

TM-505/510

Toolmaker's Microscopes

Bulletin No. 1879



Compact microscopes for inspection and measurement of machined workpieces.

Mitutoyo

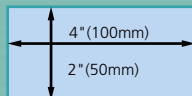
Toolmaker's Microscope

TM-505/510

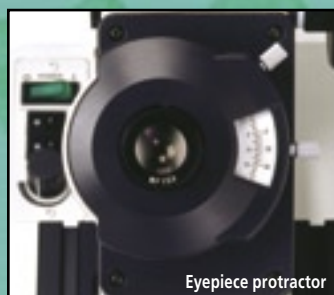


Reticles (optional)

XY Table Travel



TM-510



Eyepiece protractor



(Shown with optional micrometer heads)

APPLICATIONS



Cutting tools



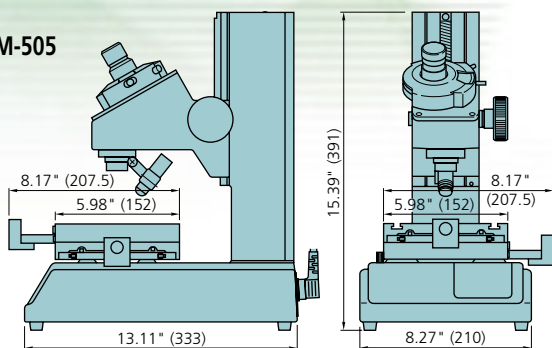
Gear



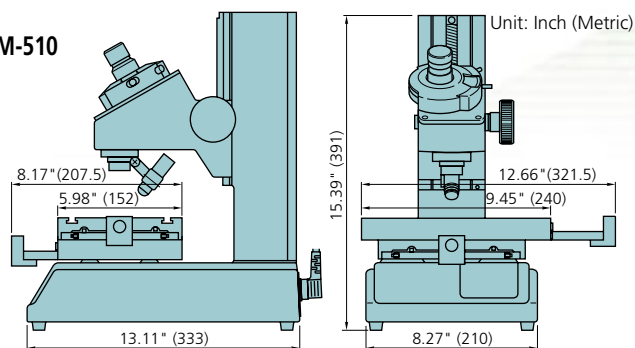
Connector

Dimensions

TM-505



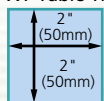
TM-510



Unit: Inch (Metric)

TM-505/510

XY Table Travel



TM-505



(Shown with optional micrometer heads)

MODEL SELECTION

Microscope Model	TM-505	TM-510
Order No.		
without micrometer heads	176-811A	176-812A
with micrometer heads	176-808A	176-809A
164-162 (X2)		
Measuring unit	Optional	Optional
XY table travel	2"x2" (50x50mm)*	4" x2" (100x50mm)*
Table top dimensions	5.98"x5.98" (152x152mm)	9.45"x5.98" (240x152mm)
Effective area of glass stage	3.78"x3.78" (96x96mm)	5.91"x3.62" (150x92mm)
Maximum workpiece load	11 lbs. (5kg)	11 lbs. (5kg)
Maximum workpiece height	4.53" (115mm)	4.21" (107mm)

*If the stroke of the stage exceeds the measuring range of the micrometer head, use the optional gage block.

FEATURES

- The eyepiece section of the optical tube incorporates a vernier protractor. Angle measurement is performed easily by turning the protractor to align the cross-hair reticle with the workpiece image.
- Complete selection of interchangeable reticles.
- Both transmitted and reflected illumination intensity can be adjusted to obtain optimal illumination intensity for the workpiece.
- Two XY stages with different travel ranges, 2"x2" (50mmx50mm) and 4"x2" (100mmx50mm), are available.
- The TM-505/510 can output XY coordinate data with optional Digimatic Micrometer Heads. Highly efficient two-dimensional data processing is available by connecting the Digimatic Micrometer Heads to an SPC tool.

