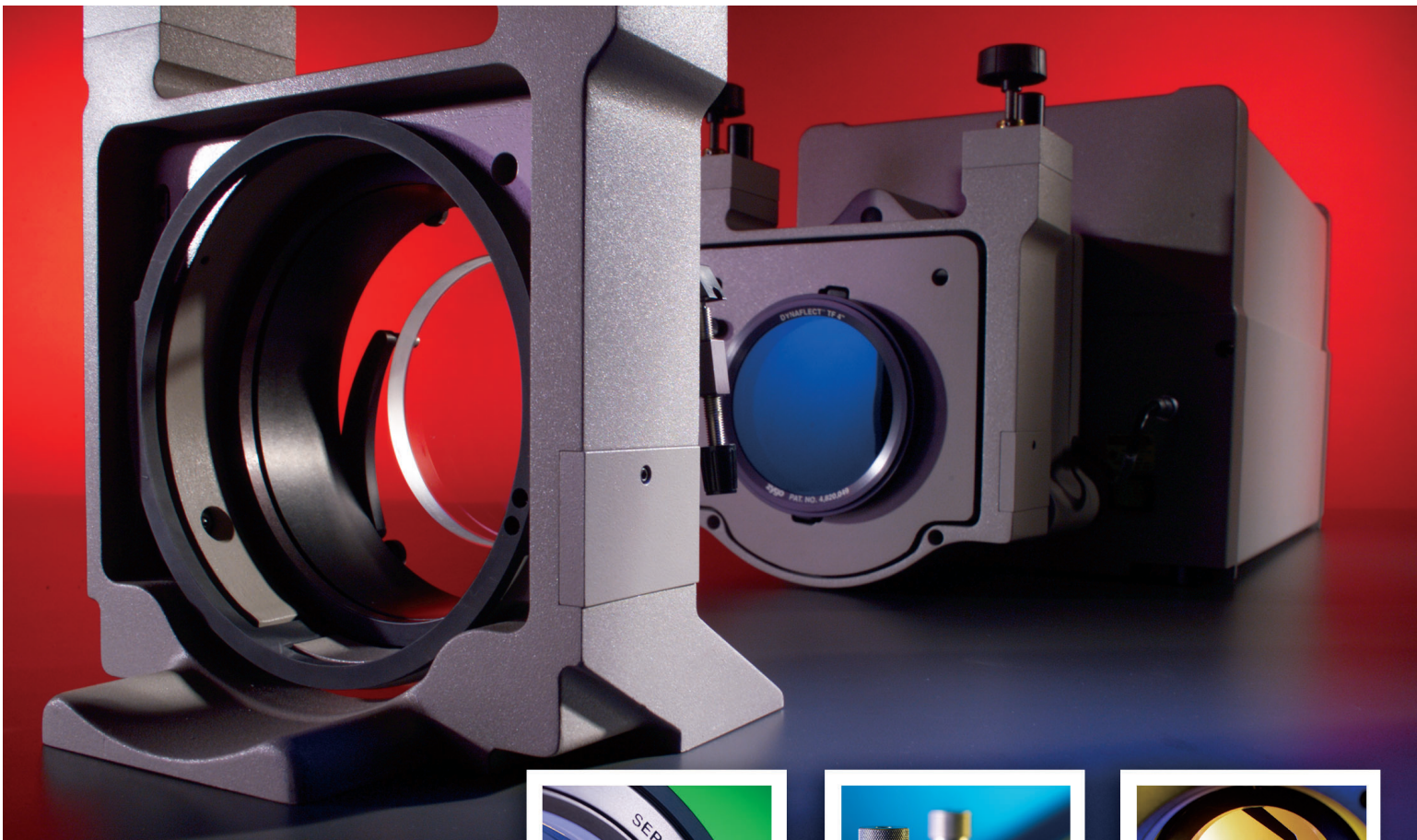


ZYGO's Guide to

Typical Interferometer Setups

- Surfaces
- Windows
- Lens Systems



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Welcome to the Interferometer Setups Guide

This booklet illustrates and discusses a number of the most common measurement setups for use with a Zygo Corporation interferometer. However, it is by no means a comprehensive collection of all the setups that are possible, partly because new and innovative setups are developed every day by users around the world.

Therein lies the beauty of Zygo Corporation's modular interferometer system; it is not limited to specific measurement setups that fit only specific measurement situations. It is dynamic, versatile, and limited only by the imagination and resourcefulness of the user.

With every technological advancement comes the challenge of finding a way to measure and quantify it, and an opportunity to use interferometry in a new way. Industries not previously considered to be likely candidates for interferometric testing are now utilizing this valuable tool to measure computer disks, diamond-turned surfaces, precision machined metal parts, highly polished metal surfaces, and so on.

All it takes is a little knowledge, some creativity, and a ZYGO interferometer. We hope this booklet sparks your imagination.

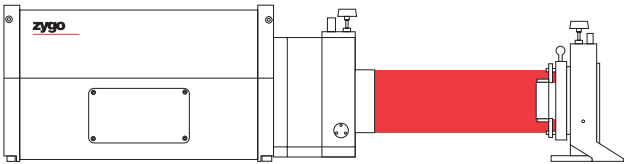
The Setups

Each setup example in this booklet shows a Mainframe, the part being tested, and the accessories required to make the setup work. The accompanying text explains how the setup is used. A GPI Mainframe is shown in the examples; however, any ZYGO interferometer may be used with equal success.

For many measurement situations, the Mainframe and the accessories may all sit on one vibration isolation table, with the measurement beam oriented horizontally. More elaborate arrangements are certainly possible, and may be required to suit particular measurement needs.

If you have questions about any of the setups, or you would like to discuss a setup not covered in this booklet, please contact Zygo Corporation for assistance. Our Support Team is ready to help you understand and explore interferometry.

