

MITUTOYO ASIA PACIFIC

## Metrology Instruments Calibration Guide

TECHNICAL SERVICES



## Accreditation of each country

The accreditation organizations in each of the countries are also signatories to the ILAC Mutual Recognition Arrangement (ILAC MRA). In other words, accredited calibration laboratories such as **JCSS** (Japan), **SAC-SINGLAS** (Singapore), **SAMM** (Malaysia), **TISI** (Thailand), **KAN** (Indonesia) and **BoA** (Vietnam) will have the same level of recognition internationally.



## Calibration Tools Uncertainty

In order to continuously achieve the best Calibration and Measurement Capability (CMC), Mitutoyo has been investing in calibration tools with the lowest possible uncertainty. This is part of our continuous effort to provide the best service to our customers.

### Benefits of using Mitutoyo calibration service:

- Your machine will be kept in optimum condition with our accuracy adjustment
- Our preventive maintenance helps to minimize chances of machine breaking down
- We provide consultation service on machine usage

## Coordinate Measuring Machine Accuracy Inspection (Calibration certificate can be issued)

Mitutoyo perform Coordinate Measuring Machine inspections in accordance with **ISO 10360-2/4/5:2009 standards**.

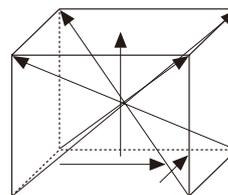
### ISO 10360-2/4/5:2009

Inspection item*	Inspection equipment	Inspection details
Indication error	Check master	See below
Probing error	Reference sphere	See below



### Indication error

Using the gauge block (or check master), enclose both ends of the test position of a given length (7 directions) as shown in the illustration on the right. Measure each of the five test lengths three times. If all 105 length measurement errors obtained by the three test length measurements are less than those of the indication error from the manufacturer, the performance of the coordinate measuring machine is verified.

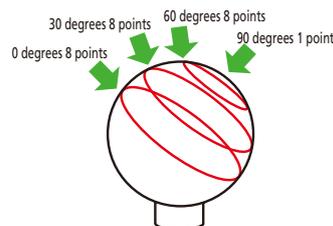


Test position (7 directions)



### Probing error

Measure 25 points with the 10-50 mm diameter sphere gauge (sphericity up to 1/5 the standard value of the probing error) and with these 25 points, find the center of the sphere using the least square method. Calculate the radius of each of these 25 points from the center of the sphere. If the range (rmax-rmin) of the radius of the 25 points is within regulation, the probing error is verified.



\* Inspection items will differ depending on the model

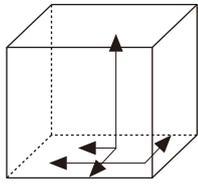
## Vision Measuring System Accuracy Inspection (Calibration certificate can be issued)



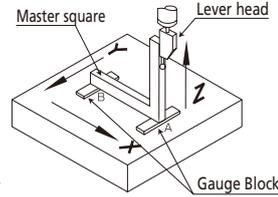
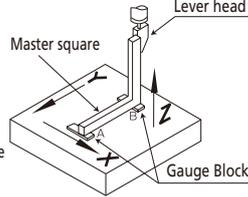
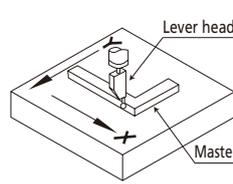
Mitutoyo perform Vision Measuring System inspections in accordance with **Mitutoyo standard**.

### Squareness Measurement

Inspection item	Inspection equipment	Inspection details
Squareness	Master square	Measure the squareness of each axis movement in 3 directions, Nxy, Nyz, and Nxz.



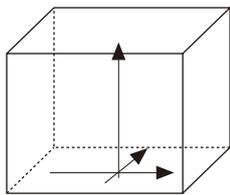
Squareness measurement



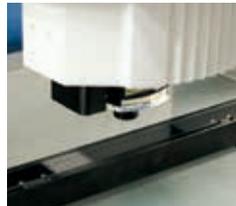
Squareness measurement

### Measuring accuracy E1, E2

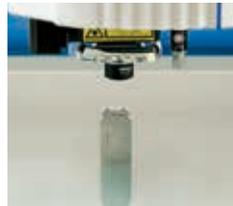
Inspection item	Inspection equipment	Inspection details
Measuring accuracy E1, E2	Standard scale	Remeasure the measuring point three times at the designated measurement points of each axis.
	Gauge block	Remeasure the measurement point three times at the designated measurement points.



