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Microchannel Reactor Components Catalog

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COMPANY PROFILE

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From everyday basic labware (beakers, measuring cylinders, crucibles, dishes, reagent/wash bottles, centrifuge and digestion tubes), high-purity trace analysis instruments, and cleaning/storage tanks, to comprehensive fluid transfer components (tubing, fittings, valves), sample prep and filtration tools (separatory funnels, burettes, filters, pipettes, tweezers, spatulas), and general consumables (stirring bars, O-rings, gaskets, seal tapes, caps, septa), extending all the way to advanced derivative and reaction apparatus like standard or custom electrochemical cells, battery testing fixtures, electrode accessories, hydrothermal synthesis liners, microwave digestion vessels, microchannel reactors, and condensation/reflux devices, KINTEK manufactures virtually all imaginable laboratory supplies crafted from PTFE and PFA. Backed by end-to-end custom CNC fabrication, we are equipped to deliver absolutely everything from complex non-standard machined parts and bespoke laboratory setups to high-volume orders, maintaining an exclusive and absolute focus on high-performance fluoropolymer materials.



Continuous Flow Microchannel Reactor System For Laboratory Microfluidics And Educational Research With Precise Temperature Control

Item Number: PL-WT06



Introduction

Achieve outstanding heat transfer and precise temperature control in laboratory synthesis with this advanced continuous flow microchannel reactor system, designed for microfluidic education and small-scale chemical process development.

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Application	Description	Key Benefit
Fine Chemical Synthesis	Synthesis of high-value intermediates, catalysts, and specialty chemicals under precise flow conditions.	Rapid heat removal prevents thermal runaway and degradation of highly sensitive target compounds.
Flavors & Fragrances	Continuous synthesis and formulation of volatile organic esters, aromatic compounds, and essential oils.	Fully enclosed microchannels prevent the vaporization of volatile components, maximizing final product yields.
Synthetic Pharmaceuticals	Active pharmaceutical ingredient (API) screening, pathway optimization, and small-batch continuous manufacturing.	Minimal hold-up volume reduces reagent waste during early-stage trials and allows safe handling of toxic reagents.
Agrochemical Formulation	High-throughput synthesis of novel herbicides, pesticides, and growth regulators.	Extremely high process repeatability ensures consistent isomer ratios and high-purity crystalline forms.
Specialty Polymeric Materials	Controlled continuous polymerization, initiator screening, and block copolymer synthesis.	Narrow residence time distribution yields polymers with highly uniform molecular weight profiles.
Scientific Research & Teaching	Laboratory instruction on mass transfer, heat transfer, chemical kinetics, and modern microfluidics.	Clear visual glass pathways allow students to directly observe flow patterns, mixing interfaces, and phase changes safely.

Specification Parameter	Plate-Type Microreactor Module	Tubular Microreactor Module	Complete Integrated System (PL-WT06)
Primary Construction Material	High Borosilicate Glass (Co-fired)	Polytetrafluoroethylene (PTFE)	Structured Rack with PMMA Protective Shields
Quantity Integrated	4 Units (in series)	1 Unit	1 Complete Pre-assembled Rack
Fluid Hold-up Volume	15 mL nominal (10 mL - 18 mL range)	47 mL	107 mL to 119 mL Total Capacity
Heat Exchange Surface Area	400 cm ² (Up to 530 cm ² oil bath area)	4580 cm ²	Over 5110 cm ² Combined Active Surface
Narrowest Channel Geometry	Width: 1.5 mm - 3.0 mm; Depth: 1.0 mm	Inner Diameter: 1 mm; Outer Diameter: 2 mm	Channel Depth Tolerance: 1.2 mm - 1.8 mm
Inlet/Outlet Port Configuration	4-Inlet / 2-Outlet per individual chip	Dual-port inline connections	High-purity PTFE compression fittings
Operating Temperature Range	-20°C to 180°C	-20°C to 180°C	-20°C to 180°C
Maximum Operating Pressure	0.3 MPa	0.3 MPa (Optional 316L > 3.0 MPa)	Rated at 0.3 MPa maximum system pressure
Overall Outer Dimensions	Reference dimensions: 200 × 150 × 10 mm	Multi-layer coil design	85 cm (W) × 57 cm (D) × 67 cm (H)

Component Identifier	Component Name	Description & Functional Purpose	Standard Quantity
PL-WT06-01	Plate Microreactor	Integrally co-fired 3-layer glass chip for high-efficiency mixing and heat transfer	4
PL-WT06-02	Tubular Reactor	Multi-layer coiled PTFE secondary reactor to extend reaction residence time	1
PL-WT06-03	Transparent Shield	Dual PMMA safety panels providing structural shielding and clear visibility	2
PL-WT06-04	Temperature Probe	High-accuracy RTD sensors for direct inline fluid temperature monitoring	3
PL-WT06-05	Digital Temperature Display	Multi-channel LED panel showing live temperatures across the reaction stages	1
PL-WT06-06	Filter Pressure Regulator	Combined filter and mechanical regulator to stabilize inlet utility pressure	1
PL-WT06-07	Pressure Sensor	Integrated digital pressure transducer for continuous line pressure tracking	1
PL-WT06-08	Control Panel	Centralized control interface for monitoring sensor telemetry	1
PL-WT06-09	Water Flow Indicator	Visual rotameter displaying auxiliary cooling or heating media flow rates	1
PL-WT06-10	One-way Check Valve	Premium fluoropolymer backflow prevention valve for inlet isolation	1
PL-WT06-11	Heavy-duty Power Cable	Grounded electrical connection for sensors and display telemetry	1

High Borosilicate Glass Microchannel Reactor With Integrated Sintered Double Heat Exchange Three Chamber Structure For Laboratory Chemical Synthesis And Process Scale Up

Item Number: PL-WT01



Introduction

Optimize chemical synthesis with this advanced high borosilicate glass microchannel reactor featuring an integrated sintered three chamber structure, double heat exchange surfaces, and exceptional pressure tolerance for safe, highly scalable laboratory and industrial process development and flow chemistry.

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Application	Description	Key Benefit
Pharmaceutical Synthesis	Used for continuous API synthesis, intermediate preparation, and rapid screening of reaction conditions under pressure.	Limits impurities, maximizes selectivity, and ensures quick transition from discovery to clinical trial volumes.
Fine Chemical Manufacturing	Handles fast, highly exothermic processes like nitrations, sulfonations, and diazotizations that are hazardous in batch mode.	Tiny hold-up volume (1-8 mL) prevents thermal runaway, ensuring inherent process safety.
Flavors & Fragrances	Synthesizes delicate compounds requiring rapid temperature adjustments and precise residence time control.	Prevents thermal degradation of sensitive aromatic structures, yielding higher olfactory purity.
Agrochemical Formulation	Performs complex catalytic and multi-step continuous-flow coupling reactions for pesticides and fertilizers.	High chemical resistance to corrosive reagents; scalable results bypass traditional pilot-scale risks.
Specialty Chemicals	Facilitates gas-liquid-solid reactions, fluorinations, and polymerizations requiring high-shear mixing.	High area-to-volume ratio ensures highly uniform mixing and tight molecular weight distribution.
Academic Research & Teaching	Serve as a visual tool for teaching transport phenomena, kinetics, and advanced green chemistry in flow.	Transparent channels allow real-time observation of reaction boundaries and mixing dynamics.

Parameter	Specifications (Model PL-WT01)
Material	High Borosilicate Glass
Overall Dimensions	150 mm × 120 mm × 10 mm
Internal Hold-up Volume	1 mL to 8 mL
Total Flow Rate Range	10 mL/min to 150 mL/min
Operating Temperature Range	-30°C to 195°C
Reaction Chamber Max Operating Pressure	20.0 Bar (Tested with N ₂ at room temperature)
Heat Exchange Chamber Max Operating Pressure	3.0 Bar (Tested with N ₂ at room temperature)
Total Heat Exchange Area	308 cm ² (Contains two 110 mm × 140 mm exchange zones)
Narrowest Channel Cross-Section	1.5 mm × 1.0 mm to 3.0 mm × 1.7 mm
Microchannel Depth	1.0 mm to 1.5 mm
Reagent Connection Ports	2 Inlets / 2 Outlets

