Mitutoyo

Mitutoyo Quality

Microscopic Form Measurement System
UMAP Vision System

NEW
Products

# Extremely small styli down to ø15 μm make contact measurement of microscopic form a reality

The UMAP Vision System is an ultra-low-measuring-force probe that uses Mitutoyo's proprietary sensing technology.

With a lineup of styli ranging from a minimum diameter of 15 μm, this product responds to the needs of our customers for microscopic dimension and form measurement.

NEW Products

UMAP Vision System Features

Stylus with a minimum diameter of 15 μm makes contact measurements of microscopic areas possible.
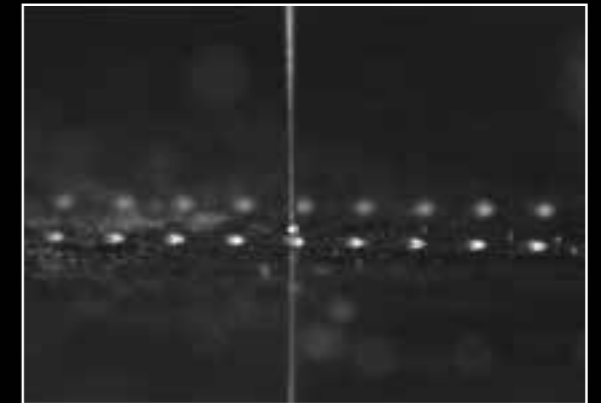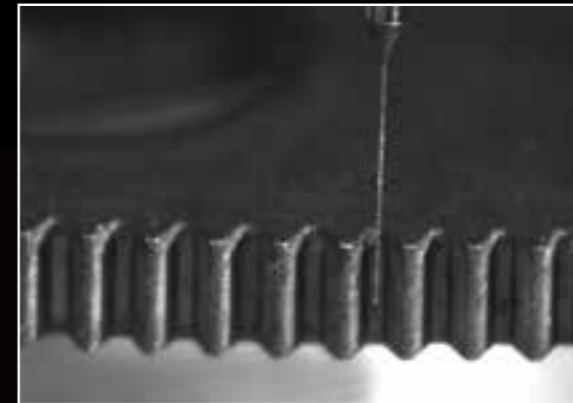
Ultra low measuring force of a minimum 1 μN (UMAP103) makes it possible to measure even workpieces that are easily deformed. Up to three types of UMAP styli, each of a different diameter can be used in combination. The user can install, remove, and replace styli.
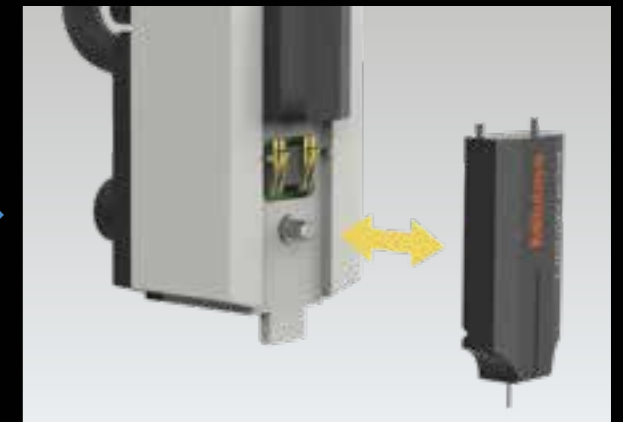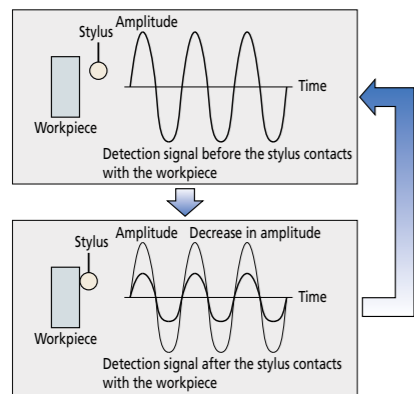

Non-contact measurement in vision mode and contact measurement using the UMAP mode can be done solely by one unit. Even for parts that are difficult to see, vision mode can be used to position workpiece, and then the UMAP mode can be used to perform aimed measurements.

