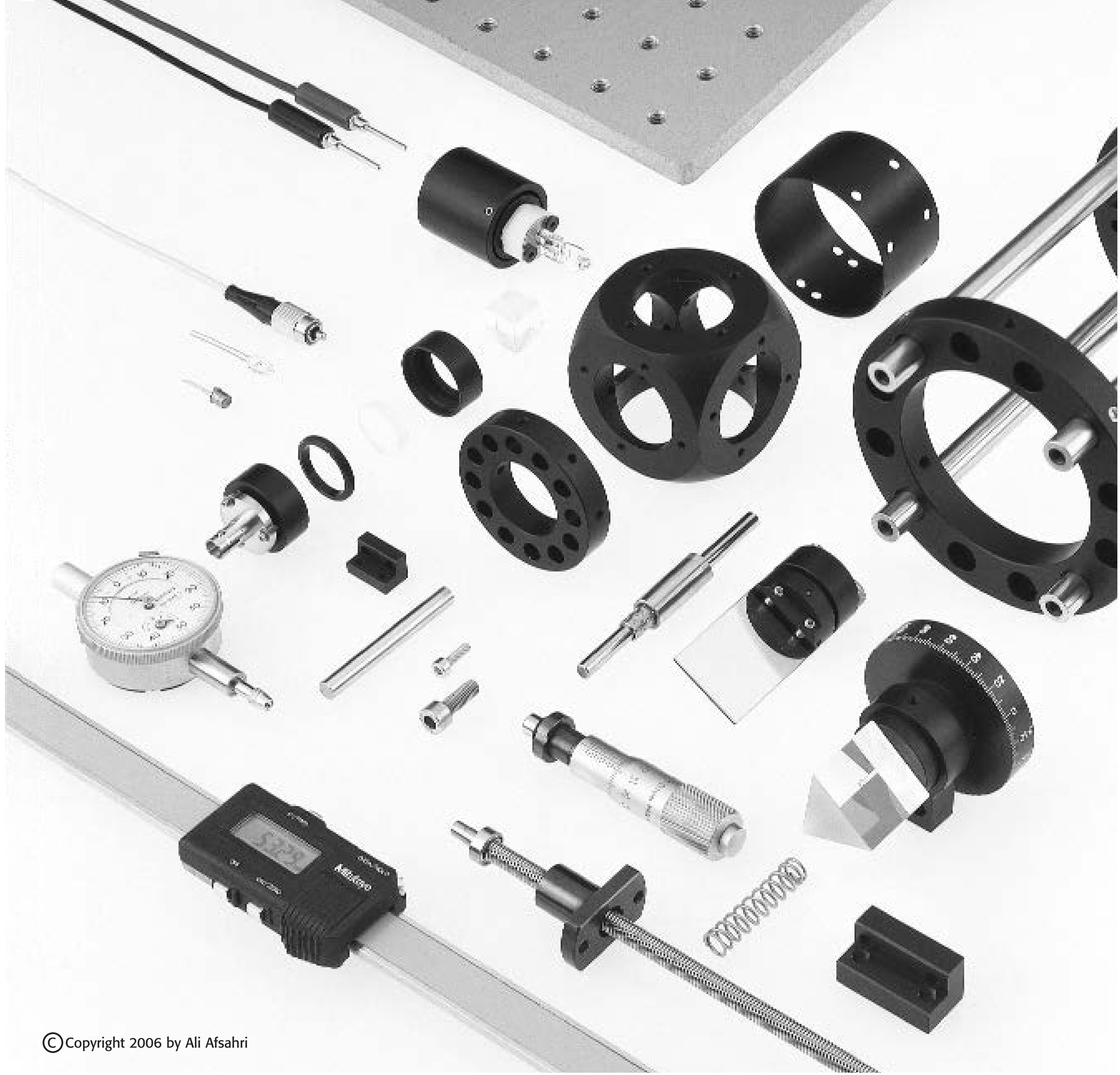
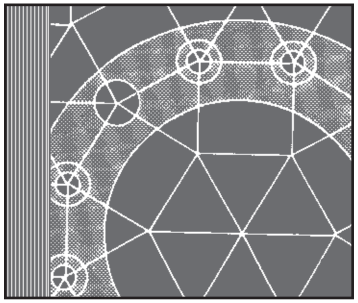
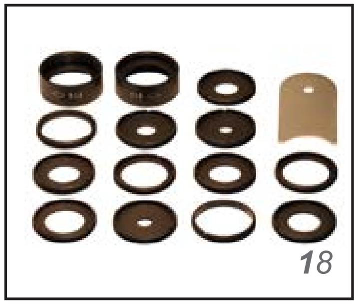
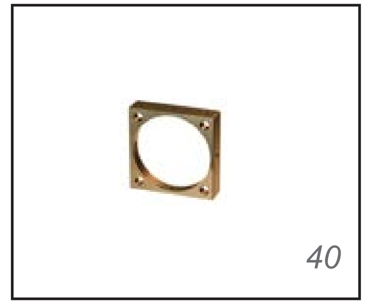


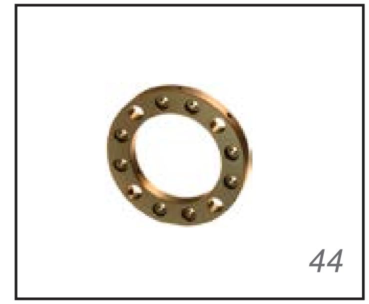
optoform

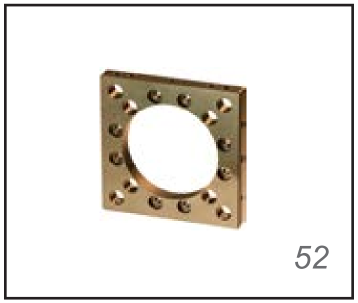
Content

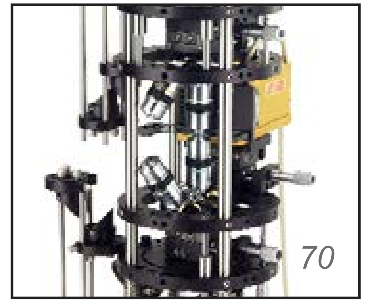


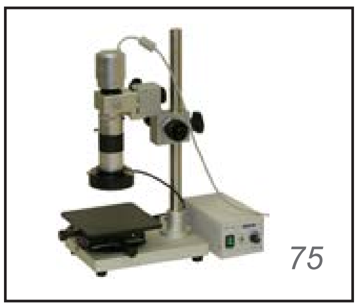


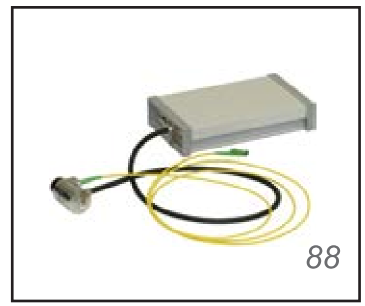


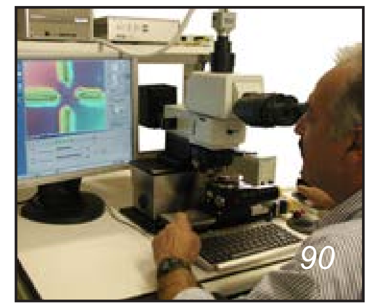


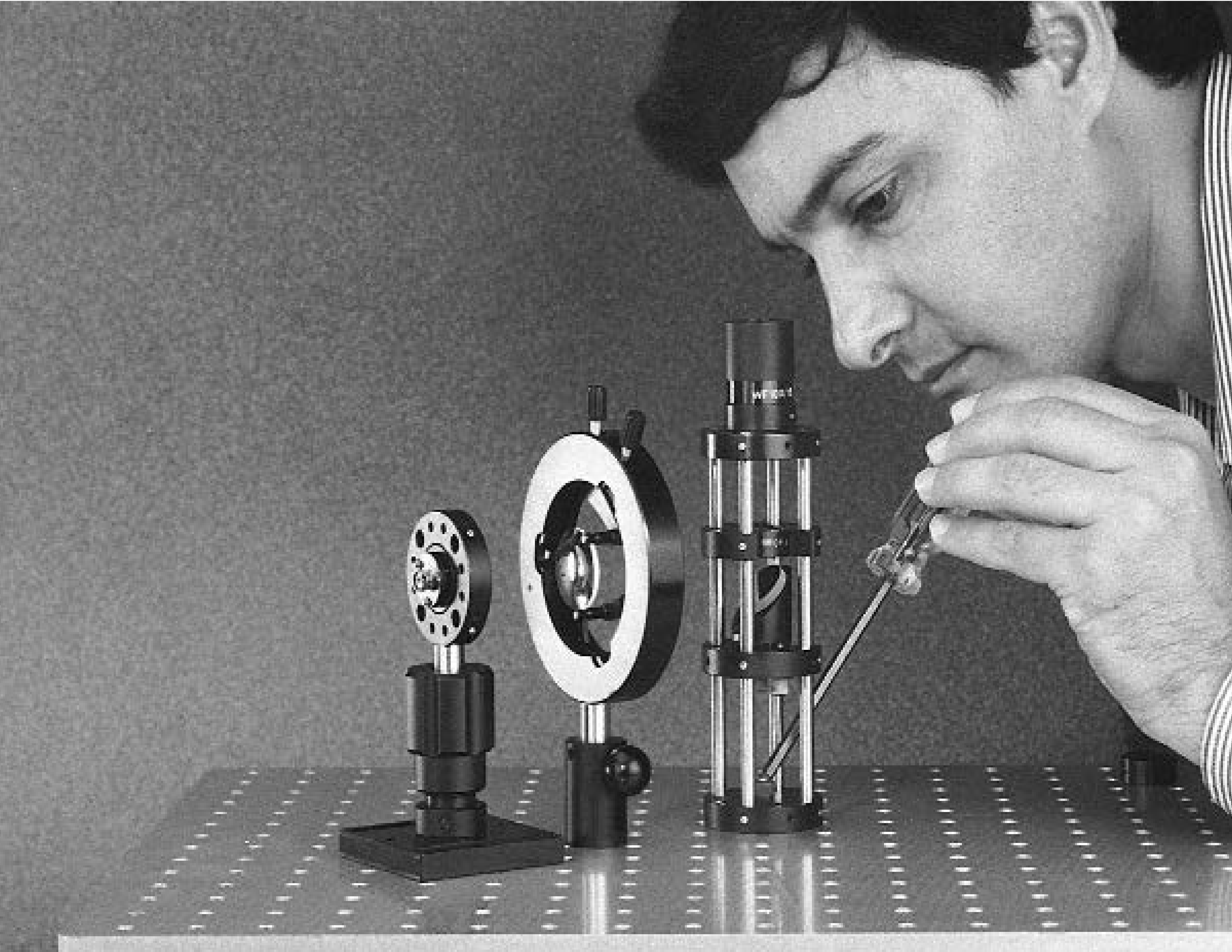












Optomechanical Design: Who said it was only that?

