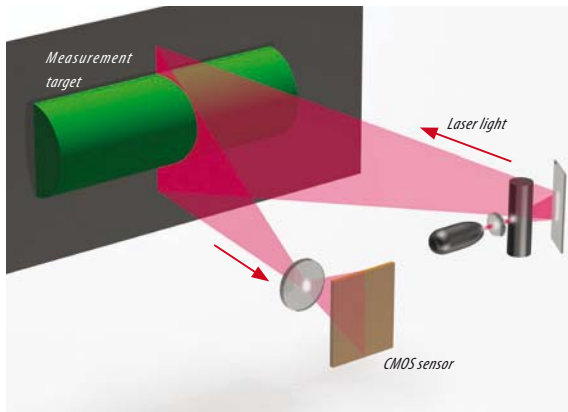
Toward new horizons for optical 3D digitizers

The KONICA MINOLTA RANGE7 boasts high accuracy and reliability. Points Konica Minolta Sensing cannot compromise as a manufacturer of measuring instruments.

01 Stable scanning with light sectioning method

KONICA MINOLTA RANGE7 employs triangulation by the light sectioning method, using a Class-2 semiconductor laser to sweep the target with laser light. In as little as approximately 2 seconds, a target is scanned with laser light that has passed through a slit, and the reflected light is received by the 1.31-megapixel CMOS sensor that provides high-resolution information.

The information is then converted into 3D data using the data for distance to the target calculated based on the triangulation principle. One scan can obtain up to approximately 1,310,000 points (1,280 x 1,024 points) of 3D coordinate data.



02 High reliability with minimized influence from environment conditions

The KONICA MINOLTA RANGE7 has adopted a new optical system which adjusts focus based on the signal from the image pickup device. It also has an integrated inner base-plate made of CFRP (carbon fiber reinforced plastic). As a result, the KONICA MINOLTA RANGE7 has achieved a lightweight body, great rigidity and high driving accuracy. At the time of measurement, the KONICA MINOLTA RANGE7 provides high reliability when operating in various environments by minimizing the influence of instrument tilt, temperature changes, etc.



CFRP box structure offering great rigidity and temperature characteristics

03 High measurement accuracy based on strict inspection standards

The KONICA MINOLTA RANGE7 has achieved high measurement accuracy*¹ of $\pm 40 \mu\text{m}$ *² in accuracy evaluation using ball bars*³ according to the guidelines in "VDI/VDE 2634*⁴ Part 2". The testing method utilizing ball bars is planned to be included in a Japanese Industrial Standards proposal related to the testing of optical non-contact coordinate measuring instruments.



Ball bars

Konica Minolta performs testing based on "VDI/VDE 2634 Part 2" using ball bars calibrated by the National Institute of Advanced Industrial Science and Technology of Japan for all KONICA MINOLTA RANGE7 units. We build confidence by clearly indicating the product accuracy and by conducting strict testing for each unit before shipment.

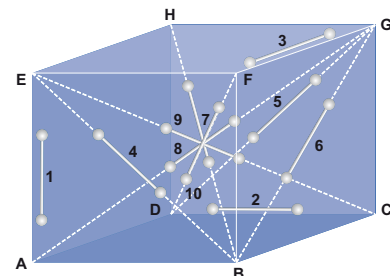
*¹ Accuracy: Measuring instrument accuracy expressed as error limits under the defined conditions.

*² Measured with the TELE lens at a distance of 450 mm and ambient temperature of $20 \pm 1^\circ\text{C}$.

Other conditions are according to Konica Minolta Sensing standards.

*³ Ball bar: Equipment for evaluation of accuracy, consisting of a bar that has balls attached at both ends.

*⁴ VDI/VDE 2634: Optical measurement system testing guidelines issued by Germany in 2002.



