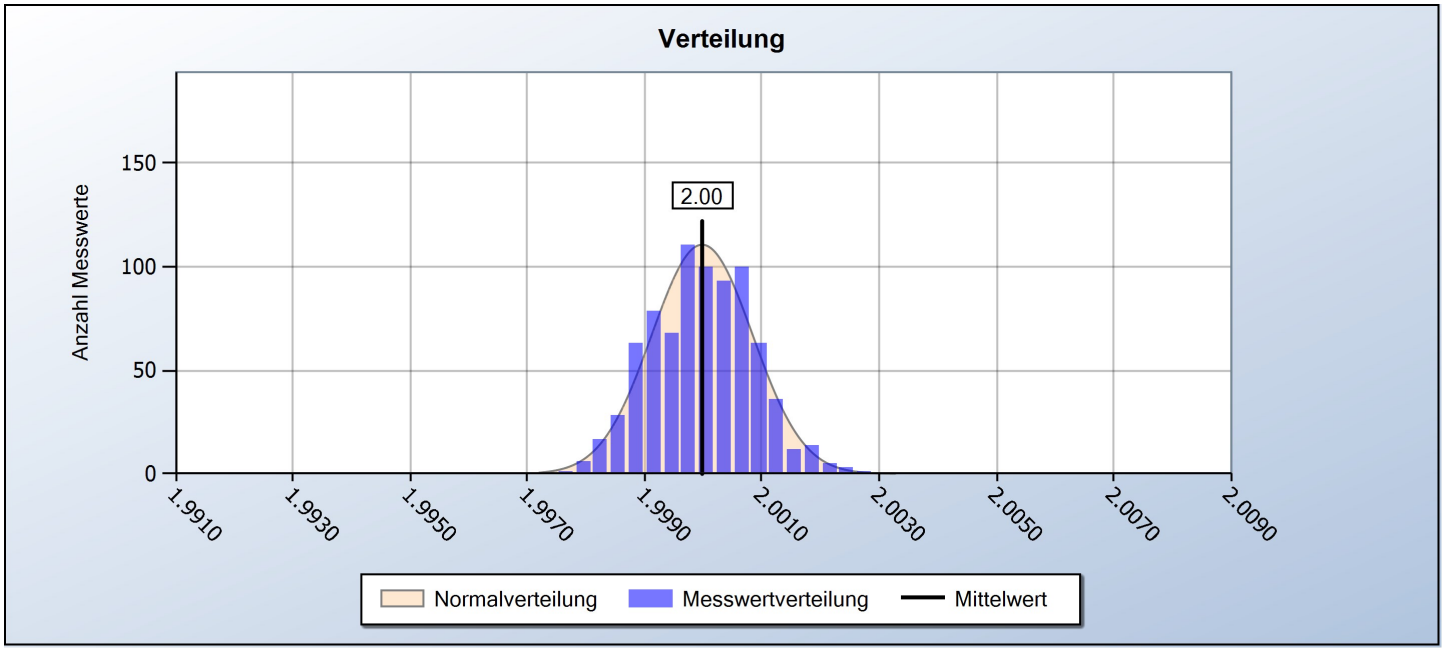
Kunde:	**Example Corporation**
Datum:	**25.04.2017 13:08:39**
Seite:	**1/16**
Version:	**V1.0**

