成都莫仕连接器有限公司
OLEX INTERCONNECT (CHENGDU) CO.,LTD

TITLE MEASUREMENT SYSTEM EVALUATION PROCEDURE

GAUGE REPEATABILITY AND REPRODUCIBILITY STUDY

EVALUATED BY: ıng Fanny & Xie | Date: 2016/07/16 | DECISION:

Gauge Type/Name:	Equipment No.:	Characteristics Measured:
QV	Q1265	160127-2xxx DIM1

Spec: USL 37.91, LSL 36.41

TV=SQRT(R&R^2+ PV^2)
TV=PROCESS 5.15 SIGMA
√ TV=PART'S TOLERANCE

Number of Operator = 3

		1	2	3	4	5	6	7	8	9	10	Average	Average
Yao Yuzhu	1	37.371	37.214	37.209	37.275	37.256	37.432	37.369	37.312	37.257	37.268	37.2963	
	2	37.368	37.212	37.210	37.274	37.254	37.429	37.370	37.313	37.257	37.266	37.2953	Xa= 37.2959
	3	37.372	37.215	37.211	37.272	37.253	37.430	37.369	37.314	37.256	37.269	37.2961	
	Range	0.004	0.003	0.002	0.003	0.003	0.003	0.001	0.002	0.001	0.003	Ra= 0.0025	
Wang Ze	1	37.363	37.206	37.202	37.262	37.242	37.426	37.361	37.307	37.252	37.265	37.2886	
	2	37.362	37.205	37.204	37.264	37.242	37.427	37.362	37.307	37.253	37.265	37.2891	Xb= 37.2889
	3	37.362	37.204	37.203	37.264	37.243	37.425	37.363	37.309	37.253	37.265	37.2891	
	Range	0.001	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.001	0.000	Rb= 0.0015	
Rao Hui	1	37.363	37.208	37.205	37.268	37.239	37.426	37.363	37.308	37.249	37.269	37.2898	
	2	37.363	37.208	37.205	37.268	37.238	37.425	37.363	37.309	37.249	37.269	37.2897	Xc= 37.2897
	3	37.363	37.209	37.204	37.268	37.238	37.426	37.363	37.309	37.249	37.268	37.2897	
	Range	0.000	0.001	0.001	0.000	0.001	0.001	0.000	0.001	0.000	0.001	Rc= 0.0006	
TTL Reading		336.2870	334.8810	334.8530	335.4150	335.2050	336.8460	336.2830	335.7880	335.2750	335.4040	Process Stdev=	0.6608
Part Ave(Xp)		37.3652	37.2090	37.2059	37.2683	37.2450	37.4273	37.3648	37.3098	37.2528	37.2671	$\overline{\overline{X}}$ =	37.2915
												Average Rp=	0.2214

$\overline{X}_{DIFF} = \overline{X}_{MAX} - \overline{X}_{MIN}$ = $\overline{X}_{DIFF}$ = 0.00697

$\overline{R} = \frac{\overline{R_1} + \overline{R_2} + \overline{R_3}}{operators}$ = 0.0015

$UCL_R = \overline{R} * D_4$ = 0.0040

UCL Represents the limit of individual R's circle those ranges that are beyond this limit. Identify the cause and correct. Repeat those readings using the same operators and units originally used or discard the reading and reaverage and recompile ranges and UCL from the remaining readings.

Parts	2	3	4	5	6	7	8	9	10
K3	0.7071	0.5231	0.4467	0.403	0.3742	0.3534	0.3375	0.3249	0.3146

# of Trials	D4	K1	Operator	K2
2	3.27	0.8862	2	0.7071
3	2.58	0.5908	3	0.5231

n = Number of Parts = 10 r = Number of Trials = 3
AV defaults to zero if a negative is calculated the square root sign

	Repeatability (EV)	Reproducibility (AV)	Combined R&R	Part Variation (PV)	Total Variation (TV)	Precision / Tolerance
ANALYSIS	EV = $\overline{R}$ * K1	$AV = \sqrt{(X_{DIFF} * K2)^2 - \frac{EV^2}{nr}}$	$R\%R = \sqrt{(EV^2 + AV^2)}$	PV = Rp * K3	TV process = SQRT (R&R*R&R + PV*P 0.06977	Tolerance = 74.5830
	EV = 0.00091	AV = 0.00364	RR = 0.00375	PV = 0.06967	TV process = 5.15 *Process Std Dev.= N/A	
% PROCESS VARIATION	% EV = 100 * (EV / TV)	% AV = 100 * (AV / TV)	% R&R = 100 * (R&R / TV)	% PV = 100 * (PV / TV)	TV spec = Part's Tolerance = 1.50	P/T = Tolerance / EV
	% EV process = NA	% AV process = NA	% R&R process = NA	% PV process = NA	TV process = N/A	P/T = NA
	% EV spec = 0.36	% AV spec = 1.46	% R&R spec = 1.50	% PV spec = 99.86	TV spec = 1.5	NDC = 26

Note: 1. Use %R&R spec for production line control and %R&R spec for Customer Acceptance application

2. TV process shall be the minimum value of SQRT(R&R^2+ PV^2) or 5.15 * Process Std Dev.

3. Enter raw data in the highlighted field and Sepc value when applicable. The rest will be calculated automatically.

4. Process Std Dev shall be "one-sixth of UCL less LCL" from SPC chart or GR&R sample if it is representative of the population

5. For One-sided Sepc, the unknown limit = 2 * Average - the known list. Ex, if LSL = 10 and Average = 30, then USL = 50. These limits shall be keyed in the highlighted Spec field.

REMARK: