

# Mitutoyo

Mitutoyo Quality

## Vision Measuring Machine with Micro-Form Scanning Probe MiSCAN Vision System

Vision Measuring Systems



Catalog No. E14024



A thoroughbred microscopic-form measurement system, developed from coordinate measuring machine and vision measurement system technology

# MiSCAN Vision System

## Highly accurate autonomous scanning covering from micro-form to large workpieces

Newly developed MPP-NANO probe on which styli as small as 125  $\mu\text{m}$  diameter can be mounted achieves autonomous scanning of fine detail. Using the observation camera, the approach to the workpiece can be easily performed while also checking for dirt and scratches on the workpiece. The highly proven SP25M scanning probe is also supported so the system can also be used for large workpieces as well as small.

## Vision measurement functions provide high level performance

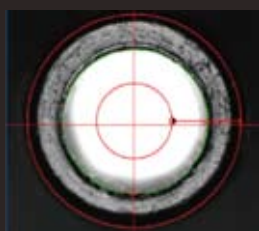
Uses the same image head as the Quick Vision series, the best-selling vision measuring system. Also equipped with the same optical system as the Quick Vision, multiple lighting functions and excellent evaluation software to provide high performance.



Vision Measuring Machine with Micro-Form Scanning Probe  
**MiSCAN Vision System**

# Measuring machine well suited to micro-form measurement

Ideal hybrid measuring machine with vision head and scanning probe (MPP-NANO, SP25M). The image head enables precise positioning and targeting measurement even in shrouded locations where visual checking is difficult.



Precise positioning by monitoring the image

Measurement using MPP-NANO stylus

For the MPP-NANO stylus, an observation unit is available as an option. Even when using the extra small 0.125-mm-diameter stylus, checking on the monitor enables a safe approach to the measuring point.



A magnetic kinematic joint connection enables easy stylus replacement. Stylus replacement tools, which are in the MPP-NANO stylus tool kit, are supplied as standard.



MPP-NANO stylus



In recent years, the need for fine-detail processing technology has been increasing rapidly, including the sensing technology essential for vehicle motorization and autonomous driving. Simultaneously, enabling high-accuracy, high-throughput measurement of microscopic form is required. Mitutoyo responded quickly to these needs, and started selling the Micro Form Measuring System UMAP Vision System some time ago. According to the current need for improving productivity, we have developed the **MiSCAN Vision System**, a measuring system capable of measuring micro form with the **MPP-NANO**, a small diameter scanning probe.

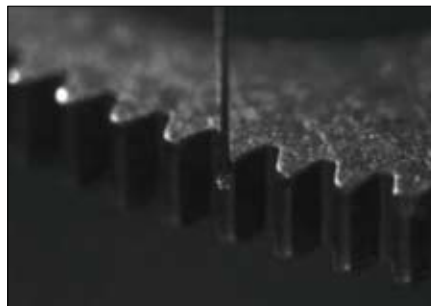
## Examples of micro-form measurement achieved with the MiSCAN Vision System and MPP-NANO

### Microscopic gear teeth

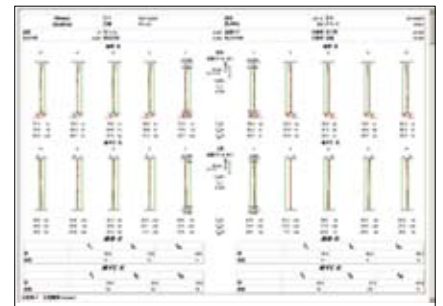
Conventionally, highly efficient scanning of microscopic gear teeth whose module is one or lower has been difficult. However, using the **MiSCAN Vision System** together with the **MPP-NANO** enables this scanning. Simply enter each nominal using GEARPAK, which is the gear teeth evaluation software, to easily evaluate the tooth profile error and tooth trace error.



Module 0.8 master gear measurement



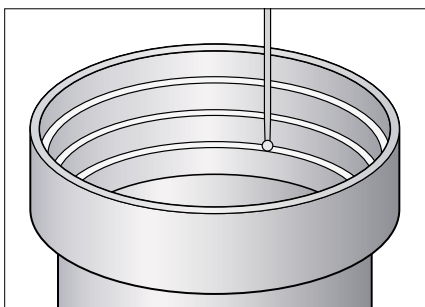
Measurement using the **MPP-NANO**  
0.125-mm-diameter stylus



GEARPAK-Cylindrical analysis

### Lenses and optical tubes

The **MiSCAN Vision System** and **MPP-NANO** enables high-accuracy, highly efficient measurement of miniaturizing and evolving optical tubes. The **MPP-NANO** can measure the contour of high degree aspheric lenses used in the vehicle-mounted camera with high accuracy.



