

# TM-505/510

## Toolmaker's Microscopes

CATALOG No. E4158-176



The TM-505/510 a compact microscope well suited for measuring dimensions and angles of machined metals. It can also be used to check the shape of screws and gears by attaching an optional reticle.

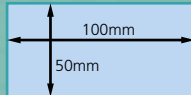
**Mitutoyo**

# Toolmaker's Microscope TM-505/510



Reticles (optional)

XY Table Travel



TM-510



Eyepiece protractor



(Micrometer heads are optional.)

## APPLICATIONS



Cutting tools

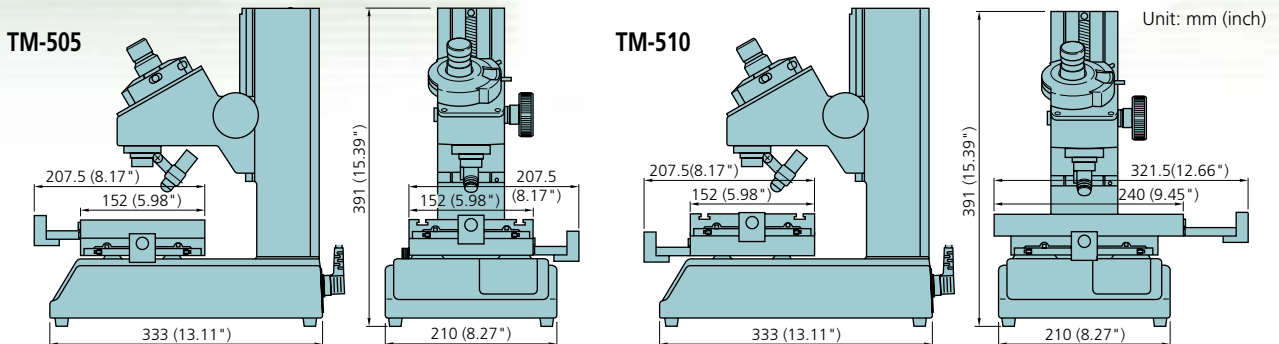


Gear



Connector

## Dimensions



# TM-505/510



(Micrometer heads are optional.)

## 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 the transmitted and reflected illumination intensity can be adjusted to obtain the optimal illumination intensity for the workpiece.
- Two XY stages with different travel ranges, 50mmx50mm (2"x2") and 100mmx50mm (4"x2"), are available.
- The TM-505/510 can output XY coordinate data if optional Digimatic Micrometer Heads are used with it. Highly efficient two-dimensional data processing is available by connecting the Digimatic Micrometer Heads to an SPC tool.

## MODEL SELECTION

| Model No.  | TM-505                  | TM-510                  |
|--|-------------------------|-------------------------|
| <b>Order No.</b>   | <b>176-811</b>          | <b>176-812</b>          |
| (Order number suffix denotes the AC power cord type equipped.) |                         |                         |
| 100V AC  | <b>176-811C</b>         | <b>176-812C</b>         |
| 120V AC  | <b>176-811A</b>         | <b>176-812A</b>         |
| 220V AC  | <b>176-811D</b>         | <b>176-812D</b>         |
| 240V AC  | <b>176-811E</b>         | <b>176-812E</b>         |
| <b>Measuring unit</b>  | Optional                | Optional                |
| <b>XY table travel</b>   | 50x50mm (2"x2")*        | 100x50mm (4"x2")*       |
| <b>Table top dimensions</b>                                    | 152x152mm (5.98"x5.98") | 240x152mm (9.45"x5.98") |
| <b>Effective area of glass stage</b>                           | 96x96mm (3.78"x3.78")   | 150x92mm (5.91"x3.62")  |
| <b>Maximum workpiece load</b>                                  | 5kg (11 lbs.)           | 5kg (11 lbs.)           |
| <b>Maximum workpiece height</b>                                | 115mm (4.53")           | 107mm (4.21")           |

