



Standard Practice for Testing Conductivity Detectors Used in Liquid and Ion Chromatography¹

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1. Scope

1.1 This practice covers the testing of the performance of conductivity detectors used as the detection component of a liquid or ion chromatography system.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

2. Referenced Documents

2.1 *ASTM Standards*:²

E1151 Practice for Ion Chromatography Terms and Relationships

3. Terminology

3.1 See Practice **E1151**.

3.2 *Definitions*:

3.2.1 *cell constant*—the cell constant (K) of a conductivity cell is equal to $1/A$, so $\kappa = G K$.

3.2.1.1 *Discussion*—If the cell constant of the flow-through cell used is equal to one, then the conductivity equals the conductance. Although the cell constant is often specified for conductivity detectors, there is little practical value in knowing the constant as long as the detector is properly calibrated for conductivity.

3.2.2 *conductance*—the conductance (G) of a solution is the inverse of the resistance measured between two electrodes in a cell, expressed in units of siemens (S), equal to inverse ohms.

3.2.2.1 *Discussion*—The term resistance refers specifically to the dc resistance to ionic current, independent of the capacitive reactance at the interfaces between the electrodes and the solution.

3.2.3 *conductivity*—since the conductance is dependent on both the conductive properties of the solution and on the dimensions of the electrodes and the cell, the conductivity (κ) of the solution is defined to be independent of electrode and cell dimensions. Specifically,

$$\kappa = G \frac{1}{A} \quad (1)$$

where:

l = the distance between two planar disk electrodes, and

A = the electrode's surface area.

3.2.3.1 *Discussion*—In liquid and ion chromatography, cell dimensions are commonly measured in centimetres, so the units of κ are S/cm. (Alternatively, the SI units of S/m may be used. S/m = 100 S/cm.)

3.2.4 *drift*—the average slope of the noise envelope expressed in nano siemens per centimetre per hour as measured over a period of 1 h.

3.2.5 *equivalent conductivity*—of an ionic solute, the contribution of the solute to the total conductivity of the solution, measured in microsiemens per centimetre, divided by its concentration in milliequivalents/litre.

3.2.6 *flow dependence rate*—the change in measured conductivity as a function of flow rate.

3.2.7 *limiting equivalent conductivity*—of an ionic solute, its equivalent conductivity extrapolated to infinite dilution.

3.2.8 *linear range*—of a conductivity detector for a given solute in a specific solvent, the concentration range of solute for which the detector response factor is within 5 % of the response factor in the middle of the range as determined from the linearity plot specified in Section 11.

3.2.8.1 *Discussion*—The lower limit may be limited by noise, and the upper limit by deviation from linearity. (The upper limit may instead be limited by the maximum full-scale deflection on the detector's least sensitive output range.)

3.2.9 *long-term noise*—the maximum amplitude in nano siemens per centimetre for all random variations of the detector output of frequencies between 2 and 60 cycles per hour.

3.2.9.1 *Discussion*—Long-term noise represents noise that can be mistaken for eluting peaks.

¹ This practice is under the jurisdiction of ASTM Committee E13 on Molecular Spectroscopy and Separation Science and is the direct responsibility of Subcommittee E13.19 on Separation Science.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.