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: Chen HongMei Date: 2017/02/03 DECISION:

Gauge Type/Name:	Equipment No.:	Characteristics Measured:
QV	Q1487	31402/34975-xxxx dim3

Spec: USL 30.20 LSL 29.60

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
Chen lifen	1	30.098	30.091	30.082	30.086	30.078	30.086	30.088	30.082	30.087	30.085	30.0863	
	2	30.098	30.091	30.085	30.087	30.078	30.085	30.087	30.084	30.091	30.085	30.0871	$\bar{X}a$= 30.0866
	3	30.098	30.090	30.081	30.087	30.078	30.088	30.086	30.084	30.089	30.084	30.0865	
	Range	0.000	0.001	0.004	0.001	0.000	0.003	0.002	0.002	0.004	0.001	$\bar{R}a$= 0.0018	
Rao Hui	1	30.099	30.091	30.082	30.085	30.075	30.085	30.084	30.083	30.084	30.085	30.0853	
	2	30.097	30.090	30.080	30.084	30.075	30.083	30.084	30.083	30.083	30.084	30.0843	$\bar{X}b$= 30.0845
	3	30.097	30.091	30.081	30.083	30.074	30.079	30.084	30.081	30.085	30.083	30.0838	
	Range	0.002	0.001	0.002	0.002	0.001	0.006	0.000	0.002	0.002	0.002	$\bar{R}b$= 0.0020	
Huang Bo	1	30.097	30.089	30.080	30.085	30.076	30.086	30.085	30.083	30.082	30.083	30.0846	
	2	30.093	30.088	30.080	30.084	30.080	30.086	30.082	30.083	30.083	30.082	30.0841	$\bar{X}c$= 30.0845
	3	30.097	30.090	30.079	30.083	30.076	30.088	30.085	30.084	30.082	30.083	30.0847	
	Range	0.004	0.002	0.001	0.002	0.004	0.002	0.003	0.001	0.001	0.001	$\bar{R}c$= 0.0021	
TTL Reading		270.8740	270.8110	270.7300	270.7640	270.6900	270.7660	270.7650	270.7470	270.7660	270.7540	Process Stdev=	0.0486
Part Ave(Xp)		30.0971	30.0901	30.0811	30.0849	30.0767	30.0851	30.0850	30.0830	30.0851	30.0838	$\bar{\bar{X}}$ =	30.0852
												Average Rp=	0.0204

$\bar{X}_{DIFF} = \bar{X}_{MAX} - \bar{X}_{MIN}$ $\bar{X}_{DIFF}$ = 0.00217

$\bar{R} = \frac{\bar{R}_a + \bar{R}_b + \bar{R}_c}{\text{operators}}$ = 0.0020

$UCL_R = \bar{R} * D_4$ = 0.0051

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 = $\bar{R}$ * 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 0.00663	Tolerance = 60.1704
	EV = 0.00116	AV = 0.00111	RR = 0.00161	PV = 0.00643	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 = 0.60	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 = 1.16	% AV spec = 1.11	% R&R spec = 1.61	% PV spec = 97.01	TV spec = 0.6	NDC = 6

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: