

## Chromatography Note

Application Note

Industry: Instrumentation

Application: Chromatography Equipment

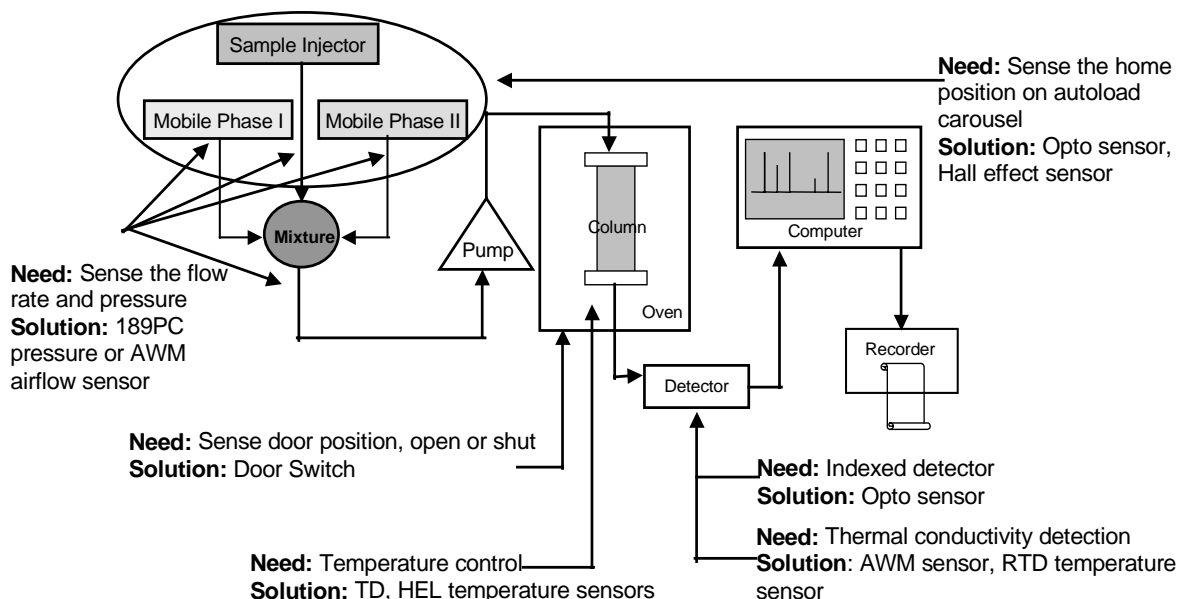


Figure 1. Application diagram

## Theory

Chromatography is a separation method that resolves the individual compounds that comprise a complex mixture. In chromatography, components in a sample are separated by an affinity to certain materials. A mobile phase (liquid or gas) passes over a stationary phase (usually a column or plate). Compounds are separated according to their relative attraction for the mobile and stationary phases.

The two essential parts of any separation process are the mobile phase and the stationary phase. The mobile phase occurs when a solvent mixture is used to carry the sample gas or liquid. When the mobile phase flows through the stationary phase (usually an absorptive medium contained in a column), a time-functioned separation occurs due to the differences of each gradient. Components with greater affinities will remain inside the column longer than the ones with less affinity. A chromatogram can be plotted showing the detection of certain components as they emerge or dilute.

Two common types of chromatography are gas and liquid chromatography, corresponding to the use of a gas or liquid in the chemical analysis. In-depth knowledge on chromatography can be obtained from the following website:

<http://www.scimedia.com>

## Application

In 1903, M.S. Tswett was first person to apply the analytical process he called *chromatography*. He used chromatography to separate the pigments of green leaves that passed through a calcium carbonate (chalk) column. Today, chromatography is widely used as a separation and isolation method and is considered an indispensable tool.

Separation systems are used in a wide variety of industrial and scientific applications. These systems isolate and analyze products that come from mixtures formed during chemical synthesis. Chromatography applications are used in many scientific analyses, including:

- Medical/biomedical research, quality control of pharmaceuticals, routine clinical determination, and drug screening
- Space-related and geochemical research and development
- Forensic sciences
- Food and cosmetic chemical measurement
- Process control in the petroleum industry
- Environmental monitoring and pollution control
- Investigation of the chemistry and metabolism of biological systems

## Honeywell's Solutions to Customers' Needs

Honeywell offers various sensors and switches that can be integrated into chromatographic systems to ensure reliable and precise performance.

### Temperature

Since partitioning behavior is dependent upon temperature, the separation column is often contained in a temperature-controlled oven. Precise oven temperature control can be achieved with Honeywell's thin film platinum RTDs that are small in size and have a very linear, repeatable, and stable output. Both 100 $\Omega$  and 1000 $\Omega$  RTD sensors are available in various packages.

### Pressure

Pressure control is especially critical for HPLC (High Performance Liquid Chromatography). In this application, a steady high pressure is pumped into the system to force the mobile phase through the column to achieve higher resolution, faster analysis time, and increased sample load capacity. Honeywell offers signal conditioned or unconditioned pressure sensors that feature a high temperature rating, no outgassing design, and versatile, easy-to-use package style for controlling pressure.

### Flow rate

The mobile phase used in gas chromatography requires an inert gas, such as helium, nitrogen, hydrogen, or argon. Therefore, the flow rate must be regulated to gain an unambiguous and reproducible result. Honeywell's mass airflow sensors meet the application requirements for multiple gas compatibility, high stability, low hysteresis, and fast response time. Application specific calibration and circuitry are available.

### Optic detection

Various detectors are used in chromatographic systems based on the distinct property of solutes. An optical index such as refraction and absorption is most frequently used. Honeywell infrared LEDs and VCSEL products serve both low end and high end customers in applications that require precision detection.

### Interlocks and position detection

Various door and panel interlocks, as well as position indicators are used in separation systems. Honeywell's Hall effect, small basics and optical sensors work well to fit all customer requirements in this facet of chromatographic separation.

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