

M³ Innovation

Strategy to take advantage of the IoT

Measure
M2M
Manage

The strategy to utilize IoT for improving production efficiency as well as quality.

Mitutoyo

Measure M2M Manage

Strategy to take advantage of the IoT

The strategy to utilize IoT for improving production efficiency as well as quality.

Mitutoyo's concept
M³ Innovation



Measure: measuring precisely
M2M: machine-to-machine connection
Manage: managing measurement data & measuring machine

Mitutoyo group suggests innovation utilizing IoT
for smart manufacturing through three "M"s.

Measure



Overturn the tradition that measurement must be performed in laboratories.
“Manufacturing” and “Measuring” will become much closer.

CONCEPT 01

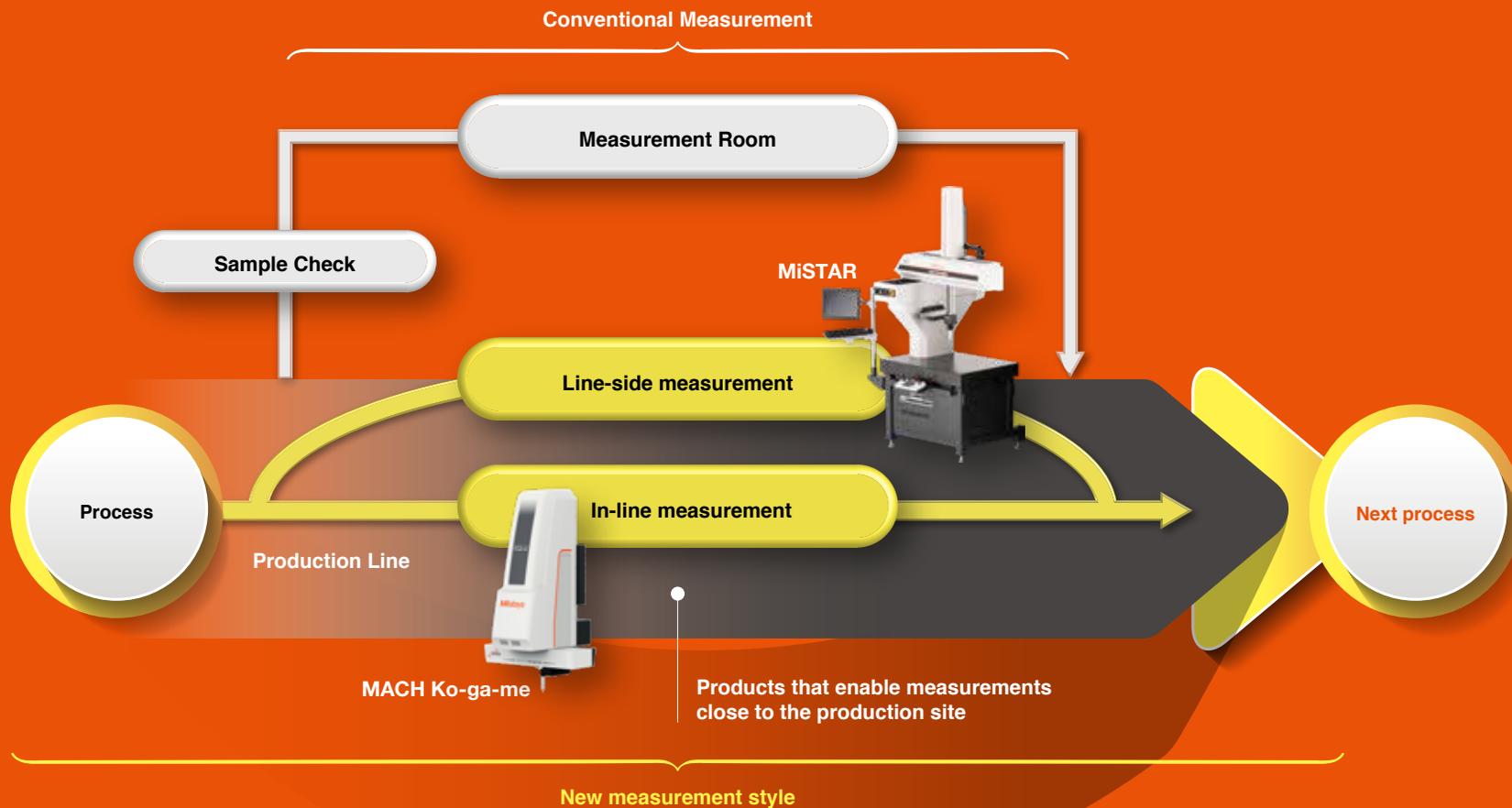
Even closer to the production line; right by the machine.
New measurement style in the IoT era.