SPECIFICATIONS

Optical tube	• Monocular with 30° depression angle • 90° broken cross-hair reticle (176-126) • Erect image • Diopter adjustable
Eyepiece protractor	• Graduation: 1° • Protractor range: 360° • Minimum reading by vernier: 6'
Eyepiece (176-116)	• Magnification: 15X • Field number: 13
Objective (176-138)	• Magnification: 2X • Working distance: 2.638" (67mm) • Numerical aperture: 0.07
Total magnification	• 30X
Transmitted illumination	• Light source: tungsten bulb (24V, 2W) • GfF (green) filter • Light intensity adjustable
Reflected illumination	• Oblique single-bulb illuminator • Optional twin-bulb illuminator (176-203) • Light source: tungsten bulb (24V, 2W) • Light intensity adjustable
Power supply	100/110/120/220/240V AC, 50/60Hz
Power consumption	100VA
Mass	TM-505: Approx. 30.8 lbs. (14kg) TM-510: Approx. 33 lbs. (15kg)

Optional Accessories

Eyepieces



Magnification	10X	15X	20X
Order No.	176-115	176-116*	176-117
Field number	13	13	10

*Standard accessory

Objectives



Magnification	2X	5X	10X
Order No.	176-138*	176-139	176-137
Numerical aperture	0.07	0.10	0.14
Working distance	2.638" (67mm)	1.299" (33mm)	.551" (14mm)

*Standard accessory

Eyepiece-Objective Performance Table

	Eyepiece 10X (176-115)			Eyepiece 15X (Standard accessory)			Eyepiece 20X (176-117)		
	Total magnification	Viewing field	Depth of focus	Total magnification	Viewing field	Depth of focus	Total magnification	Viewing field	Depth of focus
Objective 2X (Standard accessory)	20X	ø.256" (ø6.5mm)	158μm	30X	ø.256" (ø6.5mm)	124μm	40X	ø.197" (ø5mm)	107μm
Objective 5X (176-139)	50X	ø.102" (ø2.6mm)	56μm	75X	ø.102" (ø2.6mm)	47μm	100X	ø.079" (ø2mm)	42μm
Objective 10X (176-137)	100X	ø.051" (ø1.3mm)	24μm	150X	ø.051" (ø1.3mm)	21μm	200X	ø.039" (ø1mm)	19μm

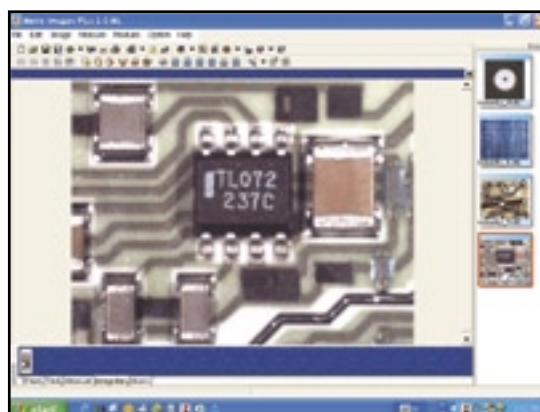
Digital Camera



Digital Imaging with Software

Order No.	Description
64PMI189*	Digital camera, 2.0 Megapixel, USB 2.0 interface

* Replaces 15X eyepiece.



