

9.2.4.5 Operation Ranges

Linear Range

The linear range of a chromatographic detector represents the range of concentrations or mass flows of a substance in the mobile phase at the detector over which the sensitivity of the detector is constant within a specified variation, usually ± 5 percent.

The best way to present detector linear range is the *Linearity Plot* (see Fig. 9.2.5) plotting detector sensitivity against amount injected, concentration or mass flow-rate. Here, the upper limit of linearity can be graphically established as the amount (concentration, or mass flow-rate) at which the deviation exceeds the specified value ($\pm x$ % window around the plot). The lower limit of linearity is always the minimum detectable amount determined separately for the same compound.

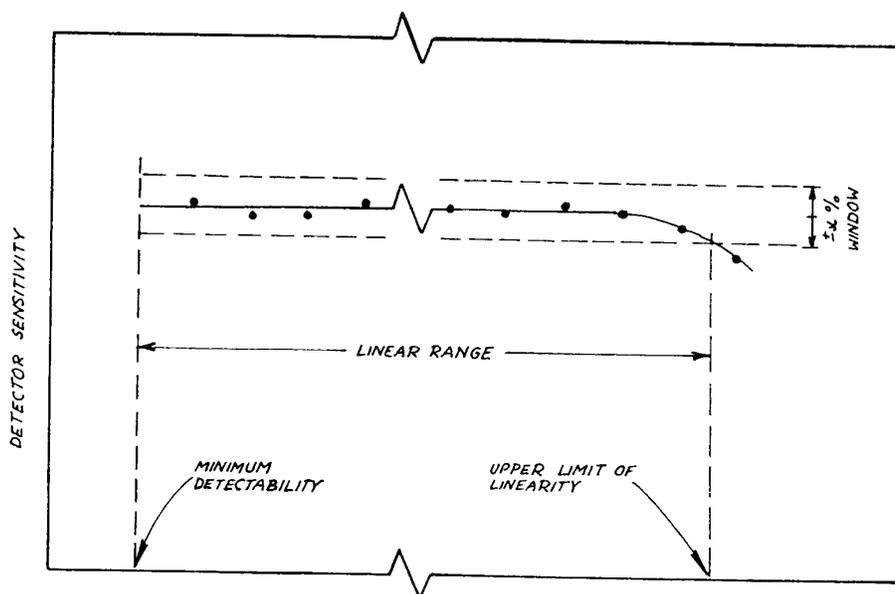


Figure 9.2.5 Linearity plot of a chromatographic detector. The scale of the ordinate is linear: the scale of the abscissa may be either linear or logarithmic.

Alternatively, the linear range of a detector may be presented as the plot of peak area (height) against concentration or mass flow-rate of the test substance in the column effluent at the detector (see Fig. 9.2.6). This plot may be either linear or log/log. The upper limit of linearity is that concentration (mass flow-rate) at which the deviation from an ideal linearity plot is greater than the specified percentage deviation ($\pm x$ % window).

Numerically, the linear range can be expressed as the ratio of the upper limit of linearity obtained from the linearity plot and the minimum detectability, both measured for the same substance.

When presenting the linear range of a detector, either as a plot or as a numerical value, the test substance, the minimum detectability, and the specified deviation must be stated.

Dynamic Range

The dynamic range of a detector is that range of concentration or mass flow-rates of a substance over which an incremental change in concentration or mass flow-rate produces an incremental change in detector signal. Fig. 9.2.6. presents a plot used for the determination of the dynamic range of a detector.

The lower limit of the dynamic range is the minimum detectability. The upper limit is the highest concentration at which a further increase in concentration (mass flow-rate) will still give an observable increase in detector signal, and the dynamic range is the ratio of the upper and lower limits. The dynamic range is greater than the linear range.

Numerically the dynamic range can be expressed as the ratio of the upper limit of the dynamic range obtained from the plot and the minimum detectability, both measured for the same substance.

When expressing the dynamic range of a detector, the test substance and the minimum detectability must be stated.

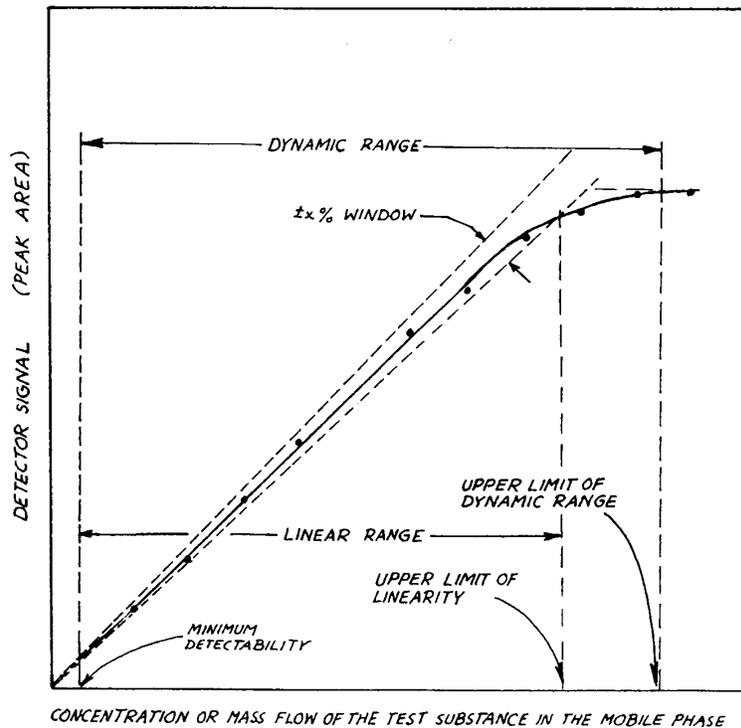


Figure 9.2.6 Determination of the linear and dynamic ranges of a chromatographic detector. Such a plot is usually in a log-log scale.