Parameter	Specifications (Model PL-WT01)
Thermal Medium Connection Ports	2 Inlets / 2 Outlets

Metric	PL-WT01 Microchannel Reactor	Traditional Stirred Tank Reactor (Batch)
Specific Area-to-Volume Ratio	3000 to 13000 m ² /m ³	1 to 10 m ² /m ³
Typical Residence Time Range	1 s to 600 s	0.5 h to 48 h
Scale-up / Amplification Effect	Extremely small (Parallel numbering-up)	High (Requires 4 to 5 optimization steps)
Surface Heat Transfer Coefficient	1090 to 3420 W/m ² ·K	2 to 15 W/m ² ·K
System Hold-up Volume (Pilot equivalent)	1 L	3000 L
Facility Footprint Required	~9 m ²	~80 m ²
Relative Solvent Consumption	0 to 30 units	90 units
Target Product Selectivity (Yield)	0.8 to 1.0	~0.8
Energy Demand (Low Temp. Reactions)	0°C to 25°C utility input	-45°C to 25°C deep-chilled utility input

Benchtop Educational Automatic Continuous Flow Microreactor Tubular Plate Microchannel Reactor System

Item Number: PL-WT07



Introduction

Achieve precise laboratory chemical synthesis with this premium automated continuous flow microreactor system featuring high borosilicate glass plates, robust PTFE tubular channels, and an advanced digital touch screen control interface for exceptional heat and mass transfer operational efficiency.

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Application	Description	Key Benefit
Fine Chemical Synthesis	Continuous synthesis of specialty compounds, additives, and high-value intermediates under precise stoichiometric control.	Reduces side-product formation and enhances overall space-time yield compared to batch vessels.
API & Pharmaceutical Development	Rapid screening of multi-step reaction pathways, energetic intermediates, and transient catalytic steps.	Safe handling of highly exothermic reactions via superior localized heat dissipation.
Flavors and Fragrances	Continuous processing of volatile, temperature-sensitive organic compounds and aromatic molecules.	Prevents thermal degradation and preserves product purity through precise temperature profiles.
Agrochemical Formulation	Automated pilot-scale synthesis of complex pesticides, herbicides, and crop protection active ingredients.	Ensures highly consistent batch-to-batch quality with automated recipe execution.
Academic Research & Education	Demonstration of advanced microfluidic principles, transport phenomena, and continuous flow chemistry in university laboratories.	Interactive touchscreen controls and visual glass reactors facilitate safe student instruction.
Nanoparticle Synthesis	Controlled precipitation and growth of uniform nanoparticles, such as Dendritic Mesoporous Silica Nanoparticles (DMSN).	Eliminates localized concentration gradients to achieve exceptionally narrow particle size distributions.

Parameter	Sub-Component / Category	Specification / Value
Overall Dimensions	Main System Frame	85 × 57 × 67 cm
Reactor Material	Plate-type Microreactor	High-borosilicate glass
	Tubular Microreactor	PTFE (Fluoropolymer)
Hold-up Volume	Plate-type Microreactor	15 mL
	Tubular Microreactor	47 mL
Temperature Range	Integrated System Limits	-20°C to 180°C
Working Pressure	Standard Operating Limit	0.3 MPa (Standard configuration)
	High-Pressure Option	Up to 3.0 MPa (With optional 316L stainless steel connectors)
Heat Exchange Area	Plate-type Microreactor	400 cm ² (Double-sided heat exchange)
	Tubular Microreactor	4580 cm ²
Minimum Channel Size	Plate-type Microreactor	1.5mm × 1.0mm to 3.0mm × 1.0mm (Depth: 1.2mm - 1.8mm)
	Tubular Microreactor	Outer Diameter: 2.0 mm, Inner Diameter: 1.0 mm

