

1. Optical flats are manufactured by grinding optical glass. They are used to measure flatness, parallelism and wringing by light-wave interference method. Classified by structure and application, they fall into two categories: optical flat and optical parallel.

---Optical Flat: Single working surface, with an arrow indicating the working surface. It is used to inspect the flatness and wringing of gauge blocks, part sealing surfaces, and the measuring surfaces of measuring tools.

---Optical Parallel : Both end faces serve as measuring surfaces and are parallel to each other. It is mainly used to measure the parallelism error between two high-finish surfaces.



Optical Flat



Optical Parallel

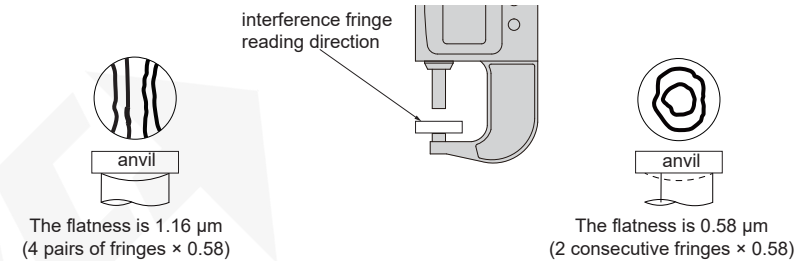
2. Before use, gently wipe the working surface of the optical flat and the measured surface with degreased cotton, aviation gasoline or alcohol, together with a lint-free cloth. Ensure both surfaces are clean and free of dust, oil stains or foreign objects.

3. Measurement:

---Before measurement, the optical flat and the workpiece to be measured shall be brought to the same temperature to eliminate measurement errors caused by differences in thermal expansion coefficients.

---Measuring flatness using an optical flat: example of micrometer measuring faces

- ① Place the optical flat with its working surface facing downward gently onto the fixed anvil face of the micrometer. Illuminate the working surface of the optical flat with monochromatic light (e.g., white light with a wavelength of $\lambda=0.58\mu\text{m}$).
- ② Observe the shape and number of the generated interference fringes, and substitute the number of fringes into the formula $N \times \lambda / 2$ (where N represents the number of fringes and λ represents the wavelength of the light source).



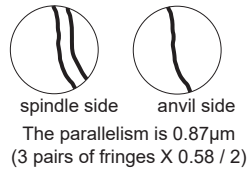
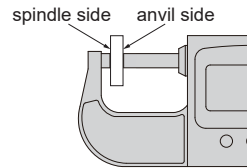
Recommended Light Source	Wavelength
Sodium lamp	$0.589\mu\text{m}$
Incandescent lamp	$0.58\mu\text{m}$

---Testing the wringing of gauge blocks using an optical flat

- ① Place the gauge block on the measurement platform and gently wring the working surface of the optical flat against the gauge block surface under uniform white light illumination.
- ② If no interference bands are observed, the wringing of the gauge block is qualified. If dense interference bands appear within the contact area, it indicates the presence of a gap; the greater the number of bands, the larger the gap.

---Using optical parallel to measure parallelism, taking the measuring faces of a micrometer as an example.

- ① Gently place the optical parallel on the anvil face of the micrometer. Rotate the flat with slight pressure to wring its working surface onto the anvil face, ensuring full contact between the optical parallel and the anvil surface. Then, rotate the micrometer's ratchet mechanism to slowly bring the spindle face into contact with the optical parallel until the ratchet produces audible clicks (approximately 2-3 clicks), indicating that the appropriate measuring force has been applied.
- ② Hold the micrometer under white light illumination and observe the pattern and number of interference bands on both measuring surfaces under the applied measuring force. Record the total number of interference bands from both surfaces and substitute it into the parallelism error formula: $M \times \lambda / 2$ (where M is the total number of interference bands).



③A set of four optical parallel with consecutive sizes must be used to sequentially calibrate the measuring faces of the micrometer. The largest measured parallelism error value among the four results shall be taken as the final calibration result.

4. Caution:

- The surface roughness of the measured face shall not exceed $0.04 \mu\text{m}$ to prevent scratching the working surface of the optical flat.
- The measuring surface of the optical flat should be utilized uniformly to prevent localized wear on its working surface.
- After use, the optical flat shall be wiped clean with degreased cotton and stored in a dried container lined with velvet.
- Optical flats of different accuracy grades must not be interchanged or stored together.