TECHNOLOGY

Detection Principle

Stylus
Amplitude
Time
Workpiece
Detection signal before the stylus contacts with the workpiece

Stylus
Amplitude   Decrease in amplitude
Time
Workpiece
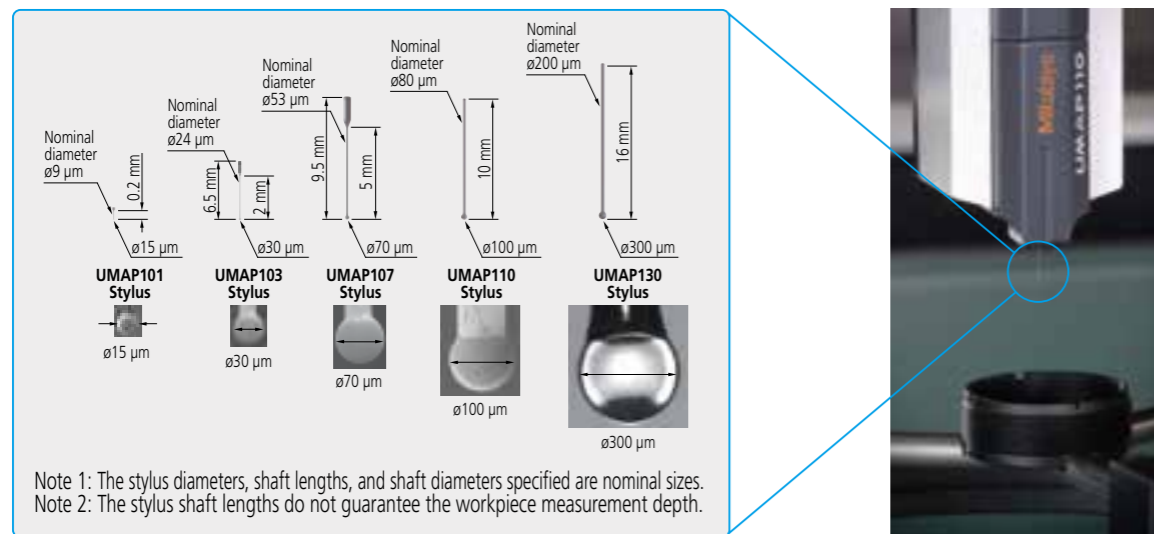Detection signal after the stylus contacts with the workpiece

1. As shown in the figure to the left, the stylus maintains a microvibrating state when not in contact with the workpiece.

2. When the stylus comes into contact with the workpiece, the stylus vibration is restricted by the workpiece, which causes the vibration amplitude to decrease. A touch-trigger signal will be detected when the amplitude decreases past a certain level.

3. When the stylus moves away from the workpiece, the stylus vibration amplitude returns to the state that was present when the stylus was not in contact with the workpiece, which makes the stylus ready for use in performing the next measurement.

UMAP Stylus Lineup

Five types of stylus modules that differ in stylus tip radius and shaft length are available.
Up to three types of styli can be used in combination, which makes it possible to select the optimum stylus to match the workpiece to be measured.

Nominal diameter ø9 μm — 0.2 mm — ø15 μm — **UMAP101 Stylus** — ø15 μm

Nominal diameter ø24 μm — 6.5 mm — 2 mm — ø30 μm — **UMAP103 Stylus** — ø30 μm

Nominal diameter ø53 μm — 9.5 mm — ø70 μm — **UMAP107 Stylus** — ø70 μm

Nominal diameter ø80 μm — 5 mm — 10 mm — ø100 μm — **UMAP110 Stylus** — ø100 μm

Nominal diameter ø200 μm — 16 mm — ø300 μm — **UMAP130 Stylus** — ø300 μm

Note 1: The stylus diameters, shaft lengths, and shaft diameters specified are nominal sizes.
Note 2: The stylus shaft lengths do not guarantee the workpiece measurement depth.