Component Name	Quantity	Primary Material	Functional Purpose
Plate-type Microreactor	2	High-borosilicate glass	Provides primary reaction space with high visual transparency and thermal transfer
Tubular Microreactor	1	PTFE / 304 Stainless Steel	Secondary reaction path inside an oil bath for prolonged residence times
System Frame	1	304 Stainless Steel	Rigid structural support for all fluidic and electrical components
Transparent Shield	1	Polycarbonate (PC)	Impact-resistant safety enclosure to protect laboratory operators
Temperature Probe	3	Thermocouple	High-accuracy, real-time temperature tracking at critical stages
Smart Controller	1	Liquid Crystal Display (LCD)	Digital readout and local processing of thermal sensors
Pressure Relief Valve	1	Pure Copper (Filter Core)	Active filtration and continuous system pressure regulation
Pressure Sensor	1	PTFE Wetted Parts	Precise inline system pressure monitoring
Peristaltic Pump	3	Engineering Plastic	Pulse-free, high-precision reagent dosing and flow rate control
Flow Indicator	1	304 Stainless Steel	Visual conformation of thermofluid and oil circulation
One-way Check Valve	1	316 Stainless Steel	Prevents backflow and cross-contamination of reactant streams
Touchscreen Panel	1	LCD Glass	Central Human-Machine Interface (HMI) for fully automated recipe execution
Protective Collar	16	Rubber	Dampens vibration and prevents wear on critical connection lines
Corrugated Hoses	6	304 Stainless Steel / Silicone	High-temperature fluid transfer lines with integrated thermal insulation

Continuous Flow Microchannel Reactor High Heat Mass Transfer Corrosion Resistant Glass Microreactor For Photocatalysis Synthesis

Item Number: PL-WT04



Introduction

Optimize your chemical synthesis with our automated continuous flow microchannel reactor designed for high-efficiency heat and mass transfer under demanding photocatalysis and corrosion-resistant conditions, providing unparalleled precision, safety, and highly scalable chemical production outcomes.

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Application	Description	Key Benefit
Pharmaceutical Intermediates	Continuous flow synthesis of highly reactive, sensitive, or short-lived pharmaceutical intermediates under tight temperature control.	Prevents runaway reactions and enhances batch-to-batch yield consistency.
Photocatalytic Synthesis	Implementation of light-driven chemical processes, leveraging the transparent glass microchannels for uniform light penetration.	Maximizes quantum yield and eliminates shadowing effects common in batch reactors.
Nanomaterial Fabrication	Synthesis of complex nanoparticles, such as Dendritic Mesoporous Silica Nanoparticles (DMSN) and quantum dots.	Precise control over particle size distribution and morphology due to uniform concentration.
Specialty Fine Chemicals	High-speed mixing of highly exothermic reagents, hazardous nitrations, or halogenations under continuous flow.	Substantially reduces active reaction volume, lowering operational hazards.
Agrochemical Formulations	Rapid formulation screening and scale-up of novel pesticides, herbicides, and crop protection compounds.	Shortens the R&D cycle and reduces overall solvent and reagent consumption.
Flavor and Fragrance Extraction	Precise thermal processing of natural extracts and synthetic aroma molecules sensitive to thermal degradation.	Maintains product purity and prevents thermal degradation of volatile organics.
Multi-Phase Liquid Extractions	Continuous separation and liquid-liquid extraction processes utilizing modular parallel and serial microchannel configurations.	Maximizes interfacial contact area, achieving higher extraction efficiency in less time.

Feature / Component	Technical Parameter Specification	Material / Construction Details
Model Reference Number	PL-WT04	Premium Industrial Grade
Microchannel Dimensions	10 to 1000 microns (characteristic width)	High Borosilicate Glass (Precision Machined)
Reaction Plate Configuration	Three-piece micro-reactor plate assembly (Standard)	High Borosilicate Glass / PTFE Interface
Support Frame Material	Structural load-bearing outer chassis	304 High-Strength Stainless Steel
Internal Seals & Supports	High-chemical-stability mounting gaskets	Pure Virgin Polytetrafluoroethylene (PTFE)
Leakage Protection	Double-barrier security sealing elements	Glass Baffle & Industrial Silicone Sleeve
Integrated Temperature Sensor	High-precision platinum RTD probe	Stainless Steel Sheathed, In-line Mounting
Integrated Pressure Sensor	Digital electronic transducer	Corrosion-Resistant Diaphragm Sensor
Control Interface	Integrated LCD digital monitor parameter unit	Multi-line LCD Character Display
Flow Compatibility	Compatible with automated pumping systems	Optimized for Peristaltic and Syringe Pumps

