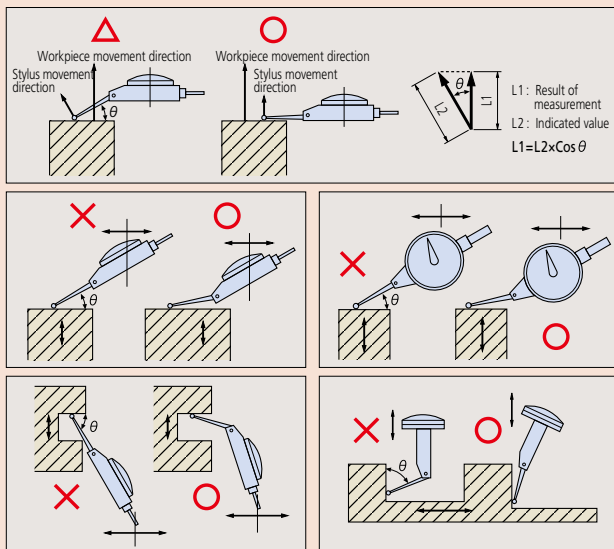


## • Maximum permissible error and permissible limits

Graduation (mm)		0.001/0.002			0.01		
Revolution		1 revolution	Multi-revolution		1 revolution		Multi-revolution
Measuring range (mm)		0.3 or less	Over 0.3, up to 0.5	Over 0.5, up to 0.6	0.5 or less	Over 0.5, up to 0.6	Over 1.0, up to 1.6
Indication error (μm)	Entire measuring range (in the forward direction)	4	6	7	6	9	10
	1 revolution	—	5	5	—	—	10
	10 scale marks	2	2	2	5	5	5
Retrace error (μm)		3	4	4	4	4	5
Repeatability (μm)		1	1	1	3	3	3
Measuring force (N)	Max.	0.5	0.5	0.5	0.5	0.5	0.5
	Min.	0.01	0.01	0.01	0.01	0.01	0.01

## ■ Dial Test Indicators and the Cosine Effect

Always minimize the angle between movement directions during use.



The reading of any indicator will not represent an accurate measurement if its measuring direction is misaligned with the intended direction of measurement (cosine effect). Because the measuring direction of a dial test indicator is at right angles to a line drawn through the contact point and the stylus pivot, this effect can be minimized by setting the stylus to minimize angle  $\theta$  (as shown in the figures). If necessary, the dial reading can be compensated for the actual  $\theta$  value by using the table below to give the result of measurement.

Result of measurement = indicated value x compensation value

### Compensating for a non-zero angle

Angle	Compensation value
10°	0.98
20°	0.94
30°	0.86
40°	0.76
50°	0.64
60°	0.50

### Examples

If a 0.200 mm measurement is indicated on the dial at various values of  $\theta$ , the result of measurements are:

For  $\theta = 10^\circ$ ,  $0.200 \text{ mm} \times 0.98 = 0.196 \text{ mm}$

For  $\theta = 20^\circ$ ,  $0.200 \text{ mm} \times 0.94 = 0.188 \text{ mm}$

For  $\theta = 30^\circ$ ,  $0.200 \text{ mm} \times 0.86 = 0.172 \text{ mm}$

## ■ Mitutoyo's Response to Lever-operated Dial Indicator B 7533 : 2015

- In the finished product inspection, the accuracy is guaranteed using the horizontal, tilted, vertical type dial indicator with its dial face facing upward; the parallel type with its dial face set in the vertical position.  
Standard-attached inspection certificate includes inspection data.
- The inspection certificate for other than the above postures is available for a fee.
- It is said that, for evaluation of the compatibility to the specifications, the criteria based on JIS B 0641-1 or ISO/TR14253-6 shall be applied.  
Also, it is said that the uncertainty is preferred to be evaluated based on ISO 14253-2 and ISO/IEC Guide 98-3. Therefore, we perform shipping inspection of dial indicators inclusive of the uncertainty of calibration as in the past.
- For universal and pocket types, we perform the finished product inspection based on JIS B 7533-1990.