Optical tube



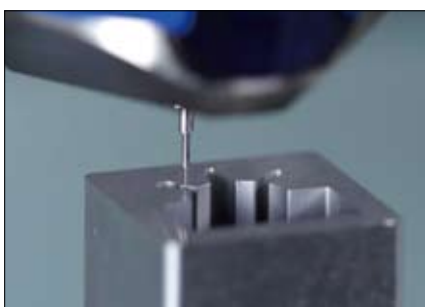
Aspheric-form **MPP-NANO** measurement



SCANPAK form analysis example

### Precision molds

The **MiSCAN Vision System** and **MPP-NANO** enable scanning measurement of microscopic feature detail, such as precision punches and dies, using extra-small-diameter styli, which are available with diameters as small as 0.125 mm.



**MPP-NANO** mold scanning

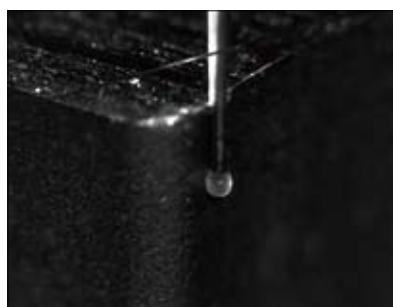


Image seen using the stylus observation  
camera unit



SCANPAK form-analysis example





## Precision mechanical parts

The **MiSCAN Vision System** and **MPP-NANO** enable highly efficient, high-accuracy measurement of miniature mechanical parts that improve precision in industrial machinery.



Precision mechanical parts (linear guide)

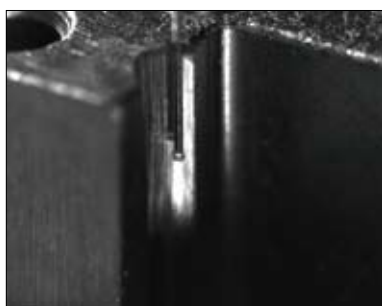


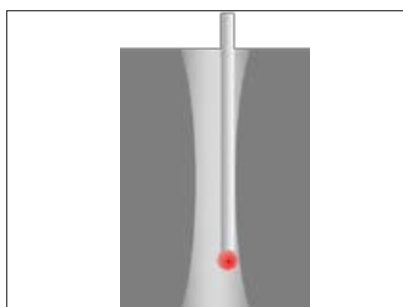
Image seen using the stylus observation camera unit



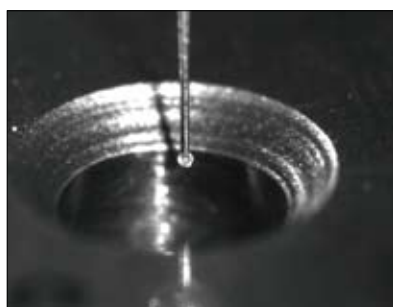
SCANPAK form analysis example

## Micro-hole measurement

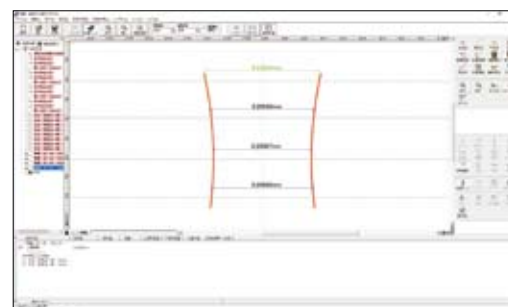
Conventionally, only destructive measurement was possible for the inner diameter of nozzles and draw dies. However, the **MiSCAN Vision System** and **MPP-NANO** now enable performing scanning measurement using the stylus on holes with a maximum aspect ratio of 17:1.



Maximum aspect ratio: 17:1 (for R500-125-85)



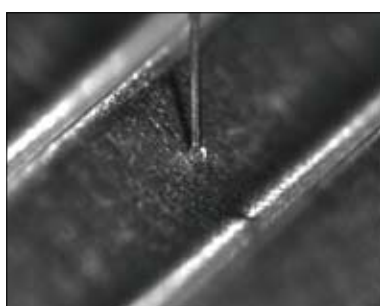
MPP-NANO micro-hole measurement



FORMTRACEPAK-AP analysis results

## Fine detail contour analysis

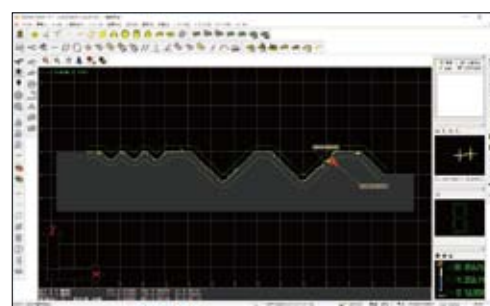
Optional CAT1000S software enables nominal scanning measurement and form evaluation of micro V-grooves and rectangular grooves.