Feature / Component	Technical Parameter Specification	Material / Construction Details
Reaction Flow Configurations	Expandable modular manifold support	In-series (□□) and Parallel (□□) Routing
Primary Functionality	Continuous flow chemical synthesis & heat exchange	Microfluidic Convection and Mixing

Continuous Flow Tubular Microchannel Reactor With Oil Bath Temperature Control And Transparent High Borosilicate Glass Jacket For High Temperature Corrosion Resistant Chemical Synthesis

Item Number: PL-WT03



Introduction

This high-performance continuous flow tubular microchannel reactor features oil bath temperature control, a transparent high borosilicate glass jacket, and corrosion-resistant PTFE channels for precise, secure chemical synthesis.

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Application	Description	Key Benefit
Fine Chemical Synthesis	Continuous synthesis of complex organic intermediates and fine compounds requiring aggressive reagents and rapid, precise temperature changes.	Excellent heat dissipation prevents thermal runaway, ensuring high product yield and purity.
Pharmaceutical & API Development	Synthesis of volatile active pharmaceutical ingredients and active intermediates that require quick reaction times and low volume risks.	Low holdup volume of 47.1 ml minimizes safety hazards associated with unstable or hazardous reaction intermediates.
Flavors and Fragrances Industry	Highly controlled synthesis of volatile esters, terpenes, and temperature-sensitive aromatic compounds.	The precise $\pm 0.5^{\circ}\text{C}$ thermal control prevents thermal degradation, preserving delicate olfactory properties.
Agrochemical Formulation	Flow-based manufacturing of chlorinated and fluorinated active crop protection agents under corrosive conditions.	Full PTFE fluidic contact path ensures zero corrosion and zero metal ion contamination throughout production.
Specialty Materials & Polymer R&D	Synthesis of high-performance specialty polymers and nanomaterials under precise continuous flow conditions.	Transparent jacket allows direct visual observation of viscosity transitions and polymerization phases in real time.
Academic & Industrial Research	Advanced education, flow chemistry training, and process parameter optimization trials in academic laboratories.	Modular design allows quick adjustments to tubing length and plate configurations to study reaction kinetics.

Parameter Category	Specification Name	Value / Detail
Model Information	Product Item Number	PL-WT03
Model Information	Origin	China
Outer Glass Tube	Shell Material	High Borosilicate Glass (heat resistant up to 500°C)
Outer Glass Tube	Structural Design	Double-layer vacuum hollow insulation
Outer Glass Tube	Height	30 cm
Outer Glass Tube	Outer Diameter	13.0 cm
Outer Glass Tube	Inner Diameter	10.3 cm
Outer Glass Tube	Cross-Sectional Area	83.3 cm ²
Outer Glass Tube	Safety Pressure Limit	≥ 0.2 MPa
Inner Microchannel	Tube Material	Polytetrafluoroethylene (PTFE)

Parameter Category	Specification Name	Value / Detail
Inner Microchannel	Outer Diameter	2 mm
Inner Microchannel	Inner Diameter	1 mm
Inner Microchannel	Cross-Sectional Area	0.79 mm ²
Inner Microchannel	Total Hold-up Volume	47.1 ml
Inner Microchannel	Number of Coils / Plates	4
Inner Microchannel	Total Length	60 m
Inner Microchannel	Recommended Flow Rate	1 - 6 ml/min
Inner Microchannel	Safety Pressure Limit	0.3 MPa
System Control	Temperature Range	-20°C to 180°C
System Control	Temperature Fluctuation	±0.5°C
System Control	Temperature Control Method	External circulation of heat-transfer media (e.g., silicone oil)
Customization Options	Custom Dimensions	Adjustable tube length, inner/outer diameters, and coil counts
Customization Options	Material Upgrades	Premium PFA (Perfluoroalkoxy), Hastelloy, or other highly resistant materials
Customization Options	System Integration	Optional feed pumps, online sensors (pH, temperature, pressure), automation integration

Continuous Flow Microchannel Reactor High Borosilicate Glass Customizable Chemical Synthesis System

Item Number: PL-WT05



Introduction

Optimize chemical synthesis with this customizable continuous flow microchannel reactor featuring high borosilicate glass plates. Engineered for pharmaceutical, fine chemical, and industrial research laboratories to achieve highly precise temperature control, exceptional heat transfer, and safe, scalable process development operations.