New measurement style in the automation era

Randomly select a product from the production line and move it to the laboratory. This process is always problematic for conventional off-line inspection aimed at improving production processes. Accordingly, Mitutoyo has developed measuring instruments that can be installed and used in the production workshop. These instruments enable in-line or line-side inspection without moving product to a laboratory. Much faster and accurate manufacturing. Mitutoyo contributes to achieve this through marketing our precision measuring instruments.

Streamlining measurement

Installing a measuring instrument on a production line or line-side eliminates the work of moving selected products to laboratories and optimizes and accelerates production processes.



M2M



Go beyond borders and seamlessly utilize measurement data.
Mitutoyo opens new horizons in the IoT era.

CONCEPT 02

Go beyond the borders of standards and manufacturers to create diverse collaborations. User-centric smart manufacturing is right there.

Measurement beyond conventional border

The M2M (machine-to-machine) concept is that all machines are able to exchange information between them through a network and perform high-level processing and control.

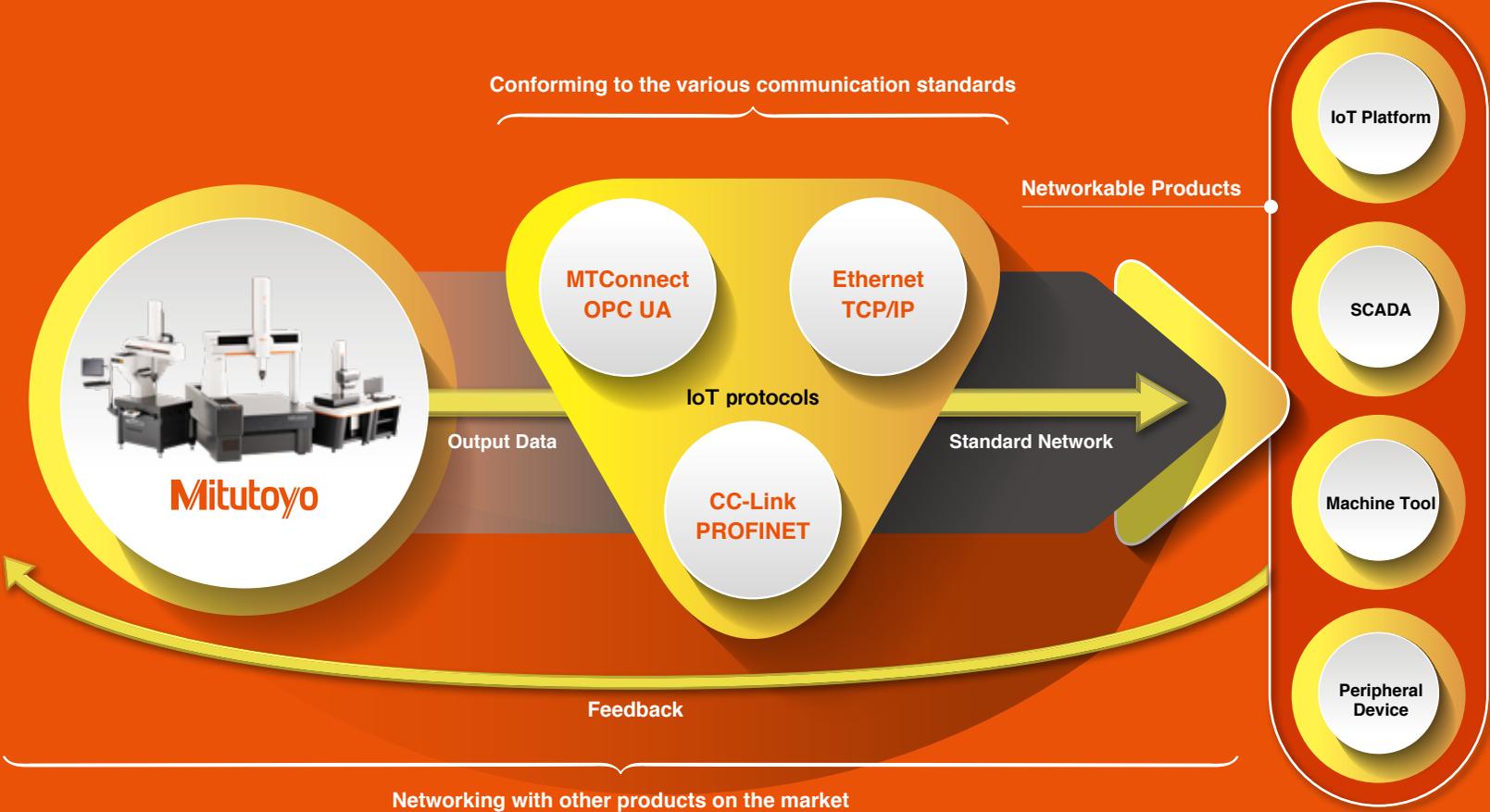
Mitutoyo also introduces this concept into measurement data utilization at a production site.