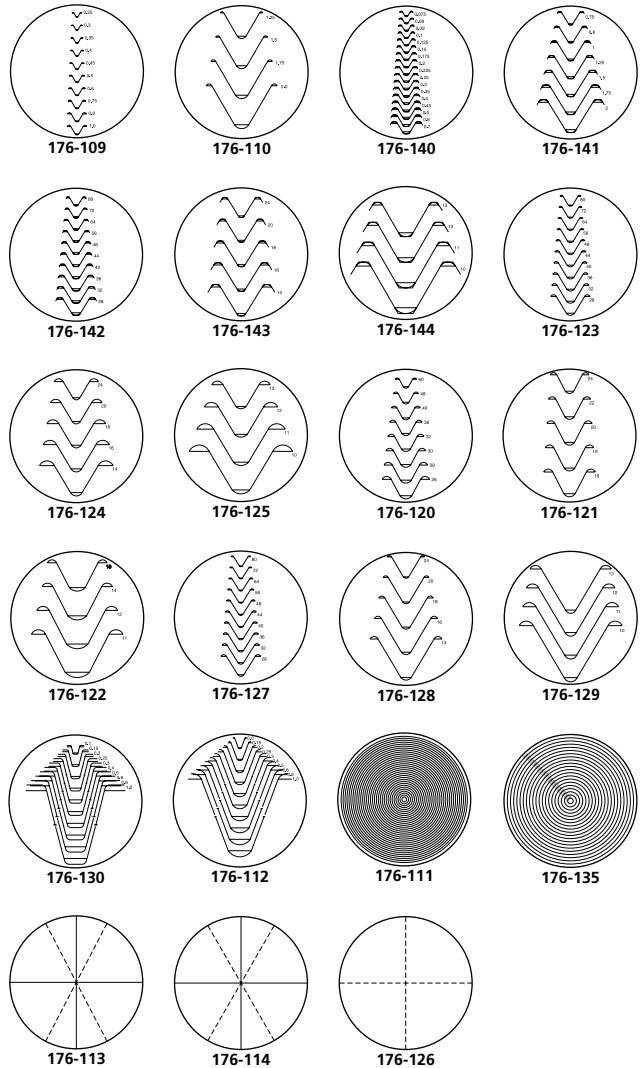
Sample Image

Versatile

Reticles

- 176-109** Metric coarse thread ($P=0.25 - 1.0$)
- 176-110** Metric coarse thread ($P= 1.25 - 2.0$)
- 176-140** ISO metric coarse thread ($P= 0.075-0.7$)
- 176-141** ISO metric coarse thread ($P= 0.75-2$)
- 176-142** ISO unified thread (80-28 TPI)
- 176-143** ISO unified thread (24-14 TPI)
- 176-144** ISO unified thread (13-10 TPI)
- 176-123** Unified screw thread (80-28 TPI)
- 176-124** Unified screw thread (24-14 TPI)
- 176-125** Unified screw thread (13-10 TPI))
- 176-120** Whitworth thread (60-26 TPI)
- 176-121** Whitworth thread (24-18 TPI)
- 176-122** Whitworth thread (16-11 TPI)
- 176-127** NF thread (80-28 TPI), inch
- 176-128** NF thread (24-14 TPI), inch
- 176-129** NF thread (13-10 TPI), inch
- 176-130** Involute gear tooth, $m=0.1-1.0$
(Pressure angle: 14.5° , normal rack)
- 176-112** Involute gear tooth, $m=0.1-1.0$
(Pressure angle: 20° , normal rack)
- 176-111** Concentric circle
(Up to $\varnothing 4\text{mm}$, 0.05mm increment)
- 176-135** Concentric circle
(Up to $\varnothing 2\text{mm}$, $.01''$ increment)
- 176-113** 55° angle
- 176-114** 60° angle
- 176-126** 90° broken cross-hair*

***Standard accessory**



Ring-Type Fluorescent Light

The adjustable fluorescent tube circular illumination provides more than twice the illumination of the standard oblique surface illumination system and mounts easily to the OD of the objective lens with three fixed screws.

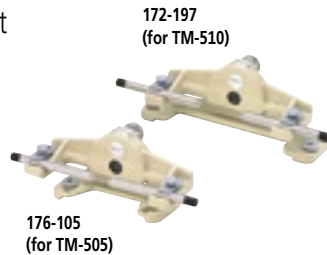


176-152A

Optional Accessories

Swivel Center Supports

- Supports a workpiece that has a center hole at both ends. The workpiece on this support can be tilted up to $\pm 10^\circ$ for precision measurement of screws, etc.



Order No.	176-105	172-197
Swivel range	$\pm 10^\circ$	
Minimum angle reading	1° (using index line)	
Maximum workpiece size		
Horizontal support	$\phi 2.76'' \times 5.51''$ long ($\phi 70 \times 140$ mm long)	$\phi 3.15'' \times 5.51''$ long ($\phi 80 \times 140$ mm long)
Swivelled 10°	$\phi 1.77'' \times 5.51''$ ($\phi 45 \times 140$ mm)	$\phi 2.56'' \times 5.51''$ ($\phi 65 \times 140$ mm)
Mass	5.28 lbs. (2.4kg)	5.5 lbs. (2.5kg)

Dial Indicator Attachment (for height measurement)