Measurement of a ball bar at 10 positions inside a defined space as pre-shipment inspection (conceptual image)

04 On-site calibration for maintaining high reliability

A compact calibration chart that can be set up on a table is supplied as standard. When calibration is required due to changes in ambient temperature, all you have to do is to scan the calibration chart according to the software guidance.

This will ensure measurements with the same accuracy as the time of shipment from the factory.



Compact calibration chart (standard accessory)

Increased mobility and operability of the compact, lightweight KONICA MINOLTA RANGE7

Various accessories specifically designed for KONICA MINOLTA RANGE7 offer flexible system configuration according to the application and operating environment.

01 Measuring Stand Set with laptop shelf (optional accessory)

The optional measuring stand allows stress-free work in cases where measurement requires the KONICA MINOLTA RANGE7 to be moved around.

Since the stand has a shelf on which a laptop PC can be placed, an all-in-one system can be built to provide high mobility within the measurement environment.



02 Tripod Set (optional accessory)

The tripod can also be used with a dolly (optional accessory) for easy movement.



03 Storage Case (optional accessory)

The instrument, lenses, calibration chart and cables can be stored securely.



04 Rotating Stage Kit (3 kg/20 kg) (optional accessory)

The rotating stage kit allows automatic positioning of a target for measuring from all sides through 360°. Two models are available depending on the load: 3 kg and 20 kg.



05 Optional application software for reverse engineering, testing, etc.

To compliment the advanced features of the KONICA MINOLTA RANGE7 scanner, Konica Minolta offer a range of third-party software solutions. Together we can identify the most effective solution to meet the needs of the user to ensure they obtain maximum benefit from their investment. The software packages offered by Konica Minolta include:



Etc

In addition the data from the KONICA MINOLTA RANGE7 can be output in many standard formats enabling data to be imported to the majority of CAD software packages.

Specifications of KONICA MINOLTA RANGE7

Measuring method	Triangulation by light sectioning method				
Light source	Semiconductor laser, Wavelength: 660 nm				
Laser class	Class 2 (IEC 60825-1 Edition 2)				
Number of pixels taken	1.31 megapixels (1280 x 1024)				
Measurement distance	450 to 800 mm				
Receiving lens (interchangeable)	TELE, WIDE				
Measurement range (mm)	Distance	TELE	TELE	WIDE	WIDE
	Direction	450 mm	800 mm	450 mm	800 mm
	X × Y	79×99	141×176	150×188	267×334
	Z	54	97	109	194
XY direction measurement interval		0.08	0.14	0.16	0.28
Accuracy (Distance between balls)*1	±40µm				
Precision (Z, σ)*2	4µm				
Auto-focus	Provided				
Auto-exposure	Provided				
Scan time	Approx. 2 sec. or more (1 scan)				
Preview function	Approx. 0.4 sec./scan				
Scanning ambient lighting condition	500 lx or less				
Output interface	USB 2.0 High Speed				
Power	Included AC Adapter Input voltage: 100 to 240 VAC (50/60 Hz), Rating: 1.4 A (at 100 VAC input)				
Dimensions	295 (W) x 190 (H) x 200 (D) mm (Excluding grips and lens)				
Weight	Approx. 6.7 kg				
Operating temperature/humidity range	10 to 40°C; Relative humidity 65% or less (no condensation)				
Storage temperature/humidity range	-10 to 50°C; Relative humidity 85% or less (at 35°C, no condensation)				

*1 When measuring the distance between balls for a ball bar (two balls) as defined in VDI/VDE 2634-2 under Konica Minolta Sensing measurement conditions.

Konica Minolta Sensing measurement conditions: Temperature: 20±1°C; Lens: TELE; Measurement distance: 450 mm; Warm-up: 20 min.; Software used: Konica Minolta processing software; After calibration of the instrument, Measurement target: Konica Minolta standard target (2 balls); Arrangement of measurement target: Konica Minolta standard arrangement (10 positions inside measurement space); Uncertainty of standard target not included.

