

Fluid Friction Resistance Determination Educational Unit

Operations Pilot Plant

Item Number: LPK-LTZL



Introduction

Engineered bench-scale system for university engineering labs. Provides hands-on fluid mechanics experience: quantitative energy loss analysis, flow regime observation, friction coefficient determination. Features four-point pressure measurement, transparent sections, industrial touchscreen PLC, 3D virtual simulation. Ideal for chemical, mechanical, civil engineering.

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Experimental Module	Technical Parameters & Instrumentation	Core Academic Concepts & Textbook Associations
Straight Pipe Resistance Determination	Stainless steel & transparent pipelines; high-accuracy differential pressure transmitters; variable-speed centrifugal circulation pump.	Darcy-Weisbach Equation; friction factor (λ or f) vs. Reynolds number (Re) relationship; turbulent flow regime verification.
Local Resistance (Minor Loss) Analysis	Selected industrial valves (e.g., globe valve, gate valve); four-point pressure tap configurations; digital flow meters.	Local resistance coefficient (K); equivalent length method (L_e/D); flow contraction and expansion losses.
Process Control & Automation	Touchscreen PLC interface; digital sensor feedback loops; USB/Wi-Fi data export utilities.	Industrial instrumentation; automated data acquisition; real-time sensor calibration and logging.
3D Virtual Simulation Practice	Interactive 3D modeling platform; offline capability; online learning management integration.	Pre-lab preparation; digital twin applications; interactive process simulation.