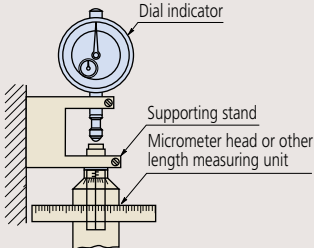
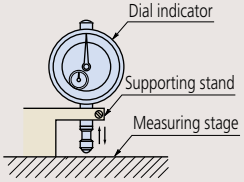
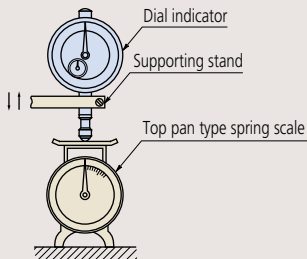


Mitutoyo's Response to Dial Indicator Standard B7503: 2011

- We guarantee the accuracy of completed products by inspecting them in the vertical posture. Standard-attached inspection certificate includes inspection data.
- We issue paid-for inspection certificates for horizontal or opposite posture if required.
- The old JIS Standard indicates that "the uncertainty of calibration" is evaluated inclusively. On the other hand, the new JIS Standard indicates that conformity or nonconformity to specification is verified based on JIS B 0641-1 and that it is preferred that the uncertainty is evaluated based on ISO/TS 14253-2 and ISO/IEC Guide 98. Therefore, we perform shipping inspection of dial indicators inclusive of the uncertainty of calibration as usual.

Dial Indicator Standard B7503 : 2011 (Extract from JIS/Japanese Industrial Standards)

Item	Calibration method	Diagram of calibration setup in vertical posture (example)	Tools for calibration (example)
Indication error	Hold the dial indicator with its plunger set vertically downward, retract the plunger (retraction direction) to set the dial hand at the zero point, and determine the indication error at the below-mentioned measurement points with reference to the dial graduations. - Every 1/10 revolution for the first two revolutions - Every half revolution for the next five revolutions - Every revolution for the next 25 revolutions - Every 5 revolutions for after the 25th revolution For one revolution type dial indicators and indicators whose graduations are not factors of 10, determine the indication errors at the closest measurement points mentioned above.		For 0.01 mm graduation dial indicators: A micrometer head or other measuring unit with 0.5 μm graduation or less and instrumental error of ±1 μm and a supporting stand. For dial indicators other than the above: A micrometer head or other measuring unit with 1 μm graduation or less and ±1 μm instrumental error and a supporting stand.
Retrace error	Next, retract the plunger more than three graduations over the entire measuring range, reverse the plunger displacement (extension direction), and determine the indication errors at the same points measured during plunger retraction. Then determine the indication errors and the retrace errors with reference to the bidirectional indication errors thus obtained. When automatically reading errors by automatic inspection machine, determine the gap between the dial hand and the graduation mark with reference to the displacement of the measuring instrument.		
Repeatability	Apply the contact point of the dial indicator perpendicularly to the upper face of a measuring stage, retract and extend the plunger quickly and slowly five times at a desired position within the measuring range and determine the maximum difference between the five indications obtained.		Measuring stage Supporting stand
Measuring Force	Holding a dial indicator, retract and extend the plunger continuously and gradually, and measure the measuring force at the zero, middle and end points in the measuring range. The largest value: maximum measurement force The smallest value: minimum measurement force The maximum difference in contact force measured when the plunger is retracting and extending at the same measuring position: difference in the measurement force		Supporting stand Top pan type spring scale (graduation: 0.02 N or less) or force gauge (sensitivity: 0.02 N or less)

Maximum Permissible Error

		Maximum permissible error (MPE) by measurement characteristics -- dial indicators with the bezel dia. 50 mm or more												Maximum permissible error (MPE) by measurement characteristics --dial indicators with the bezel dia. 50 mm or less and back plunger type dial indicators						
Graduation (mm)		0.01								0.005	0.001			0.01				0.005	0.002	0.001
Measuring range (mm)		1 or less	Over 1 and up to 3	Over 3 and up to 5	Over 5 and up to 10	Over 10 and up to 20	Over 20 and up to 30	Over 30 and up to 50	Over 50 and up to 100	5 or less	1 or less	Over 1 and up to 2	Over 2 and up to 5	1 or less	Over 1 and up to 3	Over 3 and up to 5	Over 5 and up to 10	5 or less	1 or less	1 or less
Retrace error		3	3	3	3	5	7	8	9	3	2	2	3	4	4	4	5	3.5	2.5	2
Repeatability		3	3	3	3	4	5	5	5	3	0.5	0.5	1	3	3	3	3	3	1	1
Indication error	Arbitrary 1/10 revolution	5	5	5	5	8	10	10	12	5	2	2	3.5	8	8	8	9	6	2.5	2.5
	Arbitrary 1/2 revolution	8	8	9	9	10	12	12	17	9	3.5	4	5	11	11	12	12	9	4.5	4
	Arbitrary One revolution	8	9	10	10	15	15	15	20	10	4	5	6	12	12	14	14	10	5	4.5
	Entire measuring range	8	10	12	15	25	30	40	50	12	5	7	10	15	16	18	20	12	6	5

MPE for one revolution type dial indicators does not define the indication error of arbitrary 1/2 and 1 revolution.

Notes: (1) Values in the table above apply at 20°C, which JIS B0680 defines as the standard temperature.

(2) The measurement characteristics of a dial indicator have to meet both maximum permissible error (MPE) and measurement force permissible limits (MPL) at any position within the measuring range in any posture when the measurement characteristics are not specified by the manufacturer.