The EDM on my total station is rated in the manufacturer's literature as being ±(3 mm + 3 ppm). What does this mean in practice?

"You have to check with each individual manufacturer, but generally the accuracy of the EDM is the standard deviation of a single measurement. For those not familiar with this concept, standard deviation, often represented by the lowercase Greek letter "sigma" (s) is actually a representation of uncertainty at approximately the 68 percent confidence level. This means that if a single measurement is made, there is a 68 percent probability that the measurement result will be within the published rating.

Those familiar with this concept will also know that the 95 percent and 99.9 percent confidence levels are easily determined by multiplying s by 2 and 3, respectively. The statistical basis for stating accuracy is actually determined by measuring precision, but only after all known systematic errors (instrumental, natural and human) have been removed. In your case of ±(3 mm + 3 ppm), the expected error in a 100 ft measurement at the 68 percent confidence level would be 0.01 ft[1]. The corresponding 95 percent and 99.9 percent errors would be 0.02 and 0.03 ft. Interestingly, these correspond to relative accuracies for the measurement of 1:10,000[2], 1:5,000 and 1:3,333."…

"Remember, these are theoretical numbers based on manufacturers' ratings and how your equipment is used."

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[1] Feet (ft) to meters (m) = ft * 0.3048
Meters (m) to millimeters (mm) = m / 1000
Millimeters (mm) to feet (ft) = mm * 0.0032808
Example: Expected Error
+/- (3 mm + 3 ppm)
Distance = 100 ft
Sqrt ((mm / (25.4 * 12))^2 + ((ppm * dist in feet) / 1,000,000))^2) = + / - (xerror in feet)
Sqrt ((3 / (25.4 * 12))^2 + ((3 * 100) / 1,000,000))^2) = 0.009847091
0.009847091 => + / - 0.01 ft

[2] Example: Relative Accuracy
0.01 / 100 ft = 0.0001
1 / 0.0001 = 10,000
10,000 => 1:10,000