

Dial Test Indicator Standard B7533-1990 (Extract from JIS/Japanese Industrial Standards)

No.	Item	Calibration method	Diagram of calibration setup	Tools for calibration
1	Wide-range accuracy	(1) For an indicator of 0.01 mm graduation: Displace the contact point so as to move the pointer clockwise in increments of 0.1 mm with reference to the graduations from the zero point to the end point of the measuring range while taking readings of the calibration tool at each point and determine this accuracy from the error curve drawn by plotting the differences of each "indicator reading - calibration tool reading".		Micrometer head or measuring unit (graduation: 1 μm or less, instrumental error: within ±1 μm), supporting stand
2	Adjacent error	(2) For an indicator of 0.002 mm graduation: Displace the contact point so as to move the pointer clockwise in increment of 0.02 mm with reference to the graduations from the zero point to the end point of the measuring range while taking readings of the calibration tool at each point and determine this accuracy from the error curve drawn by plotting the differences of each "indicator reading - calibration tool reading". The instrumental error of the calibration tool shall be compensated prior to this measurement.		
3	Retrace error	After the completion of the wide-range accuracy measurement, reverse the contact point from the last point of measurement while taking readings at the same scale graduations as for the wide-range accuracy measurement and determine the retrace error from the error curve plotted.		
4	Repeatability	a Holding the dial test indicator with its stylus parallel with the top face of the measuring stage, displace the contact point quickly and slowly five times at a desired position within the measuring range and determine the maximum difference in indication.		Measuring stage, Supporting stand, and Gauge block of grade 1 as stipulated by JIS B7506 (Gauge block)
		b Holding the stylus parallel to a gauge block placed on the measuring stage, move the gauge block to and fro and left to right under the contact point within the measuring range and determine the maximum difference in indication.		
5	Measuring force	Holding an indicator by the case or stem, displace the contact point gradually and continuously in the forward and backward directions respectively and take a reading of measuring force at the zero, middle and end points of the measuring range in each direction. • Performance The maximum measuring force in the forward direction shall not exceed 0.5 N. The difference between the maximum and minimum measuring forces in one direction shall not exceed 0.2 N (20 gf). Note that the smallest possible measuring force is desirable for indicators.		Top pan type spring scale (graduation: 2 gf or less) or force gage (sensitivity: 0.02 N or less)

Notes: There are no JIS standards applicable to models with a graduation of 0.001 mm. Therefore, referring to JIS B 7533-1990 for inspecting the wide-range accuracy and adjacent error, the accuracy is measured by moving the contact point 0.01 mm clockwise from the start point of the measuring range to the end point with reference to the graduations.

Accuracy of indication

Permissible indication errors of dial test indicators are as per the table below.

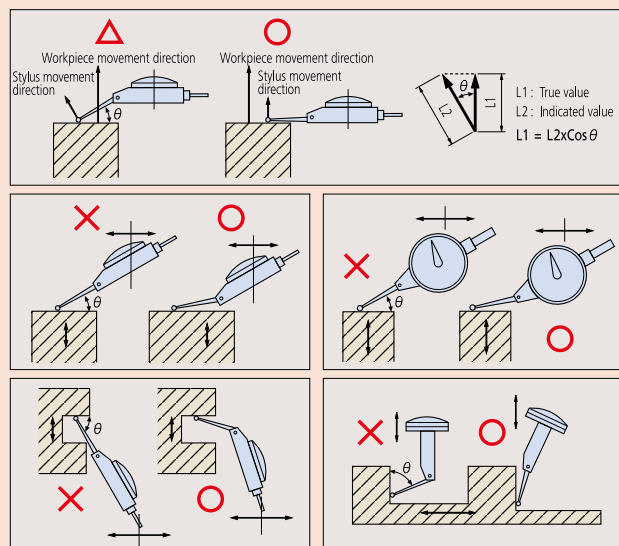
Graduation (mm)	Measuring range (mm)	Wide range accuracy	Adjacent error	Repeatability	Retrace error
0.01	0.5	5	5	3	3
	0.8	8			4* ¹
	1.0	10			
0.002	0.2	3	2	1	2
	0.28				

*1: Applies to indicators with a stylus over 35 mm long.

Remarks: Values in the table above apply at 20°C.

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 θ (as shown in the figures). If necessary, the dial reading can be compensated for the actual θ value by using the table below to give the true value of a measurement.

True value = indicated value x compensation factor

Compensating for a non-zero angle

Angle	Compensation factor
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 θ , the true values are:

For $\theta = 10^\circ$, $0.200 \text{ mm} \times .98 = 0.196 \text{ mm}$

For $\theta = 20^\circ$, $0.200 \text{ mm} \times .94 = 0.188 \text{ mm}$

For $\theta = 30^\circ$, $0.200 \text{ mm} \times .86 = 0.172 \text{ mm}$

Note: A special contact point of involute form can be used to apply compensation automatically and allow measurement to be performed without manual compensation for any angle θ from 0 to 30°. (This type of contact point is custom-made.)