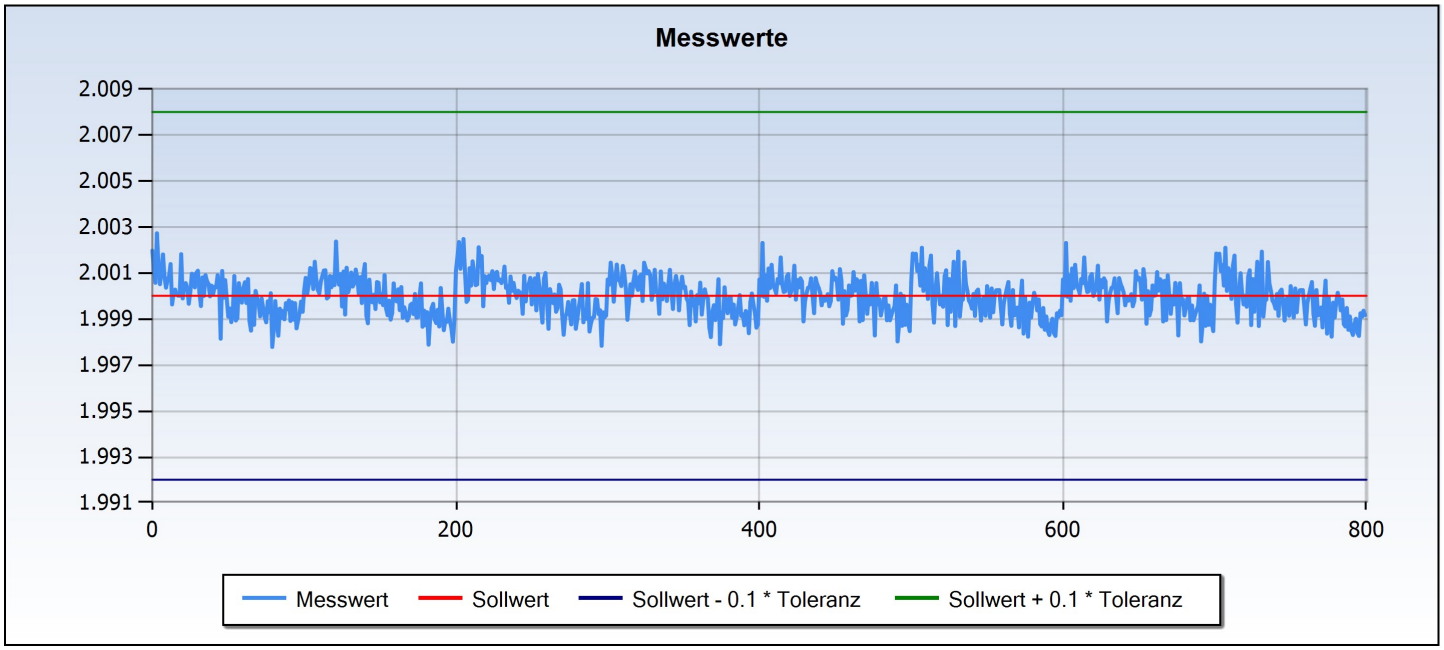
MessmittelanalyseVerfahren1.frx

Messmittelanalyse (MSA) Verfahren 1
Strommessung

Typ MCD2403
Step 90 - Channel 1 10V current [A]

MCD ELEKTRONIK GMBH





Allgemein	
Anzahl Messwerte	800
Untere Grenze (UG)	1.960
Obere Grenze (OG)	2.040
Toleranz (OG - UG)	0.080
Sollwert	2.000
Minimum	1.998
Maximum	2.003
Mittelwert	2.000
Varianz	0.000001
Sigma (s)	0.0009
Mittelwert - 3 Sigma	1.9974
Mittelwert + 3 Sigma	2.0026

