

Technical specification for Supply, installation, commissioning and training of 4" Aperture Fizeau Interferometer

1. **Brief description :** The equipment shall be non-contact and vertical type interferometer required for testing of flat as well as spherical optical components in finished (Both side polished) or semi-finished (One side polished) stages in optical production shop. The interferometer should have the provision to be mounted in horizontal condition also. System performance specifications shall conform to the parameters measured by either Test Method 1 or Test Method 2 described below.
2. **Scope of the instrument:**
 - 2.1 The instrument shall be suitable for testing the Surface Form quality of Optical components by means of deformation analysis with interference fringes and its Interferograms.
 - 2.2 The equipment shall work on non-contact principle to avoid the touching of optical reference plate / Transmission Spheres with the surfaces under test.
 - 2.3 Proper mounting setup to facilitate vertical mounting of the system with vibration isolation should be provided.
 - 2.4 Fine adjustment of the measuring table with micro-positioning screw or suitable alternate provision should be provided as required.
 - 2.5 Three axis XYZ tip/tilt control table for job accommodation shall be provided.
 - 2.6 A minimum height of 400mm shall be provided between the reference optics and the tip/tilt stage for accommodating the different job sizes.
 - 2.7 Set of interferometer-measuring rings for holding the lenses included and its holding mechanism shall be explicitly mentioned.
 - 2.8 All necessary support systems like table for Interferometer mounting and display mounts shall be a part of the scope of supply.
 - 2.9 The system should be capable of making the MTF measurements at different spatial frequencies and give a graphical representation.
3. **Shall be capable of measuring /analyzing of :**
 - 3.1 Flat, concave or convex surfaces on materials like Optical Glass, Crystalline like Germanium, SiC, Zerodur, fused silica, silicon carbide, silicon etc. (with 20% reflectivity min).
 - 3.2 Prism, corner cube, wedge, angle & homogeneity measurements through inbuilt software.
 - 3.3 Flatness on machined, ceramic and wafer/disk surfaces.
4. **The interferometers shall have the following basic features:**
 - 4.1 Technology: phase shifting Fizeau interferometer.

4.2 Type : Non contact type , vertical type

4.3 Modes of operation: Two modes shall be available.

i. View / Measurement mode.

ii. Align mode for the alignment of transmission Sphere/transmission Flat w.r.t test sphere/test flat.

5. System specifications :

5.1 Test Beam	:	102mm (4.0") (Min)
5.2 Zoom	:	1x to 5x
5.3 Focus	:	± 2.0 m (min)
5.4 Attenuation	:	Adjustable
5.5 Alignment	:	Simple two spot alignment
5.6 Alignment field of View	:	$\pm 1.5^\circ$
5.7 Fringe Monitoring	:	Live video on computer screen
5.8 Data acquisition time	:	300ms or better
5.9 Resolution	:	1k x 1k or better
5.10 Digitization	:	8 bits or better

6. System performance by Test Method 1:

- 6.1 RMS Simple Repeatability defined by 2X the standard deviation of the RMS for 36 sequential measurements (16 averages) of a short 4 inch plano cavity : $<0.06\text{nm}, \lambda/10,000 (2\sigma)$
- 6.2 RMS Wavefront Repeatability defined by the mean RMS difference plus 2X the standard deviation for the differential between all even numbered measurements and a synthetic reference (defined as the average of all odd numbered measurements); 36 sequential measurements (16 averages) form the basis for calculation. : $<0.35 \text{ nm}, \lambda/1,800 (\text{mean} + 2\sigma)$
- 6.3 Peak Pixel Deviation defined by the 99.5th percentile of the pixel-wise standard deviation map for 36 sequential measurements (16 averages); this result measures time varying behavior (or Type A uncertainties) : $<0.5 \text{ nm}, \lambda/1,200 (99.5\text{th } \%)$

7. System performance by Test Method 2:

- 7.1 Repeatability 3-Flat (3 sigma repeatability of 3-Flat Test with 32 averages per set) : $\lambda / 300 \text{ PV}$

- 7.2 RMS Repeatability (3 sigma of the rms for : $\leq 1 \text{ \AA}$
128 data sets, each an average of 32
measurements)
- 7.3 Calibrated Accuracy : $\lambda / 100$
- 7.4 Height Resolution : $\lambda / 8000$
- 7.5 Averaging Modes : Intensity and Phase

8. Laser source specification :

- 7.1 Wavelength : 632.8 nm (He-Ne)
- 7.2 Polarization : Circular
- 7.3 Coherence length : $\geq 100 \text{ m}$
- 7.4 Laser class : manufacturer to specify

8 Environment Requirements:

- 8.1 Temperature of operation : 15 to 30 °C (59 to 86 °F) (Approx)
- 8.2 Relative Humidity : 5 % to 95 %, non-condensing
- 8.3 Vibration Isolation required : Typical frequencies from 1 Hz to 120 Hz

9 Software requirements :

Shall have the following features:

- 9.1 Multiple fringe unwrapping algorithms
- 9.2 Multiple aberration polynomial sets for analysis
- 9.3 Diffraction and geometric analysis
- 9.4 Derivatives and Integrals
- 9.5 Complex masking including unlimited mask groups
- 9.6 Fiducials and image transformations
- 9.7 Measurements of wave front, Wedge, Angle, Prisms, three flat test, Two Sphere Test, Homogeneity
- 9.8 Shall be able to Interface with IDL™, LabVIEW™, Excel™
- 9.9 Shall have the capability to do static spatial carrier analysis

10 Computer Workstation requirements:

- 10.1 High performance computer with latest version will all pre-installed software .
- 10.2 All hardware interfaces shall be pre-installed with the system.
- 10.3 The compatible interferometer data acquisition software shall be pre-installed.

11. Accessories:

- 11.1 Laser power supply should be a part of the scope of supply.
- 11.2 Full set of reference optics (Please specify in details the list of offering items)
- 11.3 Reference flat optics: $\lambda/10$ (Visual inspection), $\lambda/20$ (For acquisition and analysis)
- 11.4 Supply of Isolation tables shall be in scope of supply.
- 11.5 C.D. or Flash Drive of all the software's and manuals should be a part of the scope. Two printed copies of manuals in English language shall be provided.

- 11.6 Five axis stage for mounting optical components
- 11.7 Reference spherical optics (transmission sphere) of F number 3.3 or less

12 Electrical & Mechanical Specifications:

- 12.1 Power available at IISU : 230 V, 50 Hz, 1 ϕ or 440V,50Hz, 3 ϕ
- 12.2 Foot print area : Party to specify
- 12.3 Weight : Less than 25 kg

13. Installation, commissioning and training:

- 13.1 The supplier shall be responsible for installation, commissioning and testing of the complete instrument to the accuracies claimed during the time of installation and commissioning. The instrument supplier shall also impart training additionally to min of 4 representatives of the user personnel at the time of Installation and commissioning of the equipment.
- 13.2 The supplier shall indicate in the offer all other utilities required to be provided by the user for the instruments. Like UPS, air supply etc. to run the equipment around the clock.
- 13.3 Warranty : One year from date of commissioning .
- 13.4 Availability of spare parts shall be ensured for a period of 10 years.
- 13.5 A training session of not less than 5 days shall be offered to the user representatives by the OEM or OEM trained person at user site.
- 13.6 The party should provide AMC rate for minimum 3 years after completion of warranty.
- 13.7 The party should quote all necessary spares and accessories for minimum 3 years for trouble free operation.