*2 Measurement conditions: Temperature: 20±1°C; Lens: TELE; Measurement distance: 450 mm; Warm-up: 20 min.; Measurement target: Konica Minolta standard planar chart; Software used: Konica Minolta processing software; 1 σ value

*3 Using Konica Minolta processing software

Specifications of 3D Data Processing Software RANGE VIEWER

<Major Functions>

Readable data formats	Readable data formats Konica Minolta proprietary formats: .rgv (Single-scan data group), .rvm (more than one piece of data)
Data output	STL (binary), ASCII point group Konica Minolta proprietary formats: .rgv, .rvm
Measurement functions	Monitor image, Preview, AF/AE, Measurement Control of rotating stage (Konica Minolta optional accessory)
Editing functions	Data alignment, Data merging (integration), Point group deletion
Drawing	Point group shading

SAFETY PRECAUTIONS



Read all safety and operating instructions before operating the KONICA MINOLTA RANGE7.

- Use only a power source of the specified rating.
Improper connection may cause a fire or electric shock.
- Do not stare into the laser beam.
(MAX. 34mW 660nm, CLASS 2 (IEC) LASER PRODUCT)



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Registration date : March 3, 1995 Registration date : March 12, 1997

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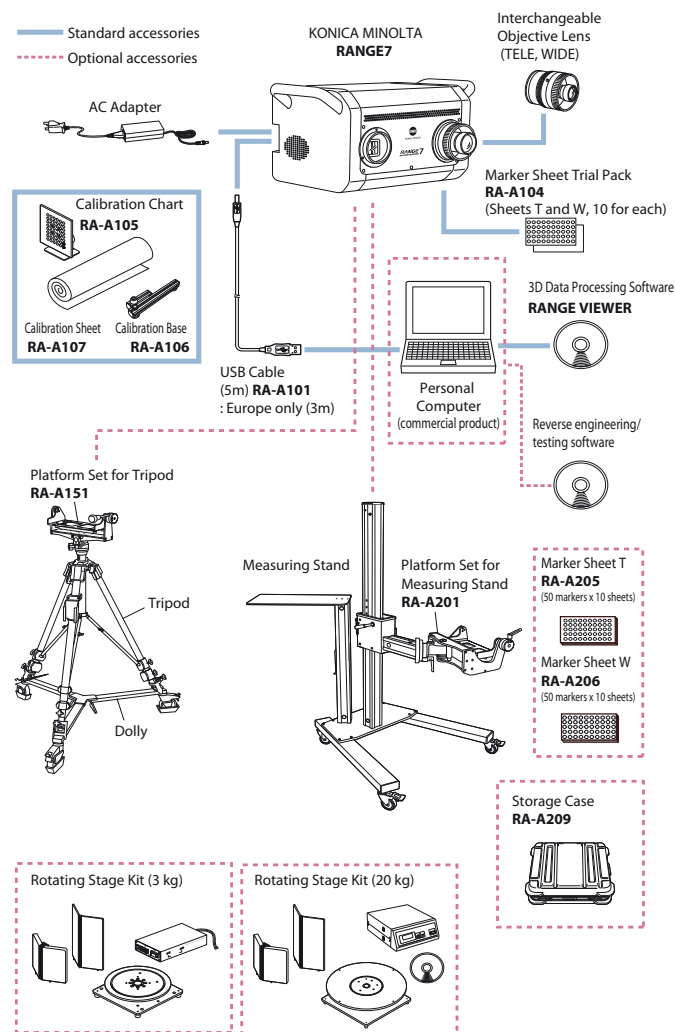
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System configuration



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- Screens shown are for illustration purpose only.

<Operating Environment>

OS	Windows® Vista 64-bit (x64)
CPU	Core2Duo, Xeon or higher
RAM	4 GB or more
Display	Graphics display capability of 1280 x 1024 or more
Graphics board	OpenGL compatible board (Konica Minolta verified compatible board recommended)
Interface	USB 2.0 port



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