Messmittelanalyse (MSA) Verfahren 1	
Cg (>=1.33)	4.65
Cgk (>=1.33)	4.63

$$Cg = \frac{0.2 * (OG - UG)}{4s}$$

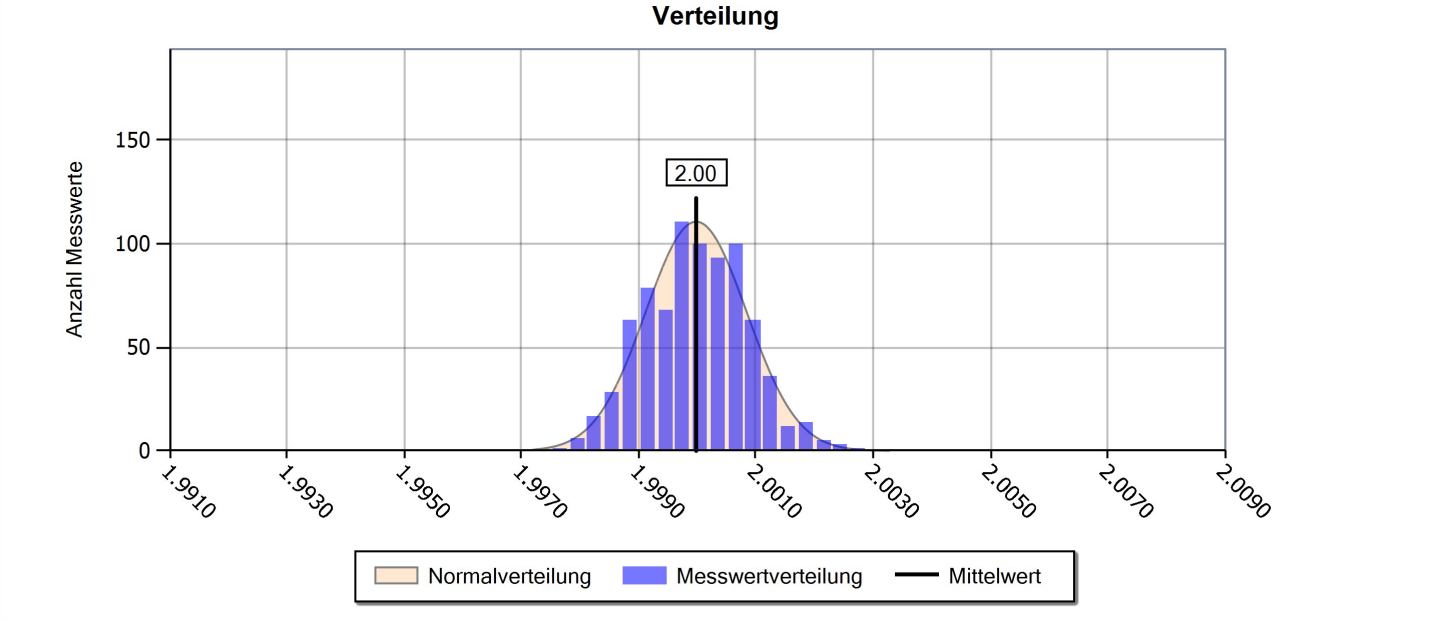
$$Cgk = \frac{0.1 * (OG - UG) - |\chi_{soll} - \overline{\chi}|}{2s}$$

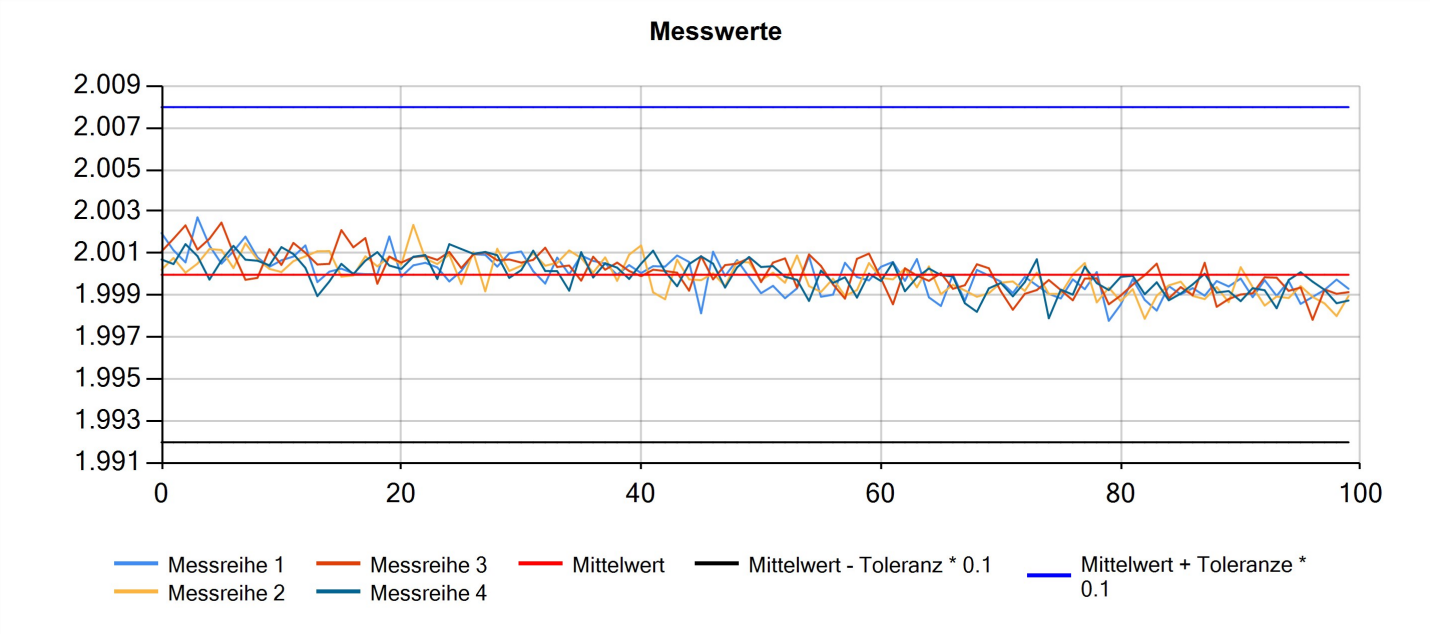
$\overline{\chi}$: Mittelwert
χ_{soll}: Sollwert
OG: obere Grenze
UG: untere Grenze
s: Standardabweichung