- Used to attach an optional digimatic indicator to the microscope for height measurement.
- Allows extended height measurements using the optional gage block.
- Stem fitting hole: $\phi .375''$ ($\phi 8$ mm with bushing)



V-Block with Clamp

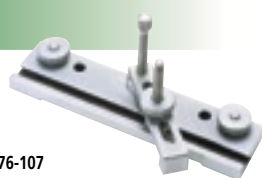
- Maximum workpiece diameter: .98" (25mm)
- Mass: 1.76 lbs. (0.8kg)

172-378

Holder with Clamp

- Maximum workpiece height: 1.38" (35mm)
- Mass: .88 lbs. (0.4kg)

176-107



Rotary Tables

176-106
(for TM-505)



172-196
(for TM-510)

Order No.	176-106	172-196
Table top diameter	4.41" (112mm)	5.75" (146mm)
Glass plate diameter	2.60" (66mm)	3.94" (100mm)
Rotation range	360°	360°
Minimum angle reading	6'	2'
Mass	3.74 lbs. (1.7 kg)	5.5 lbs. (2.5 kg)

Twin-Blub Reflected Illumination Unit

- Illumination provided by the two light sources generate a stereo-scopic workpiece image.
- Used in place of the standard single-bulb reflected illumination unit.
- The light intensity can be adjusted as desired.



176-203

Workpiece Clip

- Can be mounted on the T-groove of the XY table.
- A pair of workpiece clips come.



990561

Steel Gage Blocks

611201-531 1" (ASME 0)
611202-531 2" (ASME 0)



- Used to measure a workpiece which has a length exceeding the stroke (=measuring range) of the microscope head attached.
- Ceramic gage blocks (CERA Block) are also available.

Versatile

MEASURING UNITS (OPTIONAL)

Micrometer Heads



152-390

152-389

Digimatic Micrometer Heads (LCD readout)

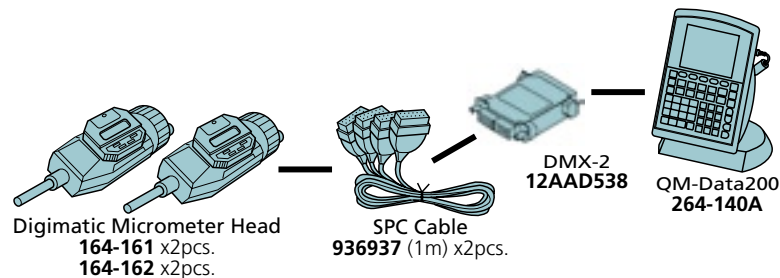


164-162

(Two units are required for an XY table.)

Order No.	152-390 (X-axis) 152-389 (Y-axis)	152-392 (X-axis) 152-391 (Y-axis)
Range	25mm	1"
Graduation	0.005mm	.0001
Instrumental error	$\pm 2\mu\text{m}$	$\pm .00008"$
Remarks	• Bidirectional graduation for versatile measurement • Provided with non-rotating spindle tip • Floating thimble allows zero setting at any spindle position	

Order No.	164-161	164-162
Range	50mm	2" (50mm)
Resolution	0.001mm	.00005"/0.001mm
Instrumental error	$\pm 3\mu\text{m}$	$\pm .00015"$
Functions	Zero set, preset, SPC data output, counting direction switch, absolute/incremental coordinate switch, inch/mm conversion (164-162 only)	
Power supply	SR44 battery (x 2pcs.)	
Battery life	1.8 years under continuous use	



Simplified Key Operation 2D Data Processing Unit QM-Data200

New 2D data processing unit for optical instruments. The QM-Data200 can add new features of 2D coordinate measurement, image processing, etc. to your current optical instruments.



QM-Data200 Order No.: 264-140A

Adjustable Stand Model

Optional Accessories

937179T: Foot switch



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

Mitutoyo America Corporation

www.mitutoyo.com

M³ Solution Centers

Aurora, Illinois

(Corporate Headquarters)
(630) 978-5385

Westford, Massachusetts

(978) 692-8765

Huntersville, North Carolina

(704) 875-8332

Mason, Ohio

(513) 754-0709

Plymouth, Michigan

(734) 459-2810

City of Industry, California

(626) 961-9661

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(408) 396-4428

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