Table of Constants and Formulas for Control Charts

	$\overline{X}$ and R Charts				$\overline{X}$ and s Charts			
	Chart for Averages $\overline{X}$	Chart for Ranges R			Chart for Averages $\overline{X}$	Chart for Averages s		
Sugroup size	Factors for Control Limits	Divisors for Estimate of Standard Deviation	Factors for Control Limits		Factors for Control Limits	Divisors for Estimate of Standard Deviation		Factors for Control Limits
n	A_2	d_2	D_3	D_4	A_3	c_4	B_3	B_4
2	1.880	1.128	0.000	3.267	2.659	0.7979	0.000	3.267
3	1.023	1.693	0.000	2.574	1.954	0.8862	0.000	2.568
4	0.729	2.059	0.000	2.282	1.628	0.9213	0.000	2.266
5	0.577	2.326	0.000	2.114	1.427	0.9400	0.000	2.089
6	0.483	2.534	0.000	2.004	1.287	0.9515	0.030	1.970
7	0.419	2.704	0.076	1.924	1.182	0.9594	0.118	1.882
8	0.373	2.847	0.136	1.864	1.099	0.9650	0.185	1.815
9	0.337	2.970	0.184	1.816	1.032	0.9693	0.239	1.761
10	0.308	3.078	0.223	1.777	0.975	0.9727	0.284	1.716
11	0.285	3.173	0.256	1.744	0.927	0.9754	0.321	1.679
12	0.266	3.258	0.283	1.717	0.886	0.9776	0.354	1.646
13	0.249	3.336	0.307	1.693	0.850	0.9794	0.382	1.618
14	0.235	3.407	0.328	1.672	0.817	0.9810	0.406	1.594
15	0.223	3.472	0.347	1.653	0.789	0.9823	0.428	1.572
16	0.212	3.532	0.363	1.637	0.763	0.9835	0.448	1.552
17	0.203	3.588	0.378	1.622	0.739	0.9845	0.466	1.534
18	0.194	3.640	0.391	1.608	0.718	0.9854	0.482	1.518
19	0.187	3.689	0.403	1.597	0.698	0.9862	0.497	1.503
20	0.180	3.735	0.415	1.585	0.680	0.9869	0.510	1.490
21	0.173	3.778	0.425	1.575	0.663	0.9876	0.523	1.477
22	0.167	3.819	0.434	1.566	0.647	0.9882	0.534	1.466
23	0.162	3.858	0.443	1.557	0.633	0.9887	0.545	1.455
24	0.157	3.895	0.451	1.548	0.619	0.9882	0.555	1.445
25	0.153	3.931	0.459	1.541	0.606	0.9896	0.565	1.435

From ASTM publications STP-15D

$$UCL_X, LCL_X = \overline{\overline{X}} \pm A_2 \overline{R} \qquad\qquad UCL_X, LCL_X = \overline{\overline{X}} \pm A_3 \overline{s}$$

$$UCL_R = D_4 \overline{R} \qquad\qquad UCL_S = B_4 \overline{s}$$

$$LCL_R = D_3 \overline{R} \qquad\qquad LCL_S = B_3 \overline{s}$$

$$\sigma = \overline{R} / d_2 \qquad\qquad \sigma = \overline{s} / c_4$$

	Mediam Charts				**Charts for Individuals**			
	Chart for Mediams X	**Chart for Ranges** R			**Chart for Individuals** X	**Chart for Ranges** R		
Sugroup size	**Factors for Control Limits**	**Divisors for Estimate of Standard Deviation**	**Factors for Control Limits**		**Factors for Control Limits**	**Divisors for Estimate of Standard Deviation**		**Factors for Control Limits**
n	A_2	d_2	D_3	D_4	E_2	d_2	D_3	D_4
2	1.880	1.128	0.000	3.267	2.660	1.1280	-	3.267
3	1.187	1.693	0.000	2.574	1.772	1.6930	-	2.574
4	0.796	2.059	0.000	2.282	1.457	2.0590	-	2.282
5	0.691	2.326	0.000	2.114	1.290	2.3260	-	2.114
6	0.548	2.534	0.000	2.004	1.184	2.5340	-	2.004
7	0.508	2.704	0.076	1.924	1.109	2.7040	0.076	1.924
8	0.433	2.847	0.136	1.864	1.054	2.8470	0.136	1.864
9	0.412	2.970	0.184	1.816	1.010	2.9700	0.184	1.816
10	0.362	3.078	0.223	1.777	0.975	3.0780	0.223	1.777

From ASTM publications STP-15D

$$\text{UCL}_X, \text{LCL}_X = \bar{X} \pm A_2 \bar{R}$$

$$\text{UCL}_R = D_4 \bar{R}$$

$$\text{LCL}_R = D_3 \bar{R}$$

$$\sigma = \bar{R} / d_2$$

$$\text{UCL}_X, \text{LCL}_X = \bar{X} \pm E_2 \bar{R}$$

$$\text{UCL}_R = D_4 \bar{R}$$

$$\text{LCL}_R = D_3 \bar{R}$$

$$\sigma = \bar{R} / d_2$$