Application Examples

The following are examples of workpieces that can be measured with UMAP. UMAP provides a solution for microscopic dimension measurement and form evaluation in a wide variety of fields such as precise microscopic molds, micromachining pressed products, microscopic resin molded products, and EDM electrodes.
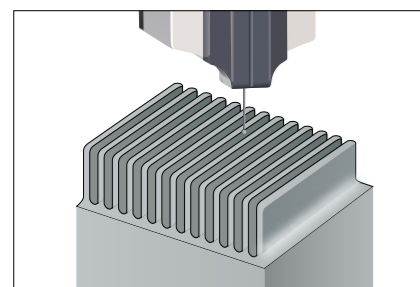
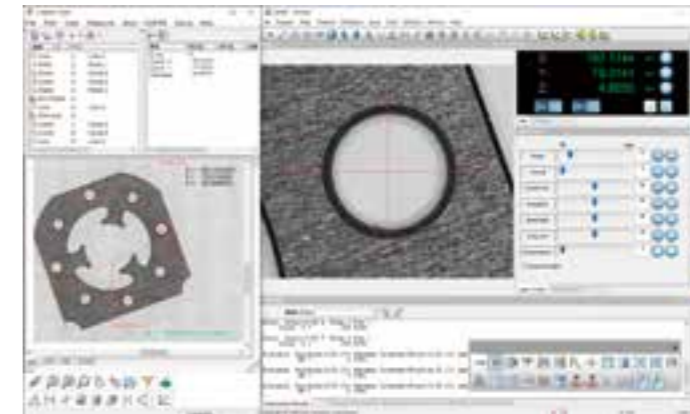Micro connector molds and electrode measurement
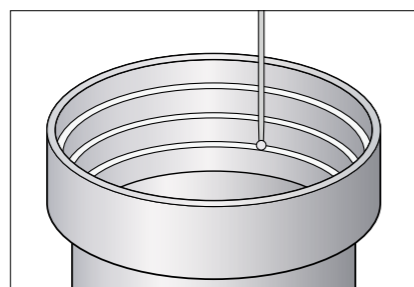
Lens barrel measurement

Measurement of microscopic gear tooth and tooth-form profile / tooth-alignment profile

SOFTWARE

QVPAK

QVPAK, the main software, supports both non-contact measurements using vision mode and contact measurements using UMAP mode.

Calculation function example

Switching between vision and UMAP modes

The user can click icons to switch between vision and UMAP modes. This makes it possible to use vision mode to perform workpiece positioning and then use UMAP mode to perform targeted measurements.

Vision mode
UMAP mode

Measuring tool arrangement with a single click

The tool size, orientation, and threshold of vision measuring tools are automatically set with one click of the mouse in the vicinity of the measurement location.


Outlier removal

Outliers caused by dirt, burrs, and chips are removed automatically. Also, it is possible to determine the optimum removal level for abnormal points while viewing the measured data.

QVGraphics

The elements measured with QVPAK and the measurement results can be displayed graphically. It is also possible to calculate distances and angles for configuring the coordinate system settings of displayed elements that the user specifies.
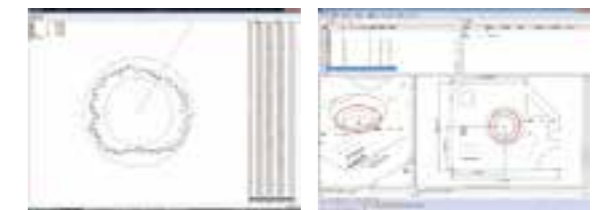
Drawing the geometrical deviation of a circle   Graphical display of a measured element
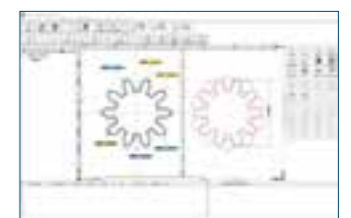
OPTIONAL SOFTWARE
FORMTRACEPAK-AP

Form Evaluation and Analysis Software

Verifies designed values and performs form analysis on the basis of the contour data obtained via the UMAP or vision mode.