Problems of differing machine specifications and communication protocols can now be solved. For example, on-line verification of measuring machine data in a specific process with operational data from a processing machine in another process is now available.

Mitutoyo is developing a network structure connecting all machines on production lines with measuring machines.

Networking machine tools and peripherals

Remove barriers of differing machine specifications and communication protocols to achieve a user-centric management system.



Manage

•

Collected data will visualize
the production status in real-time and even predictive.

CONCEPT 03

From status management to predictive maintenance.
The Smart Factory begins with visualization.

Smart factory by visualization of data

Mitutoyo has realized integrated management of production process information through a network. MeasurLink predicts defective product occurrence by collecting and analyzing measuring machine data in real time.

The Status Monitor (SMS: Smart Measuring System) that displays the operation status of the measuring machine and the Condition Monitor that displays the condition of the measuring machine itself boost maintaining measurement accuracy and improve productivity and maintenance management.

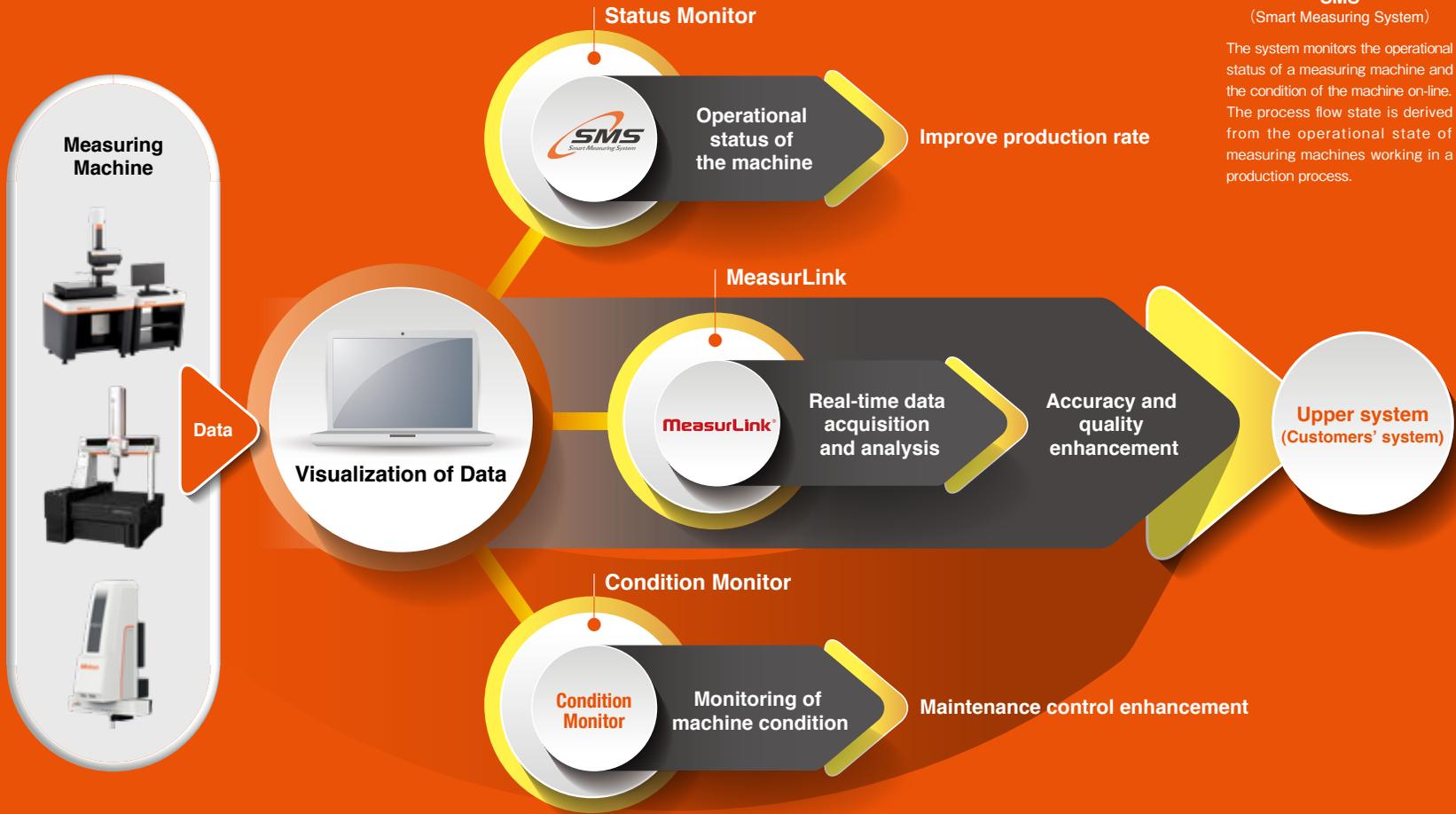
Utilizing measurement data

Visualization by monitoring data collected from measuring machines.
In addition, integrated management enables effective quality improvement of production processes.



SMS
(Smart Measuring System)

The system monitors the operational status of a measuring machine and the condition of the machine on-line. The process flow state is derived from the operational state of measuring machines working in a production process.



SMART FACTORY  MITUTOYO SYSTEM

MITUTOYO NEW DESIGN

Mitutoyo's new design chapter starts.

Currently, the B2B brand strategy product is attracting attention and becoming a global trend, even in the precision measuring machine industry.

Overseas manufacturers are aggressively developing designs pursuing visual sense and rationality; even models by a major designer can be seen.

Mitutoyo has also been emphasizing product design for a long time, but we decided to further enhance our focus on product design in accordance with this movement.

In 2018, new products are being developed with these features.



Mock-up of representative model incorporating new design approach

Newly reborn Mitutoyo

Emotions expressed in new design

Mitutoyo's challenge for new designs

Interview with Shigeru Otani,
Manager of the Industrial Design Team, Research and Development Division

Mitutoyo's product design is reborn.

This project is supported by the entire company as a symbol of company transformation, making further pursuit of usability the greatest theme.

In brief, this project strengthens the Mitutoyo brand by renewing product design both visually and functionally, reflecting what our customers would like.

