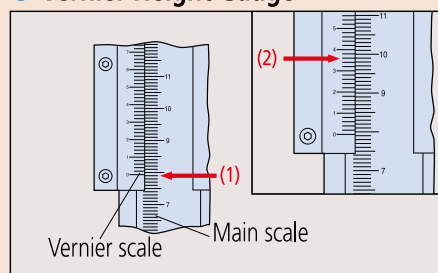


## How to read

### Vernier Height Gauge



**Graduation 0.02 mm**

|                |          |
|----------------|----------|
| (1) Main scale | 79 mm    |
| (2) Vernier    | 0.36 mm  |
| Reading        | 79.36 mm |

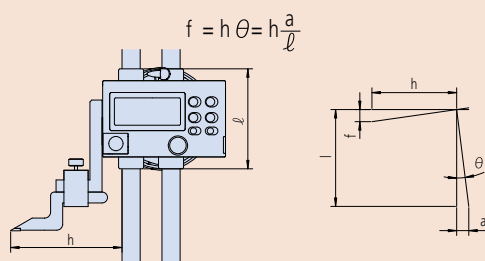
## General Notes on Use of Height Gauges

### 1. Potential causes of error

Like the caliper, the error factors involved include parallax effects, error caused by excessive measuring force due to the fact that a height gauge does not conform to Abbe's Principle, and differential thermal expansion due to a temperature difference between the height gauge and workpiece. There are also other error factors caused by the structure of the height gauge. In particular, the error factors related to a warped guide face and scriber installation described below should be studied before use.

### 2. Guide face (column) warping and scriber installation

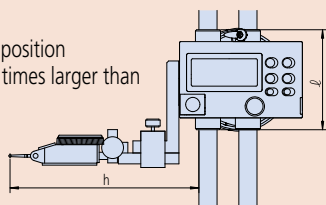
Like the caliper, and as shown in the following figure, measurement errors result when using the height gauge if the reference column, which guides the slider, becomes warped. This error can be represented by the same calculation formula for errors caused by nonconformance to Abbe's Principle.



Installing the scriber (or a lever-type dial indicator) requires careful consideration because it affects the size of any error due to a warped reference column by increasing dimension h in the above formula. In other words, if a long scriber or lever-type dial indicator is used, the measurement error becomes larger.

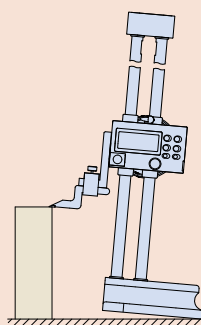
Example: Effect of measuring point position

When h is 150 mm, the error is 1.5 times larger than when h is 100 mm.



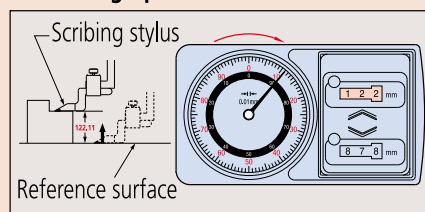
### 3. Lifting of the base from the reference surface

When setting the scriber height from a gauge block stack, or from a workpiece feature, the base may lift from the surface plate if excessive downwards force is used on the slider, and this results in measurement error. For accurate setting, move the slider slowly downwards while moving the scriber tip to and fro over the gauge block surface (or feature). The correct setting is when the scriber is just felt to lightly touch as it moves over the edge of the surface. It is also necessary to make sure that the surface plate and height gauge base reference surface are free of dust or burrs before use.



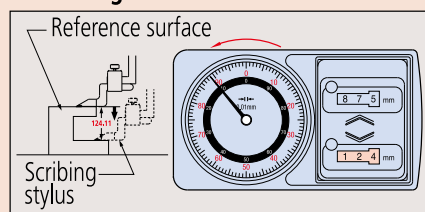
### Mechanical Digit Height Gauge

#### Measuring upwards from a reference surface



|         |           |
|---------|-----------|
| Counter | 122 mm    |
| Dial    | 0.11 mm   |
| Reading | 122.11 mm |

#### Measuring downwards from a reference surface



|         |           |
|---------|-----------|
| Counter | 124 mm    |
| Dial    | 0.11 mm   |
| Reading | 124.11 mm |

### 4. Error due to inclination of the main scale (column)

According to JIS standards, the perpendicularity of the column reference edge to the base reference surface should be better than:

$$\left(0.01 + \frac{L}{1000}\right) \text{ mm} \quad L \text{ indicates the measuring length (unit: mm)}$$

This is not a very onerous specification. For example, the perpendicularity limit allowable is 0.61 mm when L is 600 mm. This is because this error factor has a small influence and does not change the inclination of the slider, unlike a warped column.

### 5. Relationship between accuracy and temperature

Height gauges are made of several materials. Note that some combinations of workpiece material, room temperature, and workpiece temperature may affect measuring accuracy if this effect is not allowed for by performing a correction calculation.

6. The tip of a height gauge scriber is very sharp and must be handled carefully if personal injury is to be avoided.

7. Do not damage a digital height gauge scale by engraving an identification number or other information on it with an electric marker pen.

8. Carefully handle a height gauge so as not to drop it or bump it against anything.

## Notes on Using the Height Gauge

1. Keep the column, which guides the slider, clean. If dust or dirt accumulates on it, sliding becomes difficult, leading to errors in setting and measuring.

2. When scribing, securely lock the slider in position using the clamping arrangements provided. It is advisable to confirm the setting after clamping because the act of clamping on some height gauges can alter the setting slightly. If this is so, allowance must be made when setting to allow for this effect.

3. Parallelism between the scriber measuring face and the base reference surface should be 0.01 mm or better.

Remove any dust or burrs on the mounting surface when installing the scriber or lever-type dial indicator before measurement. Keep the scriber and other parts securely fixed in place during measurement.

4. If the main scale of the height gauge can be moved, move it as required to set the zero point, and securely tighten the fixing nuts.

5. Errors due to parallax error are not negligible. When reading a value, always look straight at the graduations.

6. Handling after use: Completely wipe away any water and oil. Lightly apply a thin coating of anti-corrosion oil and let dry before storage.

### 7. Notes on storage:

Avoid direct sunlight, high temperatures, low temperatures, and high humidity during storage.

If a digital height gauge will not be used for more than three months, remove the battery before storage.

If a protective cover is provided, use the cover during storage to prevent dust from adhering to the column.