Analysis on microscopic dimensions   Gear contour matching and over-pin diameter analysis

OPTIONS

QV Objectives

Objective	QV-SL0.5x[*1]	QV-HR1x	QV-SL1x	QV-HR2.5x	QV-SL2.5x	QV-HR5x	QV-5x	QV-HR10x[*1]	QV-10x[*1]	QV-25x[*1]
Code No.	02AKT199	02AKT250	02ALA150	02AKT300	02ALA170	02AWD010	02ALA420	02AKT650	02ALG010	02ALG020
Set of objectives that support PFF	–	–	–	02AKX895B	–	02AXA915B	02AKX900B	02AKX905B	–	02AKX910B
Working distance [mm]	30.5	40.6	52.5	40.6	60.0	20.0	33.5	20.0	30.5	13.0
Field of view [mm][*2] (H)×(V) — Turret 1x	12.54x9.4	6.27x4.7		2.49x1.86		1.24x0.93		0.62x0.47		0.25x0.18
Turret 2x	6.27x4.7	3.13x2.35		1.24x0.93		0.62x0.47		0.31x0.23		0.12x0.09
Turret 6x	2.09x1.56	1.04x0.78		0.41x0.31		0.20x0.15		0.10x0.07		0.04x0.03
Digital magnificationq 12x	1.04x0.78	0.52x0.39		0.20x0.15		0.10x0.07		0.05x0.03		0.02x0.01

*1 When the QV-SL0.5x, QV-HR10x, QV-10x, or QV-25x objective is used, some limitations, such as the illumination being insufficient depending on the workpiece, may occur.
*2 The values for field of view are not guaranteed values, but representative values.

Calibration

Calibration gauge (ring)
Calibration gauge (ø1 ball)

Alignment adjusting equipment

LINE-UP

UMAP Vision System TYPE2 HYPER 302 Pro

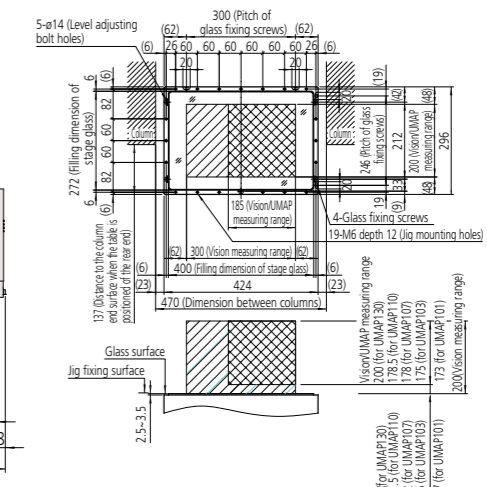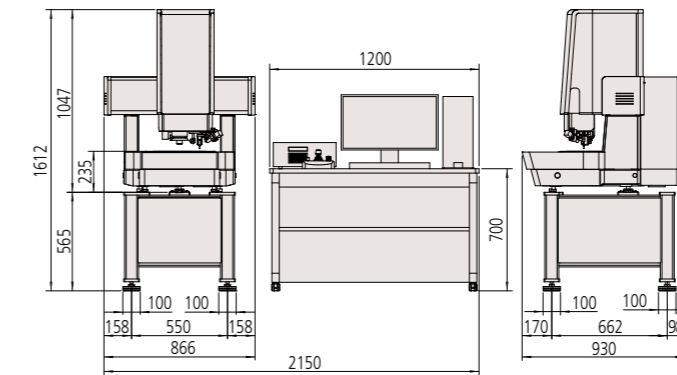UMAP Vision System TYPE2 ULTRA 404