Befitting the leading company

Our new design project started in the spring of 2017. When we started this project, reviewing our products again, we found visual design issues even though our products have very high world-level quality. Shigeru Otani, manager of the industrial design team of the research and development division, looked back on those days. "Our product forms failed to attract attention and our brand appeal including the logo and coloring was very weak. The market saw this."

The product design of Mitutoyo so far was focused on productivity and rationality, completely differing from the designs of European manufacturers that pursued beauty in form and brand. Responding to this, we determined our concept for new design development would be innovative and evolutionary; our goal was to strengthen our image and reputation as the leading measuring company.

Collaboration across boundaries between departments

The design development proceeded as an interdepartmental project involving sales staff and engineers.

Otani said: "Multilateral information including the customer's voice that we hear from our sales representatives and the influence on measurement accuracy that the person in charge of development indicated was very useful for pursuing practicality."

Three directions

The goal for new design was visual beauty, functional rationality and trustworthy measurement accuracy, which provided a strong basis for the way forward. After consideration, the pillars of the three directions were determined. They were beauty, brand power appeal and product design consistency.

The attraction of beauty

In this project, we thoroughly reviewed our major products, starting with their formative design. Our goal is coexistence of both usability and innovation.

For usability, the necessary elements are intelligibly arranged in natural positions to match operation posture. After clearing obstacles including cost and labor thanks to the company-level intent to create the ideal form of Mitutoyo, we released the contour measuring machine FORMTRACER Avant, which was the first product with the new design, in 2018.

Customers select better looking products when usability is the same. Therefore, the coexistence of measurement accuracy, operability and visual beauty is also an issue.

Otani used the Coordinate Measuring Machine MISTAR 555 as an example and said: "To improve measurement accuracy, we decided to use cast iron for the body structure (originally aluminum alloy) but we employed

Interview with a product designer.



Mitutoyo



Shigeru Otani

- 1981 Joined Mitutoyo Corporation, assigned to the Research and Development Division.
- 1989 Transferred to the Industrial Design team. Designed products from measuring instruments to machines and received many awards such as the Good Design Award (including the gold award).
- 2018 Became the manager of the Industrial Design team.



Interview with a product designer.

a design that avoided giving an oppressive and unrefined impression by adopting a smart arrangement of parts and rib-shaped components." This machine is one of the best examples among the products that achieved user-friendliness thanks to the new design.

Brand power appeal

The conventional Mitutoyo logo was smaller than a product name and less noticeable, buried among other products at the site. "However," Otani added, "users have discovered more meaning in the Mitutoyo logo than we imagined. Our logo is a symbol of accuracy for them at their site and they introduced Mitutoyo products due to the reputation for reliability." Therefore, a powerful and recognizable accent is given to the new logo design, considering the balance between the high-end display element and product design, and the orange color that is our corporate color is emphasized. This was the first attempt to enhance the Mitutoyo brand identity and has been further developed since 2017.

Product design consistency

In addition, while conventional Mitutoyo products used to have different colors according to the product category, we have unified them through one common color from now on. The typeface used for each product has also been unified. We are working to establish Mitutoyo being distinguishable at a glance, creating a presence for each product, and emphasizing our image under the Mitutoyo brand for all products. The new design is accordingly applied to all new products and to existing products, starting with the coordinate measuring machines.

Future development and expectations

Otani explained the ultimate goal of the new design: "Providing values of beauty, high accuracy and usability to sites while displaying the details of the newly reborn Mitutoyo. We will be honored if this can make our users feel that Mitutoyo is wonderful regarding everything."

The new Mitutoyo design has just started. We always pay attention to the opinions and wishes of users at sites.



In pursuit of uncompromising design in every detail

Mitutoyo's challenge for new designs

This design renewal pursues beauty, brand power appeal and product design consistency.



CRYSTA-Apex S



MISTAR 555



FORMTRACER Avant



RA-6000 CNC

New design example: Going beyond coloring, we are also working to improve the structure of the entire product and achieve usability and innovation for our users.

