

SFT standard sample guaranteed values and accuracy

Guaranteed values and accuracy (error)

There are two types of measurement error that occur in quantitative measurements, statistical error and accidental error, each with overlapping error components from several factors. This composite of errors that includes all error components is called total error. In the case of SFT standard samples, statistical error and accidental error overlap and are calculated using the square root of the sum of squares.

Currently there are two types of guaranteed values for SFT standard samples, 5% and 10%. Samples with a total error exceeding 5% have guaranteed values of 10%. Samples with a total error less than 5% have guaranteed values of 5%. Consequently, the actual accuracy of total error may not necessarily agree with the guaranteed value.

Statistical Error (slope) and Accidental Error (dispersion)

Thickness values of SFT standard samples are valued by the fluorescence X-ray method based on the calibration curve created by a primary standard sample used for calibration. The primary standard sample used for calibration is periodically corrected by a secondary standard sample. A secondary standard sample calculates the thickness value from the weight per unit area and theoretical density. The linkage (traceability) with thickness values of Japan's national standard is established by area (length) and weight.

Included in statistical error are accuracy of the secondary standard sample and primary standard sample for calibration, instrumental error or the measurement device, and personal error. Accuracy of the secondary standard sample and primary standard sample for calibration is determined by the accuracy of area and weight measurements, the element(s) used, and by thickness measurement conditions. As for instrumental error and personal error, to correct each measurement the value of the primary standard sample used for calibration is verified immediately before and after measuring and controlled to within $\pm 2\%$.

Accidental error includes statistical variation error in the X-ray measurement when measuring thickness. The size of statistical variation error depends on the intensity of fluorescent X-rays obtained in the measurement. Fluorescent X-ray intensity obviously relies on the strength of primary X-rays, but is largely controlled by sample thickness and measurement time. Therefore, to reduce statistical variation error, measurements should be performed using longer measurement times. The standard deviation (σ) of dispersion from this accidental error is displayed together with the measurement readings. At SII, accidental error when calculating total error is two times the standard deviation.