Optomechanical design is an art. It's nothing less than doing a sculpture or painting. It is taken for granted that Optomechanics needs to be only functional, and not so elegant. I think not. Form and function are not at all separable. Better form allows better usage. Perhaps the most elegant and simplest of all optomechanical designs is the rifle scope. The rifle scope design owes much of its success to its perfect marriage of form and function.

When one studies zoom lenses in past few decades, it is so noticeable that as much as the zoom ratio has improved, the body design has also become more appealing. So why the wait for 30 years to design better looking lenses? I think it has to do with the increasing bond between optomechanics and the arts. It has been my own desire, and philosophy to come up with a system that allows the optician to not only deal with functionality, but to also create form.

By pure destiny, I came across two Microbench kits at a swap meet in California back in the 80's, and I bought both kits for $180 just for curiosity. There were no instructions for the set, so I had to discover the function of each and every piece for myself. After a few days of unforgettable play, I found in it all the elements I had ever dreamed for: It was so precise, and versatile, and yet it allowed maximum playfulness, and creativity. A few years later, I learned the real cost of what I had bought was a little under $10,000. So I invented a system having two things in mind: Lower cost, and higher flexibility. Barry Johnson of Optical E.T.C. (Our eastern distributor at the time), and I, both named it Optoform. Today, Optoform is a proven design, having passed the test of time, it is implemented by many prestigious companies like NASA, IBM, Ames Research Center, and many Optics universities around the world.

What you are about to see in this catalog is the colmunation of 10 years technical development with customers to setup their research labs or companies building their first prototypes to display at trade shows, and people tossing their fortune dreams on napkin drawings.

Ali Afshari,
CEO

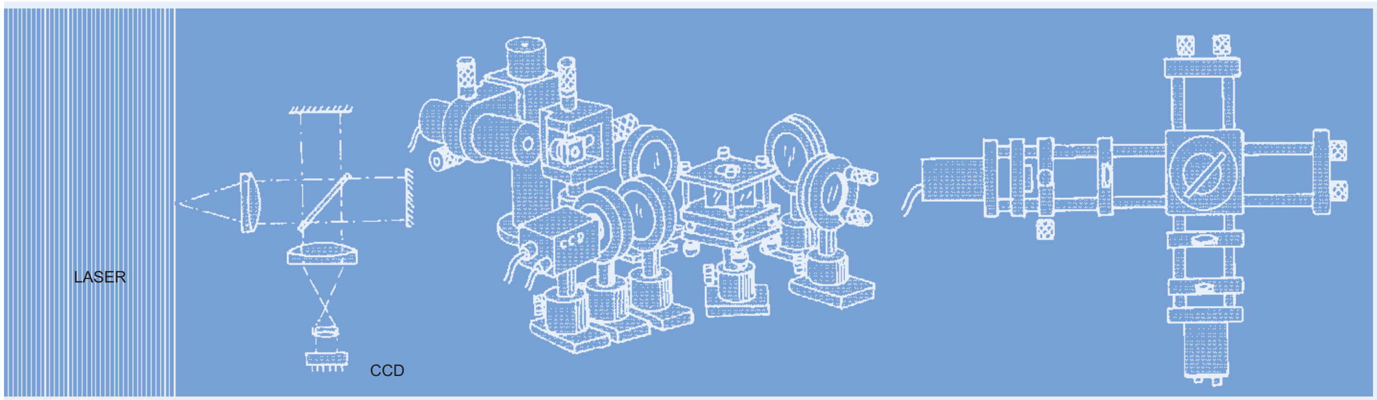


FIG.1 FIG.2 FIG.3

Optoform:

Form = Function

Post mounted setups (Fig. 1) are much more difficult to build in practice than in theory (Fig.1). Optoform allows assembly of optical setups as it is laid out in a drawing from a book (Fig. 3). Self holding scheme eliminates the need for breadboards.

NEW POSSIBILITIES

Get used to a very comfortable tool for prototyping

There has never been a better way to combine form and function like Optoform. Although building prototypes has always been possible with standard laboratory components, but form has its own impact on experimentation. The self holding feature of Optoform allows the user to examine the light path with hand held convenience. With a small number of accessories from a kit, experiments can be assembled on a desk top.

The building blocks of Optoform are circular mounts, which can slide along support rods. This simplifies the focusing dilemma along the optical axis, which is inherent to post-mounted setups. Optoform also utilizes linear bearing devices to offer precise focusing adjustments.

Bending the light path is accomplished by utilizing corner connectors, and spheres (described next). With these basic building blocks, the most sophisticated optical designs, and experiments can be pieced together. Other Optoform accessories would allow bending of the optical axis to a desired angle, perform tilts, centration, and shifting of the optical elements along the light path.

STANDARD MOUNT

POST MOUNT

SIDE CLEARANCE MOUNT

INSERTION MOUNT

LINEAR BEARING MOUNT

FIBER OPTICS MOUNT

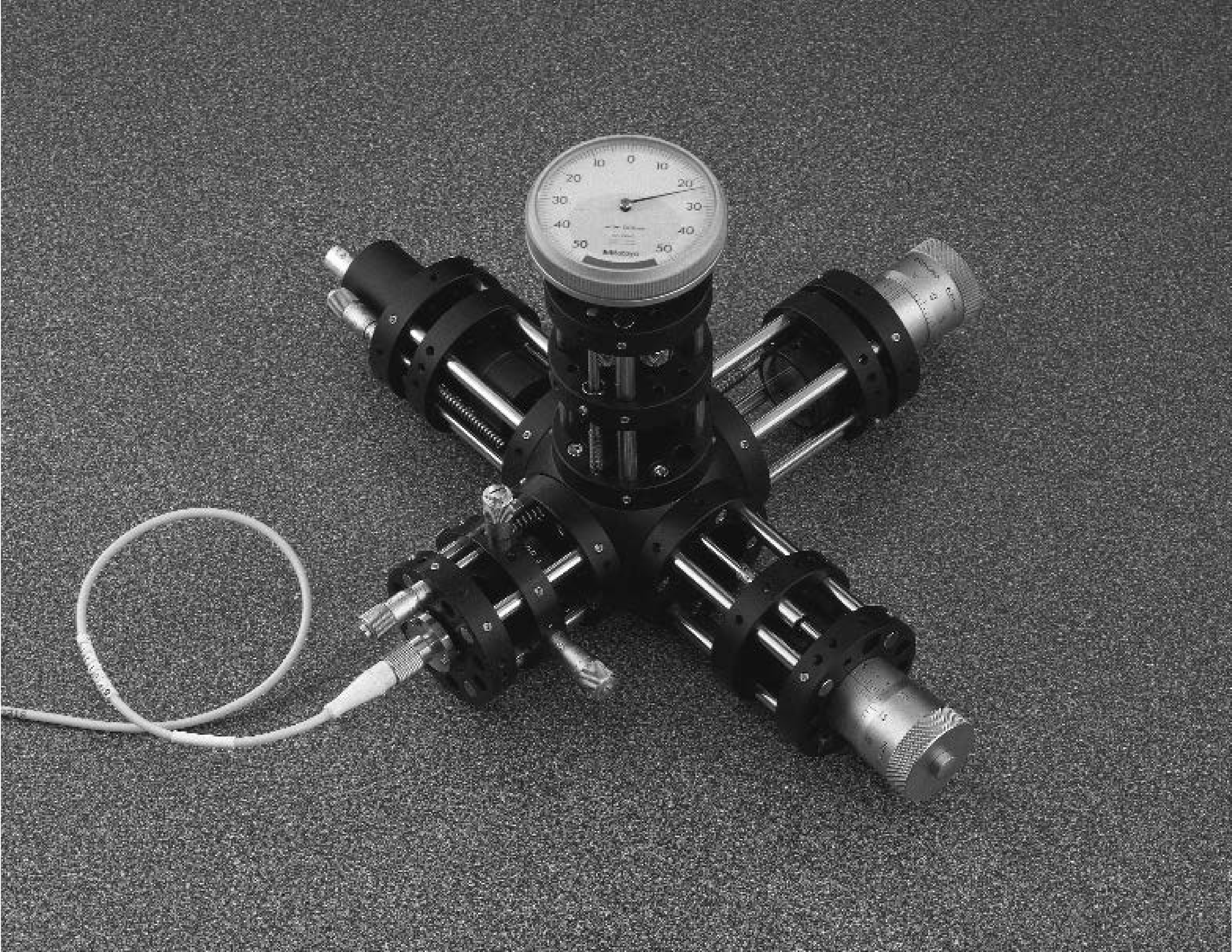
MIRROR MOUNT

BEAMSPLITTER MOUNT

LENS MOUNT

FILTER MOUNT

Basic building blocks of Optoform are: Circular mounts, Corner Connectors, Rods, Tubing, Lens Cells, Optics mounts, and connecting Spheres or Nodes.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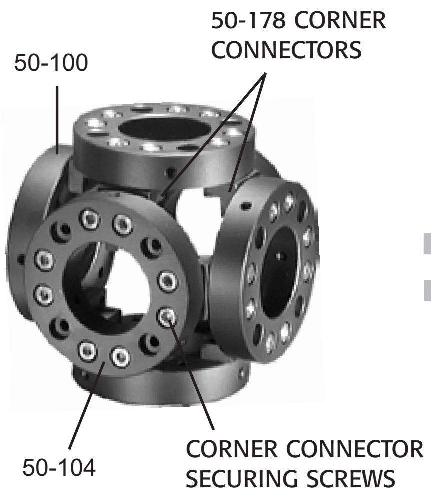