Specifications

Model name		UMAP Vision System TYPE2 HYPER 302 Pro	UMAP Vision System TYPE2 ULTRA 404
Model code		UVS2-H302P1L-E	UVS2-U404P1L-E
Main unit			
Measuring range (X×Y×Z) [mm]	Vision	300×200×200	400×400×200 Effective measuring range when contour light is used:360×400×200
	Vision+UMAP	185×200×175	285×400×175
Stage glass (W×D) [mm]		399×271	493×551
External dimensions (D×W×H) (Including dedicated stand) [mm]		930×866×1612	1736×1172×1910
Main unit mass (Including dedicated stand) [kg]		365	2185
Imaging device		B&W CMOS digital camera	
Observation unit[*1]		Programmable power turret 1x, 2x, 6x, (12x)	
Illumination unit	Vertical coaxial light	White LED	White LED
	Stage light	White LED	White LED
	Programmable ring light	White LED	White LED
Maximum stage loading [kg][*2]		15 kg	40 kg
Vision measuring accuracy [μm][*3]	Vision[*4] — $E_{UX,MPE}$ / $E_{UY,MPE}$	① (0.8 + 2 L/1000)μm / ② (0.8 + 3L/1000)	① (0.35 + 1.3 L/1000)μm / ② (0.35 + 1.8 L/1000)
	$E_{UZ,MPE}$	① (1.5 + 2 L/1000)μm / ② (1.5 + 3.5L/1000)	① (1.5 + 2 L/1000)μm / ② (1.5 + 3.5 L/1000)
	$E_{UXY,MPE}$	① (1.4 + 3 L/1000)μm / ② (1.4 + 4L/1000)	① (0.5 + 2 L/1000)μm / ② (0.5 + 2.5 L/1000)
	STREAM (optional) — E_{1X}, E_{1Y}	(1.5 + 3 L/1000)	–
	E_{2XY}	(2.0 + 4 L/1000)	–
	Optical magnification	2.5x objective (QV-HR2.5x or QV-SL2.5x) and middle magnification tube lens	
	UMAP[*5] — E_{1X}, E_{1Y}	(1.7 + 3 L/1000)	(1.5 + 3 L/1000)
Repeatability [μm]	Dimensional measurement within the FOV	–	3σ≤0.2
	UMAP[*3] [*6] — UMAP101, 103, 107	σ≤0.1	σ≤0.08
	UMAP110, 130	σ≤0.15	σ≤0.12
Operating temperature range[*7]	Ambient temperature	① 20±2 °C / ② 19 to 24 °C	
	Temperature variation	0.5 °C/1H and 1 °C/24H	
Thermal compensation function		Automatic	
Air supply	Pressure	0.4 MPa (Air supply pressure to be in range 0.5 to 0.9 MPa.)	
	Required air flow rate[*8]	–	300 L/min (ANR) Operating air pressure

*1 Programmable power turret 1x, 2x, 4x, 6x model is available by special order. Digital magnification function allows 8x and 12x in addition to 1x, 2x, 4x, 6x. 6 steps of magnification are available in total.
*2 An excessively biased or concentrated load is excluded.
*3 L: arbitrary measuring length (unit: mm)
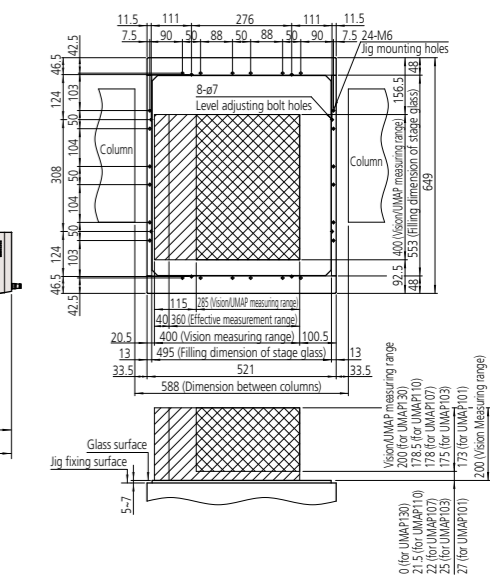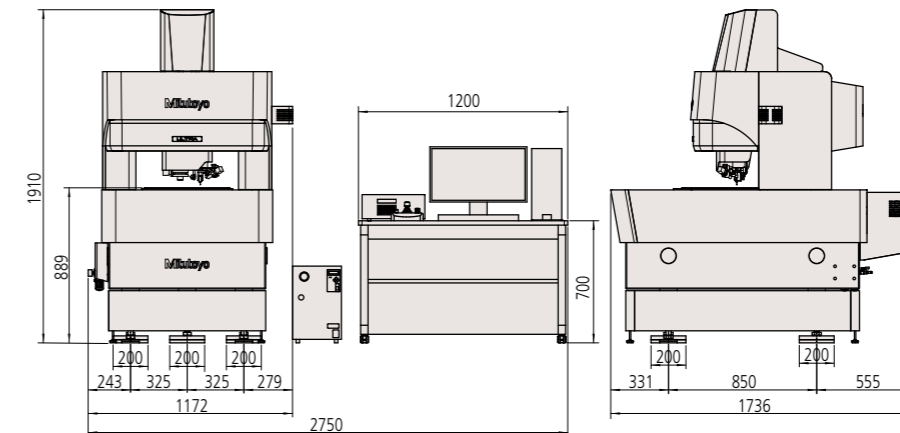*4 According to ISO 10360-7:2011 (JIS B 7440-7:2015)