Surface Flatness



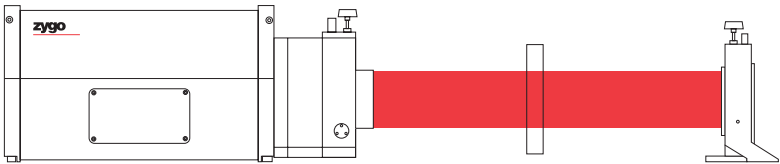
Suggested Accessories

	Transmission flat 4%
	Mount, 2-axis
	Self-centering element holder

This setup is used for the measurement of surface flatness of plano elements such as mirrors, prisms, and windows. The test object must be held so that the surface under test can be aligned in two axes of tilt.

The Align Mode is used for rough alignment. The View Mode, using the Quick Fringe Acquisition System, is then used for fine alignment.

Plano Transmitted Wavefront



Suggested Accessories

	Transmission flat 4%
	Reference flat 4%
	Mount, 2-axis

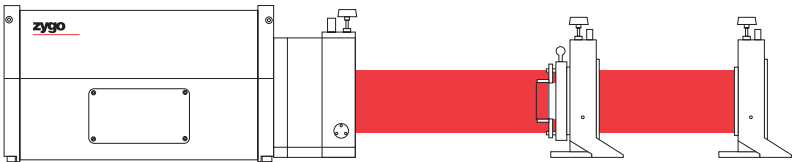
If needed, for test element:

	Mount (2-axis)
	Self-centering element holder

This setup is used to measure distortion of a plane wave transmitted through the element under test. It is typically used for windows, filters, and prisms. In addition, glass and other transparent raw material may be examined for homogeneity. Software packages are available for material homo-

geneity evaluation. Since the measurement beam passes through the element under test, this element need only be placed nominally perpendicular to the optical axis of the test beam. No special alignment is required.

Parallelism (Wedge)



Suggested Accessories



Mount, 2-axis



Self-centering element holder

For medium wedges add:



Mount, 2-axis



Transmission flat, 4%

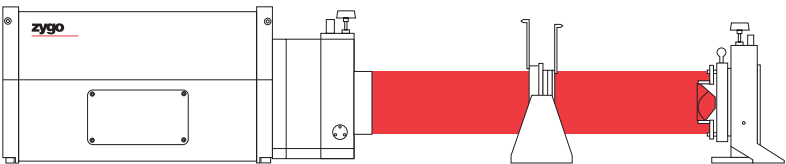


Reference flat, 4%

Parallelism (wedge) can be measured using the Mainframe. Measurement of very small wedges requires no auxiliary optics because interference is obtained between wavefronts reflected from the two surfaces of a transparent element. The element must only be placed nominally perpendicular to the Mainframe output beam. The optical and mechanical wedge can be calculated

from the resulting interference pattern. For medium wedges, the Plano Transmitted Wavefront setup can be used. This and other techniques, some with a fraction of an arc second resolution, can be used to measure wedge using a phase measuring Mainframe.

Prism and Corner Cube Testing



Suggested Accessories



Transmission flat, 4%*



Attenuation filter*



Mount, 2-axis



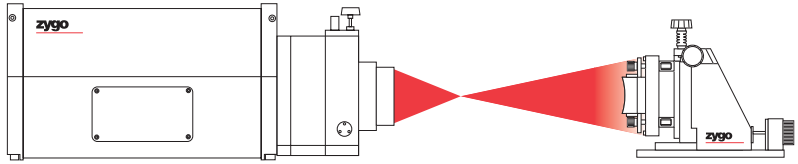
Self-centering element holder

Many prisms and corner cubes can be measured as if they were a plano, that is, facing a transmission flat on the Mainframe. For pieces with high equivalent reflectivity (i.e. > 40%) an attenuation filter can be used as shown in the center of the setup, or a

Dynalect™ flat in place of the 4% transmission flat. ZYGO's MetroPro™ software can calculate angle errors as well as transmitted wavefront errors.

*A Dynalect™ transmission flat may be used instead of these two accessories for high reflectivity pieces.

Transmission Sphere Selection



Suggested Accessories

	Transmission sphere
	Mount, 3-axis or 5-axis
	Self-centering element holder

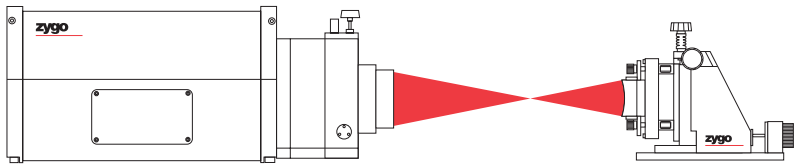
Transmission spheres of various f/numbers are available as standard items, and others may be obtained on special order. In order to select the optimum transmission sphere f/number to fill the aperture of a concave or convex surface, the R/number of the surface to be measured is calculated using the following formula:

$$\text{R/number} = \frac{\text{Radius of curvature of surface under test}}{\text{Clear aperture of surface under test}}$$

If the R/number of the surface under test does not match the f/number of the transmission sphere being used, one of two situations will occur. If the R/number is smaller than the f/number, the interferogram will not fully cover the entire aperture of the surface under test. If the R/number is larger than the f/number, the interferogram will be smaller than full size on the monitor, which can be compensated for by using the Mainframe's variable zoom.

A transmission sphere selection guide is available from Zygo Corporation to assist in choosing the correct f/number.

Concave Surface Figure



Suggested Accessories

	Transmission sphere
	Mount, 3-axis or 5-axis
	Self-centering element holder

A transmission sphere transforms the Mainframe output beam into a precise spherical wavefront for the evaluation of spherical surfaces and lenses. A concave spherical surface is examined for surface figure and irregularity, i.e., the deviation from the best-fitting sphere, by placing its center of curvature coincident with the focus of the transmission sphere. This usually difficult

alignment is simple and takes only seconds using the Mainframe's Quick Fringe Acquisition System. Adjustment of the surface under test can be provided by a 3- or 5-axis mount. The 3-axis adjustment is necessary for spheres. However, the 5-axis mount is often chosen to be used with both spheres and flats (which need tilt adjustment).