Micro V-groove



Creating nominal sections from CAD data (CAT1000S)



SCANPAK design value verification

# MiSCAN Vision System



## Specifications

Model		MVS Hyper 302	MVS Hyper 404	MVS 404 Apex
Model No.		MVS-H302P1L-D	MVS-H404P1L-D	MVS-X404P1L-D
Order No.*1		364-502	364-512	364-511
Measuring range	Image	300x200x200 mm	400x400x250 mm	
	<b>MPP-NANO/SP25M</b>	175x200x200 mm	275x400x250 mm	
Minimum reading/Scale unit		0.02 μm/Linear encoder		0.1 μm/Linear encoder
Image sensor		B&W CCD camera		
Observation unit		Power turret (1X-2X-6X)		
Illumination unit		Co-axial light, transmitted light, PRL (programmable ring light)		
Contact type probe		<b>MPP-NANO/SP25M</b>	Only <b>SP25M</b>	
Measurement accuracy [μm]	Image*2	E1X, E1Y	0.8+2L/1000	1.5+3L/1000
		E1Z	1.5+2L/1000	1.5+4L/1000
		E2XY	1.4+3L/1000	2.0+4L/1000
	<b>MPP-NANO</b>	E0MPE	1.9+4 L/1000	—
	<b>SP25M</b>	E0MPE	1.9+4L/1000	2.5+6L/1000
Scanning accuracy [μm]	<b>MPP-NANO</b>	0.6	—	
	<b>SP25M</b>	MPETHP	2.5	2.7
Probing accuracy [μm]	<b>MPP-NANO</b>	0.6	—	
	<b>SP25</b>	PFTU,MPE	1.9	2.2
Repetitive accuracy [μm]	<b>MPP-NANO</b>	0.05	—	
Accuracy guaranteed temperature	Ambient temperature	18 - 23 °C		
	Temperature variation	0.5 °C/1 H and 1 °C/24 H		
Size of stage glass		399x271 mm	493x551 mm	
Max. mass of workpiece*3		15 kg	30 kg	40 kg
Dimensions		859x951x1609 mm	1407x1027x1778 mm	
Mass (Including machine stand)		360 kg	579 kg	

\*1 Accuracy-guaranteed machines conforming to ISO10360-7:2011 are also supported. (Denoted by S at the end of the Order No.)

\*2 Image accuracy using a QV-HR 2.5X objective and 2X tube lens.

\*3 Except at limits of stage displacement or concentrated loading.

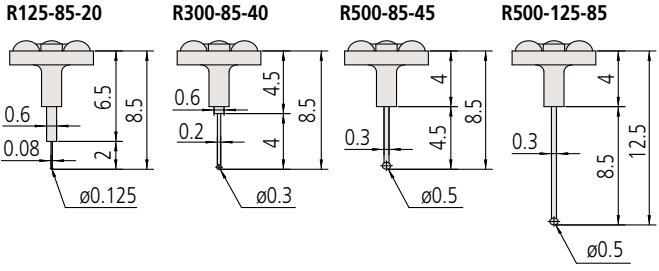
Note: CNC Vision Measuring Systems in this brochure incorporate a main startup system (relocation detection system) that disables operation when an unexpected vibration occurs or the machine is relocated. Be sure to contact your nearest Mitutoyo Sales Office prior to relocating your machine after initial installation.

## MPP-NANO For MVS-H302

### The world's most compact and accurate scanning probe

- Styli as small as a 0.125 mm-diameter are available for scanning measurement of fine-detailed features.
- Deep grooves and deep holes can be measured at the maximum aspect ratio of 17:1 (ø500L8.5).
- High accuracy form measurement is enabled by achieving high repeatability:  $\leq 0.05 \mu\text{m}$  (MVS-H302).
- The measuring force is as low as approximately 1 mN. Therefore, it will not scratch or deform the workpiece.
- The stylus can easily be replaced thanks to the magnetic joint connection.
- The stylus observation unit (optional) enables easy positioning of the stylus tip.