Messreihe	DUT	Value
1	1	2,00197000
2	1	2,00022000
3	1	2,00109000
4	1	2,00071000
5	1	2,00071000
6	1	2,00061000
7	1	2,00071000
8	1	2,00061000
1	2	2,00115000
2	2	2,00078000
3	2	2,00170000
4	2	2,00049000
5	2	2,00001000
6	2	2,00184000
7	2	2,00001000
8	2	2,00184000
1	3	2,00057000
2	3	2,00008000
3	3	2,00234000
4	3	2,00144000
5	3	2,00230000
6	3	2,00178000
7	3	2,00230000
8	3	2,00178000
1	4	2,00272000
2	4	2,00051000
3	4	2,00118000
4	4	2,00087000
5	4	1,99996000
6	4	2,00183000
7	4	1,99996000
8	4	2,00183000
1	5	2,00137000
2	5	2,00121000
3	5	2,00170000
4	5	1,99975000
5	5	2,00089000
6	5	2,00108000
7	5	2,00089000
8	5	2,00108000
1	6	2,00051000
2	6	2,00116000
3	6	2,00247000
4	6	2,00066000
5	6	1,99979000
6	6	2,00134000
7	6	1,99979000
8	6	2,00134000
1	7	2,00110000
2	7	2,00030000
3	7	2,00101000
4	7	2,00136000
5	7	2,00119000
6	7	2,00045000

7	7	2,00119000
8	7	2,00045000
1	8	2,00180000
2	8	2,00148000
3	8	1,99974000
4	8	2,00070000
5	8	2,00034000
6	8	2,00209000
7	8	2,00034000
8	8	2,00209000
1	9	2,00081000
2	9	2,00072000
3	9	1,99983000
4	9	2,00065000
5	9	2,00135000
6	9	2,00022000
7	9	2,00135000
8	9	2,00022000
1	10	2,00036000
2	10	2,00026000
3	10	2,00120000
4	10	2,00043000
5	10	2,00051000
6	10	2,00120000
7	10	2,00051000
8	10	2,00120000
1	11	2,00067000
2	11	2,00011000
3	11	2,00045000
4	11	2,00130000
5	11	2,00032000
6	11	2,00085000
7	11	2,00032000
8	11	2,00085000
1	12	2,00085000
2	12	2,00063000
3	12	2,00150000
4	12	2,00097000
5	12	2,00011000
6	12	1,99987000
7	12	2,00011000
8	12	1,99987000
1	13	2,00138000
2	13	2,00086000
3	13	2,00103000
4	13	2,00031000
5	13	2,00073000
6	13	2,00133000
7	13	2,00073000
8	13	2,00133000
1	14	1,99963000
2	14	2,00110000
3	14	2,00047000
4	14	1,99896000
5	14	2,00056000

Kunde:	**Example corporation**	**Messmittelanalyse (MSA) Verfahren 3**	MCD ELEKTRONIK GMBH
Datum:	**16.05.2017 11:11:46**	**Strommessung**	
Seite:	**1/16**	Typ MCD2403	
Version:	**V1.0**	Step 90 - Channel 1 10V current [A]	
MessmittelanalyseVerfahren3.frx			





