PROFITABILITY engineers

GAGE REPEATABILITY AND REPRODUCIBILITY DATA COLLECTION SHEET
VARIABLE DATA RESULTS

Part Number	Gage Name		Appraiser A	
Part Name	Gage Number		Appraiser B	
Characteristic/Specification	Gage Type		Appraiser C	
Characteristic Classification	Trials 0	Parts 0	Appraisers 0	Date Performed

APPRAISER/ TRIAL #	PART										AVERAGE
	1	2	3	4	5	6	7	8	9	10	
1. A 1											
2, 2											
3, 3											
4, AVE											$\bar{X}_a$=
5, R											$\bar{R}_a$=
6. B 1											
7, 2											
8, 3											
9, AVE											$\bar{X}_b$=
10, R											$\bar{R}_b$=
11. C 1											
12, 2											
13, 3											
14, AVE											$\bar{X}_c$=
15, R											$\bar{R}_c$=
16. PART AVE ($\bar{Xp}$)											$\bar{\bar{X}}$= R_p=
17, $(\bar{R}_a + \bar{R}_b + \bar{R}_c)$ / (# OF APPRAISERS) =											$\bar{\bar{R}}$=
18, (Max $\bar{X}$ - Min $\bar{X}$) =											$\bar{X}_{DIFF}$=
19, $\bar{\bar{R}}$ x D_4* =											UCL_R=
20, $\bar{\bar{R}}$ x D_3* =											LCL_R=

* D_4 =3.27 for 2 trials and 2.58 for 3 trials; D_3 = 0 for up to 7 trials. UCL_R represents the limit of individual R's. Circle those that are beyond this limit. Identify the cause and correct. Repeat these readings using the same appraiser and unit as originally used or discard values and re-average and recompute R and the limiting value from the remaining observations.

Notes: ______________________________

GAGE REPEATABILITY AND REPRODUCIBILITY REPORT
VARIABLE DATA RESULTS

Part Number	Gage Name		Appraiser A	
Part Name	Gage Number		Appraiser B	
Characteristic/Specification	Gage Type		Appraiser C	
Characteristic Classification	Trials 0	Parts 0	Appraisers 0	Date Performed

Measurement Unit Analysis / % Total Variation (TV)

Repeatability - Equipment Variation (EV)

EV = $\bar{\bar{R}} \times K_1$ % EV = 100 (EV/TV)

=   =

=   = %

Trials	K1
2	0,8862
3	0,5908

Reproducibility - Appraiser Variation (AV)

AV = $\{(X_{DIFF} \times K_2)^2 - (EV^2/nr)\}^{1/2}$ % AV = 100 (AV/TV)

=   =

=   = %

n = number of parts / r = number of trials

Appraisers	2	3
K_2	0,7071	0,5231

Repeatability & Reproducibility (R & R)

GR&R = $\{(EV^2 + AV^2)\}^{1/2}$ % R&R = 100 (R&R/TV)

=   =

=   = %

Part Variation (PV)

PV = $R_P \times K_3$ % PV = 100 (PV/TV)

=   =

=   =

Total Variation (TV)

TV = $\{(R\&R^2 + PV^2)\}^{1/2}$

=

=

Number of distinct Categories

ndc = 1.41(PV/GRR)

=

=

Parts	K_3
2	0,7071
3	0,5231
4	0,4467
5	0,4030
6	0,3742
7	0,3534
8	0,3375
9	0,3249
10	0,3146

All calculations are based upon predicting 5.15 sigma (99.0% of the area under the normal distribution curve).

K_1 is 5.15/d_2, where d_2 is dependent on the number of trials (m) and the number if parts times the number of operators (g) which is assumed to be greater than 15.

AV - If a negative value is calculated under the square root sign, the appraiser variation (AV) defaults to zero (0).

K_2 is 5.15/d_2, where d_2 is dependent on the number of operators (m) and (g) is 1, since there is only one range calculation.

K_2 is 5.15/d_2, where d_2 is dependent on the number of parts (m) and (g) is 1, since there is only one range calculation.

d_2 is obtained from Table D_3, "Quality Control and Industrial Statistics", A.J. Duncan.