SPHERE 50-116

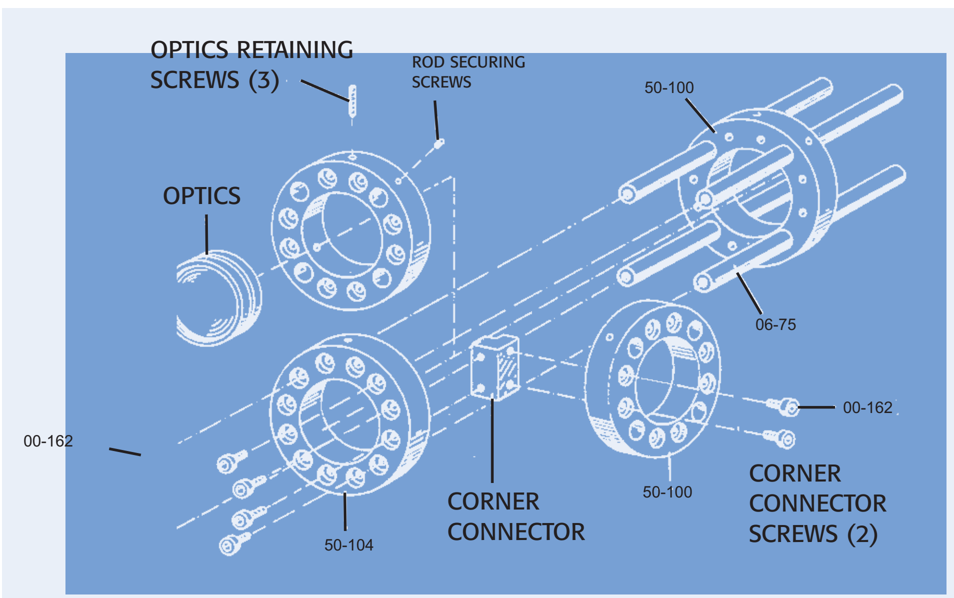
CORNER CONNECTORS AND SPHERES

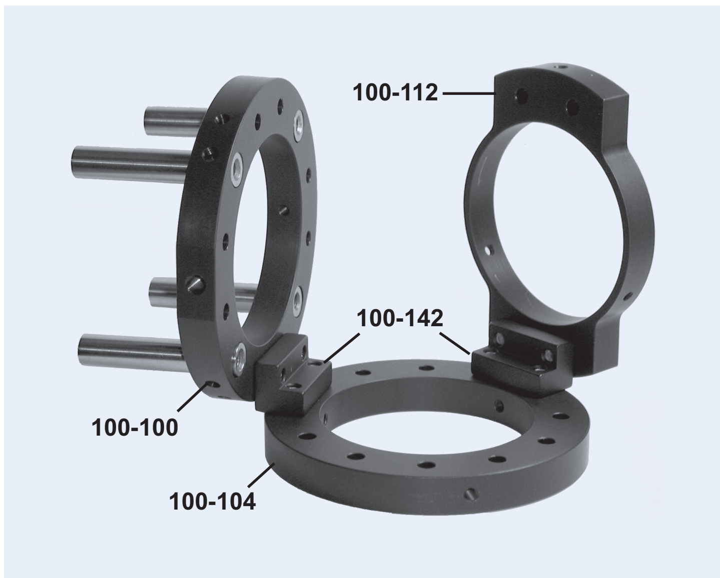
Any pair of Optoform mounting plates can be connected together via a right angle block called corner connector. Similar to MECCANO'S ERECTOR SET, corner connectors come in various sizes and shapes. As you get used to working with Optoform, you'll treat it as a building block to create the outer shape of your design knowing that the optics will just fit in later.

A NODE IS WHERE THE LIGHT BENDS

A node may consist of any two mounts joined together via a corner connector. When a six sided node (left) is assembled (using six mounts and 12 corner connectors), the standard sphere 50-116 can fit in the inner space of the assembly. This allows the two shapes to be geometrically replaceable.

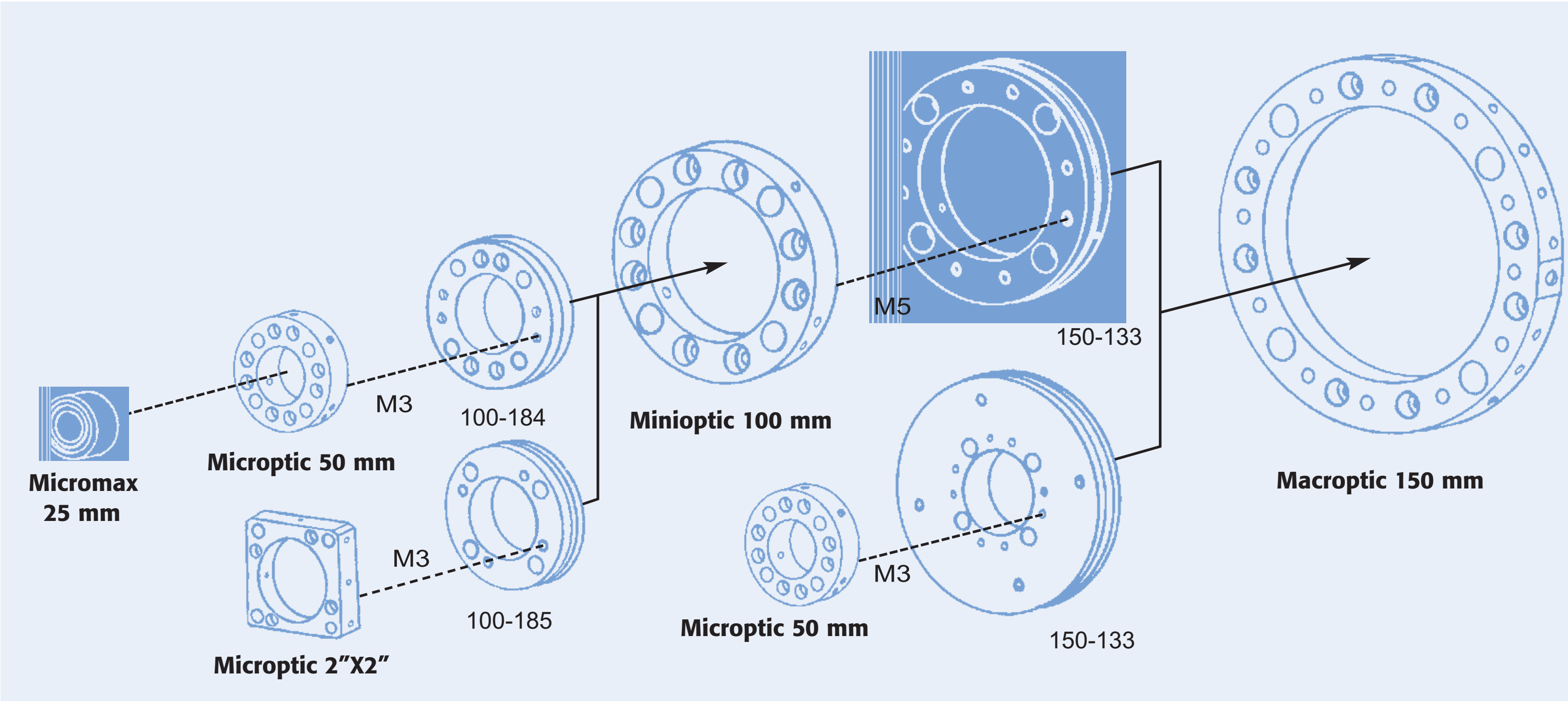
Although it is much simpler to utilize spheres, corner connectors have far more flexibility. In some cases, mounts of different diameters can be joined together (described next).





Threaded bores in corner connectors are the key in reducing the cost of mounting plates. Circular shape of mounts is the other money saving factor.

