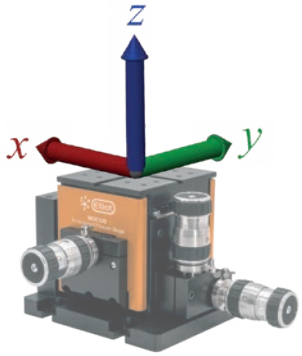
FLEXURE STAGE SELECTION GUIDE

SETTING THE STANDARD IN FIBRE AND DEVICE MANIPULATION

The original 3-axis flexure stage, designed and patented in 1982, has been developed into the highly respected **Elliot|Martock** MDE330 Professional Series flexure stage, the essential building block at the heart of our extensive line of adjusters, fibre holders, fibre rotators, lens holders and related accessories for precision manipulation of fibres and optical devices.

The MDE330 is your starting point for a dependable, stable and precision-engineered platform for all types of fibre, waveguide and photonic device applications. We offer configured systems for many typical applications (pp.7-9), but the flexure stage product family is widely adaptable to your own specific requirements through multiple accessory options (pp.10-19). Upgrades and reconfiguration are readily achievable due to the straightforward nature of the adaptable design.



AXES & UNITS

Our orthogonal coordinate system is as shown (left). The optical axis is usually arranged to be parallel to the x-axis of the flexure stage. We carry this nomenclature through to our dovetail type micropositioner stages (pp.22-25), where a single-axis stage is defined as having motion along the x-axis.

Dimensions shown in drawings are in millimetres unless noted otherwise.

In this catalogue the drawings presented for flexure stages and accessories are for versions with metric mounting threads. We also offer these products with UNC mounting threads as an option (see Product Finder, pp.30-34, where such versions are indicated E).

FLEXURE STAGES

Elliot|Martock MDE330 Professional Series 3-axis flexure stages are the result of decades of experience in design and manufacture, producing a high stability stage for smooth and continuous motion in a compact form factor. With a broad choice of options, our flexure stages can be set up in multiple formats, even with mixed adjuster types on the same stage. Conveniently configured systems for typical fibre launch applications are described on pp.8-9, with the full range of options and accessories shown on pp.10-19.

Flexure Stage

MDE330

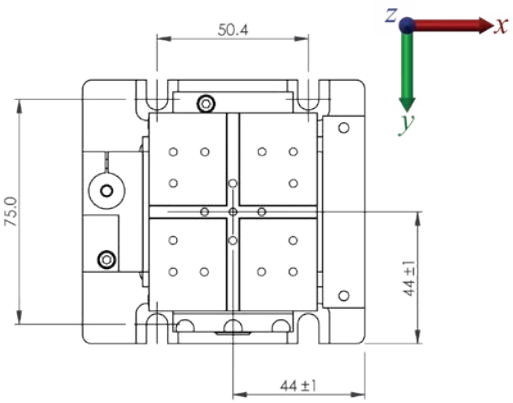
MDE330 Professional Series *xyz* flexure stage in right-hand version. Adjuster options are shown on pp.10-11, and configured stages and launch systems on pp.7-9, or design your own with our extensive line of options and accessories described on pp.10-19.

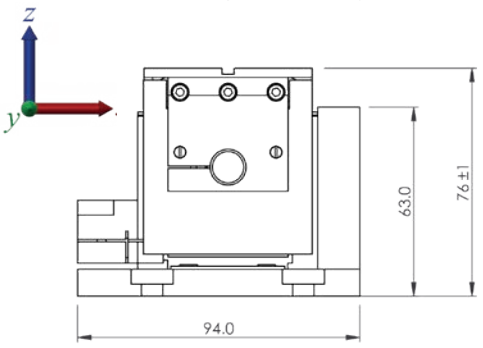
MDE330-LH left-hand version. Note the orientation of the ports for the adjusters. Use of a right/left pair of stages provides convenient one-sided access to the adjusters for input and output applications (shown below).

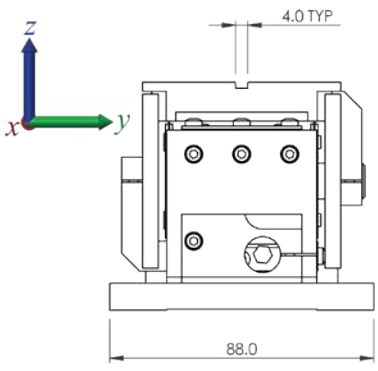
- Enhanced robustness and high stability
- No friction or stiction
- 4.5 kg load capacity
- 2 mm travel in three orthogonal axes
- Includes MDE154 clamp set (p.18)
- Top plate is 76 mm above table when *z*-axis set to mid-travel position
- Optical axis height for accessories is 18 mm above top plate except with MDE183 or MDE185 pitch and yaw modules (p.19)
- Orthogonal alignment groove allows for device positioning along *x*-axis or *y*-axis
- Several adjuster options (pp.10-11), both manual and piezo, with simple retrofitting in any combination
- Right-hand and left-hand versions for convenient paired use in input/output situations
- Very low arcuate* displacement (up to four times better than competing systems):

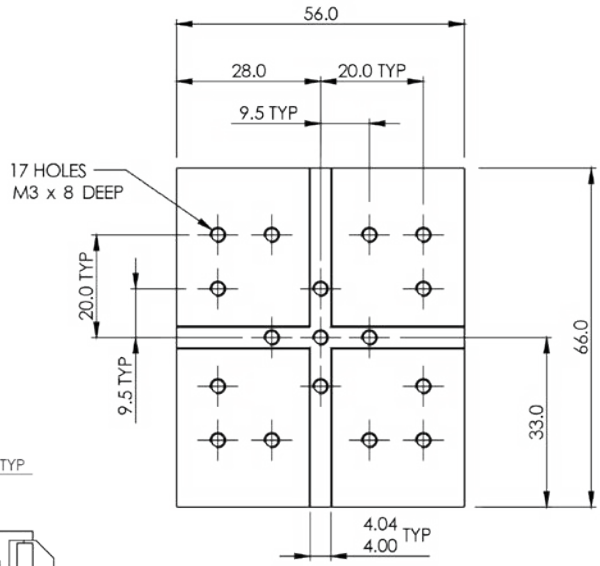
  x-axis: 20 µm
  y-axis: 14 µm
  z-axis: 14 µm

*Out of plane displacement due to the flexure bending motion causing attached surfaces to move in an arc.









Top plate detail showing mounting hole pattern for accessories.

CONFIGURED FLEXURE STAGES

For convenience we offer four flexure stage starter configurations with adjusters, for the user to build up into fibre and device manipulation systems by adding options and accessories described on pp.12-19. These starter configurations each include one MDE154 clamp set (p.18) to mount an accessory on the top plate.

Manual Flexure Stage

MDE120

MDE120 comprises MDE330 Professional Series flexure stage (p.6) and three MDE217 standard adjusters (p.10). Suitable for launch into multimode fibre or as an economical solution for less demanding applications.

Manual Flexure Stage

MDE122

MDE122 comprises MDE330 Professional Series flexure stage (p.6) and three MDE216 high precision adjusters (p.10). Suitable for launch into single mode or polarisation-maintaining fibre.

Piezo Flexure Stage

MDE123

MDE123 comprises MDE330 Professional Series flexure stage (p.6) and three MDE218A piezo adjusters (p.11). Suitable for launch into single mode or polarisation-maintaining fibre, with hands-free fine travel operation.

Piezo Flexure Stage

MDE125

MDE125 comprises MDE330 Professional Series flexure stage (p.6) and three MDE227 long travel piezo adjusters (p.11). Suitable for launch into single mode or polarisation-maintaining fibre, with hands-free fine travel operation.

