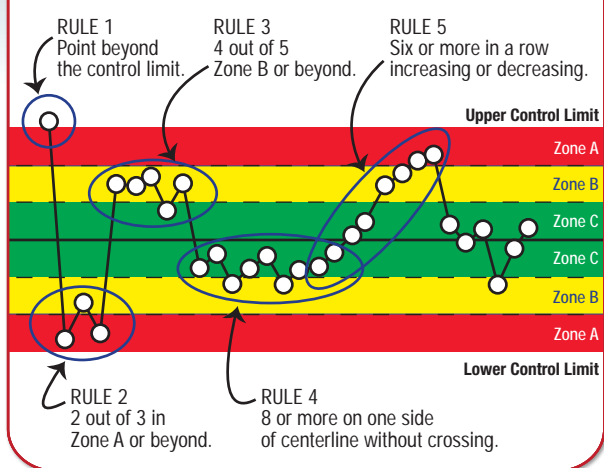


Pp and Ppk Fallout Rates

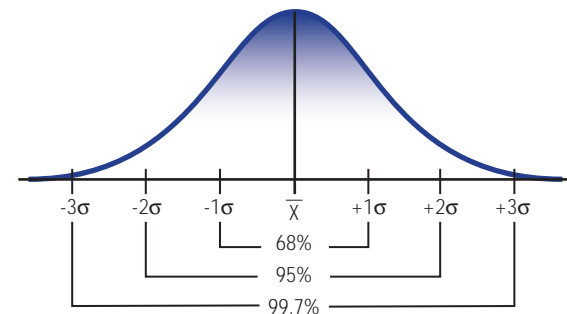
Calculated Capability Ratio	Pp Fallout (both sides combined)	Ppk Fallout (one side only)
0.50	133,620	66,810
0.60	71,860	35,930
0.70	35,730	17,865
0.80	16,396	8,198
0.90	6,934	3,467
1.00	2,700	1,350
1.10	966	483
1.20	318	159
1.30	96	48
1.40	26	13
1.50	7	3
1.60	2	1
1.70	0.340	0.170
1.80	0.060	0.030
1.90	0.012	0.006
2.00	0.002	0.001

Fallout rates expressed in PPM (parts per million)

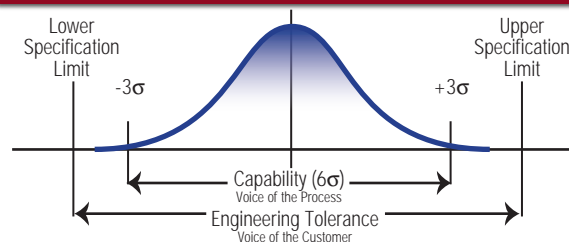
Special Cause Patterns



Empirical Rule



Capability Study



Capability Formulas

$$P_{pl} = \frac{\bar{X} - LSL}{3s}$$

$$C_{pl} = \frac{\hat{\mu} - LSL}{3\hat{\sigma}}$$

$$\bar{X} = \frac{\sum X}{n}$$

$$P_{pu} = \frac{USL - \bar{X}}{3s}$$

$$C_{pu} = \frac{USL - \hat{\mu}}{3\hat{\sigma}}$$

$$s = \sqrt{\frac{\sum (X_i - \bar{X})^2}{n - 1}}$$

$$P_p = \frac{USL - LSL}{6s}$$

$$C_p = \frac{USL - LSL}{6\hat{\sigma}}$$

$$\hat{\sigma} = \frac{R}{d_2}$$

$$\hat{\mu} = \text{Estimated population mean}$$

Control Chart Constants

\bar{X} and R Control Charts

n	A ₂	D ₃	D ₄	d ₂
1	2.660	-	-	-
2	1.880	0	3.267	1.128
3	1.023	0	2.574	1.693
4	0.729	0	2.282	2.059
5	0.577	0	2.114	2.326
6	0.483	0	2.004	2.534
7	0.419	0.076	1.924	2.704
8	0.373	0.136	1.864	2.847
9	0.337	0.184	1.816	2.970
10	0.308	0.223	1.777	3.078
11	0.285	0.256	1.744	3.173
12	0.266	0.283	1.717	3.258

\bar{X} and S Control Charts

n	A ₃	B ₃	B ₄	c ₄
10	0.975	0.284	1.716	0.9727
11	0.927	0.321	1.679	0.9754
12	0.886	0.354	1.646	0.9776
13	0.850	0.382	1.618	0.9794
14	0.817	0.406	1.594	0.9810
15	0.789	0.428	1.572	0.9823
16	0.763	0.448	1.552	0.9835
17	0.739	0.466	1.534	0.9845
18	0.718	0.482	1.518	0.9854
19	0.698	0.497	1.503	0.9862
20	0.680	0.510	1.490	0.9869
21	0.663	0.523	1.477	0.9876
22	0.647	0.534	1.466	0.9882
23	0.633	0.545	1.455	0.9887
24	0.619	0.555	1.445	0.9892
25	0.606	0.565	1.435	0.9896

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