*5 The assured accuracy of UMAP is specific to that of UMAP110 in the case of a measuring speed of 10 μm/s.
*6 The accuracies are guaranteed for a measuring speed of 5 μm/s for the UMAP101 and a measuring speed of 10 μm/s for the UMAP103, 107, 110, and 130.
*7 The guaranteed accuracy depends on ambient temperature.
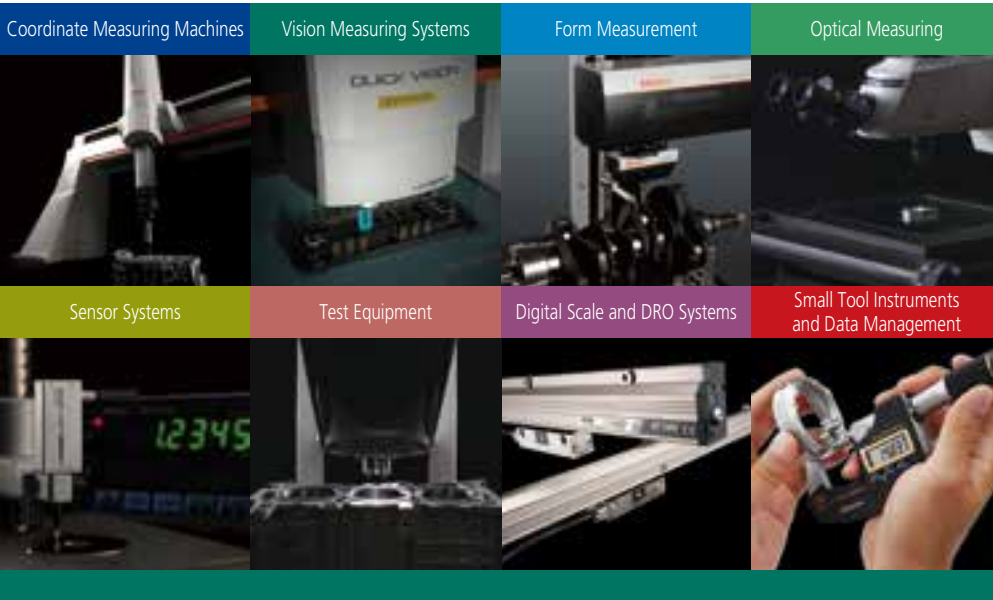*8 HYPER UMAP Vision System 302 TYPE2 HYPER 302 Pro only uses air to move UMAP up and down.

Dimensions

UMAP Vision System TYPE2 HYPER 302 Pro

UMAP Vision System TYPE2 ULTRA 404

Coordinate Measuring Machines	Vision Measuring Systems	Form Measurement	Optical Measuring
Sensor Systems	Test Equipment	Digital Scale and DRO Systems	Small Tool Instruments and Data Management

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 measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.

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