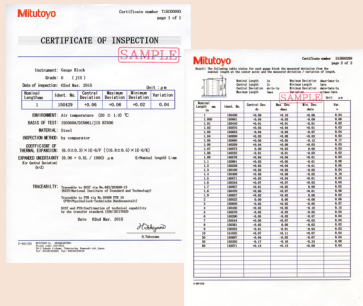


## Mitutoyo Gauge Blocks and Inspection Certificates

A Certificate of Inspection is furnished with all Mitutoyo gauge blocks with a serial number on the box (in the case of sets) and an identification number on each block. The deviation of each block from nominal length, at the time of inspection, is stated. For this inspection, each gauge block is measured relative to the upper level master using a gauge block comparator. Grade K gauge blocks are measured by a primary measurement method using an interferometer.



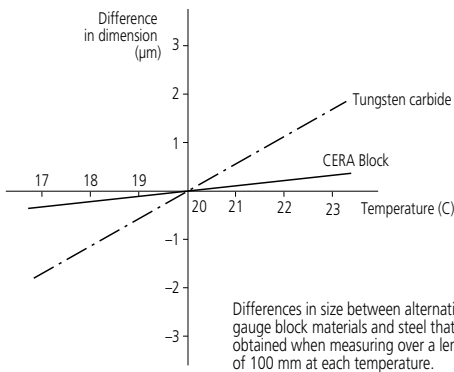
## 8. Superior Material Characteristics of CERA Block

Property	Material	CERA Block (ZrO <sub>2</sub> )	Steel (Fe)	Tungsten Carbide (WC-Co)	ZERO CERA Blocks (Low thermal expansion)
Hardness (HV)		1350	800	1650	826
Coefficient of thermal expansion (10 <sup>-6</sup> /K)		9.3±0.5	10.8±0.5	5.5±1.0	0±0.02
Flexural strength by 3-point bending (MPa)		1270	1960	1960	210
Fracture toughness K <sub>1c</sub> (MPa·m <sup>1/2</sup> )		7	120	12	1.2
Young's modulus x10 <sup>4</sup> (MPa)		20.6	20.6	61.8	130
Poisson's ratio		0.3	0.3	0.2	0.3
Specific gravity (Kg/dm <sup>3</sup> )		6.0	7.8	14.8	2.5
Thermal conductivity (W/m·K)		2.9	54.4	79.5	3.7

Note: Ceramics have the advantage of a slow response to temperature changes due to the low thermal conductivity. However, caution is required when using CERA blocks under conditions of rapid temperature change.

## 9. Closest Expansion Coefficient to Steel

The thermal expansion coefficient of a CERA Block is quite similar to that of a steel gauge block.



## 10. Highly Resistant to Dropping and Impact Damage

The CERA Block material is one of the toughest ceramics. It is extremely difficult to crack a CERA block in normal use.

## Features of Square Gauge Blocks

### 1. Gauge blocks in a stack can be clamped together

After wringing square gauge blocks, a tie rod can be inserted through the center hole to clamp the blocks together for extra security.

### 2. A height reference standard can easily be made

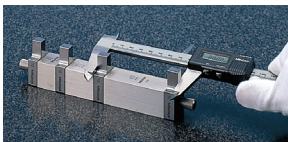
A precision height reference standard can be made easily and inexpensively using accessories such as the plain jaw and block base.

### 3. A dedicated inspection jig can easily be made

A dedicated inspection jig for periodic inspection of instruments can be made easily and inexpensively.

### 4. A wide measuring surface with cross-sectional dimensions of 24.1 x 24.1 mm is available.

A square gauge block retains stable orientation both longitudinally and laterally. A wide range of applications is covered, including cutting tool positioning, angle measurement with a sine bar, taper measurement with a roller, and inspection of depth micrometers.



## Long and Ultra-Thin Gauge Blocks

Mitutoyo offers extra-thin gauge blocks from 0.10 mm to 0.99 mm (increments of 0.01 mm) as well as long gauge blocks up to 1,000 mm as standard products.

## Grade and Application

The following table can be used to select the gauge block grade according to usage (specified by DIN861, BS4311, and JIS B 7506).

	Applications	Grade
Workshop use	<ul style="list-style-type: none"> <li>Mounting tools and cutters</li> <li>Manufacturing gages</li> <li>Calibrating instruments</li> </ul>	2
Inspection use	<ul style="list-style-type: none"> <li>Inspecting mechanical parts, tools, etc.</li> <li>Checking the accuracy of gages</li> <li>Calibrating instruments</li> </ul>	1 or 2
Calibration use	<ul style="list-style-type: none"> <li>Checking the accuracy of gauge blocks for workshop</li> <li>Checking the accuracy of gauge blocks for inspection</li> <li>Checking the accuracy of instruments</li> </ul>	0 or 1
Reference use	<ul style="list-style-type: none"> <li>Checking the accuracy of gauge blocks for calibration</li> <li>For academic research</li> </ul>	K or 0

## Constructing a Gauge Block Stack

The following points should be noted when constructing a gauge block stack:

1. Use as few gauge blocks as possible to obtain the required length by selecting thick blocks wherever possible.
2. Select the block for the least significant digit first, then work back through the more significant digits until the required length is attained.
3. There are multiple combinations for the integer part of a length. To prevent wear as much as possible, do not always use the same gauge blocks.

Example: Required length = 45.6785 mm

### • For a 1 mm-based gauge block set (112 pcs.)

$$\begin{array}{r}
 1.0005 \\
 1.008 \\
 1.17 \\
 17.5 \\
 + 25 \\
 \hline
 45.6785 \text{ mm}
 \end{array}$$

### • For a 2 mm-based gauge block set (112 pcs.)

$$\begin{array}{r}
 2.0005 \\
 2.008 \\
 2.17 \\
 14.5 \\
 + 25 \\
 \hline
 45.6785 \text{ mm}
 \end{array}$$

\* Regarding the method for wringing, refer to "Quick Guide to Precision Measuring Instruments" on page E-33.