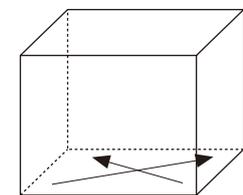
Measuring accuracy E1



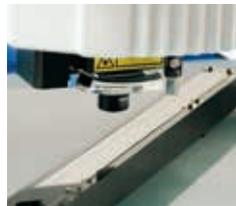
Measuring accuracy E1: X, Y



Measuring accuracy E1: Z



Measuring accuracy E2



Measuring accuracy E2

Note: For high-accuracy instruments, remeasure E2 (designated points at the 45° and 135° table surface tilt points) three times.

## Profile Projector and Measuring Microscope Accuracy Inspection

(Calibration certificate can be issued)

Mitutoyo perform Profile Projector inspections in accordance with **JIS B 7184:1999 standard**, and Measuring Microscope inspections in compliance to **JIS B 7153:1995 standard**.



Magnification accuracy (Measuring Microscope)



Projection accuracy (Profile Projector)

\* Inspection items will differ depending on the model

## Contour Measuring Instrument Accuracy Inspection (Calibration certificate can be issued)

Mitutoyo perform Contour Measuring Instrument inspections in accordance with **Mitutoyo standard**.



Inspection item*	Inspection equipment	Inspection details
Z-axis indication accuracy	Gauge block	Measure the indication error of designated points using a gauge block.
X-axis indication accuracy	X-axis inspection reference gage	Measure the indication error of designated points using a reference gage.
Symmetry accuracy inspection Waviness accuracy inspection Alignment accuracy	Triangle block	Measure according to the designated standard measurements for triangle block, etc.
Straightness	Straightedge	Measure the straightness with a straightedge in the pullout direction by X-axis full stroke.
R-tip accuracy	Pin gauge unit	Check the R-stylus tip diameter using a pin gauge unit.



Z-axis indication accuracy



X-axis indication accuracy



Symmetry accuracy inspection



Straightness

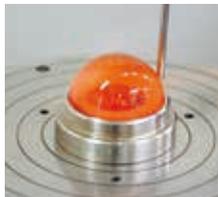


R-tip accuracy

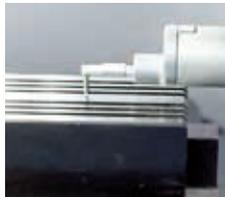
## Roundness/Cylindrical Measuring Instrument Accuracy Inspection

Mitutoyo perform Roundness/Cylindrical Measuring Instrument inspections in accordance with **JIS B 7451:1997 standard**.

Inspection item*	Inspection equipment	Inspection details
Rotational accuracy	Reference radius	Center the reference radius without a load. Measure the rotational accuracy of radial and axial directions.
Indication accuracy of the detector and its calibration	Magnification Calibrator	Perform static calibration and measure the indication error.
Detector linearity	Magnification Calibrator	Perform static calibration and assess the straightness.
Column parallelism	Cylinder square or inspection tool for Z-axis column parallel evaluation	Measure the parallelism and cylindricity with axis column and table axis.



Rotational accuracy



Detector indication accuracy and linearity of calibration detector



Column parallelism

## Surface Roughness Measuring Instrument Accuracy Inspection

Mitutoyo perform Surface Roughness Measuring Instrument inspections in accordance with **JIS B 0651:2001 standard**.

Inspection item*	Inspection equipment	Inspection details
Stylus verification	Roughness specimen	Check for tip fragments in repeat measurements of roughness specimen.
Indication accuracy of the detector	Magnification Calibrator	Measure the indication error with magnification calibrator.
Straightness	Straightedge	Measure the maximum error of the P curve on the X-axis full stroke with a straightedge.
X-axis indication accuracy	Standard scale	Measure the reference scale and measure the Sm value.