	Specifications			
Order No.	02ATX718	02ATX719	02ATX721	02ATX722
Item name	MPP-NANO stylus, ø125L2	MPP-NANO stylus, ø300L4	MPP-NANO stylus, ø500L4.5	MPP-NANO stylus, ø500L8.5
Model	R125-85-20	R300-85-40	R500-85-45	R500-125-85
Nominal tip diameter	125 $\mu\text{m}$	300 $\mu\text{m}$	500 $\mu\text{m}$	500 $\mu\text{m}$
Nominal stylus length	2 mm	4 mm	4.5 mm	8.5 mm
Stem diameter	0.08 mm	0.08 mm	0.2 mm	0.3 mm
Aspect ratio	16	13.3	9	17
Tip material	Ruby	Ruby	Ruby	Ruby



## SP25M

### Compact, high accuracy scanning probe

- The highly proven SP25 scanning probe used with 3D measuring machines can be mounted.
- Stylus changer FCR25 (optional) handles multiple styli, including one in the horizontal position, and enables automatic stylus changes.
- Captures the target point in high-accuracy point measurement and centripetal aligning point measurement (optional).



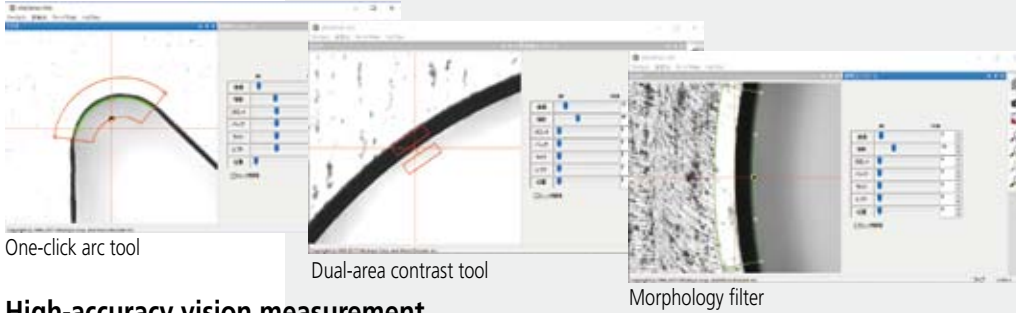
## Non-contact measurement (vision measurement)

The MiSCAN Vision System is equipped with an optical observation system and an illumination unit of the QUICK VISION measuring system. It can perform as a high-level vision measuring system.



### VISIONPAK-PRO (required option)

High-level vision measurement functions are equipped, including a one-click tool that enables easy edge detection; a dual-area contrast tool that automatically recognizes optimal illumination; and filters (morphology filter) that enable highly accurate edge detection.



One-click arc tool

Dual-area contrast tool

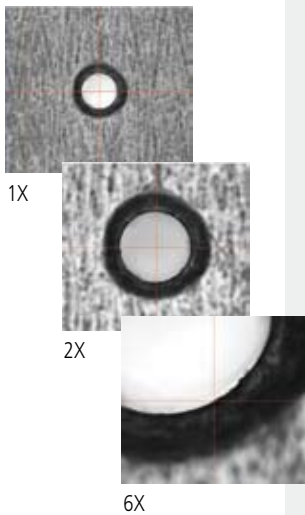
Morphology filter

### High-accuracy vision measurement

High-accuracy edge detection is performed using the image obtained by the image sensor.

### Programmable power turret

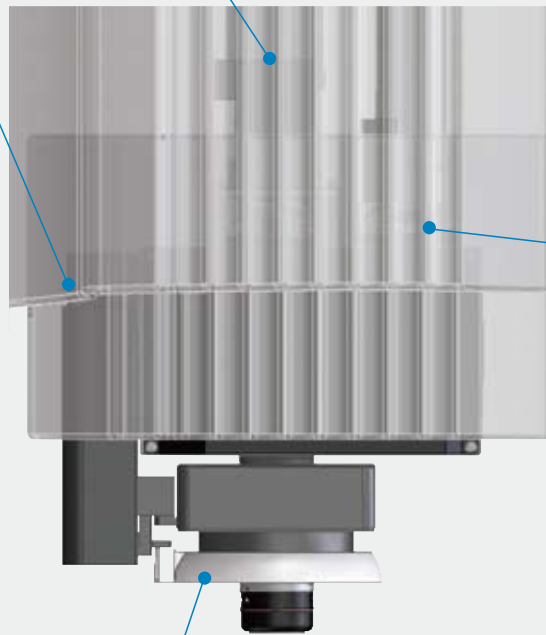
The observation unit uses a high-resolution programmable power turret with high magnification repeatability.



