Answer on Question #57931-Physics-Mechanics

A micrometer screw gauge was used to measure the diameter of ball bearing. Three measurements were found as follows: 5.26mm, 5.21mm, 5.24 mm. Calculate the absolute error in the sum of these values

Solution

Usually the mean value $\bar{d}$ is taken as the true value. So,

$$\bar{d} = \frac{5.26 + 5.21 + 5.24}{3} = 5.237\ mm$$

$$\Delta d_1 = \left|d_1 - \bar{d}\right| = |5.26 - 5.237| = 0.023\ mm$$

$$\Delta d_2 = \left|d_2 - \bar{d}\right| = |5.21 - 5.237| = 0.027\ mm$$

$$\Delta d_3 = \left|d_3 - \bar{d}\right| = |5.24 - 5.237| = 0.003\ mm$$

The absolute error in the sum of these values is

$$\Delta(d_1 + d_2 + d_3) = \Delta(d_1) + \Delta(d_2) + \Delta(d_3) = 0.023 + 0.027 + 0.003 = 0.053\ mm.$$

Answer: $\mathbf{0.053\ mm}$.