Product	Coarse Travel	Coarse Resolution	Fine Travel	Fine Resolution
MDE120	2 mm	200 nm	N/A	N/A
MDE122	2 mm	1 µm	300 µm	20 nm
MDE123	2 mm	1 µm	25 µm	10 nm
MDE125	2 mm	1 µm	100 µm	50 nm

CONFIGURED FIBRE LAUNCH SYSTEMS

The most common configuration for a fibre launch involves coupling light from a free-space laser beam into an optical fibre. Flexure stages and accessories are ideal for this application, and we offer a number of pre-configured systems for user convenience. Our comprehensive range of accessories means that many other configurations may be easily assembled from the parts and accessories described on pp.10-19.

Manual Launch System

MDE510

- MDE330 flexure stage (p.6)
- Three MDE216 high precision manual adjusters (p.10)
- MDE710 adjustable force fibre holder (p.13)
- MDE150 objective mount with RMS thread (p.18)
  NOTE: objective lens not included
- MDE148 small fixed bracket (p.12)
- Clamp arm fibre holder can be replaced with connectorised version (p.15)

Optional connectorised holder

Manual Launch System

MDE511

- MDE330 flexure stage (p.6)
- Three MDE217 standard manual adjusters (p.10)
- MDE711 simple fibre holder (p.13)
- MDE150 objective mount with RMS thread (p.18)
  NOTE: objective lens not included
- MDE148 small fixed bracket (p.12)
- Clamp arm fibre holder can be replaced with connectorised version (p.15)

Optional connectorised holder

We offer a range of achromatic objective lenses suitable for use with the configured fibre launch systems (pp.8-9) or any other configuration that uses the MDE150 objective mount (p.18). All objectives have RMS 0.800"-36 thread.

10x Objective

MDE172

20x Objective

MDE173

40x Objective

MDE174

60x Objective

MDE175

Product	Magnification	Numerical Aperture	Working Distance
MDE170	4x	0.10	37.38 mm
MDE172	10x	0.25	6.61 mm
MDE173	20x	0.40	1.85 mm
MDE174	40x	0.65	0.78 mm
MDE175	60x	0.85	0.20 mm

CONFIGURED FIBRE LAUNCH SYSTEMS

When launching into polarisation-maintaining fibre, the roll axis must be adjusted to align the polarisation axes correctly. We offer two 360° rotator accessories for this application: a high resolution version with 5 arcsec resolution and fine control range of ±5°, and a standard rotator with 0.1° resolution for less demanding applications.

Manual Launch System

MDE520

- MDE330 Professional Series flexure stage (p.6)
- Three MDE216 high precision manual adjusters (p.10)
- MDE717 high precision fibre rotator (p.16)
- MDE150 objective mount with RMS thread (p.18)
  NOTE: objective lens not included
- MDE147 large fixed bracket (p.12)

Manual Launch System

MDE521

- MDE330 Professional Series flexure stage (p.6)
- Three MDE217 standard manual adjusters (p.10)
- MDE718 standard fibre rotator (p.16)
- MDE150 objective mount with RMS thread (p.18)
  NOTE: objective lens not included
- MDE147 large fixed bracket (p.12)

Manual Launch System

MDE522

- MDE330 Professional Series flexure stage (p.6)
- Three MDE216 high precision manual adjusters (p.10)
- MDE718 standard fibre rotator (p.16)
- MDE150 objective mount with RMS thread (p.18)
  NOTE: objective lens not included
- MDE147 large fixed bracket (p.12)

Product	Fine Travel *xyz*	Resolution *xyz*	Resolution rotation	Application
MDE510	300 µm	20 nm	N/A	Single mode fibre
MDE511	N/A	200 nm	N/A	Multimode fibre
MDE520	300 µm	20 nm	5 arcsec	Polarisation-maintaining fibre
MDE521	N/A	200 nm	0.1°	Polarisation-maintaining fibre
MDE522	300 µm	20 nm	0.1°	Polarisation-maintaining fibre

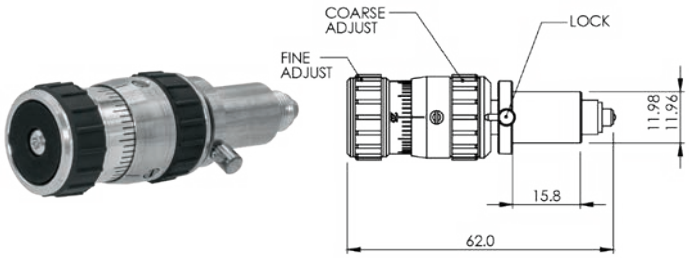
MANUAL ADJUSTERS

Application-specific manual adjusters fit the 12 mm diameter bore of MDE330 Professional Series flexure stages (p.6). The adjusters are easily user replaceable and can be used in mixed configurations (including piezo versions as described on p.11) to meet specific requirements.

Manual Adjuster

MDE216

The MDE216 high precision adjuster is based on a unique cone and cam mechanical lever system and is the highest resolution mechanical (non-piezo) adjuster in the **Elliot|Martock** range. This adjuster is recommended for the most demanding manual launch applications such as single mode fibre and polarisation-maintaining fibre.

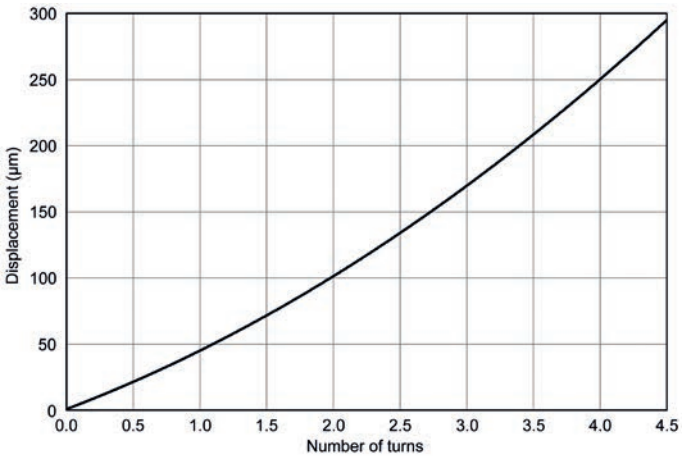


- 0.3 mm fine adjustment travel with 20 nm resolution
- 8 mm coarse adjustment travel with 1 µm resolution
  (travel limited to 2 mm when installed in flexure stages)
- Very smooth feel, largely independent of load
- Negligible backlash
- Output via non-rotating hard steel ball
- Graduated knob marked with 50 arbitrary divisions
- Positive travel limit stops

APPLICATION NOTE

As a consequence of its unique high precision design, the MDE216 adjuster has a non-linear transfer function between the number of turns of the fine control and the output movement delivered to the flexure stage. Displacement per marked division on the fine control therefore varies with number of turns completed, and provides only a guide rather than a measurement.

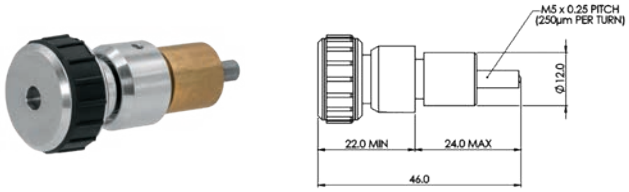
The typical adjuster response of output displacement versus number of turns for the fine control is shown below.



Manual Adjuster

MDE217

The MDE217 is a standard manual adjuster providing a cost-effective solution where simple adjustment is required such as for launch applications involving multimode fibre, or for x-axis control with the more critical y- and z-axes fitted with MDE216 high precision adjusters.