1X

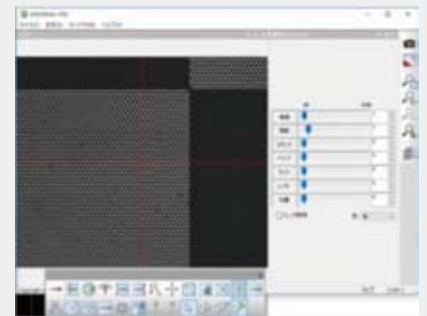
2X

6X



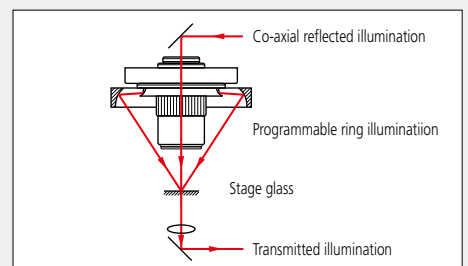
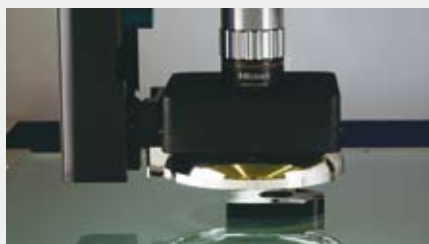
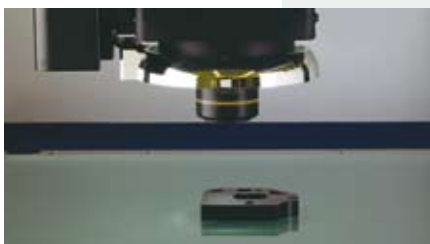
### Image auto focus

The auto focus enables non-contact high-accuracy height measurement. Pattern focus enabling focusing on transparent and mirror objects is also equipped.



### Programmable ring illuminator

A high-function programmable ring illuminator that has the ability to control the irradiation angle and direction is equipped as standard.





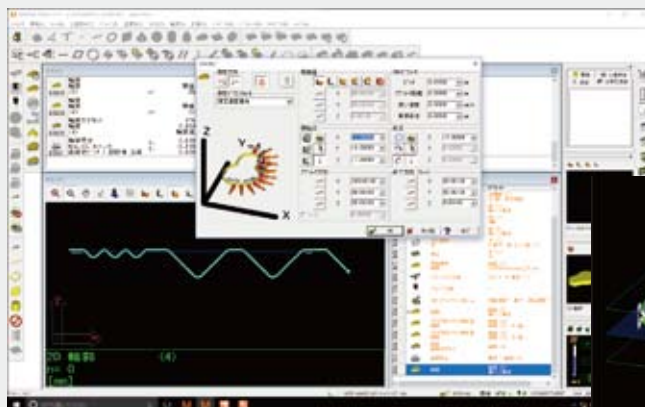


## Contact measurement/ Scanning measurement

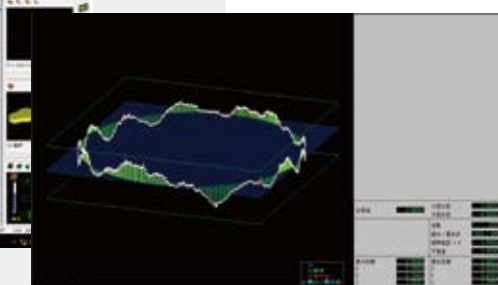
The **MiSCAN Vision System** uses the main unit controller and software that have long been used in 3D measurement and provides high-level coordinate measurement technology.

### MCOSMOS (required option)

**MCOSMOS** has long been used in 3D measurement; in addition to size measurement, it offers very powerful geometric tolerancing functions such as linear contour and plane contour evaluations.



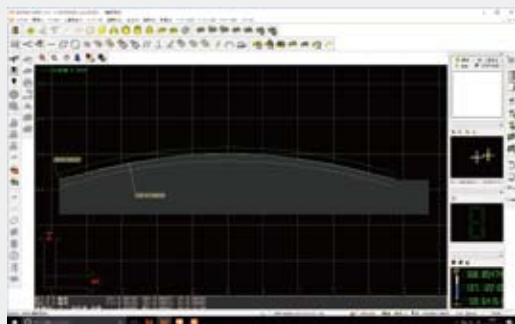
MCOSMOS



MCOSMOS flatness drawing

### SCANPAK (required option)

Using contour data obtained by the **MiSCAN Vision System**, nominal verification, best-fit contour construction and more are available in addition to element calculation.