Stylus verification



Indication accuracy of the detector



Straightness



X-axis indication accuracy

\* Inspection items will differ depending on the model

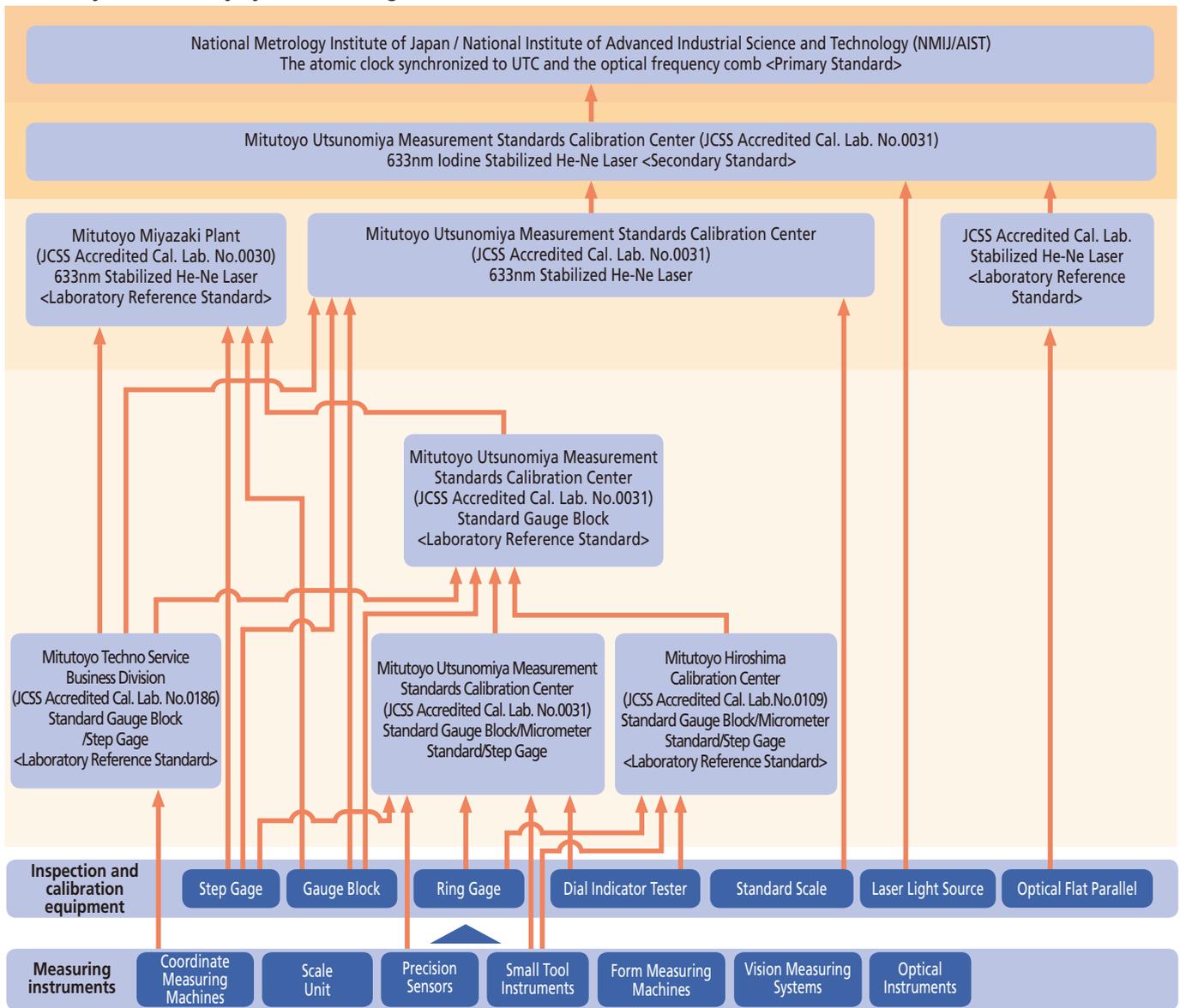
# Traceability System (Guarantees and upholds length standards)

Through its accredited calibration laboratories, Mitutoyo guarantees the traceability of its measurement standards to national standards, and conducts calibration at calibration cycles regulated by the JCSS (Japan Calibration Service System) via specified secondary standards owned by Mitutoyo. Mitutoyo can calibrate all measuring instruments used by customers and ensures their traceability to national standards.

