



# Gauge Blocks

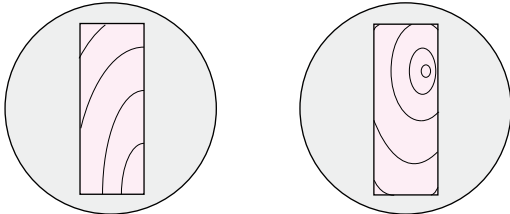
## Definition of the Meter

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  $1/299\,792\,458$  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:



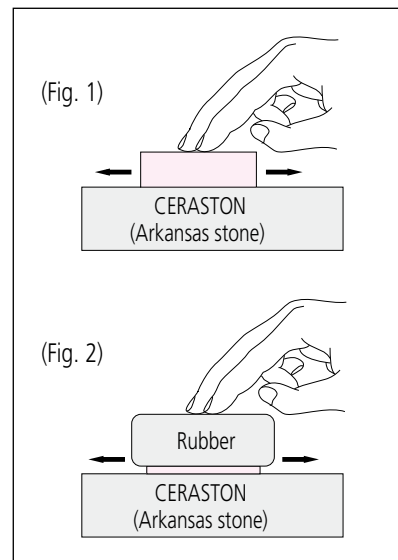
- a. Wipe each measuring face clean.
- b. Gently place the optical flat on the gauge block measuring face.
- c. Lightly slide the optical flat until interference fringes appear.
 

Judgment 1: If no interference fringes appear, it is assumed that there is a large burr or contaminant on the measuring face.
- 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 to and fro, 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. Remove burrs, if any, from the measuring face using a flat, fine-grained abrasive stone.
  - ① Wipe off any dust or oil from the gauge block and the Ceraston (or Arkansas stone) using a solvent.
  - ② Place the gauge block on the Ceraston so that the measuring face that has burrs is on the abrasive surface of the stone. While applying light pressure, move the gauge block to and fro about ten times (Fig. 1). Use a block rubber for thin gauge blocks to apply even pressure (Fig. 2).

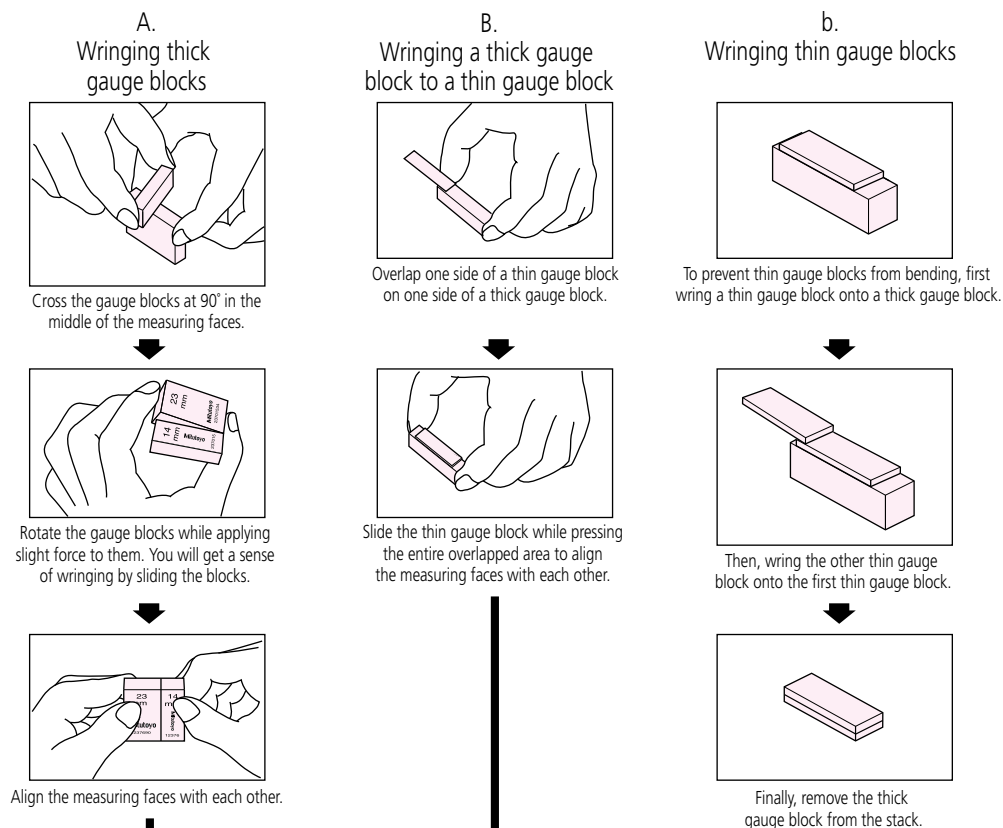


- ③ Check the measuring face for burrs with an optical flat. If the burrs have not been removed, repeat step (2). If burrs are too large to be removed with a stone, discard the gauge block.

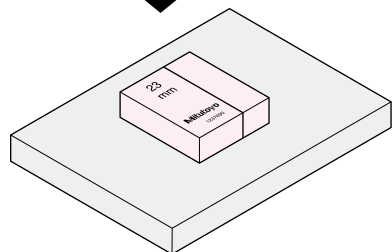
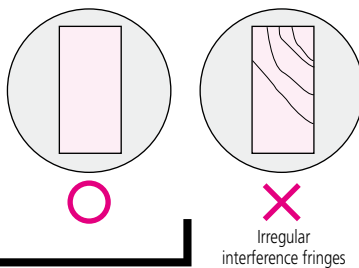
Note: The abrasive surface of a Ceraston must be made flat by lapping it from time to time. After lapping the Ceraston, the lapping powder must be completely removed from the stone to prevent the surface of the gauge block being scratched. Mitutoyo does not supply the Arkansas stone.

- (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.

(5) Gently overlay the faces of the gauge blocks to be wrung together.  
There are the following three methods depending on the size of wringing:



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



Wipe the exposed measuring face(s) and continue building up the stack, in the same manner as above, until complete. The stack can then be thermally stabilized on a surface plate before use, if required. Do not leave the stack assembled for longer than is necessary, and clean and apply rustproofing protection to the blocks before packing them away in their box after use.

### Thermal Stabilization Time

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