Convex Surface Figure

Suggested Accessories



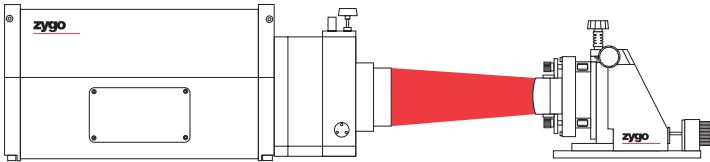
Transmission sphere



Mount, 3-axis or 5-axis



Self-centering element holder



Convex spherical surfaces are examined for surface figure and irregularity using the setup shown. In order to select the optimum transmission sphere, two criteria must be met. First, the radius of curvature of the convex surface under test must be less than the back focal length of the transmission sphere. Second, the radius of curvature of

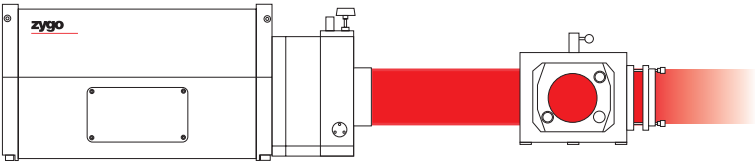
the surface under test divided by the clear aperture, i.e., the R/number, should be greater than or equal to the f/number of the transmission sphere. Both four-inch and six-inch diameter transmission spheres are available for these applications. Adjustment of the surface under test can be provided by either a 3-axis or 5-axis mount.

Two or More Simultaneous Measurement Channels

Suggested Accessories

MUX Cube

Other accessories as required



This illustration shows how two horizontal measurement channels are produced with a MUX (multiplexing) cube. Each channel can support its own measurement setup and has all of the Mainframe's features.

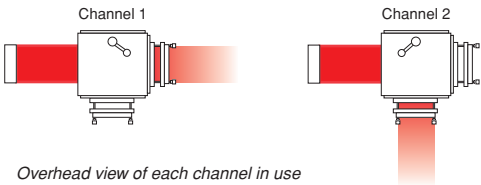
The transmission elements for each channel snap in the accessory receptacle on the MUX cube.

The two measurement channel feature is particularly useful because it significantly enhances the utilization of the Mainframe. Two common use modes are:

Two operators can each use one of the measurement channels and thereby share one Mainframe.

An operator can take measurements in one channel while the test setup in the second channel is coming to thermal equilibrium.

Very simply, the Mainframe can remain in use while a test setup comes to thermal equilibrium or while test setup is being put together in the other channel.



Slow Concave Surface Figure (Moderately-Long Radii)

Suggested Accessories



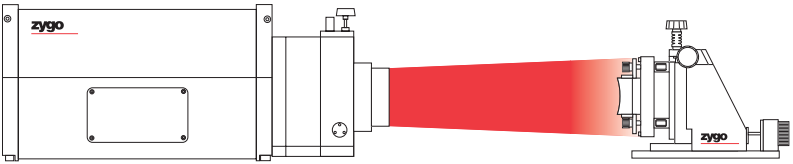
Transmission
sphere, diverger



Mount, 3-axis
or 5-axis



Self-centering
element holder



Spherical surfaces with R/numbers in the range from 11 to 50 are best measured using the converger/diverger series of transmission spheres. The illustration depicts the

measurement of a slow concave surface using a diverger. Refer to the converger/diverger accessory sheet for the range of radii covered by each member of this series.

Slow Convex Surface Figure (Moderately-Long Radii)

Suggested Accessories



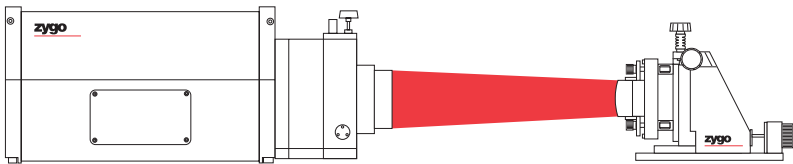
Transmission
sphere,
converger



Mount, 3-axis
or 5-axis



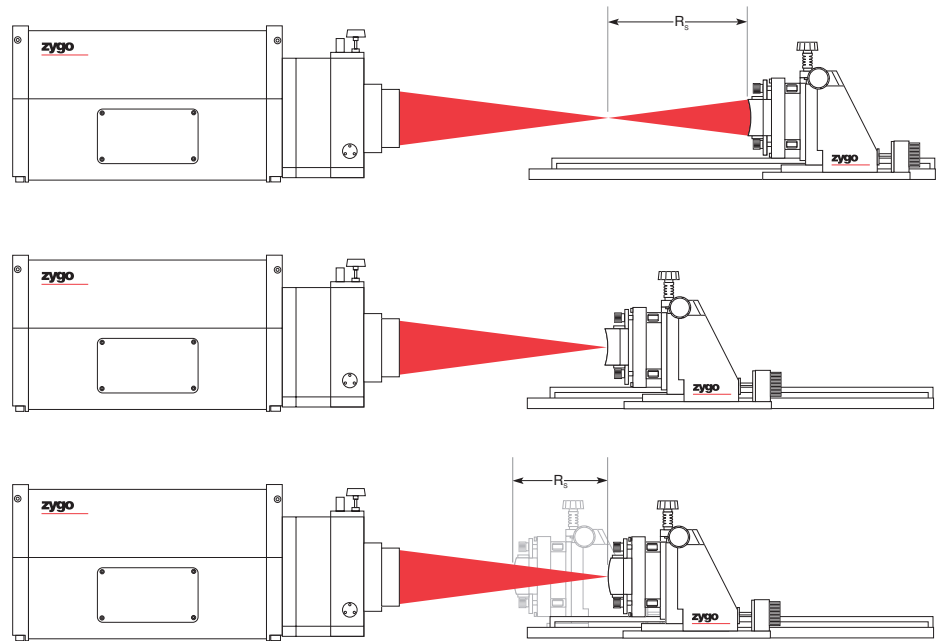
Self-centering
element holder



This illustration depicts the measurement of a slow convex surface using a converger.