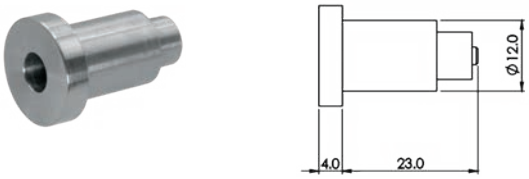


- 0.25 mm pitch thread (250 µm travel per turn)
- 8 mm travel with 200 nm resolution
  (travel limited to 2 mm when installed in flexure stages)

Fixed Spacer

MDE229

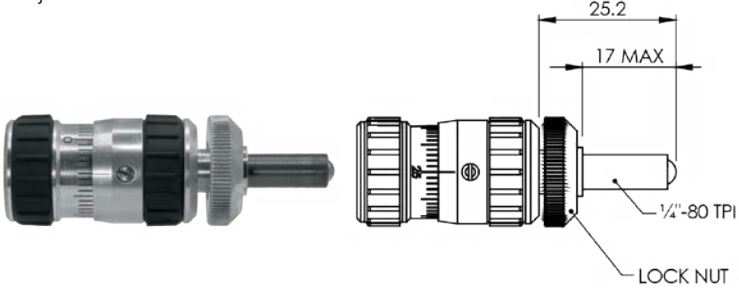
For positioning applications that don't require all three axes of a flexure stage to be populated with adjusters, the MDE229 fixed axis spacer sets an axis in mid-range position and is a low cost alternative to an active adjuster. This can be useful when a flexure stage is used as a 2-axis (yz) waveguide mount between two 3-axis stages, for example.



Manual Adjuster

MDE215

The MDE215 ultra-fine adjuster is not designed for use with flexure stages, but is a development of the MDE216 intended for retrofitting to optical mounts with ¼"-80 threads as typically found on kinematic mirror mounts, significantly enhancing their adjustment resolution.

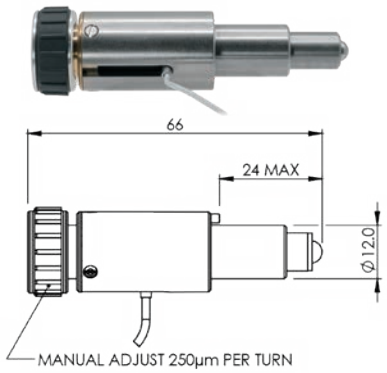


PIEZO ADJUSTERS

Piezo adjusters are intended for applications where positioning resolution exceeding that of manual positioners is required. Other benefits include remote operation. Our piezo adjusters are a direct fit into MDE330 Professional Series flexure stages (p.6), easily user replaceable, and can be used in mixed configurations (including manual versions as described on p.10) to meet specific requirements.

MDE218A

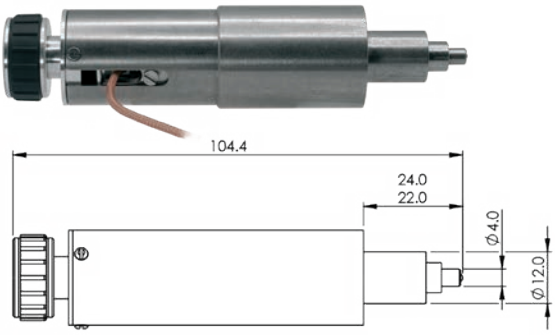
The MDE218A piezo adjuster offers 25 µm of direct piezo travel with additional manual control provided for coarse positioning.



- 25 µm direct piezo drive
- 10 nm resolution for piezo operation
- Operating voltage 0 V to 150 V
- Hysteresis 12% to 15%
- 0.25 mm pitch thread for smooth coarse control by manual adjuster (250 µm travel per turn)
- 8 mm coarse adjustment travel with 1 µm resolution
  (travel limited to 2 mm when installed in flexure stages)
- Adjustable hard stop prevents damage to piezo when axis is at full mechanical extension

MDE227

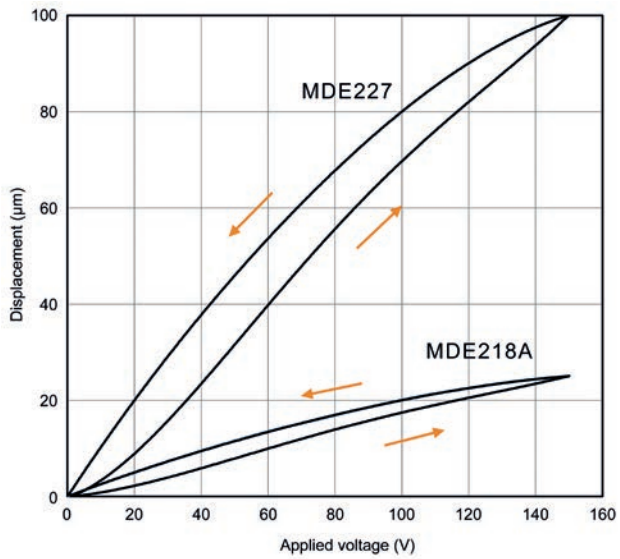
The MDE227 piezo adjuster offers 100 µm total travel via a combined 40 µm piezo actuator and amplifying lever system derived from the MDE216 high precision manual adjuster (p.10).



- 100 µm travel using 40 µm piezo actuator and lever
- 50 nm resolution for piezo operation
- Operating voltage 0 V to 150 V
- Hysteresis 12% to 15%
- 2 mm coarse adjustment travel with 1 µm resolution
- Socket in end of coarse drive knob for operation by hex key (2.5 mm A/F) to remove finger pressure on long adjuster body that could otherwise cause crosstalk between axes

APPLICATION NOTE

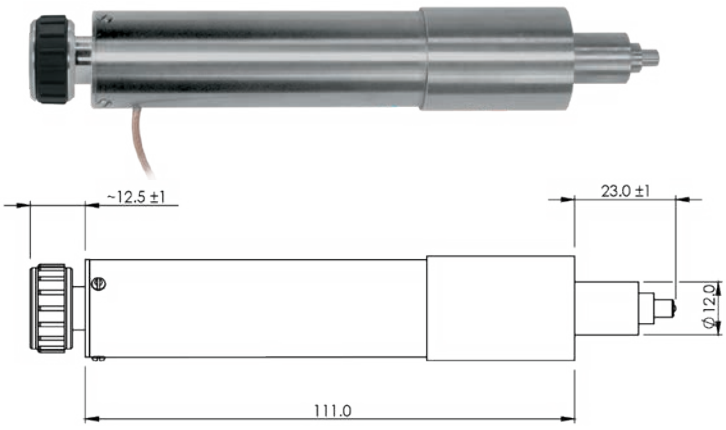
Piezo-based adjusters exhibit a small amount of hysteresis due to their ferroelectric nature, which should be considered if using voltage as an indicator of displacement. The graph below shows the hysteresis of the MDE218A and MDE227 adjusters when fitted to an MDE330 Professional Series flexure stage.



Piezo Adjuster

MDE230

The MDE230 has a similar design to the MDE227 (above), but uses a piezo actuator with 80 µm travel amplified by a lever system to provide 200 µm total travel.



- 200 µm travel using 80 µm piezo actuator and lever
- 130 nm resolution for piezo operation
- Other features as MDE227

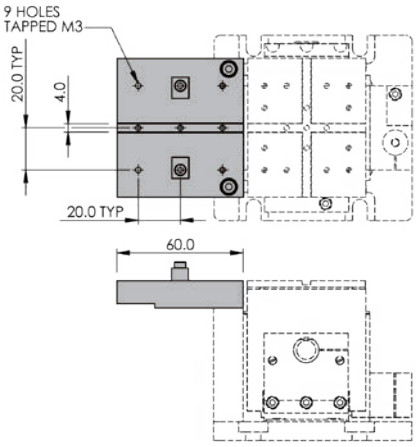
FIXED PLATFORMS

The MDE147, MDE148 and MDE149 fixed platforms are used for mounting components to the "fixed world" section of MDE330 Professional Series flexure stages (pp.6-7). Each platform attaches to the front vertical pillar on the stage and provides a rigid mounting surface for accessories such as lens mounts. When mounting these brackets, a straight edge is a useful aid to ensure that they are aligned with the location slot on the top plate of the flexure stage when set to its mid-range position.