## • Relationship between the National Standard Provision Scheme and the Calibration Laboratory Accreditation Scheme under JCSS



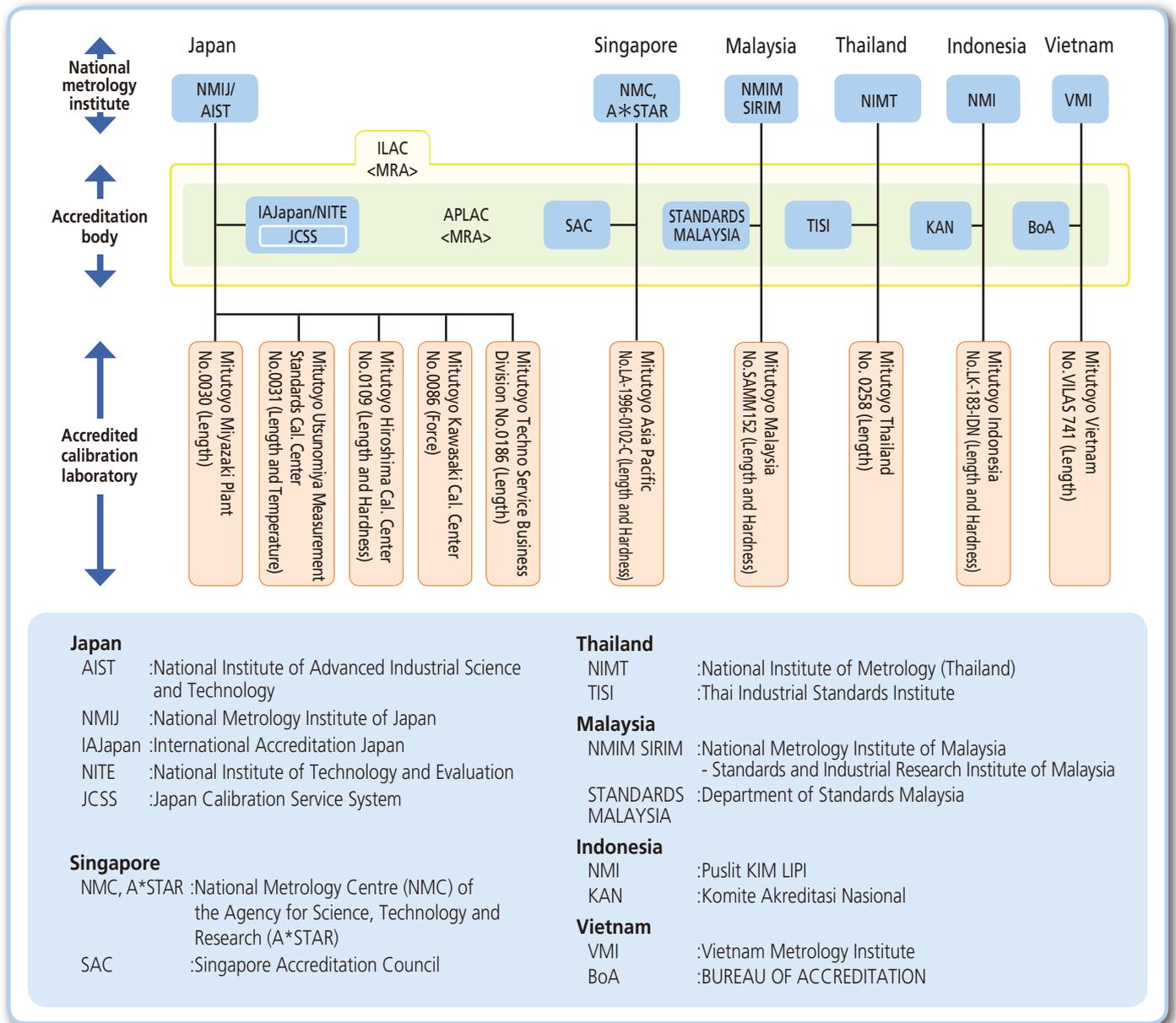
## • Mitutoyo traceability system for length standard



Note: This chart is a simplified representation of Mitutoyo's overall traceability system. Detailed traceability charts are published for each product.

# Calibration Laboratories (Offering High-level Calibration Services)

Mitutoyo has calibration laboratories that have received ISO/IEC 17025 certification, an international standard, from accredited organizations in each of the countries in which Mitutoyo operates in Japan and abroad.



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