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Application	Description	Key Benefit
Fine Chemical Synthesis	Continuous synthesis of specialty organic compounds, active ingredients, and intermediate reagents utilizing micro-scale channels for instantaneous mixing.	Eliminates localized concentration gradients, dramatically improving product yield and batch-to-batch consistency.
Active Pharmaceutical Ingredients (APIs)	Multi-step continuous synthesis of target drug candidates and sensitive chemical intermediates requiring precise residence time control.	Accelerates lead optimization, ensures exceptional purity profiles, and simplifies regulatory validation via steady-state processing.
Agrochemical Formulation & R&D	High-throughput synthesis of pesticides, herbicides, and growth regulators under strictly controlled continuous flow parameters.	Enhances process safety during highly exothermic reactions and reduces raw material consumption during pilot-scale testing.
Nanoparticle & Quantum Dot Synthesis	Precision manufacturing of uniform silica nanoparticles (e.g., DMSN) and high-quality quantum dots using controlled laminar flow profiles.	Ensures extremely narrow particle size distributions and outstanding reproducibility by eliminating local temperature fluctuations.
Flavors & Fragrance Extraction	Rapid synthesis and processing of volatile aromatic compounds and heat-sensitive essential oils under tight thermal constraints.	Prevents thermal degradation of delicate fragrance molecules thanks to the rapid millisecond-level heating and cooling capabilities.
Academic & Industrial R&D	High-performance laboratory research and chemical engineering education focusing on green chemistry, microfluidics, and flow chemistry kinetics.	Provides visual observation of reaction dynamics through the transparent borosilicate glass plate, coupled with low reagent waste.

Parameter	Specification Details / Value
Product Model	PL-WT05
Microchannel Plate Core Material	High Borosilicate Glass
Maximum Working Temperature (Glass Plate)	Up to 500°C
Thermal Jacket Operating Range	-20°C to 200°C
Temperature Control Precision	±1°C
Flow Control Mechanisms	5 Integrated Stainless Steel Needle Valves
Fluidic Flow Regime	Laminar Flow (Low Reynolds Number)
Channel Dimensions	Tens to hundreds of micrometers
System Scalability	Supporting up to 12 pipelines for series/parallel configurations

Sub-Assembly	Component Name	Quantity	Material Specifications
Single Microreactor Plate Assembly	Reaction Plate	1	High Borosilicate Glass
	Frame Body	1	Corrosion-Resistant Plastic
	U-Clamp	4	316 Stainless Steel
	Reaction Interface	4	PTFE (Polytetrafluoroethylene)
	Oil Bath Connector	2	304 Stainless Steel
Overall System Frame	Seal Plug / Stopper	4	PTFE (Polytetrafluoroethylene)
	Frame Body	1	Aluminum Alloy
	Internal Pipelines	12	Stainless Steel
	Fluidic Interface Ports	4	304 Stainless Steel
	Shock-Absorbing Sleeves	Multiple	Silicone
	Control Valves	5	Stainless Steel

High Borosilicate Glass Microchannel Reactor With Monolithic Sintering And Dual Side Heat Exchange For Photocatalysis And Laboratory Scientific Research

Item Number: PL-WT02



Introduction

This high borosilicate glass microchannel reactor features monolithic sintering and dual side heat exchange for laboratory scientific research and photocatalysis, providing precise temperature control, high mass transfer, and absolute reaction visibility for demanding chemical synthesis.

