

Appendix 1. Decision tool to select appropriate control-chart.

DATA TYPE	CHARTS	MONITORS	APPLICATIONS
Variable	X-Bar and S	Process average and standard deviation	High volume, single characteristic Sample size 2 or larger
Variable	X-Bar and R	Process average and range	High volume, single characteristic Sample size between 2 and 6
Variable	X and MR	Process average and moving range	Sensitivity not required Sampling is costly Long cycle time (Note: Normality of data must be considered.)
Variable	Deviation from Nominal	Process average and range (or standard deviation)	Short production runs (multiple parts) All parts have similar standard deviation
Variable	Standardized X-Bar and R Standardized X-Bar and S	Process average and range Process average and standard deviation	Short production runs (multiple parts) Part standard deviations differ
Variable	X-Bar, Rb, d	Process average, range between and difference between extreme locations	Multiple locations within subgroup Location averages are statistically different
Variable	X-Bar, Rb, Rw X-Bar, Rb, S	Process average, range (or standard deviation) within and range between subgroup	Multiple locations within subgroup Variation within and between subgroups different Location averages are not statistically different
Variable	CUSUM	Cumulative deviations from mean	Charts for individuals when X and MR are not sensitive enough
Variable	EWMA	Weighted moving average	Charts for individuals when X and MR are not sensitive enough
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Attribute	Np	Number of Defectives	Pass/Fail Data Constant Sample Size $n > 3/p$
Attribute	P	Proportion Defective	Pass/Fail Data

Attribute	Standardized p	Standardized Proportion Defective	Constant or Variable Sample Size $n > 3/p$ Pass/Fail Data Variable Sample Size $n > 3/p$ Can be used for short production runs
Attribute	C	Number of Defects	Multiple types of defects on unit Constant sample size n such that $c > 7$
Attribute	U	Number of Defects per unit	Multiple types of defects on unit Constant or variable sample size n such that $c > 7$
Attribute	Standardized u	Standardized Number of Defects per unit	Multiple types of defects on unit Variable sample size n such that $c > 7$ Can be used for short production runs