Fixed Platform

MDE147

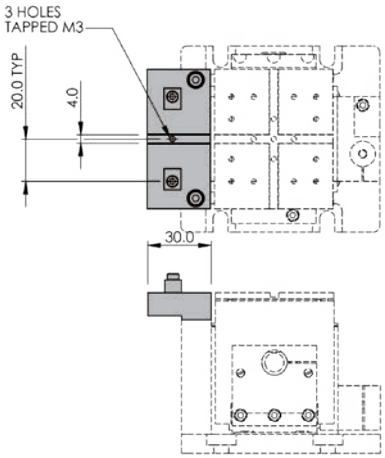
- Large fixed platform
- 60 mm long locating slot
- For accessories on x-axis
- 9 x M3 mounting holes
- Includes MDE154 clamp set (p.18)



Fixed Platform

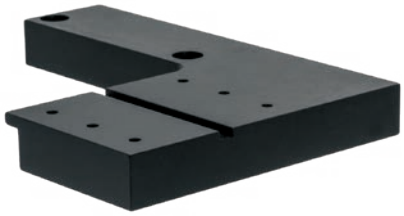
MDE148

- Small fixed platform
- 30 mm long locating slot
- For accessories on x-axis
- 3 x M3 mounting holes
- Includes MDE154 clamp set (p.18)

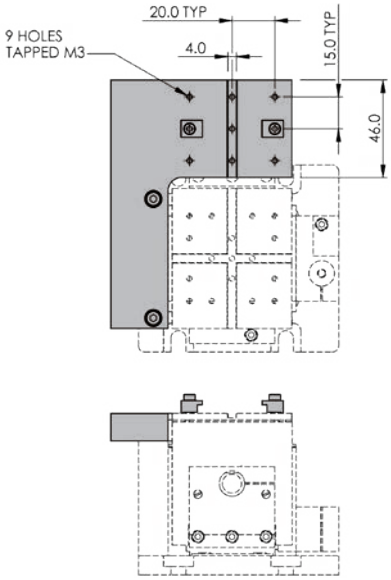


Fixed Platform

MDE149



- L-shaped platform
- 46 mm long locating slot
- For accessories on y-axis
- 9 x M3 mounting holes
- Includes MDE154 clamp set (p.18)



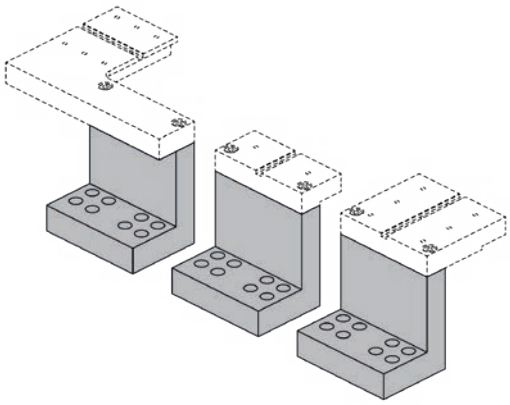
Platform Bracket

MDE189

When used with the MDE147, MDE148 or MDE149 fixed platforms, the MDE189 platform bracket forms a free-standing platform for mounting standard accessories or any other component that needs to be placed at the same height as a flexure stage top plate (76 mm).

The addition of the MDE190 riser block (p.19) between the bracket and the fixed platform raises the platform height by 31 mm for use with the MDE183 and MDE185 pitch and yaw modules (p.19).

The MDE189 platform bracket can be directly bolted to an optical table.



FIBRE HOLDERS

Fibres require precise and firm location for optimum input or output coupling with bulk optics, or for fibre to device coupling. Our precision cut v-grooves secure the fibre in place through various methods. In many cases the v-groove is user-replaceable to enable the user to work with different fibre sizes economically. Ordinarily, the fibre holder will be mounted to the “moving world” section of an MDE330 Professional Series flexure stage (pp.6-7) for typical applications, but other configurations are possible including use with micropositioning stages (pp.22-25).

Fibre Holder

MDE710

- V-groove block cut in two sizes to accommodate cladding and jacket
- Supplied with v-groove block cut for 125/250 µm fibre as standard
- Replacement v-grooves available as MDE720 (p.14)
- Two spring-based adjustable force clamp arms
- Clamp arms raise clear of the v-groove into a secure upright position for easy loading of fibre
- Optical axis height 18 mm above top plate of flexure stage

Fibre Holder

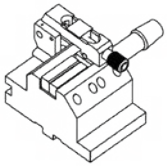
MDE711

- Economical model with a single v-groove cut into the body of the holder (non-replaceable)
- V-groove cut for 250 µm diameter fibre
- Single clamp arm secured in down position by magnet
- Optical axis height 18 mm above top plate of flexure stage

Fibre Holder

MDE715

- Vacuum holder for fibre cladding diameter 125 µm to 400 µm
- Vacuum applied through a fine slot for even retention of fibre with very low force
- Vacuum v-groove can be taken apart for cleaning
- Optical axis height 18 mm above top plate of flexure stage



APPLICATION NOTE

Upgraded fibre holding for the MDE715 vacuum holder is available with the MDE705 version, which adds a spring-based clamp arm and precision cut v-groove block behind the vacuum v-groove to hold the fibre jacket.

Fibre Holder

MDE722

- As MDE710 but without the locating tenon on the base
- Slotted spigot (11 mm diameter) fits into circular format MDE251 micropositioners (p.23)
- Slot allows for easy insertion and removal of fibre
- Optical axis height 11 mm above base of holder

Fibre Holder

MDE723

- As MDE710 but without the locating tenon on the base
- Can be mounted onto 255 Series micropositioners (pp.22-23) except MDE251, MDE257 and MDE257M
- Can be mounted onto 260 Series micropositioners (p.24)
- Optical axis height 11 mm above base of holder; M4 hole on base for post mounting

Fibre Holder

MDE730

- Basic holder for use with 265 Series micropositioners (p.25)
- V-groove cut for 125 µm fibre (other sizes available) fixed into body of holder
- Fibre retained by separate magnet (not shown)
- Optical axis height 5 mm above base of holder

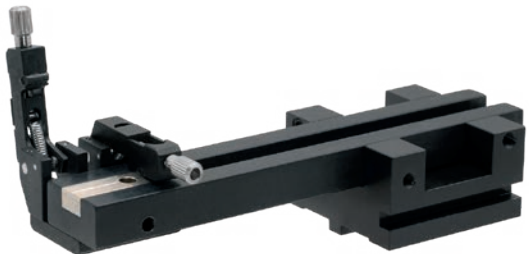
FIBRE HOLDERS

Long reach fibre holders are useful for situations where devices or optics may need to be located beyond the confines of the standard fixed platforms (p.12) for flexure stages, such as where positioning around a pedestal may be required, or for complex arrangements of stages where positioning is required from orthogonal directions. Holders of this type are also helpful for use with our waveguide workstation (pp.20-21).

The use of a universal base allows the holder to be positioned along the x-axis slot in a flexure stage top plate as usual. By detaching the base from the arm section, rotating it by 90° and re-attaching, it can also be placed in the y-axis slot. This permits mounting of the fibre holder offset from, but parallel to, the optical axis. Such an arrangement is useful for alignment to DWDM components or other extended devices.