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Application	Description	Key Benefit
Fine Chemical Synthesis	Synthesis of high-value compounds, dyes, and specialized intermediates requiring precise stoichiometric control and rapid mixing.	Drastically reduces byproduct formation and increases overall product purity through highly controlled residence times.
Pharmaceutical Synthesis	Continuous-flow synthesis of active pharmaceutical ingredients (APIs), key building blocks, and highly unstable intermediates.	Safe handling of hazardous reactions and unstable intermediates due to low internal hold-up volumes.
Photocatalysis & Photoredox	Carrying out light-driven organic synthesis and catalyst testing utilizing the high UV-visible light transmission of the glass body.	Maximizes photon efficiency and ensures uniform light exposure across the thin, high-surface-area microchannels.
Flavors & Fragrances	Development and continuous manufacturing of delicate aroma chemicals, essential oil derivatives, and cosmetic compounds.	Eliminates thermal degradation of heat-sensitive compounds through ultra-precise, localized temperature control.
Agrochemical Formulations	Process development for active ingredients in herbicides, pesticides, and growth regulators requiring multi-phase mixing.	Enhances mass transfer coefficients of liquid-liquid and gas-liquid biphasic reactions for higher conversion rates.
Specialty Chemicals	Synthesis of performance polymers, electronic chemicals, and highly reactive reagents under extreme conditions.	Provides complete chemical inertness against aggressive compounds, eliminating metal contamination risks.
Academic Research & Education	Practical study of chemical kinetics, continuous-flow dynamics, and thermodynamics in laboratory and university settings.	Complete visual transparency allows real-time observation and recording of phase changes, color shifts, and precipitation.

Parameter	Specifications (Model: PL-WT02)
Material	Premium High Borosilicate Glass (3.3)
Overall Plate Dimensions	200 mm × 150 mm × 10 mm
Internal Hold-up Volume	8 mL to 18 mL
Total Continuous Flow Rate	300 mL/min to 1000 mL/min
Operating Temperature Range	-30°C to 195°C
Reaction Chamber Max Pressure	20.0 Bar (tested at room temperature with Nitrogen gas)
Heat Exchange Chamber Max Pressure	3.0 Bar (tested at room temperature with Nitrogen gas)
Total Heat Exchange Area	530 cm ² (consisting of two 190 mm × 140 mm active heat plates)
Reagent Fluid Connections	4 Inlets / 2 Outlets
Thermal Fluid Connections	2 Inlets / 2 Outlets

Parameter	Specifications (Model: PL-WT02)
Minimum Channel Cross-Section	1.5 mm × 1.0 mm to 3.0 mm × 1.7 mm
Microchannel Depth	1.0 mm to 1.5 mm

Performance Metric	PL-WT02 Continuous Micro-Reactor	Traditional Stirred Tank Reactor (STR)
Instantaneous Reactions (< 1s)	Excellent (optimized mixing & immediate heat removal)	Poor (diffusion-limited, high risk of hot spots)
Fast Reactions (10s - 30min)	High selectivity through precise residence time control	Moderate (requires slow reagent dosing to control temperature)
Slow Reactions (> 30min)	Safe operation under expanded pressure/temperature windows	Standard (requires large thermal management systems)
Specific Surface Area-to-Volume Ratio	3,000 m ² /m ³ to 13,000 m ² /m ³	1 m ² /m ³ to 10 m ² /m ³
Typical Residence Time Range	1 second to 600 seconds	0.5 hours to 48 hours
Surface Heat Transfer Coefficient	1,090 W/m ² ·K to 3,420 W/m ² ·K	2 W/m ² ·K to 15 W/m ² ·K
Scale-Up Complexity	Extremely low (linear numbering-up of plates)	High (requires 4 to 5 stages of geometric optimization)

Resource/Metric	PL-WT02 Microfluidic System (1L Scale equivalent)	Conventional Stirred Tank (3000L Scale equivalent)
System Hold-Up Volume	1 Liter	3,000 Liters
Physical Equipment Footprint	9 m ²	80 m ²
Relative Solvent Consumption	0 to 30 units	90 units
Target Product Selectivity Index	0.8 to 1.0	0.8
Low-Temp Reaction Energy Efficiency	Optimum thermal control at 0°C to 25°C	Requires cryogenic cooling from -45°C to 25°C



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