

Standard Practice for Use of Control Charts in Statistical Process Control¹

This standard is issued under the fixed designation E2587; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice provides guidance for the use of control charts in statistical process control programs, which improve process quality through reducing variation by identifying and eliminating the effect of special causes of variation.

1.2 Control charts are used to continually monitor product or process characteristics to determine whether or not a process is in a state of statistical control. When this state is attained, the process characteristic will, at least approximately, vary within certain limits at a given probability.

1.3 This practice applies to variables data (characteristics measured on a continuous numerical scale) and to attributes data (characteristics measured as percentages, fractions, or counts of occurrences in a defined interval of time or space).

1.4 The system of units for this practice is not specified. Dimensional quantities in the practice are presented only as illustrations of calculation methods. The examples are not binding on products or test methods treated.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E456 Terminology Relating to Quality and Statistics

E1994 Practice for Use of Process Oriented AOQL and LTPD Sampling Plans

E2234 Practice for Sampling a Stream of Product by Attributes Indexed by AQL

¹ This practice is under the jurisdiction of ASTM Committee E11 on Quality and Statistics and is the direct responsibility of Subcommittee E11.30 on Statistical Quality Control.

Current edition approved April 1, 2016. Published May 2016. Originally approved in 2007. Last previous edition approved in 2015 as E2587 – 15. DOI: 10.1520/E2587-16.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

E2281 Practice for Process Capability and Performance Measurement

E2762 Practice for Sampling a Stream of Product by Variables Indexed by AQL

3. Terminology

3.1 Definitions:

3.1.1 See Terminology E456 for a more extensive listing of statistical terms.

3.1.2 *assignable cause, n*—factor that contributes to variation in a process or product output that is feasible to detect and identify (see *special cause*).

3.1.2.1 *Discussion*—Many factors will contribute to variation, but it may not be feasible (economically or otherwise) to identify some of them.

3.1.3 *accepted reference value, ARV, n*—value that serves as an agreed-upon reference for comparison and is derived as: (1) a theoretical or established value based on scientific principles, (2) an assigned or certified value based on experimental work of some national or international organization, or (3) a consensus or certified value based on collaborative experimental work under the auspices of a scientific or engineering group. E177

3.1.4 *attributes data, n*—observed values or test results that indicate the presence or absence of specific characteristics or counts of occurrences of events in time or space.

3.1.5 *average run length (ARL), n*—the average number of times that a process will have been sampled and evaluated before a shift in process level is signaled.

3.1.5.1 *Discussion*—A long ARL is desirable for a process located at its specified level (so as to minimize calling for unneeded investigation or corrective action) and a short ARL is desirable for a process shifted to some undesirable level (so that corrective action will be called for promptly). ARL curves are used to describe the relative quickness in detecting level shifts of various control chart systems (see 5.1.4). The average number of units that will have been produced before a shift in level is signaled may also be of interest from an economic standpoint.

3.1.6 *c chart, n*—control chart that monitors the count of occurrences of an event in a defined increment of time or space.

3.1.7 *center line, n*—line on a control chart depicting the average level of the statistic being monitored.