Long Reach Fibre Holder

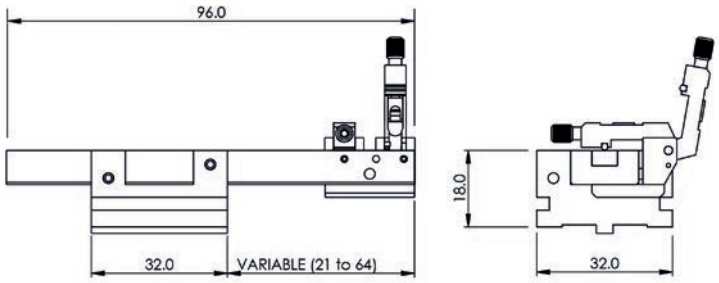
MDE750



Right-hand version

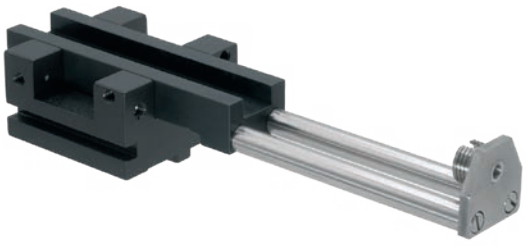
Left-hand version

- Long reach fibre holder with double v-groove for cladding and jacket (125/250 µm as standard; other sizes available)
- Two spring-based adjustable force clamp arms
- Universal base permits mounting offset from optical axis for alignment to extended devices; base also available separately as MDE752 (p.18)
- Arm section can be slid and locked in position to vary the extension between 21 mm and 64 mm from the front edge of the base
- Optical axis height 18 mm above flexure stage top plate
- Right-hand and left-hand versions



Long Reach Fibre Holder

MDE751



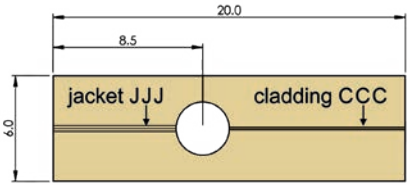
- Long reach version of fibre holder for FC/PC connectorised fibre
- Universal base permits mounting offset from optical axis for alignment to extended devices; base also available separately as MDE752 (p.18)
- Optical axis height 18 mm above flexure stage top plate

Custom V-groove

MDE720

The standard v-groove supplied with the MDE709, MDE710, MDE722, MDE723 and MDE750 fibre holders is a dual size design with one section cut for 125 µm cladding and the other for 250 µm jacket as standard, separated by a small hole at the transition.

Custom grooves are our speciality and we can manufacture to your requirements, with cladding and jacket diameters specified.



MDE720-CCC/JJJ*
(for MDE709, MDE710, MDE722, MDE723 and MDE750)

*Specify cladding diameter CCC and jacket diameter JJJ in microns

FIBRE HOLDERS

For connectorised fibre, we offer receptacle-style holders for the most common formats: FC/PC, SMA and ST. Receptacle-style holders have the same optical axis height of 18 mm above the flexure stage top plate as bare fibre holders (pp.13-14) and fibre rotators (pp.16-17).

Fibre Holder

MDE735

Fibre holder for FC/PC connectorised fibre

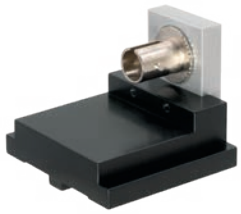
Fibre Holder

MDE736

Fibre holder for SMA connectorised fibre

Fibre Holder

MDE737



Fibre holder for ST connectorised fibre

For optical fibres terminated with ferrules, or GRIN lenses and similar cylindrical components, holders designed around twin parallel rods and v-blocks are available, with the same 18 mm optical axis height above the flexure stage top plate as for other accessories.

MDE700 uses two stainless steel rods to form a 9 mm long groove to accommodate cylindrical elements of diameter 2.0 mm to 4.5 mm (1.0 mm to 2.0 mm with MDE701 variant), held by a nylon clamp screw.

MDE734 uses a spring-loaded clamp and invertible 4 mm long v-block to hold cylindrical elements of diameter 2.0 mm to 3.0 mm, or 1.0 mm to 2.0 mm with the block removed, flipped over and replaced in the holder to switch between the two size ranges.

Ferrule Holder

MDE700/701

Ferrule Holder

MDE734

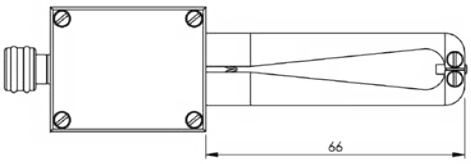
Fibre/Ferrule Gripper

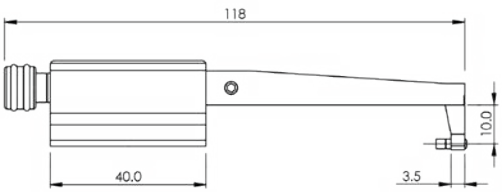
E770-125

The E770-125 fibre gripper is designed to fit to Professional Series flexure stages (pp.6-7) for demanding fibre alignment tasks involving optical fibre or small components.

The supplied standard jaws for 125 µm fibre can be replaced with optional E781 custom jaws to accommodate other fibre sizes, or optional E782 jaws for ferrules up to 2.5 mm in diameter.

- Extended reach for alignment tasks in difficult to reach spaces
- Grips a wide range of configurations from clad fibres to ferrules by using optional jaws E781 and E782
- Precision screw driven open/close action with up to 10 mm open jaw separation
- Gripping arms are contoured to allow a clear view and/or tool access
- Minimal gripped length of 3.5 mm helps to maximise package accessibility
- Repeatable gripping force





Replacement Jaws

E781

Specify diameter of fibre within a range of 125 µm to 800 µm.

Replacement Jaws

E782

Specify diameter of ferrule within a range of 800 µm to 2500 µm.

FIBRE ROTATORS

Rotation of polarisation-maintaining fibre is necessary to align the fast or slow axis of the fibre to the polarisation state of the input light source. We offer three versions of fibre rotator: MDE717 high precision with very fine control of the rotation angle (below), MDE235 motorised high precision (p.17), and MDE718 standard precision (below) as an economical alternative for less demanding rotation requirements. For applications involving ribbon fibre, optical crystals or other angle-critical devices, we also offer the MDE884 array rotator (p.17).

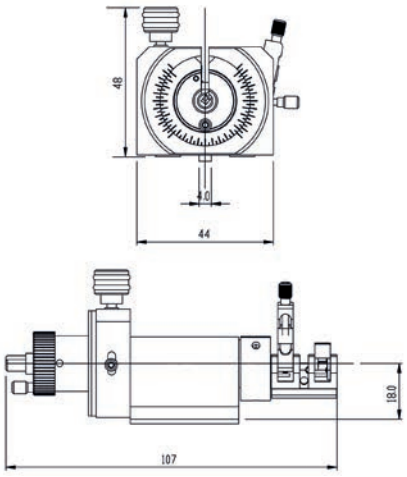
All rotators fit to the slot on the top plate of MDE330 Professional Series flexure stages (pp.6-7) or MDE185/MDE183 pitch and yaw modules (p.19), with an optical axis height of 18 mm above the plate surface.

Fibre Rotator

MDE717

Right-hand version MDE717-RH

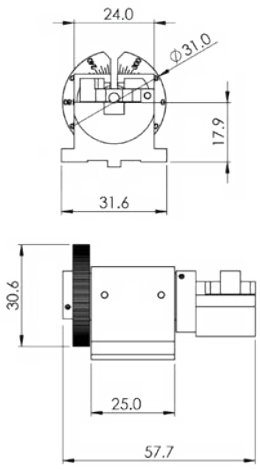
Left-hand version MDE717-LH



- Slotted design for easy insertion and removal of fibre, with split spring sleeve to retain fibre in slot at the control end to prevent fouling during rotation
- 360° roll axis (θx) rotation
- Engraved scale ±90° and vernier reading to 30 arcmin
- Fine rotation adjustment screw with ±5° range and 5 arcsec resolution
- Fibre holder with double v-groove for cladding and jacket (125/250 µm as standard; other sizes available)
- Two spring-based adjustable force clamp arms
- V-groove pre-set on rotation axis with <1 µm of concentricity error (can be re-centred by user)
- Right-hand and left-hand versions

Fibre Rotator

MDE718



- Slotted design for easy insertion and removal of fibre
- 360° roll axis (θx) rotation
- Rotation resolution approximately 0.1°
- Fibre held in v-groove by single clamp arm
- Rotation lockable by set screw with socket for hex key (2.0 mm A/F)

The standard v-groove supplied with the MDE717 and MDE235 rotators is a double-size design with one section cut for 125 µm cladding and the other for 250 µm jacket as standard, separated by a small hole at the transition.