Note: For surfaces with very long concave or convex radii, contact Zygo Corporation for a quotation on a custom transmission sphere.

Noncontact Radius of Curvature and Figure



Suggested Accessories



Transmission
sphere



Mount, 3-axis
or 5-axis



Self-centering
element holder

Digital
Radius Slide

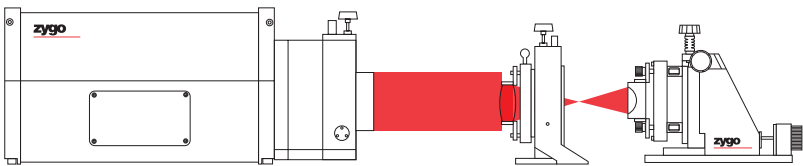
In addition to surface figure and irregularity, the radius of curvature of both concave and convex spherical surfaces can be measured. The center of curvature of the test surface is positioned to coincide with the focus of the spherical wave emanating from the transmission sphere. In this arrangement, shown in the first illustration, the fringe pattern provides information not only about the figure and irregularity of the surface under test, but also about the precise location of the center of curvature of the test surface with respect to the focus of the transmission sphere. The surface under test is then translated along the optical axis of the interferometer until the surface under test coincides with the transmission sphere focus, as shown in the second illustration. The fringe pattern again provides a very sensitive indicator of the point where the surface coincides with the focus. The distance that the surface under test is translated, R_s , is equal to the radius of curvature of the surface.

A digital radius slide provides a convenient read-out of the translated distance. Used with an encoder, this technique is accurate to 20 μm or 0.1%, whichever is larger. For cases where very high accuracy is required (1 μm or 0.001%) an Interferometric Radius Slide is available. Both the encoder and the Interferometric Radius Slide can input these distance measurements directly to the interferometer's processor to correct for positioning errors.

The accuracy to which the radius of curvature of a high quality spherical or cylindrical surface can be determined is not just a function of the distance measurement accuracy. It is also a function of the R/number of the surface being measured, as well as the user's ability to judge fringe straightness (if the user does not choose to correct for positioning errors).

The third illustration shows the equivalent surface figure and irregularity and radius of curvature measurement setups for convex surfaces.

Lens/System Performance



Suggested Accessories



Transmission flat, 4%



Mount, 2-axis



Mount, 3-axis or 5-axis



Reference sphere



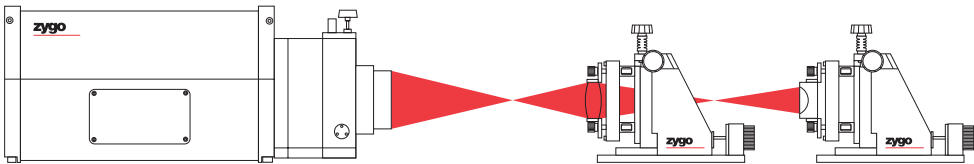
Self-centering element holders (2)

Lens or system quality can be measured by examining the distortion of the transmitted wavefront. For a lens or system focused for infinity, the lens can be placed in the collimated measurement beam and a high quality concave or convex sphere can be

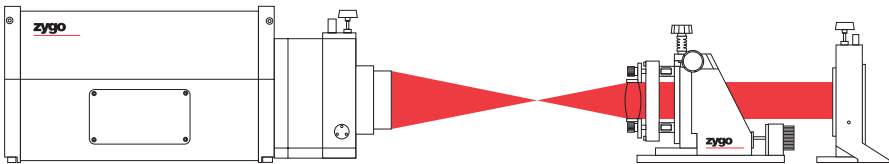
used to retroreflect the transmitted wavefront. By rotating the optical axis of the lens under the test with respect to the axis of the measurement beam, performance at various field angles can be determined.

Lens/System Performance (Alternate Method)

Finite conjugate lens test



Alternate infinite conjugate lens test



Suggested Accessories



Transmission sphere



Mount, 5-axis

For finite conjugate lens test add:



Reference sphere



Mount, 3-axis or 5-axis

For infinite conjugate lens test add:



Reference flat



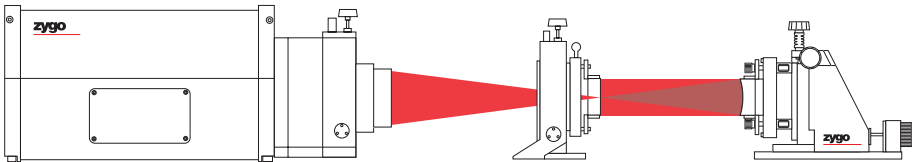
Mount, 2-axis

Particular situations may require an alternate lens/system setup. For lenses or systems with finite conjugates, a transmission sphere is necessary to form the “object” position in front of the lens under test. For systems with apertures larger than the sample beam of the interferometer, or for systems with apertures much smaller than the sample beam of the interferometer, this alternate setup may be advantageous. The alignment of the elements, however, may be significantly more difficult, and errors due to misalignment may be introduced.

Parabola Surface Figure

Suggested Accessories

	Transmission sphere		Mount, 5-axis
	Mount, 2-axis		Self-centering element holders (2)
	Perforated reference flat		

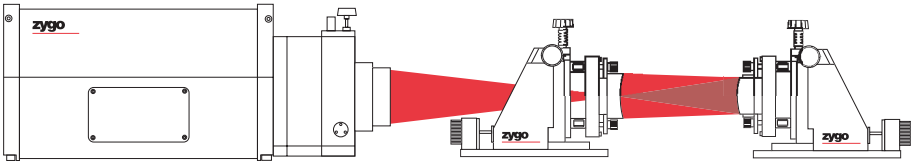


The surface figure and irregularity of a parabolic surface can be measured by employing a reference flat with a small central perforation, as shown in the illustration. Misalignment of a parabola as well as any of the other conical surfaces discussed here will introduce alignment errors, so a 5-axis mount is recommended to align these parts.