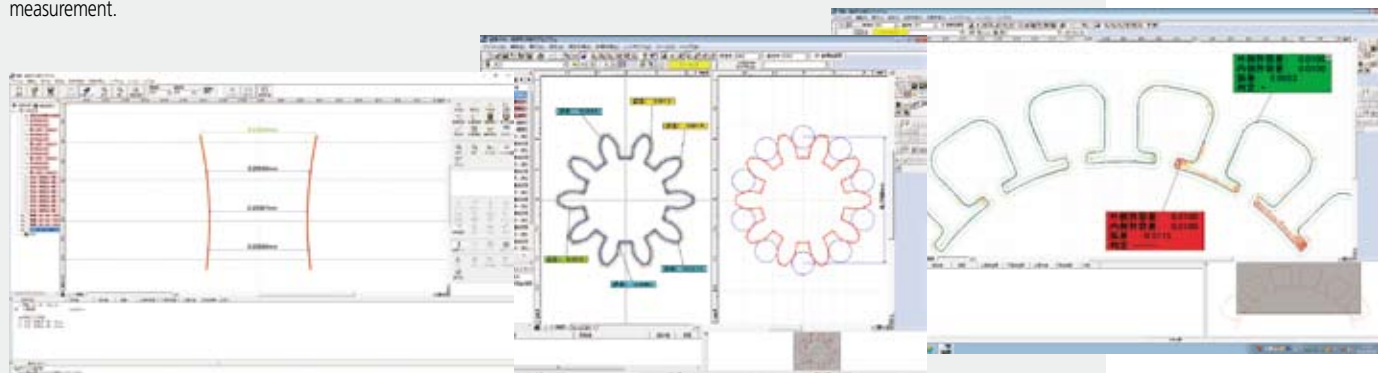
### CAT1000S (optional)

Using 3D CAD data, section extraction in the nominal scanning or linear and plane contour evaluations are available.



### FORMTRACEPAK-AP (optional)

Using data obtained by the **MiSCAN Vision System** enables highly sophisticated analysis including nominal verification, over-pin diameter measurement and arbitrary depth measurement.



## Main options

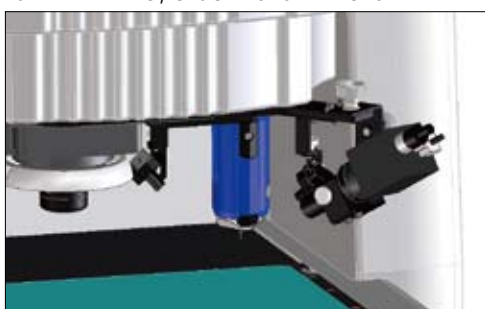
Objective lens



Objective lens	QV-SL0.5X*	QV-HR1X	QV-SL1X	QV-HR2.5X	QV-SL2.5X	QV-5X	QV-HR10X*	QV-10X*	QV-25X*
Order No.	02AKT199	02AKT250	02ALA150	02AKT300	02ALA170	02ALA420	02AKT650	02ALG010	02ALG020
Working distance	30.5 mm	40.6 mm	52.5 mm	40.6 mm	60 mm	33.5 mm	20 mm	30.5 mm	13 mm
PRO model imaging area [(H5) mm × (V5) mm]	Turret 1X	12.54×9.4	6.27×4.7		2.49×1.86		0.62×0.47		0.25×0.18
	Turret 2X	6.27×4.7	3.13×2.3		1.24×0.93		0.31×0.23		0.10×0.07
	Turret 6X	2.09×1.56	1.04×0.78		0.41×0.31		0.10×0.07		0.04×0.03

\* When using a QV-SL0.5X, QV-HR10X, QV-10X or QV-25X objective, partial functional limitations such as insufficient light intensity may occur depending on the target workpiece.

Stylus observation camera unit  
For MPP-NANO, Order No. 02ATX846A



For FCR25 SP25M  
Order No. 02ATV887



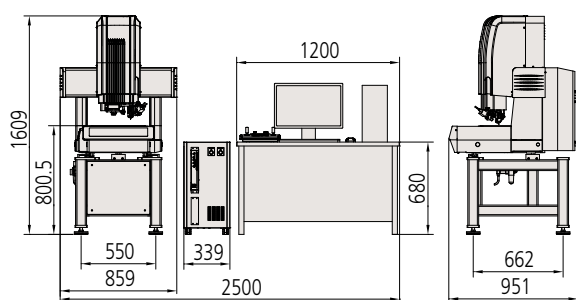
Master ball (ø4) for MPP-NANO  
Order No. 02ATY823

