Response/Calibration Factor
Definitions

Calibration Factor: A measure of the chromatographic response of a target analyte relative to the mass injected.

Response Factor: A measure of the relative mass spectral response of an analyte compared to its internal standard.

Ref: EPA R3 Quality Manual Rev 3 (1/12/04)
Definitions

**Calibration Factor:** A measure of the chromatographic response of a target analyte relative to the mass injected.

**Response Factor:** A measure of the relative mass spectral response of an analyte compared to its internal standard.

Ref: EPA R3 Quality Manual Rev 3 (1/12/04)
Definitions-Cont.

Each calibration or response factor represents the slope of the line between the response for a given standard and the origin.

The average calibration factor or response factor of the standards for each analyte is then used to calculate the concentration of the sample.

*Ref: EPA R3 Quality Manual Rev 3 (1/12/04)*
Criteria

When the variation, measured as the relative standard deviation (RSD) of the factors, is less than or equal to 20%, then the slopes of the lines for each standard are sufficiently close to one another that the use of the linear model is generally appropriate over the range of standards that are analyzed.

Ref: SW-846, 8000C, Section 11.5.1
Criteria-Cont.

A relative standard deviation (RSD) of 25% or less is considered linear.

Response/Calibration Factor Equations

External Standard Equation
\[ CF = \frac{A_x}{C_x} \]

or

Internal Standard Equation
\[ RF = \frac{(A_x)(C_{is})}{(A_{is})(C_x)} \]

Where:
- \( A_x \) = Area of the compound
- \( C_x \) = Concentration of the compound
- \( A_{is} \) = Area of the internal standard
- \( C_{is} \) = Concentration of the internal standard
Response/Calibration Factor Statistical Equations

Average RF or CF: \[ RF_{AVE} = \frac{S \cdot RF_i}{n} \]

Standard Deviation (s): \[ s = \sqrt{\frac{S \cdot (RF_i - RF_{AVE})^2}{n-1}} \]

Relative Standard Deviation (RSD): \[ RSD = \frac{s}{RF_{AVE}} \times 100 \]

Where:
- \( n \) = number of pairs of data
- \( RF_i \) = Response Factor for each level
- \( RF_{AVE} \) = Average of all the response factors
- \( S \) = the sum of all the individual values

*In the equations above RF can be replaced with CF*
Response/Calibration Factor Equations for Concentration

External Standard Equation

\[ C_x = \frac{A_x}{CF_{AVE}} \]

or

Internal Standard Equation

\[ C_x = \frac{((A_x)\times(C_{is}))}{((A_{is})\times(RF_{AVE}))} \]
Benefits

1. Assumes linearity through the origin, no negative calculated concentrations.

2. Simple calculation.
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Disadvantages

1. Linearity of the curve is required.

2. May not reflect actual detector response curve.
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