Hyperbola Surface Figure

Suggested Accessories

	Transmission sphere		Mount, 5-axis
	Mount, 3-axis		Self-centering element holders (2)
	Perforated reference sphere		

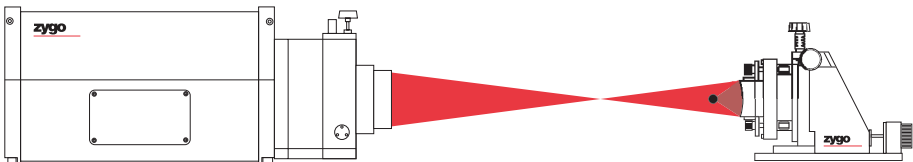


For a hyperbolic surface, the surface figure and irregularity can be measured as shown by using a reference sphere with a small central perforation.

Concave Elliptical Surface Figure

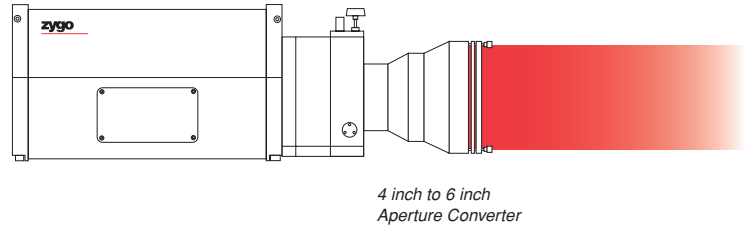
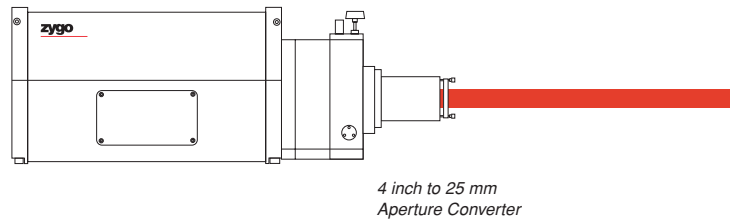
Suggested Accessories

	Transmission sphere		Mount, 5-axis
	Mount, 3-axis, modified for this setup to hold a glass retrosphere		Self-centering element holders (2)



Concave elliptical surfaces are examined for surface figure and irregularity by positioning a glass retrosphere in the measurement beam as depicted in the illustration.

The Need for Various Aperture Diameters



A number of situations may require the use of a different interferometer aperture diameter. For example, a single interferogram does not provide complete coverage when a plano surface, tested at normal incidence, is larger than the interferometer's aperture diameter. In this case, an interferometer aperture diameter at least equal to the test surface diameter is needed for full coverage with one interferogram.

Conversely, very small plano elements can produce interferograms too small to be useful. The Mainframe's 6X zoom obviates

this problem until the elements become very small ($< 15\text{mm}$), at which point the 6X zoom is not enough for the interferogram to appear full size on the video monitor. For these parts, it is helpful to begin with a smaller interferometer aperture diameter.

Convex surfaces, which must be placed in a converging measurement beam, may require a larger interferometer aperture. For convex surfaces of large size and/or long radius, it may be necessary to begin with a larger aperture converging beam produced by the appropriate transmission sphere.

Aperture Converters



To meet the above needs, Zygo Corporation offers two different aperture converters, which can be inserted into the Mainframe accessory receptacle, to convert the 4 inch measurement beam to either a 25 mm or 6 inch diameter. The 25 mm aperture converter accepts both the 25 mm and the older 33 mm transmission elements. The 6 inch converter accepts all standard 6 inch transmission elements. By changing the size of the measurement beam, the aperture converters provide magnification in addition to the Mainframe's 6X zoom.

For example, using the 25 mm aperture converter in conjunction with the 6X zoom, a 4 mm diameter plano element will appear full size on the video monitor. A complement of accessories is available for both the 25 mm and the 6 inch aperture systems. Zygo Corporation also offers larger fixed beam expanders for 12 inch, 18 inch, 24 inch and 32 inch apertures. These expanders are switched in using a MUX cube allowing alternate use of the 4 inch and expanded channel.

Accessories

A product guide for the ZYGO Interferometer

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Transmission Elements

Transmission Flats

Transmission Flats (TF) are used when measuring the surface quality or transmitted wavefront of flat surfaces or optics.

Flats are available with clear apertures from 33 millimeters to 32 inches. Each element is mounted in a cell and comes with a storage case.



Transmission Flat 4"

A reflectivity of 4% is standard, which provides the capability to measure surfaces with 0.1% to 40% reflectivity. For surface reflectivities greater than 40%, either an attenuation filter must be used to reduce the intensity of the beam returning to the interferometer, or a Dynaflect™ transmission flat may be used. A Dynaflect™ element accommodates surfaces ranging from 4% to 99% reflectivity.

The 4 inch and 6 inch flats mount directly into the Accessory Receptacle and other adjustable mounts.

Aperture	Reflectivity	Surface Error	P/N
33 mm	4%	$\lambda/20$	6024-0312-01
33 mm Dynaflect™	20%	$\lambda/20$	6024-0420-01
4 inch	4%	$\lambda/20$	6024-0314-01
4 inch Dynaflect™	20%	$\lambda/20$	6024-0385-01
4 inch long radius	4%	$\lambda/20$	6024-0341-01
6 inch	4%	$\lambda/20$	6024-0317-01
6 inch Dynaflect™	20%	$\lambda/20$	6024-0419-01
12 inch	4%	$\lambda/10$	6068-0338-01
18 inch	4%	$\lambda/10$	6068-0380-01
24 inch	4%	$\lambda/10$	6068-0176-01
32 inch	4%	$\lambda/10$	6068-0189-01

Transmission Spheres

Transmission Spheres (TS) are used when measuring the surface quality or transmitted wavefront of concave or

convex surfaces or optics. A concave or convex spherical surface is examined for surface figure and irregularity by placing its center of curvature coincident with the focus of the transmission sphere.