ONE SYSTEM

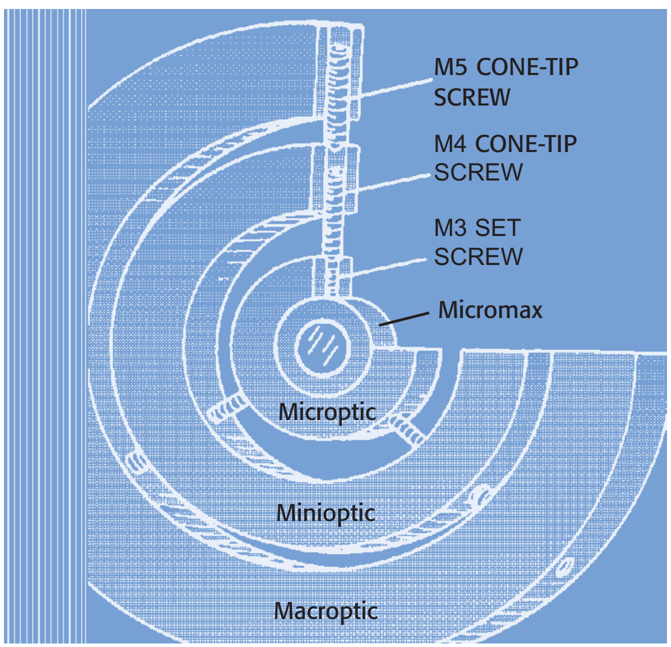


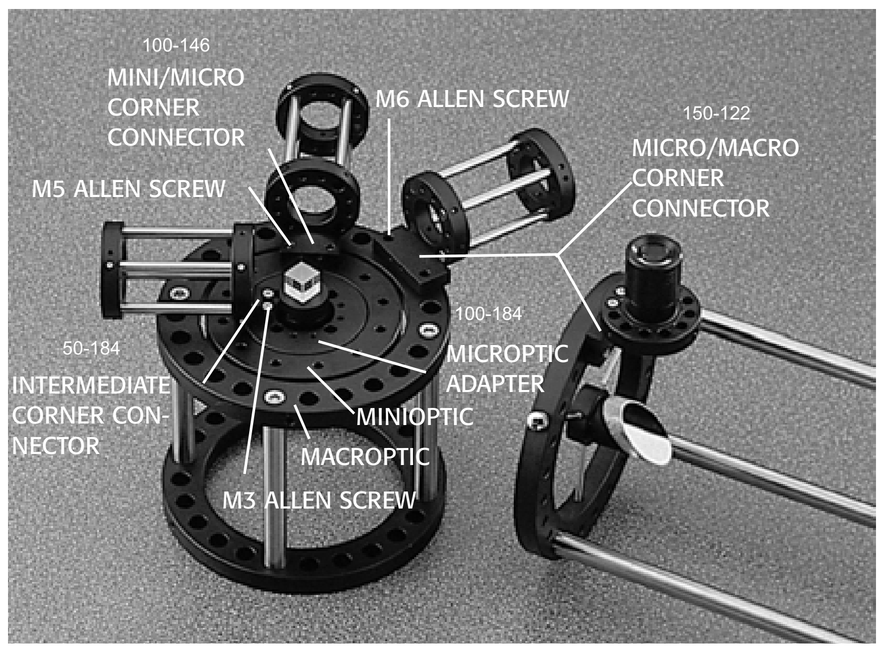
The most advantageous feature of Optoform is its three-point optics-mounting scheme. It allows you to center the optics, build spider assemblies, secure smaller plates within larger plates, etc.

All Optoform mounting plates (ranging from 25 mm to 150 mm in diameter) are directly upward and downward compatible in two distinct ways:

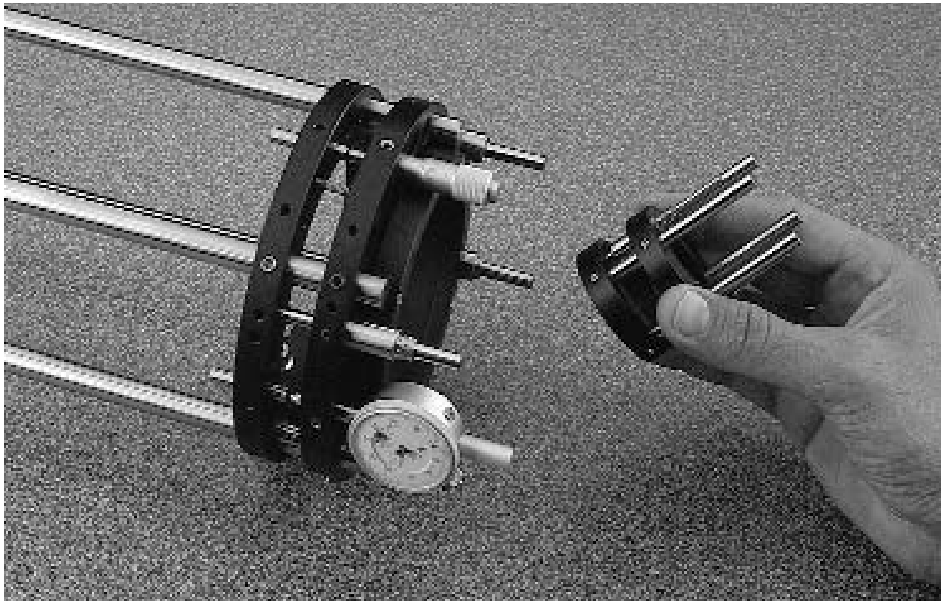
1) By means of cone-tip, optics mounting screws that are oriented 120 degrees apart, and step up in size as mounting plates increase in diameter (left).

2) By means of corner connectors, that allow mixing of different plate sizes (right).

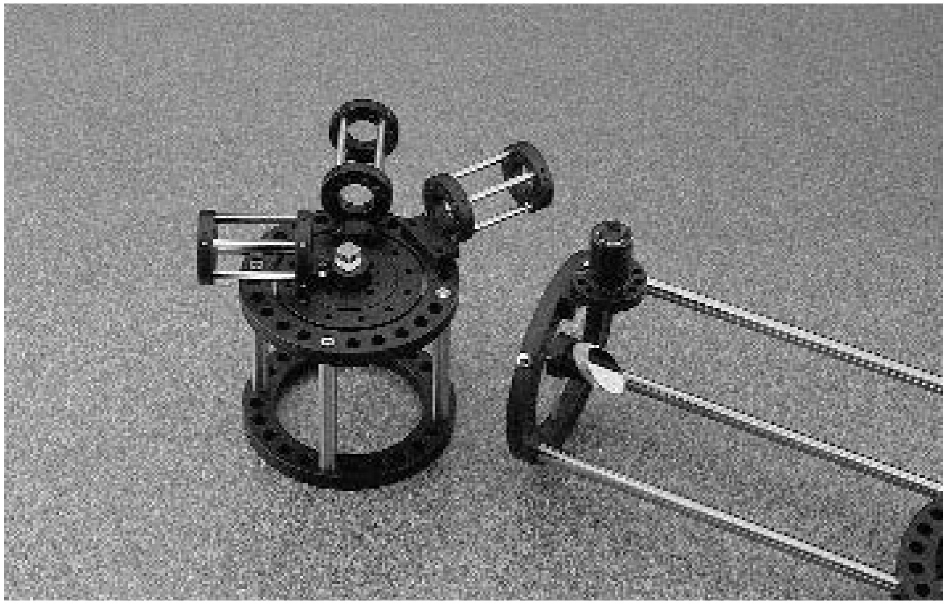




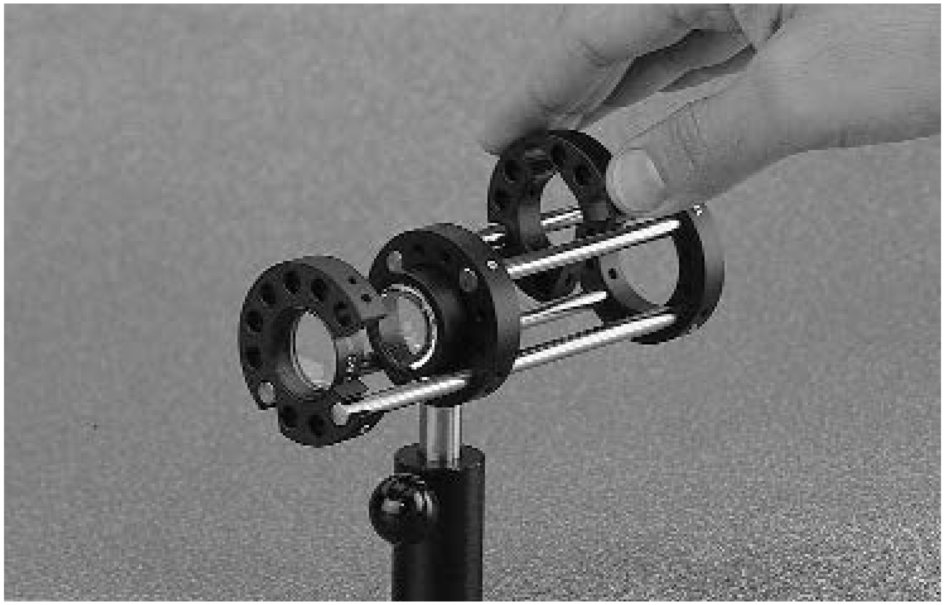
Each circular mount in Optoform can secure the smaller mount via cone-tip set screws. To obtain central adjustments, reducing adapters must be utilized.



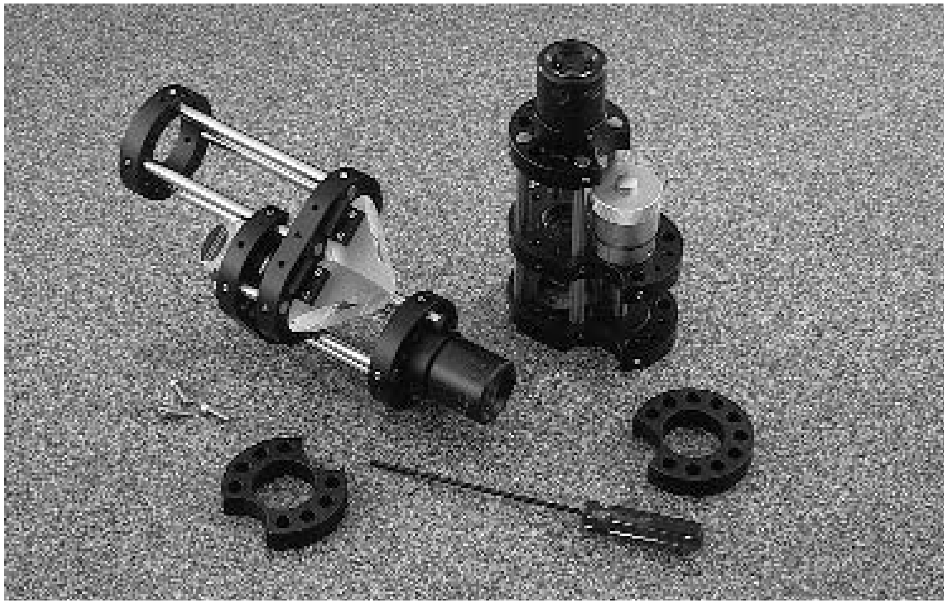
Precision linear bearings provide smooth axial displacement. For the first time, large optical elements can be accurately displace and their position be measured by electronics linear scales,or dial indicators. Also shown is 100 mm lens mount.