Mitutoyo Recommend

Strategy to take advantage of the IoT

Mitutoyo's precision measuring machines to realize a Smart Factory



PRODUCT

01



Compact high-accuracy scanning probes

CNC Coordinate Measuring Machine
CRYSTA-Apex S 9106 (Scanning probe SP25M installed)

The SP25M is a compact high-accuracy scanning probe with an outside diameter of $\varnothing 25$ mm. This multi-functional probe is suitable for a CNC coordinate measuring machine that performs not only scanning measurement (measurement method that collects a large amount of coordinate data while traveling along a path in contact with the workpiece), but also high-accuracy point measurement, as well as data collection from a centering point measurement.

PRODUCT

02



Can be installed outside of the inspection room

In-line Type CNC Coordinate Measuring Machine
MACH Ko-ga-me

Designed to be operational 24 hours a day and can be installed on a production line. In addition to measuring small workpieces by itself, a measurement system for large workpieces can be configured by using the moving axis unit. Designed to be lightweight and compact, various types of probe can be mounted.

PRODUCT

03



Suitable for measuring large workpieces
and for machine tool error evaluation

Laser Tracker

SpaceTrac Series / XD Laser

This CMM calculates the position from the center coordinates of the X-, Y- and Z-axis obtained by the laser beam emitted from the main unit. The SpaceTrac series for large components, such as aircraft parts or parts used in construction, and the XD Laser for machine tool error evaluation to achieve greater efficiency are also available.

PRODUCT

04



Ultra-high-speed scanning of
complicated contours

Five-axis CNC-controlled 3D Measuring Machine (REVO-2 installed)

CRISTA-Apex S EX R Series

The REVO-2 scanning head supporting five-axis control is installed. Astonishingly speedy scanning measurement of workpieces with complicated forms can be achieved by synchronous five-axis control three axes (X, Y and Z) of the measuring machine and two axes (A and B) of the REVO-2. Also, the sampling function of 4,000 points/second at maximum enables acquiring high density point clouds, even with the high-speed scanning.

PRODUCT

05



High-speed measurement of complicated workpieces is possible from 3D CAD models

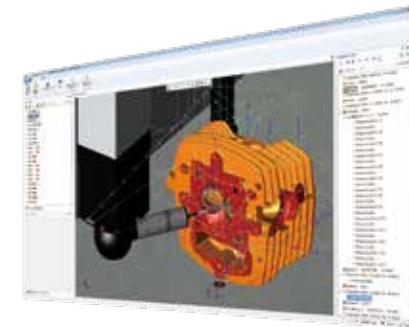
Five-axis CNC-controlled 3D Measuring Machine (PH20 installed)

CRYSTA-Apex EX 544T

The PH20 five-axis control touch-trigger probe system is installed. High-speed point measurement can be performed controlling three axes (X, Y and Z) of the measuring machine and two axes (A and B) of the PH20. Also, using 3D CAD data of a workpiece, the measurement program to perform a highly accurate measurement cycle can be quickly and easily created.

PRODUCT

06



Time for creating measurement programs is drastically shortened

CMM Measurement Program Automatic Creation Software

MiCAT Planner

The software reads the tolerance information from the 3D CAD model, and quickly and automatically uses optimization to create a measurement program. Also, a rule editor enables each setup and stores the measurement rules. Regardless of who creates the program, the quality remains constant.

PRODUCT

07



All the items for every single workpiece are checked within 30 seconds

In-line Total Inspection System for Automotive Industry

Quality Gate

Digitized image data is obtained by high-speed photogrammetry and used to evaluate the target part. All the inspection items for every single workpiece can be checked within 30 seconds; size measurement and appearance checks can also be performed. NG parts will not be passed on to the next process. Swift and precise inspection capability contributes to realizing a Smart Factory with automation and reduced downtime.

PRODUCT

08



Large and heavy cylindrical parts can be measured with high accuracy

CNC Roundness / Cylindricity Measuring System

RA-6000 CNC

The loading capacity is 350 kg. In addition to roundness and cylindricity, flatness can also be measured with this turntable measuring machine that has the highest rotational accuracy in its class. The newly developed turntable incorporates high rigidity air bearings to provide high rotational accuracy with better stability. Also, the linear scale on the X-axis directly detects displacement to perform high precision positioning.