Transmission Sphere

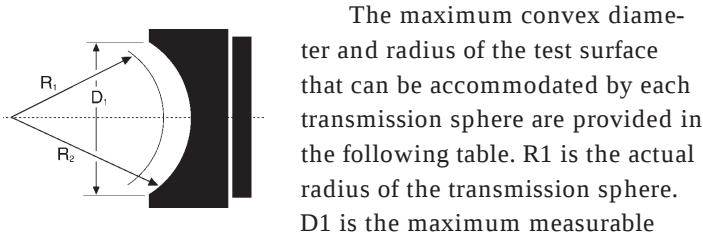
Transmission Spheres are available with clear apertures from 4 to 6 inches, with various f/numbers. Each optic is mounted in a cell and comes with a storage case. The spheres mount directly into the Accessory Receptacle and other adjustable mounts.

Aperture	f/No.	Surface Error	P/N
4 inch	0.65	$\lambda/10$	6024-0398-01
4 inch	0.65	$\lambda/15$	6024-0398-02
4 inch	0.65	$\lambda/20$	6024-0398-03
4 inch	0.75	$\lambda/10$	6024-0444-01
4 inch	0.75	$\lambda/15$	6024-0444-02
4 inch	0.75	$\lambda/20$	6024-0444-03
4 inch	1.5	$\lambda/10$	6024-0430-01
4 inch	1.5	$\lambda/15$	6024-0430-02
4 inch	1.5	$\lambda/20$	6024-0430-03
4 inch	3.3	$\lambda/10$	6024-0399-01
4 inch	3.3	$\lambda/15$	6024-0399-02
4 inch	3.3	$\lambda/20$	6024-0399-03
4 inch	7.2	$\lambda/10$	6024-0404-01
4 inch	7.2	$\lambda/15$	6024-0404-02
4 inch	7.2	$\lambda/20$	6024-0404-03
4 inch	11.0	$\lambda/10$	6024-0410-01
4 inch	11.0	$\lambda/15$	6024-0410-02
4 inch	11.0	$\lambda/20$	6024-0410-03
6 inch	0.77	$\lambda/10$	6024-0432-01
6 inch	1.1	$\lambda/10$	6024-0431-01
6 inch	2.2	$\lambda/10$	6024-0414-01
6 inch	3.2	$\lambda/10$	6024-0413-01
6 inch	5.3	$\lambda/10$	6024-0417-01
6 inch	7.2	$\lambda/10$	6024-0405-01

Transmission Elements

Transmission Spheres - The Standard Series

For most applications, 4 inch Transmission Spheres selected from the f/0.65 to f/11 range provide sufficient flexibility for measuring both convex and concave spherical surfaces.

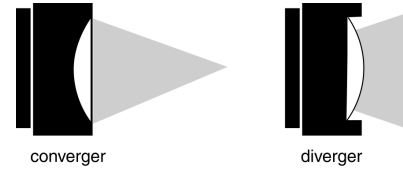


The maximum convex diameter and radius of the test surface that can be accommodated by each transmission sphere are provided in the following table. R1 is the actual radius of the transmission sphere. D1 is the maximum measurable part diameter. R2 is the maximum measurable part radius. R3 is the maximum measurable part radius when using an attenuation filter, which must be used when measuring parts with reflectivity above 40%.

Input Aperture	Output. f/No	R1 (mm)	D1 (mm)	R2 (mm)	R3 (mm)
4 inch	0.65	38.24	51.0	36	10
4 inch	0.75	48.24	60.9	44	26
4 inch	1.5	121.21	80.9	115	101
4 inch	3.3	298.03	97.5	272	263
4 inch	7.2	681.70	97.5	676	670
4 inch	11.0	1043.00	97.0	1016	1011
6 inch	0.77	80.00	104.0	78	43
6 inch	1.1	123.00	117.0	121	95
6 inch	2.2	298.03	136.1	281	265
6 inch	3.2	475.82	144.0	454	442
6 inch	5.3	776.44	144.5	743	734
6 inch	7.2	1039.25	144.5	1005	996

Transmission Spheres - Converger and Diverger Series

A converging transmission sphere has a measurement wavefront that is concave; it is useful for testing midrange convex spherical surfaces. Each Converger has a real focus and therefore the test surface must have a radius equal to or less than the radius of the Converger.



A diverging transmission sphere has a measurement wavefront that is convex; it has a virtual focus and is useful for testing midrange concave spherical surfaces. The radius of the test surface must be equal to or longer than the radius of the Diverger in order to have the center of curvature coincident with focus.

The Converger and Diverger Transmission Spheres are available in only 4 inch aperture size. Each optic is mounted in a cell and comes with a storage case. The spheres mount directly into the Accessory Receptacle and other adjustable mounts. The maximum surface error is $\lambda/10$.

In the following table a negative radius is a concave surface and a positive radius is a convex surface.

Radius (mm)				
f/No.	Type.	Maximum (or shorter)	Minimum (or longer)	P/N
f/15	diverger		-1500	6024-0283-01
f/15	converger	+1500		6024-0284-01
f/25	diverger		-2500	6024-0285-01
f/25	converger	+2500		6024-0286-01
f/35	diverger		-3500	6024-0287-01
f/35	converger	+3500		6024-0288-01
f/45	diverger		-4500	6024-0289-01
f/45	converger	+4500		6024-0290-01
f/80	diverger		-8000	6024-0291-01
f/80	converger	+8000		6024-0292-01

Reference Elements

Reference Flats



Reference Flat

Reference Flats (RF) are used along with a transmission flat when measuring the transmitted wavefront of flat optics. They are available with clear apertures from 33 millimeters to 32 inches, with varying reflectivity on the reference surface. Each optic is mounted in a cell and comes with a storage case. The 4 inch and 6 inch flats mount directly into the adjustable mounts.