Messmittelanalyse (MSA) Verfahren 3	
Anzahl Teile	100
Anzahl Messungen pro Teil	8
Toleranz (OG - UG)	0.080
Minimum	1.998
Maximum	2.003
Mittelwert	2.000
Varianz	0.000001
Sigma (s)	0.0009
Mittelwert - 3 Sigma	1.9974
Mittelwert + 3 Sigma	2.0026
S²E	0.00000039
EV (99%)	0.00323570
%R & R (zur Toleranz)	4.04 %

$$\sum E = \sum_{i=1}^{n} \sum_{j=1}^{k} (X_{ij} - X_{i\bullet})^2 \quad \text{nit } X_{i\bullet} = \text{Mittelwert der Messung pro Teil}$$

$$i = 1, 2, \ldots, n = \text{Anzahl Teile}$$

$$j = 1, 2, \ldots, k = \text{Anzahl Messung pro Teil}$$

$$S_E^2 = \frac{1}{n*(k-1)} \sum E$$

$$EV = 5{,}15 * S_E \qquad \text{für Vertrauensniveau 99\%}$$

$$\%R \;\&\; R = \%EV = \frac{EV}{T} * 100\% \text{ mit Toleranz (T) als Referenzgröße}$$

Messreihe	DUT	Value
1	1	2,00197000
1	2	2,00115000
1	3	2,00057000
1	4	2,00272000
1	5	2,00137000
1	6	2,00051000
1	7	2,00110000
1	8	2,00180000
1	9	2,00081000
1	10	2,00036000
1	11	2,00067000
1	12	2,00085000
1	13	2,00138000
1	14	1,99963000
1	15	2,00013000
1	16	2,00027000
1	17	2,00005000
1	18	2,00001000
1	19	2,00001000
1	20	2,00181000
1	21	1,99989000
1	22	2,00043000
1	23	2,00055000
1	24	2,00033000
1	25	1,99966000
1	26	2,00016000
1	27	2,00096000
1	28	2,00093000
1	29	2,00037000
1	30	2,00100000
1	31	2,00109000
1	32	2,00015000
1	33	1,99956000
1	34	2,00080000
1	35	2,00000000
1	36	2,00090000
1	37	2,00064000
1	38	2,00052000
1	39	1,99998000
1	40	2,00044000
1	41	2,00006000
1	42	2,00039000
1	43	2,00037000
1	44	2,00090000
1	45	2,00059000
1	46	1,99814000
1	47	2,00108000
1	48	1,99992000
1	49	2,00068000
1	50	1,99988000
1	51	1,99910000
1	52	1,99945000
1	53	1,99886000
1	54	1,99933000

Messreihe	DUT	Value
1	55	2,00086000
1	56	1,99893000
1	57	1,99903000
1	58	2,00055000
1	59	1,99987000
1	60	1,99971000
1	61	2,00036000
1	62	2,00059000
1	63	1,99969000
1	64	2,00073000
1	65	1,99890000
1	66	1,99849000
1	67	1,99999000
1	68	1,99874000
1	69	2,00021000
1	70	1,99994000
1	71	1,99965000
1	72	1,99911000
1	73	1,99988000
1	74	1,99947000
1	75	1,99907000
1	76	1,99885000
1	77	1,99976000
1	78	1,99929000
1	79	2,00011000
1	80	1,99778000
1	81	1,99856000
1	82	1,99977000
1	83	1,99878000
1	84	1,99827000
1	85	1,99944000
1	86	1,99904000
1	87	1,99934000
1	88	1,99898000
1	89	1,99968000
1	90	1,99942000
1	91	1,99980000
1	92	1,99891000
1	93	1,99972000
1	94	1,99897000
1	95	1,99968000
1	96	1,99859000
1	97	1,99892000
1	98	1,99926000
1	99	1,99975000
1	100	1,99931000
2	1	2,00022000
2	2	2,00078000
2	3	2,00008000
2	4	2,00051000
2	5	2,00121000
2	6	2,00116000
2	7	2,00030000
2	8	2,00148000