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

## SPECIFICATIONS

|                              |   |
|------------------------------|---|
| Optical tube                 | <ul style="list-style-type: none"> <li>• Monocular with 30° depression angle</li> <li>• 90° broken cross-hair reticle (<b>176-126</b>)</li> <li>• Erect image</li> <li>• Diopter adjustable</li> </ul>                                |
| Eyepiece protractor          | <ul style="list-style-type: none"> <li>• Graduation: 1°</li> <li>• Protractor range: 360°</li> <li>• Minimum reading by vernier: 6'</li> </ul>  |
| Eyepiece ( <b>176-116</b> )  | <ul style="list-style-type: none"> <li>• Magnification: 15X</li> <li>• Field number: 13</li> </ul>  |
| Objective ( <b>176-138</b> ) | <ul style="list-style-type: none"> <li>• Magnification: 2X</li> <li>• Working distance: 67mm (2.638")</li> <li>• Numerical aperture: 0.07</li> </ul>  |
| Total magnification          | • 30X   |
| Transmitted illumination     | <ul style="list-style-type: none"> <li>• Light source: tungsten bulb (24V, 2W)</li> <li>• GIF (green) filter</li> <li>• Light intensity adjustable</li> </ul>   |
| Reflected illumination       | <ul style="list-style-type: none"> <li>• Oblique single-bulb illuminator</li> <li>• Optional twin-bulb illuminator (<b>176-203</b>)</li> <li>• Light source: tungsten bulb (24V, 2W)</li> <li>• Light intensity adjustable</li> </ul> |
| Power supply                 | 100/110/120/220/240V AC, 50/60Hz  |
| Power consumption            | 100VA   |
| Mass                         | <b>TM-505:</b> Approx. 14kg (30.8 lbs.)<br><b>TM-510:</b> Approx. 15kg (33 lbs.)  |

# 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   | 67mm (2.638") | 33mm (1.299") | 14mm (.551") |

\*Standard accessory

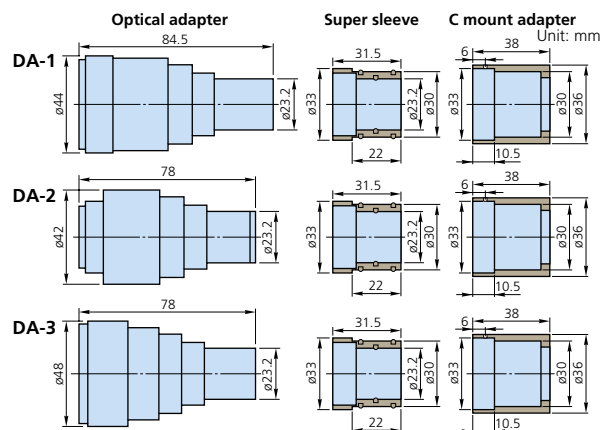
## Eyepiece-objective Performance Table

|                                   | 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                    | ø6.5mm (ø.256") | 158μm          | 30X                               | ø6.5mm (ø.256") | 124μm          | 40X                    | ø5mm (ø.197") | 107μm          |
| Objective 5X (176-139)            | 50X                    | ø2.6mm (ø.102") | 56μm           | 75X                               | ø2.6mm (ø.102") | 47μm           | 100X                   | ø2mm (ø.079") | 42μm           |
| Objective 10X (176-137)           | 100X                   | ø1.3mm (ø.051") | 24μm           | 150X                              | ø1.3mm (ø.051") | 21μm           | 200X                   | ø1mm (ø.039") | 19μm           |

## Digital camera adapter

Adapter for taking a photograph of microscope's observation image by digital camera (LCD monitor type) on a market. Possible to attach on C mount or eyepiece sleeve of microscope by combining three parts which constitute an adapter. Also to using eyepiece adapter, attachment to the eyepiece sleeve (ø35) of a microscope becomes possible.