PRODUCT

09



Inner wall hardness measurement without workpiece destruction

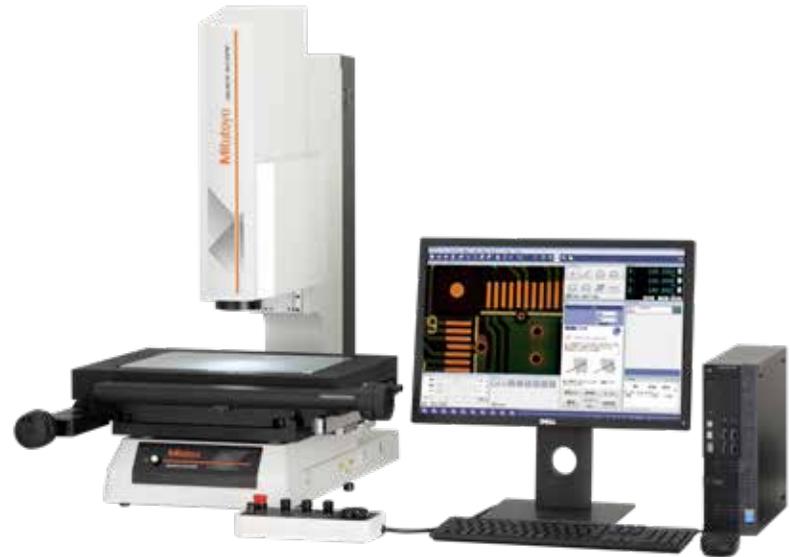
Rockwell Hardness Testing Machines

HR-500 Series

An internal feature down to 34 mm in diameter can be measured without needing to section the workpiece, which diameter can be reduced to 22 mm if an optional accessory is used. The operation panel can be switched according to the application and is mountable on the machine. Also, thanks to the versatile electronic control, hardness tests including Rockwell, Rockwell superficial, Brinell, indentation depth Brinell and plastic can be performed.

PRODUCT

10



High-accuracy vision measurement with easy operation

Manual Vision Measuring System

QS-L/AF

High-speed auto-focus enables a reduction in the time needed for non-contact height measurement, while the three-million-pixel camera and LED lighting provides a high-definition and high-quality image. The four-quadrant ring lighting supports high-accuracy and precise vision measurement and the interchangeable lens covers a wide range.

PRODUCT

11



High accuracy and efficient measurement of very small features

Measuring Machine with Scanning Probe
MiSCAN Vision System

The high accuracy 3D scanning of the newly developed MPP-NANO enables measuring small features difficult to measure by the conventional model. Also, it is equipped with multiple lighting options, the same as the Quick Vision series' optical system, and multi-functional 3D evaluation software to provide high performance.

PRODUCT

12



One-click vision measurement

2D Color Vision Measuring System
Quick Image

The position or angle of the workpiece in the view field is automatically detected and corrected. You can execute measurement with a single click. The work efficiency can be improved thanks to the optical system saving focusing operation, intuitive OK/NG judgement using the templates and graphics that enable quick and easy visual checking.

PRODUCT

13



Promotes Smart Factory

Measurement Data Wireless Communication System

U-WAVE fit

Measurement data collected by calipers and micrometers can be sent via wireless communication. The data can be monitored and managed by software such as Excel* and other text editors. This software collects and totalizes information in real-time at low cost, helping to achieve visualization of quality linking with MeasurLink.

* Microsoft Excel is a registered trademark of Microsoft Corporation.

PRODUCT

14



Achieves quality visualization

Measurement Data Network System

MeasurLink

Real-time statistical processing of measurement data helps visualize quality. The measurement data of each measuring device is collected at the server via a network, enabling collective control and sharing quality information. This will prevent defectives and strongly supports troubleshooting using the accumulated data.

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