Aperture	Reflectivity	Surface Error	P/N
33 mm	90%	$\lambda/20$	6024-0220-02
4 inch	90%	$\lambda/20$	6024-0309-01
6 inch	90%	$\lambda/20$	6024-0318-01
12 inch	4%	$\lambda/10$	6068-0227-01
12 inch	90%	$\lambda/10$	6068-0228-01
18 inch	4%	$\lambda/10$	6068-0389-01
18 inch	90%	$\lambda/10$	6068-0389-02
24 inch	4%	$\lambda/10$	6068-0176-03
24 inch	90%	$\lambda/10$	6068-0176-02
32 inch	4%	$\lambda/10$	6068-0189-02

Note for 4% reflectivity 33 mm, 4 inch, and 6 inch Reference Flats, use standard Transmission Flats. For availability and part numbers see “Transmission Flats.”

Reference Spheres

Reference Spheres (RS) are used along with a transmission sphere when measuring the transmitted wavefront of spherical optics. They are available with clear apertures of 25 or 37 millimeters.



Reference Sphere

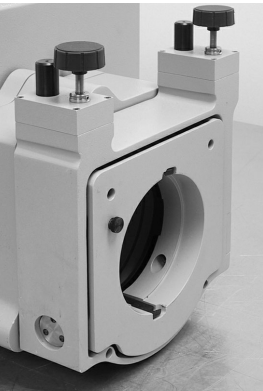
Each optic is mounted in a cell and comes with a storage case. The spheres can be mounted using the Self-Centering Element Holders.

Aperture	R/No.	Reflectivity	Surface Error	P/N
25 mm	0.51	4%	$\lambda/10$	6024-0302-01
37 mm	0.68	4%	$\lambda/20$	6024-0304-01
37 mm	0.68	40%	$\lambda/20$	6024-0305-01

Mounts

Mounts are available as options. They are designed to integrate with the various accessories and test setups. The centerline height or optical axis of each setup is consistent within the 4 inch and 6 inch mounts, thereby eliminating the need for shims or adjustments.

Accessory Receptacle, Tip/Tilt



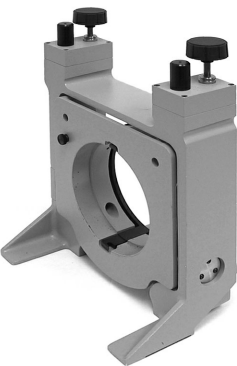
Accessory Receptacle, 4 inch shown

4 inch P/N 6500-0105-01

6 inch P/N 6500-0111-01

The Accessory Receptacle provides a two axis mount for a transmission element mounted in the output beam of the mainframe. It mounts to the front of the mainframe or the Phase Measuring Receptacle (PMR). The beam centerline height is 4.25 inches (108 millimeters). It is available in two sizes to fit either 4 inch or 6 inch diameter optical elements.

Adjustable Mount, 2-Axis



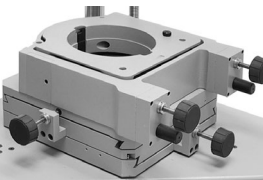
Adjustable Mount, 2-Axes, 4 inch shown

4 inch P/N 6500-0104-01

6 inch P/N 6500-0106-01

The Adjustable Mount provides a two axis mount for holding test parts or reference elements when measuring transmitted wavefront quality. The mount accepts the self centering element holder, the universal element holder, and other mount accessories. It is available in two sizes to fit either 4 inch or 6 inch diameter optical elements.

X-Y Stage, 4 inch



X-Y Stage shown mounted on Z Stage under the Accessory Receptacle (not included)

P/N 6500-0110-01

The X-Y Stage attaches to the Accessory Receptacle or the Adjustable Mount to provide 0.5 inches of x and y adjustment. The stage accepts the 4 inch accessories.

High Accuracy Mount, 4 inch, 3-axis and 5-axis



High Accuracy Mount, shown with Tip/Tilt Mount tip/tilt mount.

3-Axis Mount P/N 6090-0230-01

Tip/Tilt Mount addition P/N 6024-0371-02

The High Accuracy Mount has x, y, and z axis adjustments, with 50 mm of z-axis travel. To make the High Accuracy Mount into 5 axes, add the

Mount Accessories

Accessory Adapter, 6 inch to 4 inch



Accessory Adapter

P/N 6500-0132-01

The Accessory Adapter mounts into the 6 inch Accessory Receptacle or Adjustable Mount so they can accept 4 inch based accessories.

Self Centering Element Holder



Self Centering Element Holder, 6 inch

4 inch P/N 6024-0161-01

6 inch P/N 6500-0107-01

The Self Centering Element Holder provides a flexible way to hold round parts of varying diameters for measurement. The Holder mounts into the applicable Adjustable Mount. The 6 inch model includes adaptable posts for holding the part under test.

Universal Element Holder

The Universal Element Holder provides a datum plate with threaded holes and holding apparatus to easily adapt the holder for test parts of various sizes and shapes. The Holder mounts onto the applicable Adjustable Mount.



Universal Element Holder, 6 inch

Size	P/N
6 inch	6500-0130-01
12 inch	6068-0111-01
18 inch	6068-0162-01
24 inch	6068-0183-01
32 inch	6068-0330-01

Other Accessories

Attenuation Filters and Screens



Attenuation Filter, 4 inch

In order to obtain acceptable fringe contrast, the reference beam and the measurement beam should have approximately equal intensities. Typically, the reference beam generated within a transmission element is reflected from a 4% reflectivity surface. This enables surfaces whose reflectivity is within the range 0.1% to 40% to be examined with acceptable fringe contrast using the 4% reflectivity transmission elements.

