BACK PRESSURE REGULATOR FOR CATALYST RESEARCH



Equilibar back pressure regulators are ideal to control reactor pressure due to their high precision, wide flow range, and two-phase flow capability

Research into new and improved catalysts is key for the advancement of products in multiple industries. For example, petrochemical companies search for improved catalysts to convert hydrocarbons into more useful and efficient energy sources. Fine chemical producers use the catalysis process to develop novel and useful organic compounds. The automotive industry continuously refines catalysts to more efficiently remove pollutants from engine exhaust. Most catalyst research utilizes heated reactors, beginning with multiple parallel trials at the microscale, and gradually increasing reactor scale up to the semi-works facility that can study practical catalyst performance at the kilogram scale. Pressures vary from near 1 bar, for environmental catalysis, up to 300 bar for many petrochemical conversions.

The Equilibar[®] precision back pressure regulator is designed and demonstrated to excel within the demanding requirements of catalysis research, including:

•Ultra wide flow window, from litres/minute down to nano flows and zero flow

• Precision typically within 0.5% of set-point in many research applications (5X to 10X more precise than traditional spring regulators)

- Stability during two-phase flow
- High temperature compatibility up to 450C
- Compact design easily fits into oven, with set-point controls kept outside oven
- PTFE/Glass diaphragms (most popular for reactor pressure control application)

•Hastelloy C276 and SS316L bodies (typically in stock for quicker response)



As shown above, mass flow meters are often used to control the input of various gases (and sometimes liquids) into the heated reactor containing the catalyst sample. A back pressure regulator is typically used on the exit of the reactor to maintain stable pressure control for the catalysis process. The products of reaction are monitored using gas chromatography or other forms of analysis.

Application Focus: Two-Phase Flow for Research Pressure Control

Many laboratory catalysis reactors utilize a high pressure liquid separator downstream of the reactor. In addition to requiring an expensive pressure vessel, such processes typically need a liquid level control loop in parallel to the gas phase back pressure regulator. This traditional approach is complex and has several limitations.

Because the Equilibar back pressure valve provides stable pressure control in $\frac{1}{1}$ two-phase flow, it is possible to eliminate the high pressure separator and level control system downstream of the reactor.