Concentric mounting of plates (left) allows several beams to be combined and independently rotated. The same outer ring (MACROPTIC) is utilized to construct a Newtonian telescope (right). The spider assembly utilizes standard mounting bores.

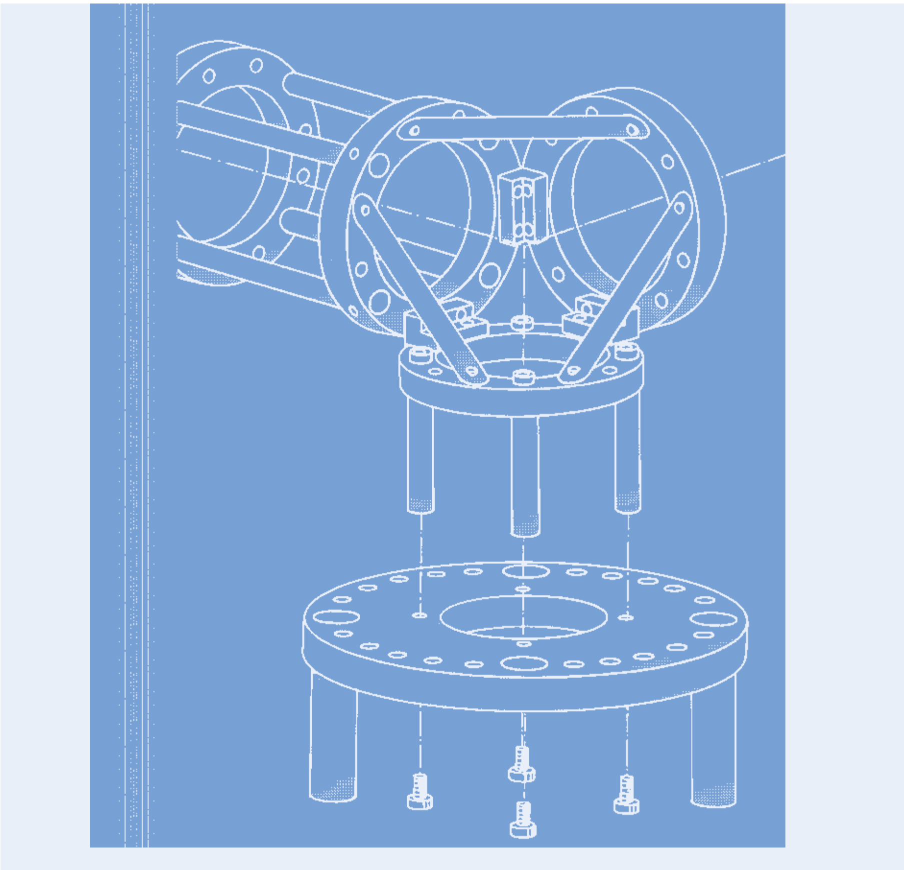


The two-rod insertion plate (50-102) and four-rod insertion plate (50-148) have open support rod mounting holes that permit their insertion into assemblies without disturbing the system. Also shown is post mount 50-126.



BIOPTIC mount (50-133) permits mounting of two closely spaced optical elements such as used in stereo microscopes. Shown is a porro-prism erecting system (left) and a compact microscope with fine focusing micrometer (right).

These are close ups of a few Optoform accessories. It's not the accessories that make Optoform so versatile, but the possibility of their combination.

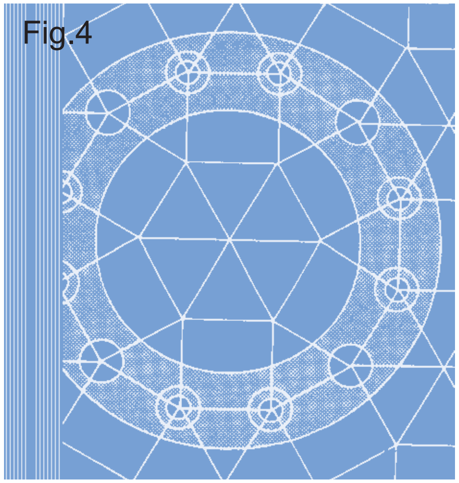


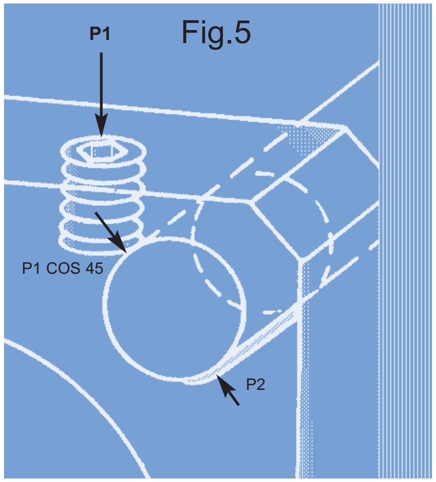
OPTOMECHANICAL STABILITY

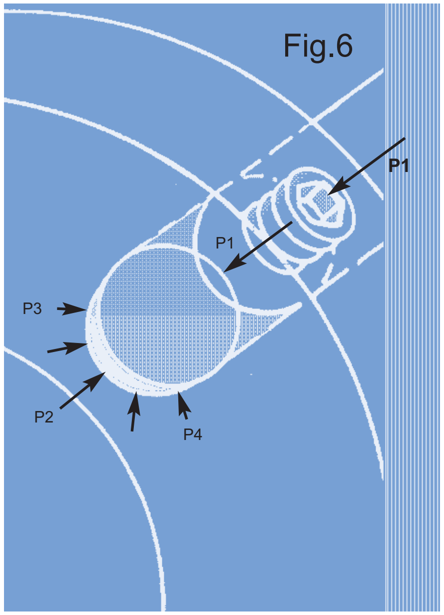
Optoform consists of modular parts for assembly of self-supporting frameworks, i.e. two dimensional and space frame optical structures. It means creative design using geometrical shapes that conform with the internal optical elements.

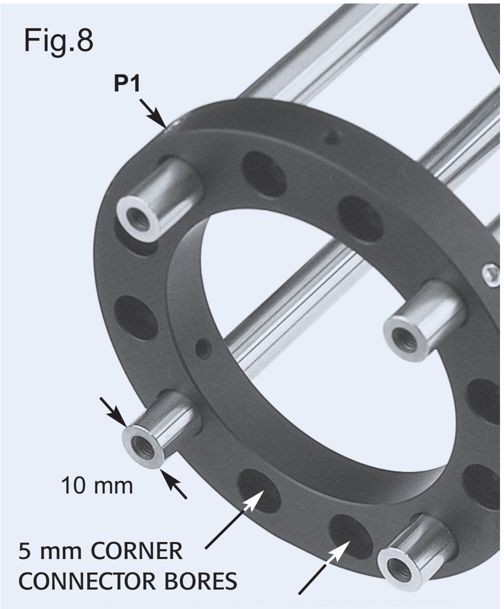
The hole pattern in Microptic, Minioptic and Macroptic plates obey a geometrical design consisting of equilateral triangles and squares (Fig.4). This crucial geometry is the basic principle on which optical support frames are founded. By the joining of these modular elements, a network of intersecting supports is obtained designed to cope with bending stresses with alternating directions of force.

The clamping technique of support rods is the most crucial factor in stability of optical rail systems. If the clamping screw is touching the rod at only one edge (Fig.5), the resulting pressure would only secure the rod between two contact points. Systems with direct pressure of set screw against the rod (Fig.6) produce large enough clamping force to flex the cylindrical bore. This in turn, forms an actual contact area on the opposite side of the rod (as shown), resulting in a wobble-free joint. A prerequisite to this is close tolerance bore location, and precision ground support rods.