Attenuation filters and screens are used when measuring the surface quality of highly reflective parts. To measure any element that has a surface reflectivity or an equivalent surface reflectivity greater than 40%, an attenuation filter or screen is placed between a 4% transmission element and the article under test. As a result, some of the measurement beam going to and reflected from the article under test is absorbed, thereby reducing the reflected beam intensity to a level that produces good fringe contrast.

Attenuation Filters come with a protective mount and a stand for tabletop use. The filter may also be removed and mounted directly on a transmission element of the similar size. The filter has a transmitted wavefront distortion of $\leq \lambda/10$. Attenuation Screens are available for the larger apertures for use with the transmission flats and reference flats. Each screen comes with a protective mount and a stand for tabletop use.

Aperture Size	Type	P/N
4 inch	Filter	6024-0322-01
6 inch	Filter	6024-0323-01
12 inch	Screen	6068-0191-01
18 inch	Screen	6068-0190-01
24 inch	Screen	6068-0192-01
32 inch	Screen	6068-0218-01

Aperture Converters



Aperture Converter, 4 to 6 inch shown

Converts from the 4 inch aperture size to either a 6 inch or 25 millimeters aperture. It mounts directly onto the output face of the interferometer.

Size	Configuration	P/N
4 to 6 inch	horizontal	6024-0380-02
4 to 6 inch	vertical	6024-0380-03
4 inch to 25 mm	horizontal	6024-0429-01

MUX Cube



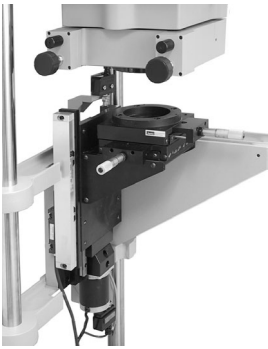
MUX Cube with base

without base P/N 6168-0100-01
with base P/N 6168-0100-03

The MUX Cube provides a switchable beam path, one straight through the Cube, the other at 90 degrees to the input beam. This provides two measurement channels from one interferometer. In the switch position, the output is reflected 90 degrees by a high quality flip mirror.

Radius of Curvature Options

Short Radius Kit (vertical)

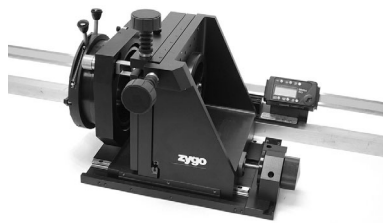


Short Radius Kit

P/N 6500-0165-01

The Short Radius Kit is for a 4 inch GPI. It is used to measure radii with the GPI in a vertical orientation. The Kit includes: a baseplate, three 1.5 meter rods, an XYZ stage mounted on support arms, an encoder display, a f/0.75 transmission sphere, and RS232 communication hardware.

Digital Radius Scale, 1 meter (horizontal)



P/N 6090-0246-01

The Digital Radius Scale (DRS) consists of a magnetic scale for position feedback, mounted on a 1 meter guide bar that is fixed to the granite or optical table. The bar is

used to guide the 3-axis Mount in a straight path when measuring the radius. The distance the mount moves from catseye position to confocal position is the radius of curvature of the part under test. The 1 meter scale has a resolution of 20 μm .

High Resolution Digital Radius Scale, 2 meter (horizontal)



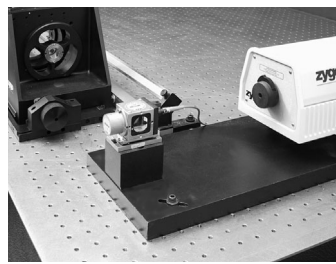
Digital Radius Scale, 2 meter
the digital readout and the linear
encoder are shown

P/N 6090-0259-01

The Digital Radius Scale (DSR) consists of a precision Heidenhein sealed linear encoder for position feedback, mounted on a 2 meter guide bar that is fixed to the granite or optical table. The bar is

used to guide the 3-axis Mount in a straight path when measuring the radius. The distance the mount moves from catseye position to confocal position is the radius of curvature of the part under test. This position data is displayed on the digital readout and can be transmitted into MetroPro™ software for computerized calculation. The 2 meter scale has a resolution of 1 μm .

Interferometric Radius Slide (horizontal)



Interferometric Radius Slide,
Baseplate, Linear Interferometer,
and Laser Head are shown. Note
the retroreflector mounted in the
3-Axis Mount.

P/N 6090-0232-07 (100-120V)

P/N 6090-0232-08 (220-240V)

The Interferometric Radius Scale (IRS) uses a high-precision heterodyne laser displacement measuring interferometer for position feedback. Measurements are taken at catseye position and confocal position; the position error is calculated and subtracted, and the radius

of curvature results are calculated by MetroPro™ software. The slide has a resolution of 2.25 nm.

The IRS includes: a IRS baseplate with a laser head and linear interferometer with a fiber optic pickup, a target retroreflector and mount for the 3-Axis Mount, a ZMI 1000™ electronics enclosure with a ZMI™ measurement board, and the necessary interface cables. A guide bar, available separately, is required.

Guide Bar (required for IRS)

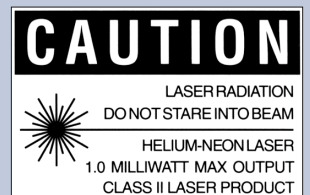
1 meter P/N 6090-0246-02

2 meter P/N 6090-0246-03

The bar is used to guide the 3-axis Mount in a straight path when measuring the radius of curvature with the Interferometric Radius Slide (IRS). The bar is a precision ground steel bar with attachment legs on 1 inch centers for mounting to an optical table. It is available in either 1 meter or 2 meter lengths.

Photographic images are representative only.

Specifications and part numbers are subject to change without prior notice.



Laser Radiation Safety
This product conforms with
NCDRH radiation performance
standard 21 CFR, chapter 1,
subchapter J.

Data is subject to change without notice.

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