Master ball (ø16) for SP25M  
Order No. 02ATY790

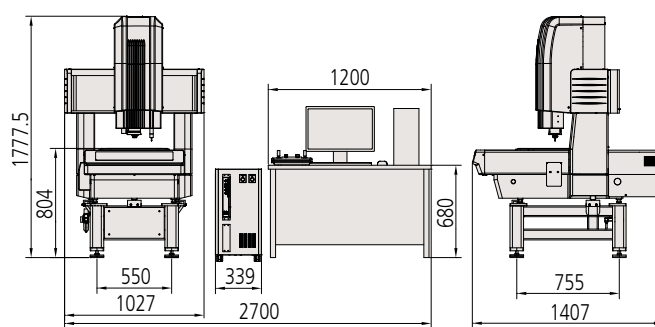
Calibration gauge for MPP-NANO  
Order No. 02ATV821

Calibration gauge for SP25M  
Order No. 02ATV882

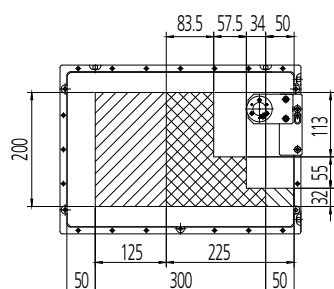
## External dimensions and measuring ranges



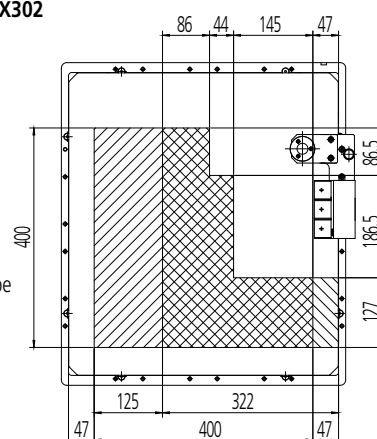
MVS-H302



MVS-X404/MVS-X302



- Common measuring range of image and contact probe
- Contact probe measuring range
- Image measuring range



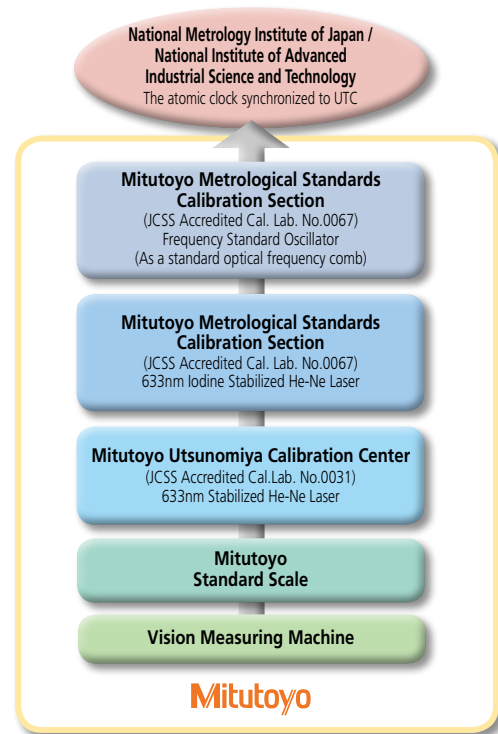
Stage size: MVS-X404 Contact probe (SP-25M)

Stage size: MVS-H302 Contact probe (MPP-NANO/SP-25M)

# Traceability

## Traceability to the national standard of length

- Mitutoyo owns standard scales that are traceable to the national standard of length and these are used to calibrate the reference gages used for calibration of measuring instruments, thus establishing and maintaining traceability for each instrument.
- Our calibration organizations are accredited by IAJapan, a signatory to the Mutual Recognition Arrangement (MRA) of the International Laboratory Accreditation Cooperation (ILAC), and approved of as having the measurement skills equivalent to those of overseas organizations.