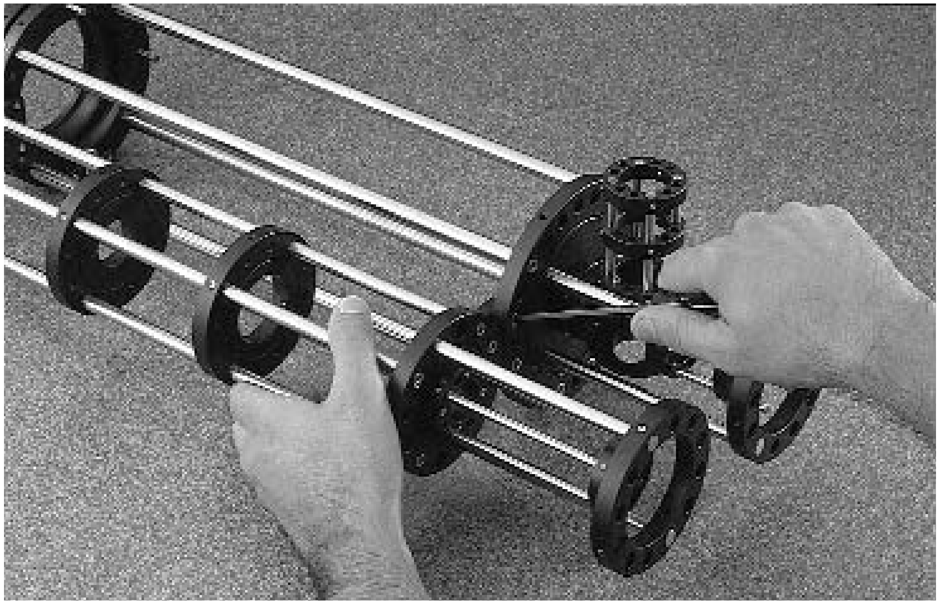




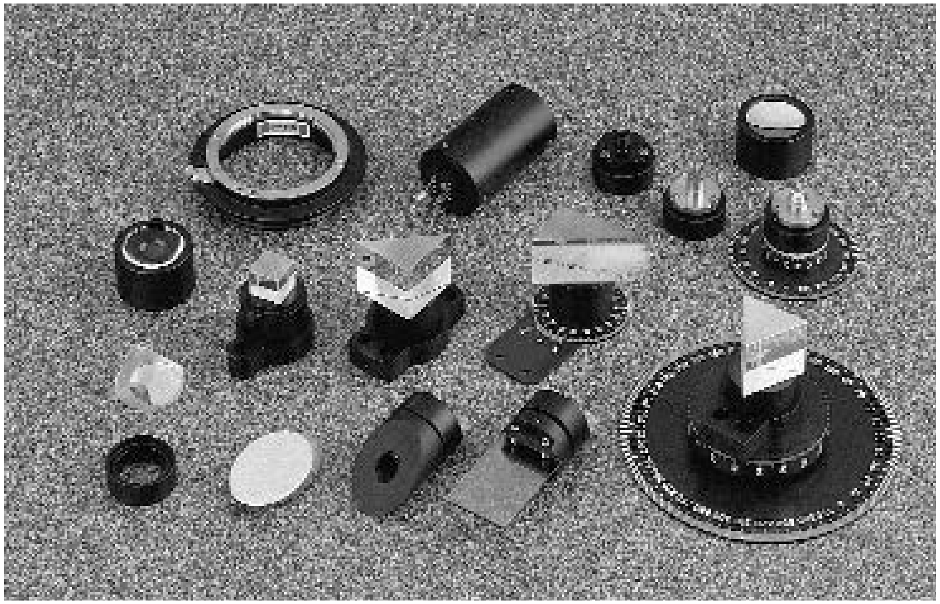


High tolerance bores and rods do pay off when structural stability is tested and compared between various systems.

Support tubes allow long optical path-lengths and utilization of larger optics. Shown above is a 50 mm MICROPTIC lens mount attached to a 5-way node. A 3-way node is shown on the left. Oblique rods (rear) maintain rigidity at the node.



The MINI and MACRO assemblies are side-mounted here to reduce size and weight. The MINI assembly supports a laser and beam expander. This beam is folded twice and brought to the MACRO assembly which supports a 100 mm lens.



A wide variety of mounts and accessories are available for opto-electronics, fiber optics,and spectroscopy experiments. The circular shape of Optoform mounts naturally integrate with graduated rings for precise angular measurements.

Various illumination methods are available for Optoform. Two alternative light sources are shown above for MICRO and MINI systems. Tubing can be used to both shield and lamp housing and provide sufficient space for large lamps.

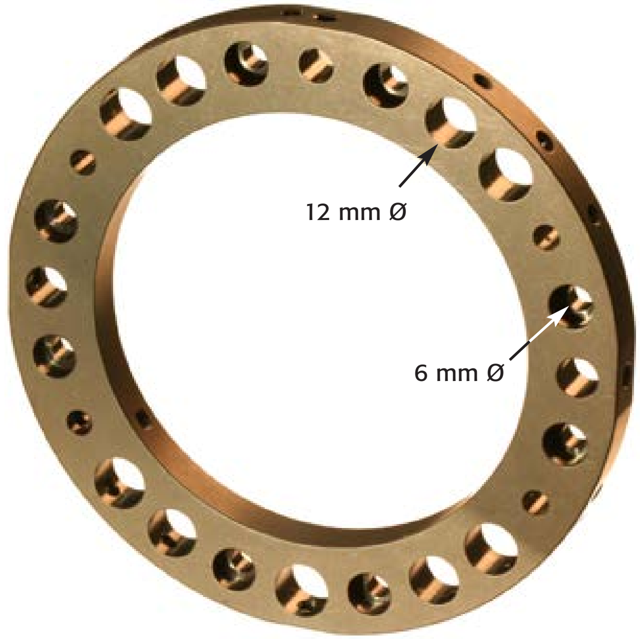
Accessories in Optoform are designed to have upwards and downwards compatibility. Nothing is added unless every other piece is first considered.

LINEAR BEARINGS

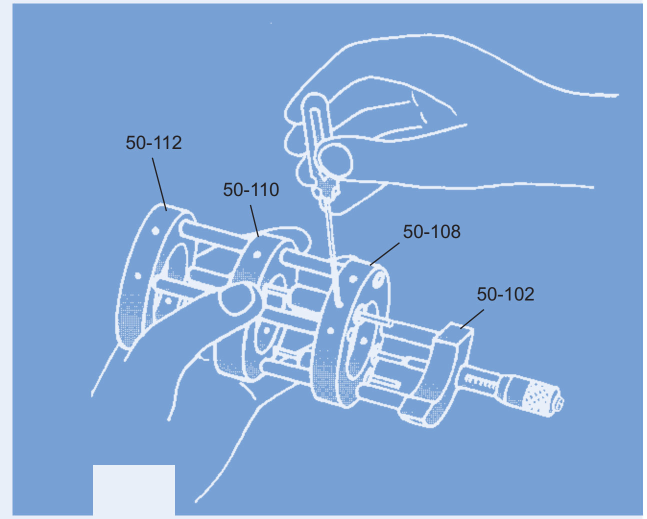
Linear bearings are the heart of many optical translation stages. These precision ground devices consist of a central shaft, a ball cage, and an outer bushing.

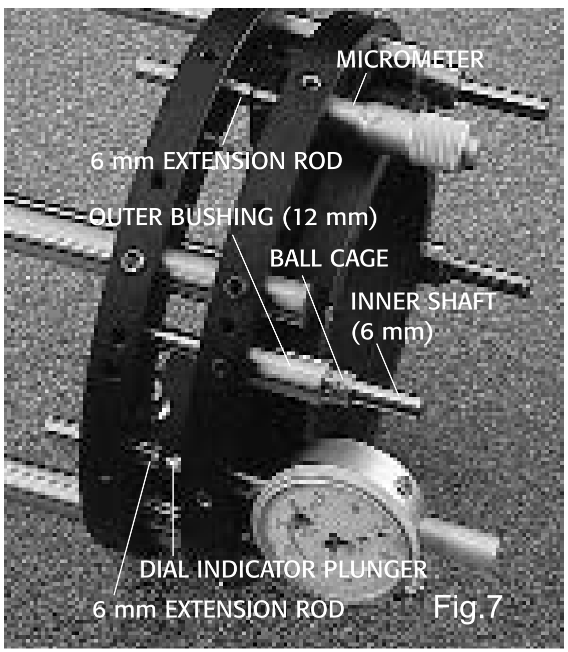
Optoform uses linear bearings in a very unique way: The two sizes of bores for support rods and corner connector bores are identical to the outer bushing and inner shaft of linear bearings respectively.

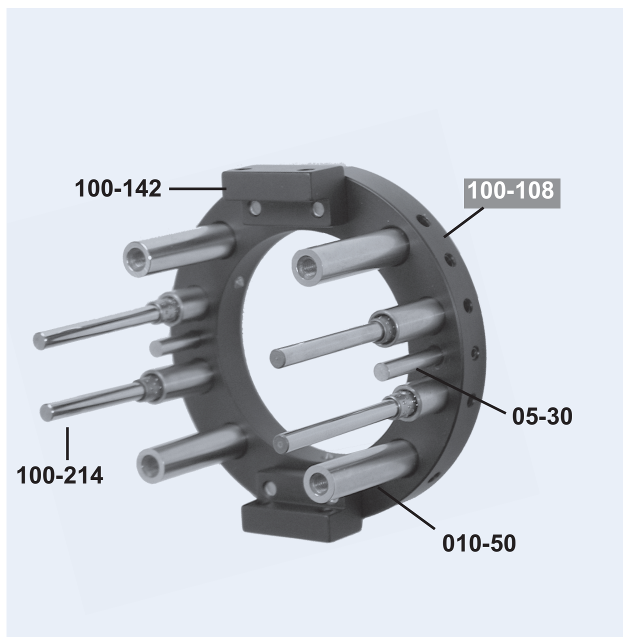
For example, in Minioptic (Fig.8, previous page), these two sizes are 5 mm and 10 mm, and for Macroptic (right) they are 6 mm and 12 mm. This feature makes linear bearings a natural part of the system.

