

Throttling Effect Determination Educational Unit Operations Pilot Plant

Item Number: LPK-CGT



Introduction

Investigate the Joule-Thomson throttling effect with this educational unit operations pilot plant. Designed for engineering students, it enables hands-on comparative analysis of adiabatic gas expansion using precise process control, interactive digital interface, and eco-friendly operation, ensuring safe repeatable thermodynamic experiments.

[Learn More](#)

Parameter	Specification
Supported Test Gases	Air (cooling effect), Helium (heating effect)
Piping & Structural Material	Grade 304 Stainless Steel
Temperature Control System	Integrated constant-temperature water bath (precision: $\pm 0.1^{\circ}\text{C}$)
Refrigeration Type	Fluorine-free, eco-friendly cooling
Flow Measurement	High-precision electronic mass flow meters
Sensors	Integrated RTD temperature sensors and industrial pressure transmitters
User Interface	Industrial touch-screen HMI with modular signal transmission
Power Supply	Standard single-phase AC (tailored to regional voltage requirements)

Laboratory Experiment Module	Key Thermodynamic Concept	Direct Textbook Alignment & Terminology
Joule-Thomson Coefficient Determination	Isenthalpic expansion, real gas behavior, inversion temperature curves	<i>Introduction to Chemical Engineering Thermodynamics</i> (Thermodynamic properties of fluids, volumetric properties of pure fluids)
Adiabatic Expansion of Compressible Gases	Open system energy balances, enthalpy changes, irreversible thermodynamic processes	<i>Unit Operations of Chemical Engineering</i> (Flow of compressible fluids, thermodynamic equations of state)
Fluid Flow and Pressure Drop Dynamics	Friction in pipes, throttling devices, expansion valves	<i>Transport Processes and Separation Process Principles</i> (Fluid mechanics, momentum transfer, mechanical energy balances)
Thermal System Energy Balances	Heat exchanger design, system boundary energy conservation, utility integration	<i>Chemical Engineering Design</i> (Energy balance calculations, piping and instrumentation design)