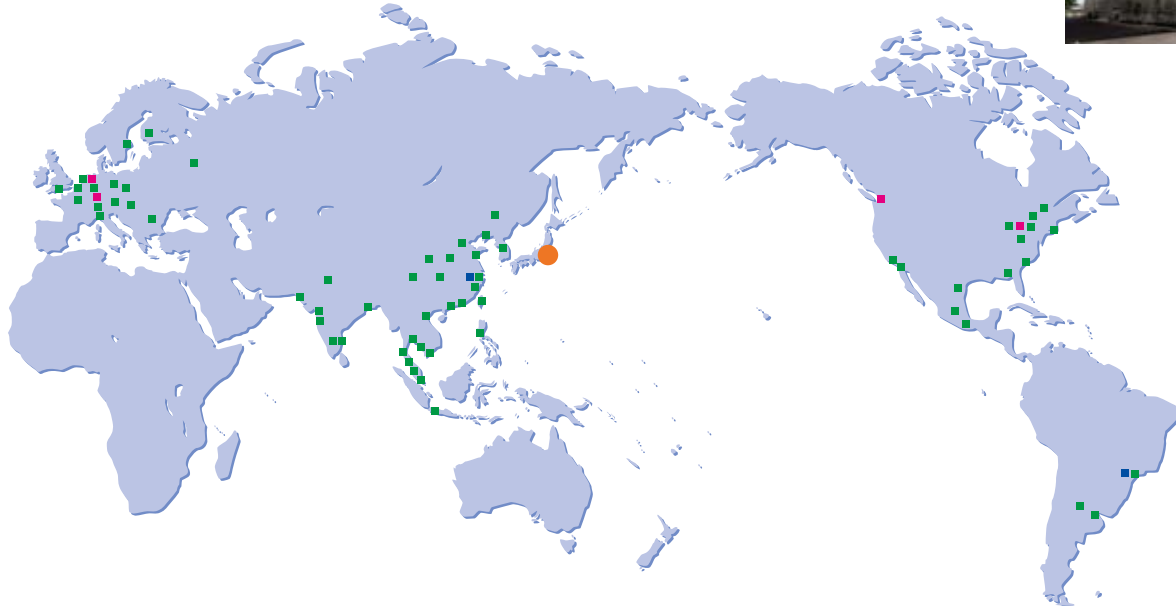
## Reliable support system

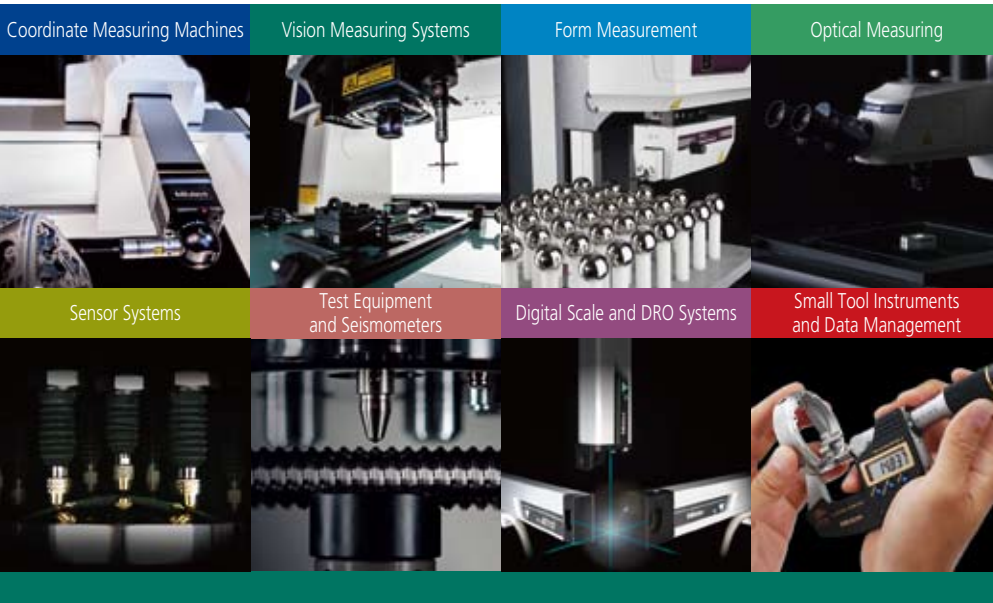
### The world's top-level global network

Following the establishment of MTI Corporation (U.S.) in 1963, Mitutoyo has been expanding its market throughout the world. Currently, the company has R&D, manufacturing, sales, and engineering service bases in 29 countries, as well as a network of distributors in some 80 countries. Mitutoyo maintains its rock-solid status as a leading global manufacturer providing services tailored to each regional society.



Headquarters





### Whatever your challenges are, Mitutoyo supports you from start to finish.

Mitutoyo is not only a manufacturer of top quality measuring products but one that also offers qualified support for the lifetime of the equipment, backed up by comprehensive services that ensure your staff can make the very best use of the investment.

Apart from the basics of calibration and repair, Mitutoyo offers product and metrology training, as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test and deliver bespoke measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.



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