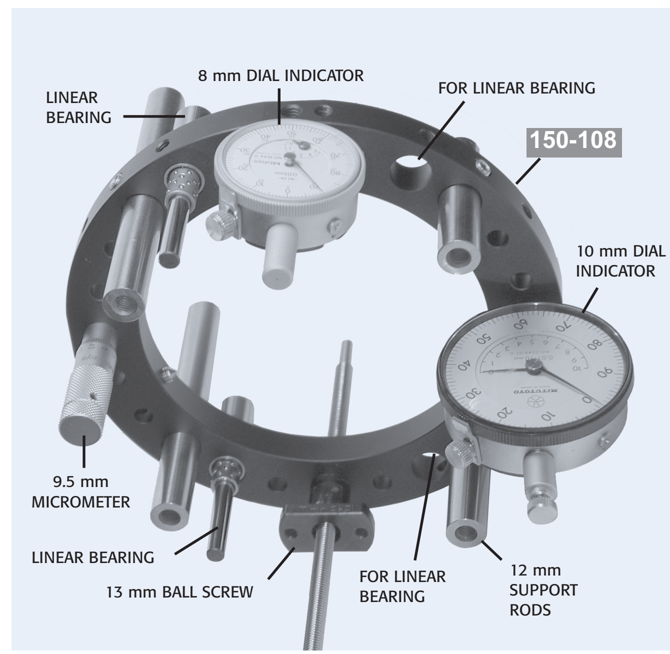


A LINEAR BEARING MOUNT







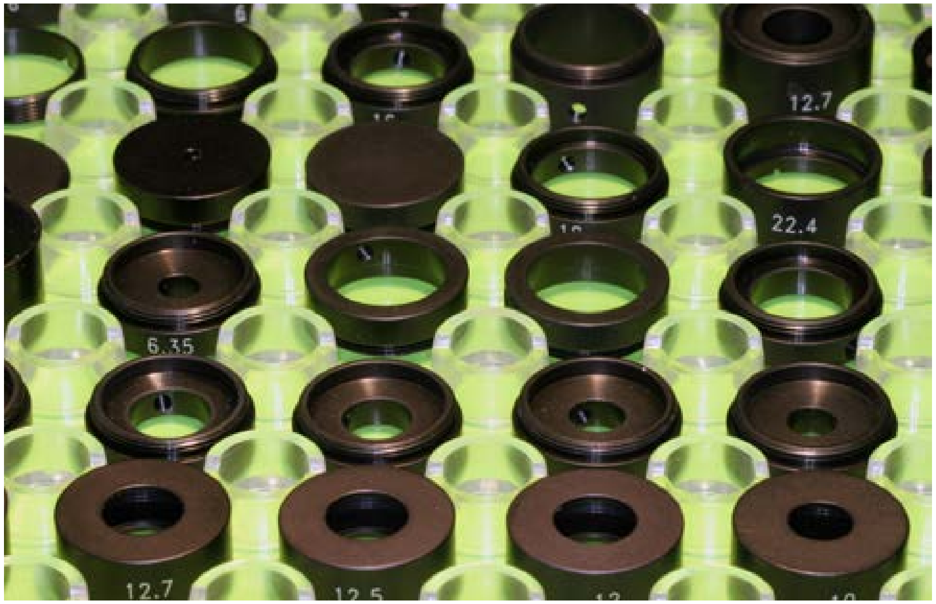


Linear bearings are utilized in vertical or horizontal arrangements. Up to four linear bearings are possible on each translational plate.

MICROPTIC Kit 50 contains 73 mounting, positioning, and illumination components, and 34 rods ranging from 30 mm to 450 mm in length. Appropriate for building microscopes, alignment telescopes, spectrometers, beam expanders, etc.

MINIOPTIC Kit 100 contains 42 mounting and positioning pieces, and 28 rods ranging from 50 mm to 450 mm in length. Ideal for taking table-top experiments outside the lab or mounting setups against vacuum chamber window, etc.

MACROPTIC Kit 150 contains 35 mounting, and positioning components, and 28 rods ranging from 50 mm to 450 mm in length. Useful for building telescopes, tall microscopes assemblies, wave-front analyzers, optical test beds, etc.



Micromax Kit 25-700 contains most of the 85 Micromax pieces, including lens mounts from 6 mm to 22.4, accessory holders from 3 mm to 20 mm, tube lengths from 5 mm to 30. The fitted case is also suitable to store mounted optics.

Optical kits are designed to deliver the main role of each system: Microptic is for beam manipulation, beam focusing, beam steering, illumination, etc.

DESIGN WORKS

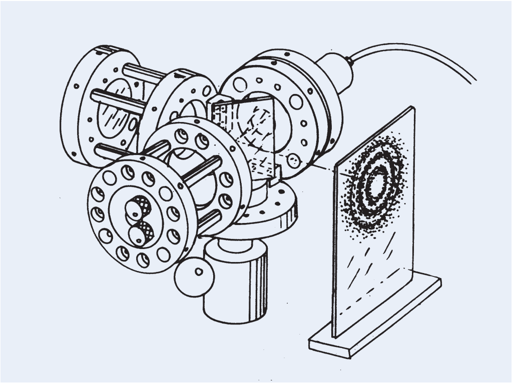
It would be useful to have already designed Optoform kits to build, i.e., an autocollimator, a Michelson Interferometer, or a special filter, etc. These kits are available throughout the catalog whenever a setup is found to have standard uses by everyone. The user could then purchase the complete setup by ordering one part number, and then modify it as required.

Various DWX kits will be available at our website. These kits are predesigned and include all the necessary hardware. Because the optical design is left to the end user, optical elements, and fiber patchcoards are eliminated. We do offer the correct optics to use with each DWX kit as we have designed them.

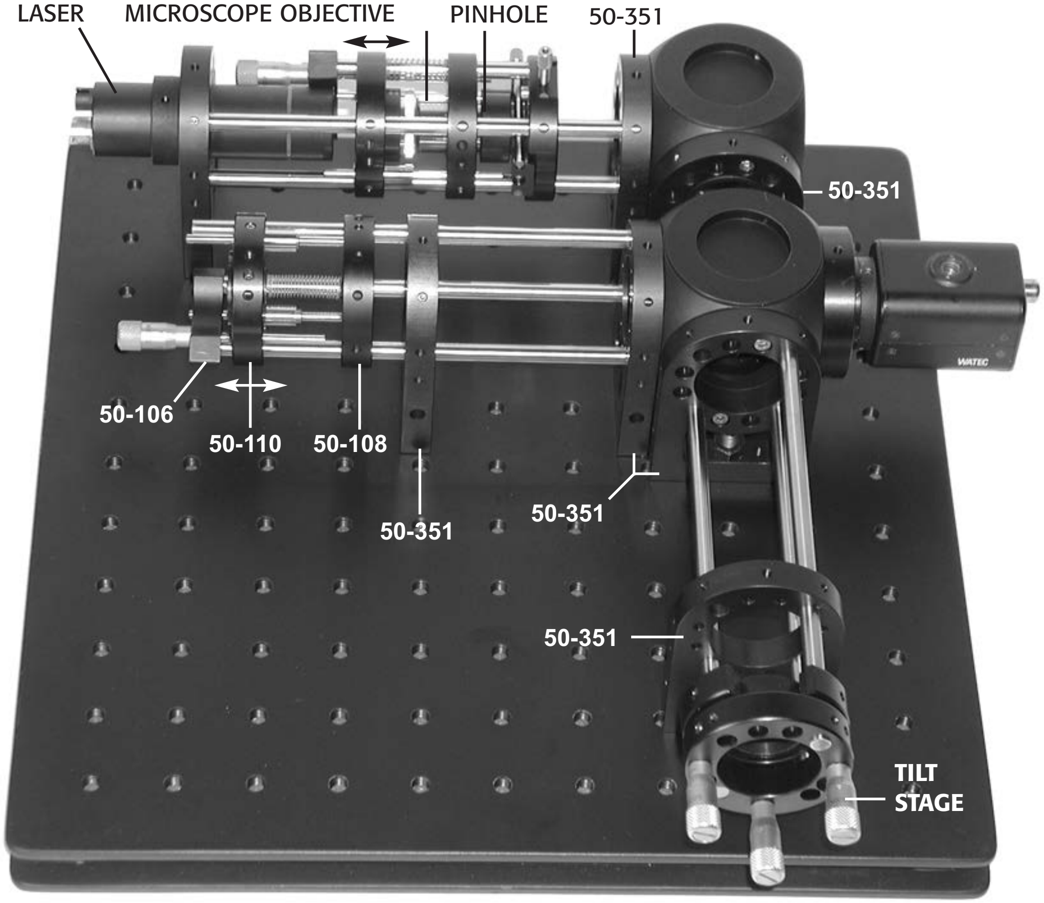
Michelson Interferometer has many applications in Optical surface testing, stellar interferometry, surface profiling, displacement measurements, etc.

DWX-150 Uses a laser diode with circular beam spot output, a 6X beam expander similar to DWX-100, a fold mirror, a beamsplitter, and two flat mirrors, each at the end of 150 mm arms. The interference fringes are projected onto a CCD camera.

One arm of the interferometer is equipped with a linear bearing adjustable delay line carrying an adjustable prism table 50-335. The other arm carries kinematic tilt stage 50-177 with .25 mm pitch micrometers.



A SIMPLE INTERFEROMETER BUILT WITH THE EDUCATIONAL KIT 50-710



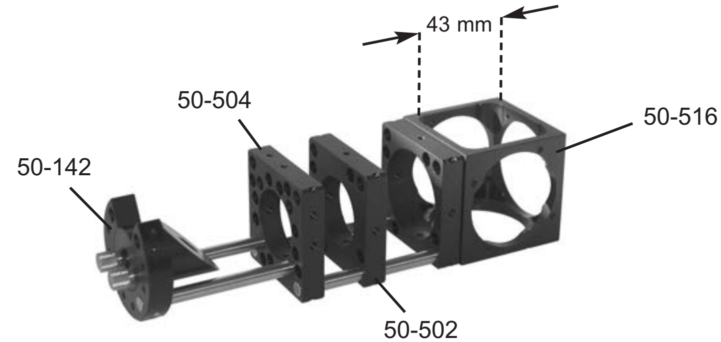
DWX-150 MICHELSON INTERFEROMETER

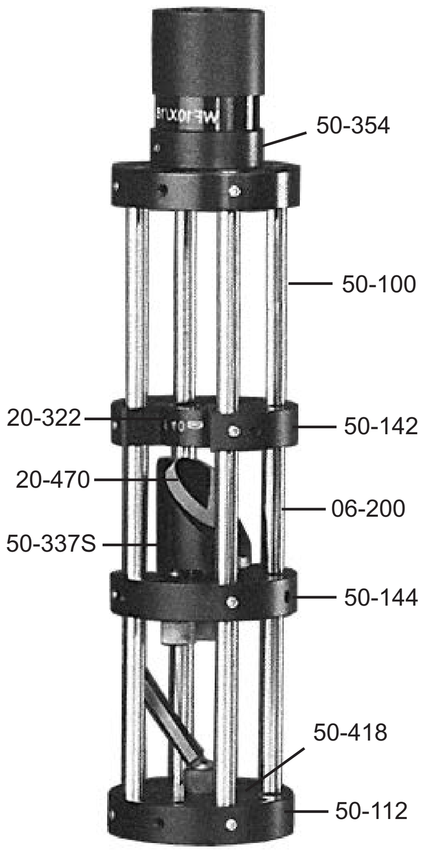
We offer 12X12" breadboards that can support small Microptic setups. The main support base for Microptic is 50-351. This mount allows adjustable mounting.

