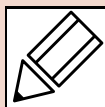

Quick Guide to Precision Measuring Instruments

Quality Control

A

■ Quality Control (QC)

A system for economically producing products or services of a quality that meets customer requirements.

■ Process Quality Control

Activities to reduce variation in product output by a process and keep this variation low. Process improvement and standardization as well as technology accumulation are promoted through these activities.

■ Statistical Process Control (SPC)

Process quality control through statistical methods.

■ Population

A group of all items that have characteristics to be considered for improving and controlling processes and quality of product. A group which is treated based on samples is usually the population represented by the samples.

■ Lot

Collection of product produced under the same conditions.

■ Sample

An item of product (or items) taken out of the population to investigate its characteristics.
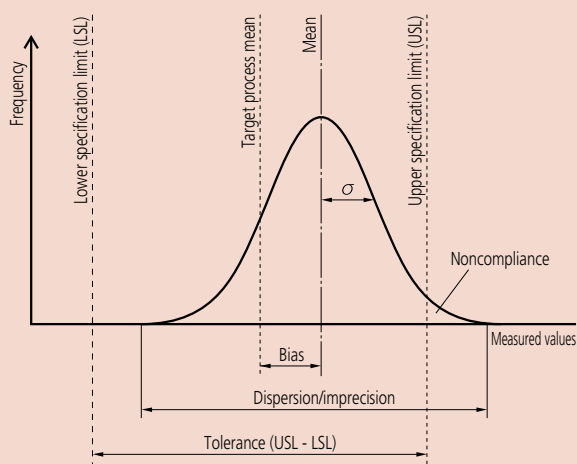
■ Sample Size

Number of product items in the sample.

■ Bias

Value calculated by subtracting the true value from the mean of measured values when multiple measurements are performed.

■ Dispersion

Variation in the values of a target characteristic in relation to the mean value. Standard deviation is usually used to represent the dispersion of values around the mean.

■ Histogram

A diagram that divides the range between the maximum and the minimum measured values into several divisions and shows the number of values (appearance frequency) in each division in the form of a bar graph. This makes it easier to understand the rough average or the approximate extent of dispersion. A bell-shaped symmetric distribution is called the normal distribution and is much used in theoretical examples on account of its easily calculable characteristics. However, caution should be observed because many real processes do not conform to the normal distribution, and error will result if it is assumed that they do.

■ Process Capability

Process-specific performance demonstrated when the process is sufficiently standardized, any causes of malfunctions are eliminated, and the process is in a state of statistical control. The process capability is represented by mean $\pm 3\sigma$ or 6σ when the quality characteristic output from the process shows normal distribution. σ (sigma) indicates standard deviation.

■ Process Capability Index (PCI or Cp)

A measure of how well the process can operate within the tolerance limits of the target characteristic. It should always be significantly greater than one. The index value is calculated by dividing the tolerance of a target characteristic by the process capability (6σ). The value calculated by dividing the difference between the mean ($\overline{X}$) and the standard value by 3σ may be used to represent this index in cases of a unilateral tolerance. The process capability index assumes that a characteristic follows the normal distribution.

Notes: If a characteristic follows the normal distribution, 99.74% data is within the range $\pm 3\sigma$ from the mean.

Bilateral tolerance

$$Cp = \frac{USL-LSL}{6\sigma}$$

USL: Upper specification limit
LSL: Lower specification limit

Unilateral tolerance ... If only the upper limit is stipulated

$$Cp = \frac{USL-\overline{X}}{3\sigma}$$

Unilateral tolerance ... If only the lower limit is stipulated

$$Cp = \frac{\overline{X}-LSL}{3\sigma}$$

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