

Quick Guide to Precision Measuring Instruments



Gauge Blocks

Definition of the Meter

The 17th General Conference of Weights and Measures in 1983 decided on a new definition of the meter unit as the length of the path traveled by light in a vacuum during a time interval of 1/299792458 of a second. The gauge block is the practical realization of this unit and as such is used widely throughout industry.

Selection, Preparation and Assembly of a Gauge Block Stack

Select gauge blocks to be combined to make up the size required for the stack.

- (1) Take the following things into account when selecting gauge blocks.
 - a. Use the minimum number of blocks whenever possible.
 - b. Select thick gauge blocks whenever possible.
 - c. Select the size from the one that has the least significant digit required, and then work back through the more significant digits.
- (2) Clean the gauge blocks with an appropriate cleaning agent.
- (3) Check the measuring faces for burrs by using an optical flat as follows:

Figure 1

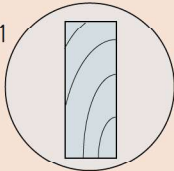
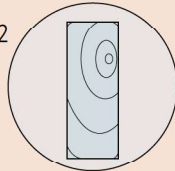


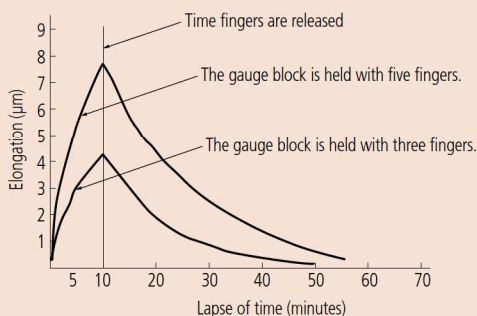
Figure 2



- a. Wipe each measuring face clean.
 - b. Gently place the optical flat on the gauge block measuring face.
 - c. Lightly slide the optical flat until interference fringes appear.
 - Judgment 1: If no interference fringes appear, it is assumed that there is a large burr or contaminant on the measuring face.
 - Judgment 2: If the interference fringes disappear, no burr exists on the measuring face.
 - Judgment 3: If some interference fringes remain locally while the flat is gently moved back and forth, a burr exists on the measuring face. If the fringes move along with the optical flat, there is a burr on the optical flat.
 - d. Lightly press the optical flat to check that the interference fringes disappear.
 - Judgment 2: If the interference fringes disappear, no burr exists on the measuring face.
 - Judgment 3: If some interference fringes remain locally while the flat is gently moved back and forth, a burr exists on the measuring face. If the fringes move along with the optical flat, there is a burr on the optical flat.
 - e. To remove burrs, follow the directions on page 01-33.
- (4) Apply a very small amount of oil to the measuring face and spread it evenly across the face. (Wipe the face until the oil film is almost removed.) Grease, spindle oil, vaseline, etc., are commonly used.

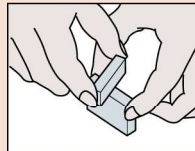
Thermal Stabilization Time

The following figure shows the degree of dimensional change when handling a 100 mm steel gauge block with bare hands.

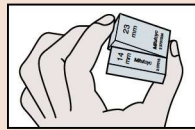


- (5) Gently overlay the faces of the gauge blocks to be wrung together. There are three methods to use (a, b and c as shown below) according to the size of blocks being wrung:

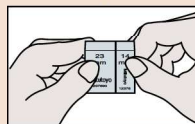
a. Wringing thick gauge blocks



Cross the gauge blocks at 90° in the middle of the measuring faces.

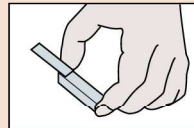


Rotate the gauge blocks while applying slight force to them. You will get a sense of wringing by sliding the blocks.

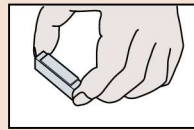


Align the measuring faces with each other.

b. Wringing a thick gauge block to a thin gauge block

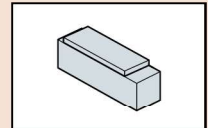


Overlap one side of a thin gauge block on one side of a thick gauge block.

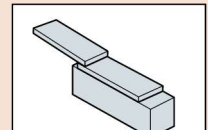


Slide the thin gauge block while pressing the entire overlapped area to align the measuring faces with each other.

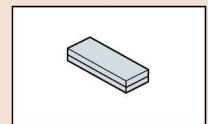
c. Wringing thin gauge blocks



To prevent thin gauge blocks from bending, first wring a thin gauge block onto a thick gauge block.

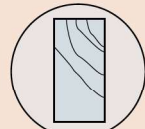
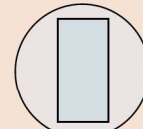


Then, wring the other thin gauge block onto the first thin gauge block.

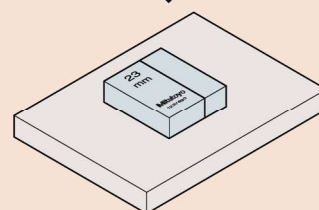


Finally, remove the thick gauge block from the stack.

Apply an optical flat to the surface of one thin gauge block to check the wringing state.



Irregular interference fringes



Wipe the exposed measuring face(s) and continue building up the stack, in the same manner as above, until complete.