### Control Chart Constants

**X and R Control Charts**

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**X and S Control Charts**

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### Special Cause Patterns

- **RULE 1:** Point beyond the control limit.
- **RULE 2:** 2 out of 3 in Zone A or beyond.
- **RULE 3:** 4 out of 5 Zone B or beyond.
- **RULE 4:** 8 or more on one side of centerline without crossing.
- **RULE 5:** Six or more in a row increasing or decreasing.

### Empirical Rule

- 68% ($3\sigma$) capability (6σ)
- 95% (4σ) capability
- 99.7% (3σ) capability

### Calculated Capability Ratio

- $P_p$ Fallout (both sides combined): 133,620
- $P_p$ Fallout (one side only): 66,810
- $P_{pk}$ Fallout (both sides combined): 71,860
- $P_{pk}$ Fallout (one side only): 35,930

### Fallout Rates expressed in PPM (parts per million)

- $0.50$: 0.076
- $0.60$: 0.136
- $0.70$: 0.184
- $0.80$: 0.223
- $0.90$: 0.256
- $1.00$: 0.283
- $1.10$: 0.308
- $1.20$: 0.337
- $1.30$: 0.366
- $1.40$: 0.395
- $1.50$: 0.419
- $1.60$: 0.443
- $1.70$: 0.466
- $1.80$: 0.489
- $1.90$: 0.510
- $2.00$: 0.531

### Voice of the Process (VOP) and Voice of the Customer (VOC)

- VOP: Lower Specification Limit (LSL)
- VOC: Upper Specification Limit (USL)

### Capability (6σ)

- $P_{pk}$: Calculated $P_{pk}$ Fallout (one side only)
- $P_{pk}$: Ppk Fallout (both sides combined)

### To order pocket cards, contact:

- Ppl = 
- Ppu = 
- Pp = 

### Empirical Rule

- $\sigma = n - 1$
- $\mu = \frac{\sum X}{n}$
- $\bar{X} = \frac{\sum X}{n}$
- $\hat{\sigma} = \frac{R}{d_i}$
- $\mu' = \frac{USL - LSL}{3\sigma}$
- $C_{M} = \frac{\mu' - LSL}{3\sigma}$
- $C_{U} = \frac{USL - \mu'}{3\sigma}$
- $C_{L} = \frac{\bar{X} - LSL}{3\sigma}$
- $C_{U} = \frac{USL - \bar{X}}{3\sigma}$
- $C_{M} = \frac{\bar{X} - LSL}{3\sigma}$
- $C_{U} = \frac{USL - \bar{X}}{3\sigma}$
- $C_{L} = \frac{\bar{X} - LSL}{3\sigma}$
- $C_{U} = \frac{USL - \bar{X}}{3\sigma}$

For more information, visit www.infinityqs.com
Variable Data Control Chart Selection Tree

Data Type: There are two types of attribute data - defects and defectives. Defects data are count data and are described with a Poisson distribution. Counting the number of visual blemishes on a part or the number of support calls received in an hour are examples of defect data. Defectives data are pass/fail in nature. The number of rejected parts in a lot is an example of defective data. Defectives data are described with a binomial distribution.

Sample Size: The number of items in a single subgroup.

Group: Group processing is required when desiring to combine multiple process streams on the same chart. Plotting the output from multiple fill heads, a multi-cavity mold or multiple lines are classic examples for using Group charts.

3D: Used when measuring within-piece and piece-to-piece variation. Examples include measuring a spacer thickness in multiple places or measuring a bore diameter in three places to test for out-of-roundness.

Target: This processing is required when combining characteristics on the same chart that have different nominal or target values.

Coded: This processing is required when combining characteristics on the same chart that are of different units of measure, different expected levels of variation or different expected fallout rates.

Attribute Data Control Chart Selection Tree

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Control Chart Formulas

Attribute Control Charts

Variables Control Charts

Variable Data Control Chart Selection Tree

Decision Tree Definitions

Control Chart Formulas

Attribute Data Control Chart Selection Tree

InfinityQS Supports All These Variables Control Charts And Many More

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