The MDE718 uses a simplified groove cut for a single dimension (125 µm as standard)

Custom grooves are our speciality; we can manufacture to your requirements, with cladding and jacket diameters specified. The MDE720 v-groove block is for the MDE717 and MDE235 rotators, and the MDE712 v-groove block is for the MDE718 rotator.

Custom V-groove

MDE720

MDE720-CCC/JJJ*
(for MDE717 and MDE235)

Custom V-groove

MDE712

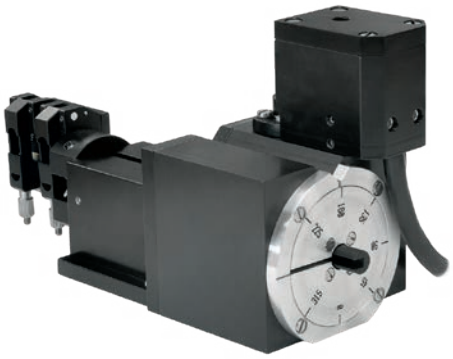
MDE712-CCC*
(for MDE718)

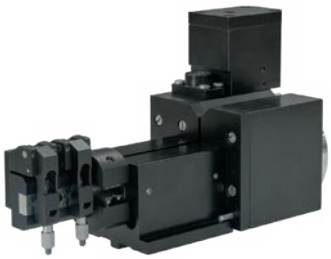
*Specify cladding diameter CCC and jacket diameter JJJ in microns

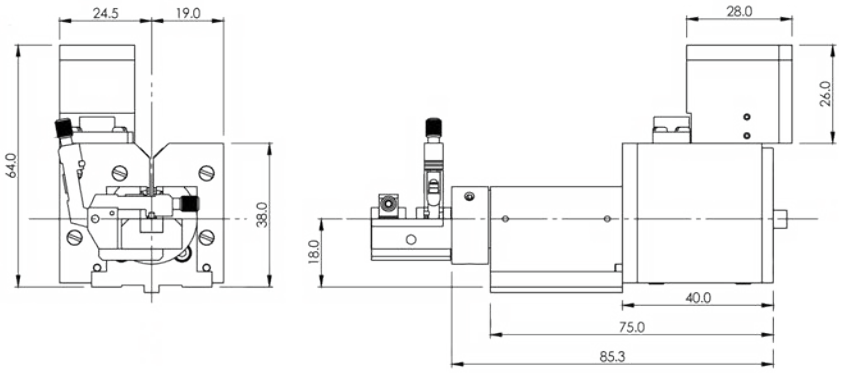
FIBRE ROTATORS

Motorised Fibre Rotator

MDE235







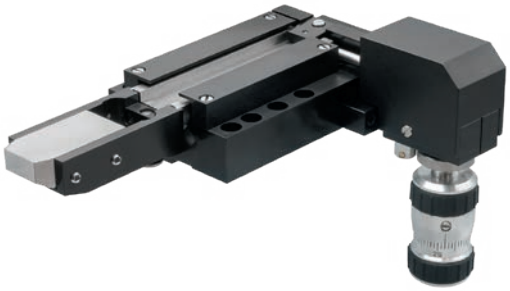
The MDE235 is a motorised version of the MDE717 fibre rotator (p.16) with the same main features of the manual version plus a smooth and accurate stepper motor drive.

Designed for the demanding task of controlled rotation and alignment of angle-sensitive components, the MDE235 can be used anywhere that stable, accurate motorised fibre rotation is needed.

- Slotted design for easy insertion and removal of fibre, with split sleeve to retain fibre in slot at the control end to prevent fouling during rotation
- 360° roll axis (θx) rotation
- Integrated 2-phase stepper motor drive
- Rotation resolution <0.01° when operated with half-step controller
- Fibre holder with double v-groove for cladding and jacket (125/250 µm as standard; other sizes available)
- Two spring-based adjustable force clamp arms
- V-groove pre-set on rotation axis with <1 µm of concentricity error (can be re-centred by user)
- Motor controller available with MDE235-CO2 version comprising MDE235 rotator and E1200 single-axis control unit with USB interface and software.

Ribbon/Array Rotator

MDE884

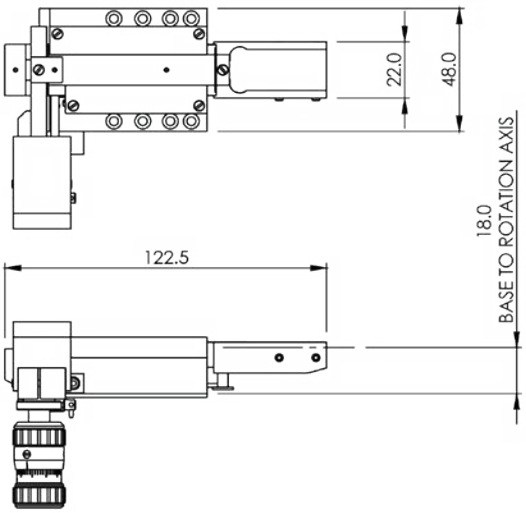


For applications involving ribbon cables, fibre arrays or optical crystals, the single v-groove of our MDE717 (p.16) and MDE718 (p.16) rotators would not be suitable. To meet the requirement of rotating extended devices, we developed the MDE884 array rotator, which takes its actuation input from the MDE216 high precision adjuster (p.10).

The unique mechanical roll design decouples the linear adjuster travel from the roll motion to minimise radial offset during rotation. This ensures that angular movements are exactly about the x-axis. The precision of this motion results in a very high level of accuracy of the roll angle.

Right-hand and left-hand versions provide user convenience. The image shows the right-hand model, and the drawing below shows the left-hand model. See Application Note below for use with MDE185 and MDE183 pitch and yaw module (p.19).

- High precision array rotator
- MDE216 (p.10) high precision adjuster with coarse and fine control
- ±4° coarse range in roll axis (θx) with 8 arcsec resolution
- ±10 arcmin fine range in roll axis (θx) with <0.1 arcsec resolution
- Rotates exactly on x-axis
- Fits to flexure stage with 18 mm optical axis height above stage top plate
- Right-hand and left-hand versions

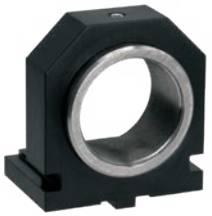


APPLICATION NOTE

Where the MDE884 array rotator is to be used with the MDE185 or MDE183 pitch and yaw module, only the left-hand version of the rotator is compatible. Drawing (left) shows left-hand version.

MOUNTING ACCESSORIES

Our range of accessories for adding objective lenses and other components to MDE330 Professional Series flexure stages (pp.6-7) maintains in most cases an optical axis height of 18 mm above the top plate on the centre line of the x-axis location slot. Where necessary a locating tenon forms part of the accessory, and a clamp system is used in the form of pairs of clamps (MDE154, below) attached by screws into threaded holes on the top plate. An M6 threaded accessory also allows table post holders to be fitted to flexure stages for very precise positioning of any typical post mountable component.