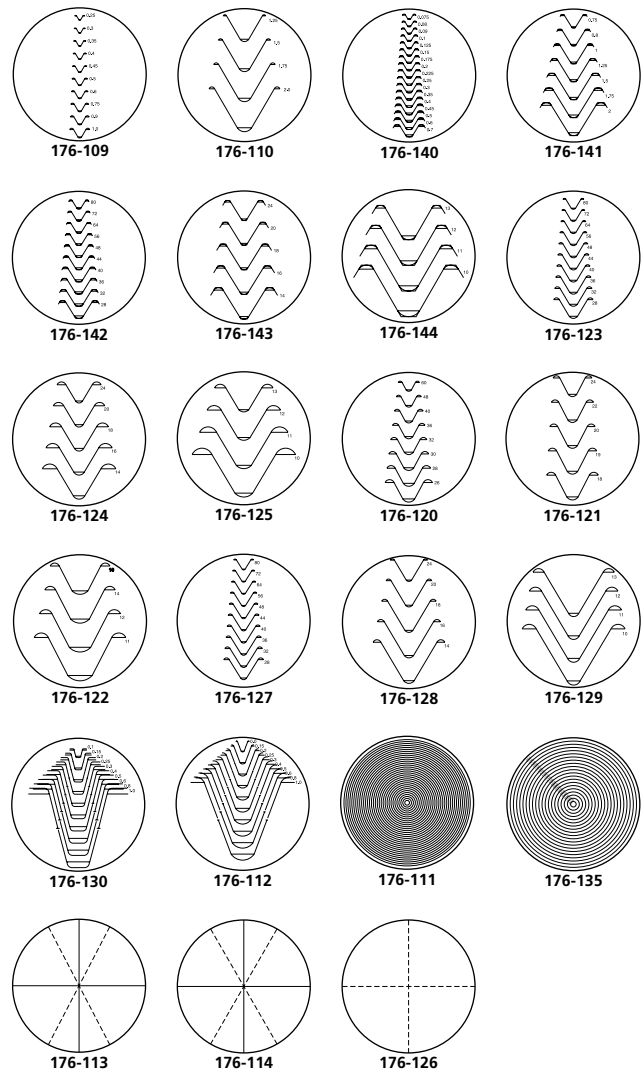
|                     |  |                          |                 |
|---------------------|--|--------------------------|-----------------|
| Code No.            | 378-741  | 378-742                  | 378-743         |
| Model               | DA-1   | DA-2                     | DA-3            |
| Field of view       | ø18  |                          |                 |
| Attachment position | C mount, eyepiece (ø35, ø30, ø23.2)                    |                          |                 |
| Applicable model:   | CAMEDIA (OLYMPUS)                                      |                          | COOLPIX (NIKON) |
| digital camera      | C-200Z/2020Z/2040Z/3000Z/3030Z/3040Z/3100Z/4040Z/5050Z | 900/910/950/990/998/4500 | 5000            |
| microscope          | VMU, FS70, FS110, FS300, 5M500, MF-A/UA, MSM400        |                          |                 |



# Versatile

## Reticles

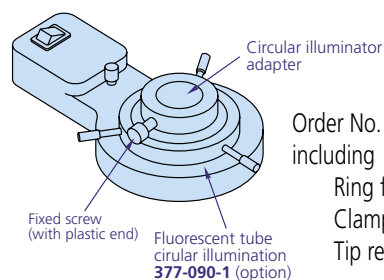
- 176-109** Metric coarse thread (P=0.25 - 1.0)
  - 176-110** Metric coarse thread (P= 1.25 - 2.0)
  - 176-140** ISO metric coarse thread (P= 0.075-0.7)
  - 176-141** ISO metric coarse thread (P= 0.75-2)
  - 176-142** ISO unified thread (80-28 TPI)
  - 176-143** ISO unified thread (24-14 TPI)
  - 176-144** 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 TOI), 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 ø4mm, 0.05mm increment)
  - 176-135** Concentric circle  
(Up to ø2mm, .01" increment)
  - 176-113** 55° angle
  - 176-114** 60° angle
  - 176-126** 90° broken cross-hair\*
- \*Standard accessory**



## Ring type fluorescent adapter

This is an adapter to install the fluorescent tube circular illumination\*1 on the TM-500 series. The observation image near natural light is obtained by the lighting in a fluorescent light. It can get the 2times or more illumination compare to the oblique surface illumination system (standard accessory). It is possible to attach the outside diameter of Objective lens easily with one fixed screw.

\*1 This is not attached. Please buy this separately.

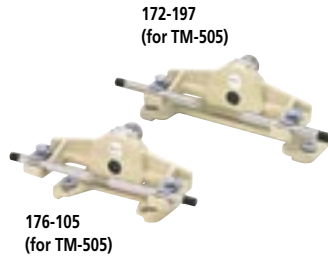


Order No. **12AAE044**  
including  
Ring fluorescent adapter:**12BAF630**  
Clamp screw:**220303**  
Tip resin:**515510**

# Optional Accessories

## Swivel center

- 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,



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

## 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 gauge block.
- Stem fitting hole:  $\varnothing .375''$  ( $\varnothing 8$ mm with bushing)



## V-block with clamp

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



## Holder with clamp

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



## Rotary tables



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

## Twin-bulb 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.



## Workpiece clip

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



## Steel Gauge Blocks

- 611635-04 25mm (JIS/DIN Grade 2)
- 611635-14 25mm (BS Grade 2)
- 611675-04 50mm (JIS/DIN Grade 2)
- 611675-14 50mm (BS Grade 2)
- 611201-24 1" (FS Grade 3)
- 611202-24 2" (FS Grade 3)

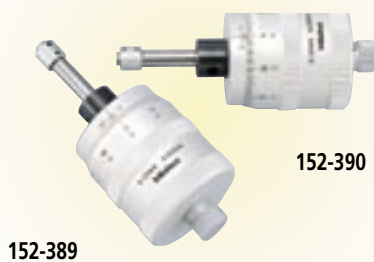


- Used to measure a workpiece which has a length exceeding the stroke (=measuring range) of the micrometer head attached.
- Ceramic gauge blocks (CERA Block) are also available.

# Versatile

## MEASURING UNITS (OPTIONAL)

### Micrometer Heads



### Digimatic Micrometer Heads (LCD readout)



**164-162**  
(Two units are required for an XY table.)

| Order No.          | 152-390 (X-axis)<br>152-389 (Y-axis)   | 152-392 (X-axis)<br>152-391 (Y-axis) |
|--------------------|--|--------------------------------------|
| Range              | 25mm   | 1"                                   |
| Graduation         | 0.005mm  | .0001                                |
| Instrumental error | ±2µm   | ±.00008"                             |
| Remarks            | <ul style="list-style-type: none"> <li>• Bidirectional graduation for versatile measurement</li> <li>• Provided with non-rotating spindle tip</li> <li>• Floating thimble allows zero setting at any spindle position</li> </ul> |                                      |

| Order No.          | 164-161   | 164-162         |
|--------------------|---|-----------------|
| Range              | 50mm  | 2"(50mm)        |
| Resolution         | 0.001mm   | .00005"/0.001mm |
| Instrumental error | ±3µm  | ±.00015"        |
| Functions          | Zero set, preset, SPC data output, counting direction switch, absolute/incremental coordinate switch, inch/mm conversion ( <b>164-162</b> only) |                 |
| Power supply       | SR44 battery (x 2pcs.)  |                 |
| Battery life       | 1.8 years under continuous use  |                 |

## TM-MICROMETER HEAD COMBINATION SETS

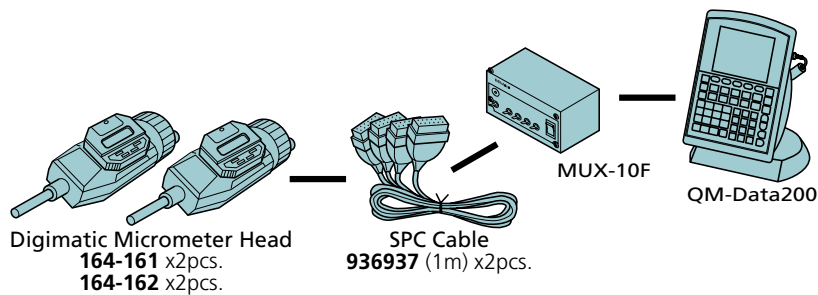
| Set No.  | 100V AC | 176-801              | 176-806              | 176-802               | 176-807               |
|--|---------|----------------------|----------------------|-----------------------|-----------------------|
| (Set number suffix denotes the AC power cord type equipped.) | 110V AC | 176-801C             | —                    | 176-802C              | —                     |
|  | 120V AC | 176-801A             | 176-806A             | 176-802A              | 176-807A              |
|  | 220V AC | 176-801D             | 176-806D             | 176-802D              | 176-807D              |
|  | 240V AC | 176-801E             | 176-806E             | 176-802E              | 176-807E              |
| Microscope main unit   |         | TM-505               |                      | TM-510                |                       |
| Micrometer heads equipped                                    |         | 152-390*<br>152-389* | 152-392*<br>152-391* | 152-390*<br>152-389** | 152-392*<br>152-391** |
| Graduation   |         | 0.005mm              | .0001"               | 0.005mm               | .0001"                |

\* 25mm (or 1") gauge block is required if measuring a length over 25mm (1").

\*\* 25mm (or 1") and 50mm (or 2") gauge blocks are required if measuring a length over 25mm (1").



176-801



## Simplified Key Operation 2D Data Processing Unit QM-Data200

Mitutoyo launches a new 2D data processing unit for optical instruments. The QM-Data200 can add new features of 2D coordinate measurement, image processing, etc. into your ordinary optical instruments to improve the QC control system.



### QM-Data200 Order No.: 264-140

adjustable stand model

To denote your AC line receptacle/cable add the following suffixes (e.g. **264-140A**). **A** for UL/CSA type, **C** for JAPAN type, **D** for CEE type, **E** for BS type

**K** for FK (South Korea) type  
**DC** for CCC (China) type

#### Optional accessories

**937179T:** Foot switch

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

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# Mitutoyo

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