Individuals and Moving Range (I-MR) Control Chart

Centre line and control limits of an individuals (X) chart and a moving range chart from up to 12 readings, with the estimated sigma and points out of limits.

Method: Shewhart individuals and moving range chart

Input parameters

Unit system: SI

Parameter	Value	Unit
Number of readings used (3–12)	10.000	
Value 1	50.200	
Value 2	49.800	
Value 3	50.500	
Value 4	50.100	
Value 5	49.600	
Value 6	50.300	
Value 7	50.900	
Value 8	49.900	
Value 9	50.000	
Value 10	50.400	
Value 11	0	
Value 12	0	

Calculated results

Parameter	Value	Unit
Centre line (mean)	50.170	
Mean moving range	0.53333	
Estimated sigma $\bar{MR}/d_2$	0.47265	
Upper control limit (X)	51.588	
Lower control limit (X)	48.752	
Upper control limit (MR)	1.7422	
Readings outside the X limits	0	

Notes for this case

• For individual readings the short-term sigma is estimated from the average moving range of successive pairs, $\hat{\sigma} = \bar{MR}/d_2$ with $d_2 = 2/\sqrt{\pi} \approx 1.128$ for ranges of two. The X chart limits are $\bar{x} \pm 3\hat{\sigma}$ ($\bar{x} \pm 2.66\,\bar{MR}$) and the MR chart's upper limit is $D_4\bar{MR}$ with $D_4 = 1 + 3d_3/d_2 \approx 3.267$ (lower limit zero). Set limits from a stable period of at least 20 readings in practice; a dozen gives only a first look.

Formula and method

$$\widehat{\sigma} = \frac{\overline{MR}}{d_2}, \quad UCL, LCL = \bar{x} \pm 3\widehat{\sigma}, \quad UCL_{MR} = \left(1 + 3\frac{d_3}{d_2}\right)\overline{MR}$$

Variables

n	Number of readings used (3–12)	-
x_1	Value 1	-

x_2	Value 2	-
x_3	Value 3	-
x_4	Value 4	-
x_5	Value 5	-
x_6	Value 6	-
x_7	Value 7	-
x_8	Value 8	-
x_9	Value 9	-
x_{10}	Value 10	-
x_{11}	Value 11	-
x_{12}	Value 12	-
$\bar{x}$	Centre line (mean)	-
$\overline{MR}$	Mean moving range	-
$\widehat{\sigma}$	Estimated sigma $\bar{MR}/d_2$	-
UCL_X	Upper control limit (X)	-
LCL_X	Lower control limit (X)	-
UCL_{MR}	Upper control limit (MR)	-
n_{out}	Readings outside the X limits	-

Method and standards

I-MR chart.

Assumptions and limits

- Readings independent and roughly normal; d_2 and d_3 for subgroups of two.

References

Shewhart individuals and moving range chart

Report details

Report reference	FCC-0104-J6GA (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/general/geometry/individuals-moving-range-chart

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.