Lens Holder

MDE150

Threaded mount for objective lens. Fitted with a removable stainless steel sleeve with RMS 0.800”-36 thread.

Plain Mount

MDE151

Plain mount with 25 mm diameter bore to hold MDE152 flanged insert or other suitably sized components or optics.

Flanged Insert

MDE152

Flanged insert for use with MDE151 plain mount or MDE150 threaded mount (with sleeve removed) to be adapted by the user to hold components such as fibre chucks.

Component Plate

MDE153

Basic component plate for non-standard components. Requires further machining by the user (no mounting features are provided).

Clamp Set

MDE154

Clamp set (two clamps with screws and hex key, 2.5 mm A/F) to attach accessories to top plate of flexure stage. The clamp set is included with several products as standard (see Product Finder, pp.30-34).

Adaptor Plate

MDE155A

Adaptor plate to attach M6 post holder to flexure stage top plate, useful for precision positioning of post mounted optics and components.

Extension Tube

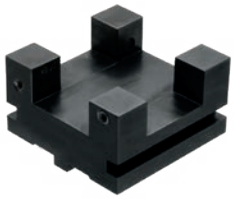
MDE156

Extension tube for use with MDE150 threaded lens mount to extend reach by 25 mm, allowing access to components on wide platforms. Fits in place of the sleeve on the MDE150, with the sleeve relocated to the end of the MDE156.

Threaded Mount

MDE157

Mount with 1.035”-40 internal thread for compatibility with components such as lens tubes from other optomechanics manufacturers.



Universal Base

MDE752

Universal base, locates in either of the two orthogonal slots on a flexure stage top plate for on-axis or offset component mounting (useful for DWDM component applications).

Long Reach Lens Holder

MDE753

Long reach threaded mount for objective lens with RMS 0.800”-36 thread.

PITCH AND YAW MODULES

MDE185 and MDE183 modules add pitch and yaw adjustments to MDE330 Professional Series flexure stages (pp.6-7) for a wide range of fibre and device alignment tasks requiring the ultimate in flexibility and precision control. The pitch and yaw module screws onto a flexure stage using a dovetail bracket, allowing coarse adjustment along the optical axis. A clamp screw secures the position.

The pitch and yaw modules provide a range of ±3° in pitch (θy) and ±5° in yaw (θz), with a resolution of better than 0.1 arcsec (MDE185). Each module has a locating slot to accept **Elliot|Martock** standard top plate accessories such as long reach fibre holders allowing bare and connectorised fibre (p.14) and ribbon cable or arrays (p.17) to be used. When fitted with a fibre rotator (pp.16-17) and attached to a stage, the module provides 6-axis manipulation about a single point in space.

A swing-out pointer identifies the 26 mm distance of the rotation centre from the front of the module for ease of set up. The optical axis height is 18 mm above the module platform surface and on the centre line of the location slot (see MDE141 and MDE190 below for riser blocks to match the optical axis height to other flexure stage mounted accessories).

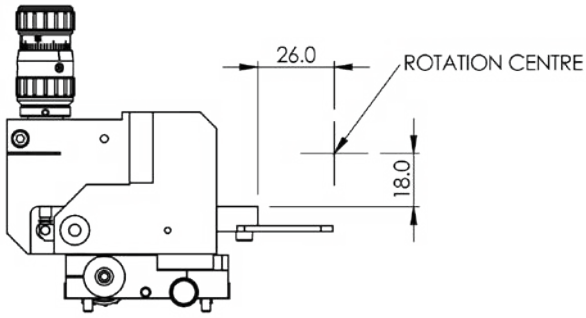
Pitch and Yaw Module

MDE185

Pitch and Yaw Module

MDE183

- ±3° range in pitch (θy) and ±5° range in yaw (θz)
- Precision bearings for rotation in a true arc with no crosstalk
- Right-hand and left-hand versions
- MDE185 has resolution of <0.1 arcsec using MDE216 high precision adjusters (p.10)
- MDE183 has resolution of 2 arcsec using MDE217 standard adjusters (p.10)
- Optical axis height of mounted accessories is 125 mm above the table when pitch and yaw module fitted to flexure stage
- Fits flexure stage (pp.6-7) to provide 5-axis operation, or 6-axis if a rotator (pp.16-17) is added to the module – see MDE187 below for a high precision example (other configurations are available)
- Use with MDE884 (p.17) for ribbon fibre applications



6-Axis Manipulator

MDE187

For user convenience, we offer a ready-built stage configuration for 6-axis manipulation of an optical fibre in xyz linear axes plus pitch (θy), yaw (θz) and roll (θx). The MDE187 package is a combination of the MDE185 pitch and yaw module (above), MDE717 high precision rotator (p.16) and MDE122 flexure stage (p.7).

Flexure Stage Riser

MDE141

Fixed Platform Riser

MDE190

When the MDE185 or MDE183 is attached to a flexure stage, the optical axis height for a mounted accessory beomes 125 mm above the table instead of the standard 94 mm. Riser blocks address this 31 mm difference.

When using a flexure stage fitted with an MDE185/MDE183 in combination with a second flexure stage, the MDE141 riser block pair beneath the second stage adds the necessary height to present an optical axis height of 125 mm for mounted accessories. The MDE141 riser block pair can also be used to match the height of a flexure stage to other flexure stages that are mounted to MDE889-60 rack and pinion stages (p.21).

The MDE190 riser block can be fitted between the MDE189 platform bracket (p.12) and an MDE147, MDE148 or MDE149 fixed platform (p.12) to raise an accessory mounted on the platform to an optical axis height of 125 mm, for compatibility with the MDE185/MDE183.

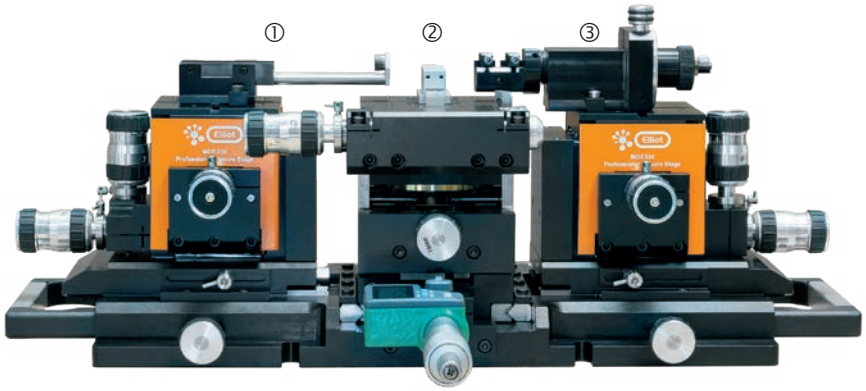
WAVEGUIDE WORKSTATION

SETTING THE STANDARD IN DEVICE AND WAVEGUIDE MANIPULATION

Alignment tasks become more challenging when the device under test has multiple input/output channels or where fibre arrays are involved. Angular offsets need to be considered, as does traversing the device across the optical axis for characterisation and pigtailing applications. Our MDE881 waveguide workstation was designed to address this interesting set of applications in a convenient package offering truly independent 6-axis manipulation. Fast access to the waveguide position is achieved through a transverse travel micrometer with digital readout of position to a display resolution of 1 µm. Moving along a row of waveguides becomes easy once the spacing is known.

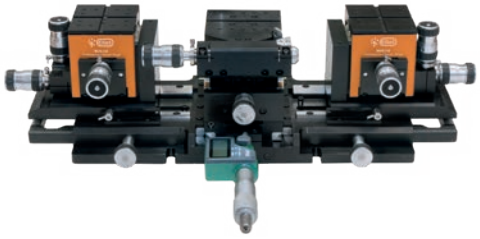
Waveguide Workstation

MDE881



Workstation with optional accessories to illustrate typical usage: MDE751 long reach fibre holder (p.13)①, MDE741 waveguide holder (see Accessories below)②, and MDE717 high precision fibre rotator (p.15)③

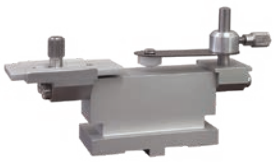
The MDE881 waveguide workstation was designed with user convenience in mind. Incorporating our MDE330 Professional Series flexure stages (p.6) with high precision adjusters (p.10), it offers convenient operator features such as rack and pinion drives with 40 mm travel below each flexure stage. This allows fast outward movement of the flexure stages to access the central module. Adjustable end stops are provided to prevent mounted fibres touching the waveguide facets, and to accurately re-locate them to better than 1 µm.



Workstation in open position for loading/unloading

- Incorporates two MDE330 Professional Series flexure stages (p.6) with MDE216 high precision adjusters (p.10) for 20 nm resolution on x-, y- and z-axes either side of a central module
- Fast access to waveguide position with transverse travel micrometer: 25 mm standard range (MDE881) with option for 50 mm (MDE881-L)
- Central module provides precise roll and yaw over ±4° ranges using curved bearings for rotation in a true arc with no crosstalk
- Coarse pitch control for waveguides mounted in non-flat epoxy packages, with pitch axis coincident with roll and yaw axes
- Fast-track rack and pinion drives beneath the flexure stages move the stages out by 40 mm for easy access to the central module
- Flexure stages can be fitted with single or ribbon fibre holders with rotation feature (pp.16-17) or other long reach holders (p.14)

Many designs of waveguide holder are available. Holders of various sizes, and versions fitted with a clamp as shown in the example (right) can be provided. Other standard **Elliot|Martock** flexure stage accessories (pp.10-19) are also compatible with the waveguide workstation.



Typical Workstation Add-ons

ACCESSORIES

MDE717
High precision fibre rotator
— see p.16 for details

MDE750/751
Long reach fibre holder
— see p.14 for details

MDE753
Long reach objective holder
— see p.18 for details

MDE884
Ribbon cable/crystal rotator
— see p.17 for details

MDE741/744
Basic mount, 15 mm high (MDE741) or 18 mm high* (MDE744), specify length along x-axis as 10 mm, 14 mm or 30 mm

MDE742/745
Vacuum mount, 15 mm high (MDE742) or 18 mm high* (MDE745), specify length along x-axis as 10 mm, 14 mm or 30 mm

MDE747
Mount with kinematic adjustment of pitch and roll (±3°) plus height (±3 mm); short length along x-axis (6 mm) for objective access

MDE890
Mount with fine θy (pitch) adjustment range of ±1° (1 arcsec resolution) and coarse x-axis adjustment range of 16 mm

*Use 18 mm height for MDE717 or MDE718

WAVEGUIDE WORKSTATION

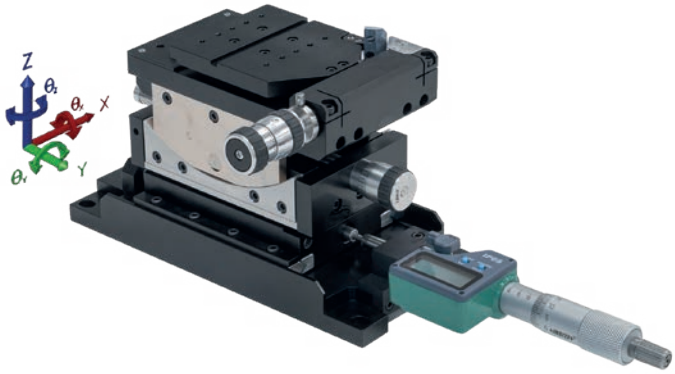
The central module of the MDE881 provides roll (θx) and pitch (θy) at a height of 125 mm from the bottom of the base plate. These motions both coincide with the yaw (θz) axis at a height of 18 mm above the middle of the top plate.

All six axes are truly independent of each other (no crosstalk). Rotation axes are defined by curved bearings, hence rotation is always in a true arc. Digital readout of the y-axis travel is provided to allow the operator to read waveguide positions. Stepping the fibre across the substrate to locate individual waveguides becomes a simple and repeatable task.

Axis	Central Module Specifications
Roll (θx)	±4° rotation about the x-axis with 1 arcsec resolution adjustable by high precision adjuster
Yaw (θz)	±4° rotation about the z-axis with 1 arcsec resolution adjustable by high precision adjuster
Pitch (θy)	±1° rotation (coarse) about the y-axis adjustable by hex key (2.5 mm A/F), to correct for non-flat packages
y-axis travel	25 mm (±2 µm accuracy) with option for 50 mm travel (±4 µm accuracy) adjustable by micrometer with digital readout of position to 1 µm display resolution
z-axis travel	±3 mm adjustable by hex key (2.5 mm A/F) to 2 µm resolution

Central Module

MDE883

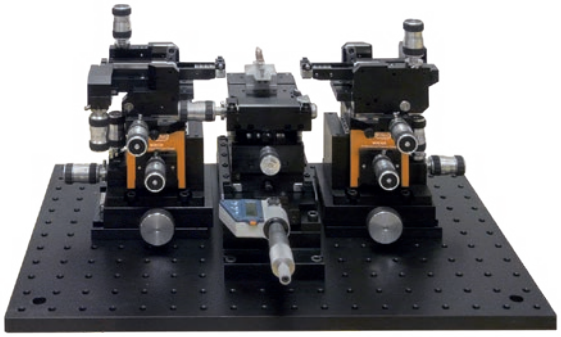


The central module of the workstation is available separately as MDE883 for 25 mm travel or MDE883-L for 50 mm travel. This provides a means for customers to build their own configuration in kit form. MDE889-60 rack and pinion stages (below) can be used to replicate the open/close function of the workstation. An MDE330 Professional Series flexure stage (pp.6-7) mounted to either a rack and pinion stage or to a set of MDE141 riser blocks (p.19) will be conveniently located at an optical axis height of 125 mm for compatibility with the central module.

APPLICATION NOTE

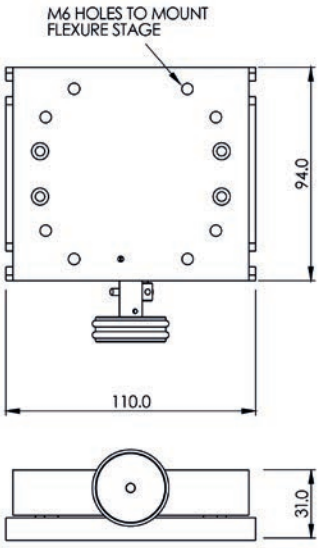
The MDE883 central module can be used in situations where the standard in-line configuration of the MDE881 is not suitable, for example where the waveguide inputs are angled 90° apart.

Alternatively, building the system in kit form offers a flexible format suitable for laboratory use in a wide range of applications. A system with the same functionality as the MDE881 workstation can be built up on a breadboard or optical table using an MDE883 central module with, on each side, an MDE889-60 rack and pinion stage (below) fitted with a configured flexure stage (p.7), plus any of the workstation or flexure stage accessories (pp.13-20) that can be used with the MDE881 workstation, as shown in the example (right).



Rack and Pinion Stages

MDE889-60



The MDE889-60 is a rack and pinion translation stage designed for mounting directly to an optical table. The large mounting area can be quickly moved back and forth via the thumb wheel mechanism.

- 60 mm travel
- Lockable
- Bolts directly to optical table
- Mounting hole pattern for MDE330 Professional Series flexure stages
- Adjustable end-stop defines position to <1 µm accuracy
- Large thumb wheel for fast adjustment
- Right-hand and left-hand versions