BUILDING LARGE INTERFEROMETERS

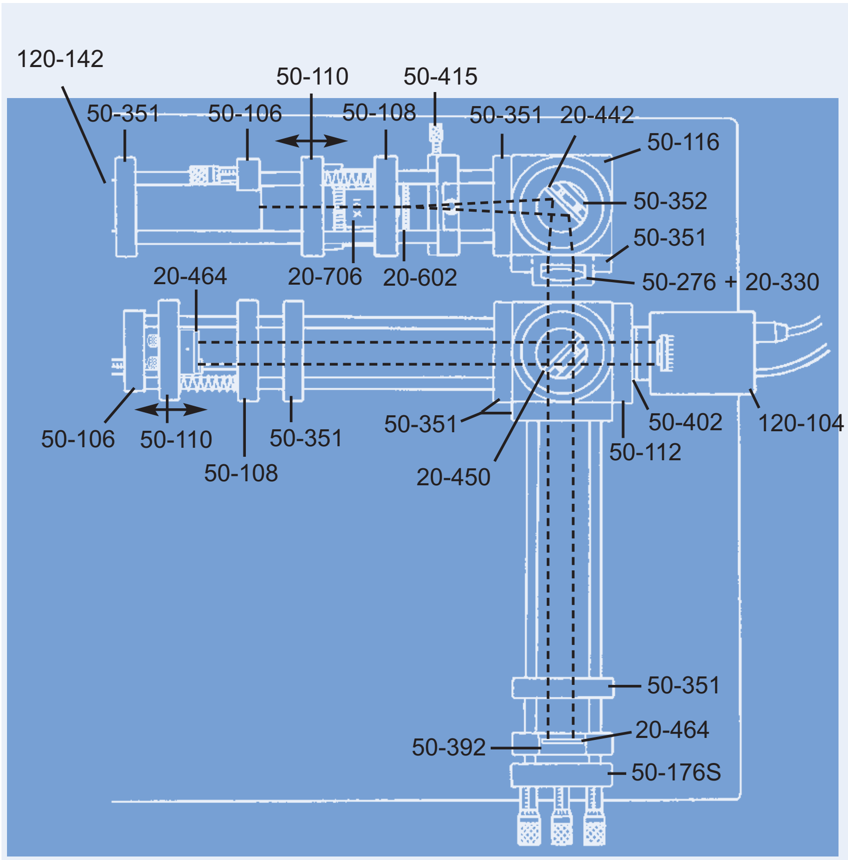
Like the rest of Microptic 2X2 components, 50-516S (right) provides space for beamsplitter prisms as large as 1.5X1.5 inches. Building a large interferometer on the other hand, does not require all the optics to have the same large diameter.

An interferometer that can cover a 4"Ø area, could be setup by simply building a small interferometer first, and then expanding the beam to 4 inches. Therefore, the main structure of large interferometers can be easily constructed with Macroptic and Minioptic components, while the interferometry aspect could be given to Microptic.

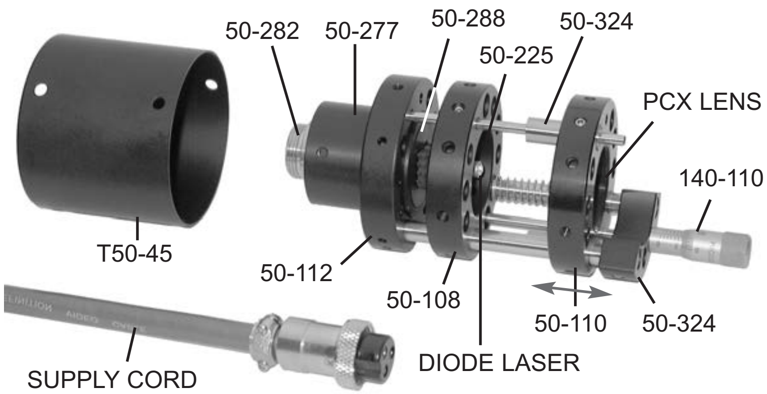




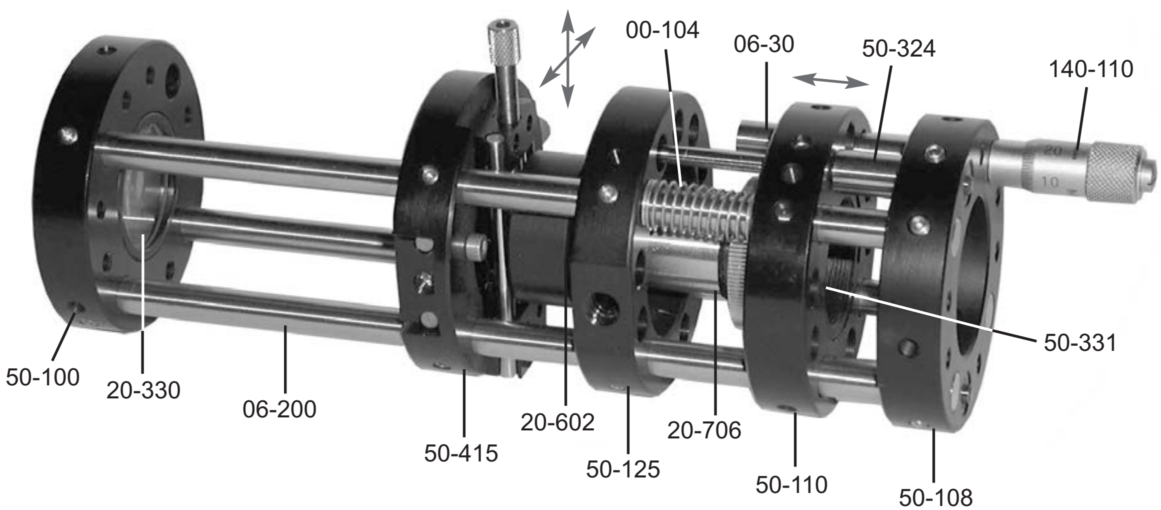
DWX-118 ALIGNMENT TELESCOPE



DWX-150 THE SCHEMATIC OF THE MICHELSON INTERFEROMETER

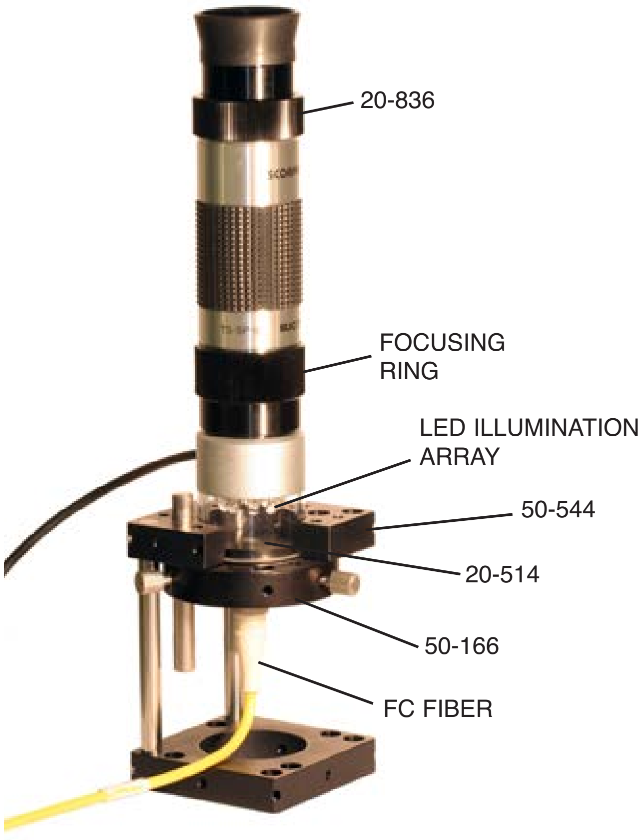


DWX-126 **LASER DIODE / PHOTO DIODE COLLIMATOR**



DWX-100 **SPATIAL FILTER / 6X BEAM EXPANDER**

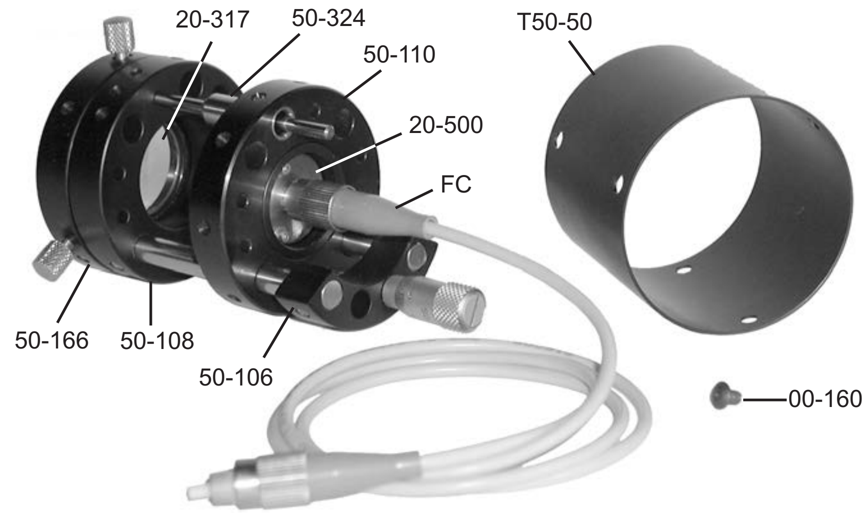
Optoform setups can be put away as stand alone instruments. When disassembled, the spare parts can be put together to make other small instruments.



FIBER END INSPECTION MICROSCOPE

Microscope stands have the traditional horseshoe shape. In Optoform, 50-352, and 50-149 are side mountable to create an instrument base (see page 99). The simplest form for a microscope base is the vertical configuration shown above.

Sugitoh's illumination ring (above) consists of an array of bright LED's with adjustable output. The 25, and 30 mm O.D. of Sugitoh's accessories makes them an ideal companion to the Optoform system.



DWX-120 FIBER COLLIMATOR

SURFACE INSPECTION MICROSCOPE