Calibration Line, Limit of Detection and Quantitation

Least-squares calibration line from three to six standards, the residual standard deviation, limits of detection and quantitation, and a sample's concentration.

Method: Calibration-curve LOD and LOQ (3.3σ/S and 10σ/S)

Input parameters

Unit system: SI

Parameter	Value	Unit
Number of standards	5.0000	
Sample signal	0.41000	
Standard 1	0	mg/L
Signal 1	0.012000	
Standard 2	1.0000	mg/L
Signal 2	0.20500	
Standard 3	2.0000	mg/L
Signal 3	0.39800	
Standard 4	3.0000	mg/L
Signal 4	0.60300	
Standard 5	4.0000	mg/L
Signal 5	0.79000	
Standard 6	5.0000	mg/L
Signal 6	1.0000	

Calculated results

Parameter	Value	Unit
Slope	195.40	
Intercept	0.010800	
Residual standard deviation	0.004382	
Limit of detection	0.074001	mg/L
Limit of quantitation	0.22425	mg/L
Sample concentration	2.0430	mg/L

Notes for this case

• y = b + mx by least squares; s_y/x = √(Σe²/(n − 2)); LOD = 3.3s/m and LOQ = 10s/m (the calibration-curve approach used in method validation). Blank replicates give an alternative LOD from the blank standard deviation; report which was used.

Formula and method

$$m = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}, \quad s_{y/x} = \sqrt{\frac{\sum e^2}{n - 2}}, \quad LOD = \frac{3.3 s_{y/x}}{m}, \quad LOQ = \frac{10 s_{y/x}}{m}$$

Variables

n	Number of standards	-
y_x	Sample signal	-
x_1	Standard 1	kg/m³

y_1	Signal 1	-
x_2	Standard 2	kg/m³
y_2	Signal 2	-
x_3	Standard 3	kg/m³
y_3	Signal 3	-
x_4	Standard 4	kg/m³
y_4	Signal 4	-
x_5	Standard 5	kg/m³
y_5	Signal 5	-
x_6	Standard 6	kg/m³
y_6	Signal 6	-
m	Slope	-
b	Intercept	-
$s_{y/x}$	Residual standard deviation	-
LOD	Limit of detection	kg/m³
LOQ	Limit of quantitation	kg/m³
C_x	Sample concentration	kg/m³

Method and standards

Calibration statistics.

Assumptions and limits

- Linear response; constant variance.

References

Calibration-curve LOD and LOQ (3.3σ/S and 10σ/S)

Report details

Report reference	FCC-EF1Y-XCZW (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/instrumentation/analysers/calibration-line-lod-loq

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.