VACUUM DRYER | VD-P Series

Professional Mixing Technologies

Mechanimix VD-P Series Overview

The Mechanimix VD-P Series represents a new generation of laboratory-scale vacuum drying and mixing systems, designed to deliver high precision, efficiency, and full process reliability.
Built with high-grade stainless-steel construction, the VD-P Series ensures gentle, uniform, and contamination-free drying for heat-sensitive or high-value materials.
The conical vessel combined with a top-mounted agitator provides complete mixing and excellent discharge performance, while the integrated heating jacket and vacuum system enable fast and controlled drying with accurate temperature management.
VD-P Series is the ideal solution for laboratories requiring industrial-level drying and mixing performance.

Working Capacity	5–100 [L]
Total Volume	7–132 [L]
Addition Port	DN15–DN50
Discharge Valve	DN40–DN125
Working Temperature	25–150 [°C]
Pressure	(-1) – 2 [bar]
Speed Range	20–117 [RPM]
Motor Power	1.1–5.5 [kW]
Materials	AISI 304, AISI 316, AISI 316L, etc.
Industries	Pharmaceutical, Chemical, Food Specialty Materials

VD-P

Advanced Laboratory Mixing & Drying Solutions

Professional Mixing Technologies

FEATURES

Vacuum Drying System
Provides gentle, low-temperature vacuum drying ideal for heat-sensitive materials and small-batch processing.

Integrated Mixing Mechanism
Ensures uniform mixing and efficient drying by promoting continuous material movement inside the vessel.

Precise Temperature Control
Delivers accurate thermal control via a fully integrated heating jacket for repeatable process performance.

Compact Heat-Jacketed Design
Combines efficient heat transfer with an easy-to-clean, space-saving structure ideal for laboratory environments.

APPLICATIONS

Pharmaceutical Research
For formulation development, drying of active ingredients, and small-batch sterile processing.

Food & Nutritional Studies
For testing and drying of heat-sensitive nutritional powders and functional ingredients.

Chemical Analysis & Material Testing
For controlled drying, mixing, and sample preparation of fine chemicals and specialty materials.

Biotechnology and Laboratory R&D
For small-scale production, sample preparation, and pilot testing under controlled vacuum conditions.

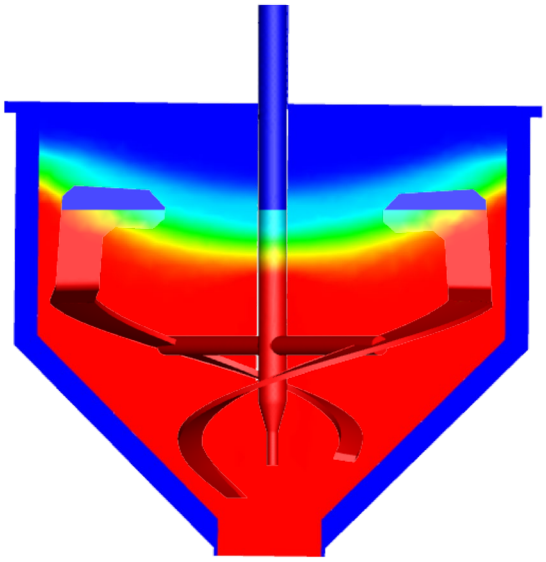
ADVANTAGES

- **Precise Process Control**
  Accurate monitoring of temperature, vacuum, and speed.
- **Laboratory-Scale Efficiency**
  Industrial performance in compact lab design.
- **Modular Connectivity**
  Supports condenser, vacuum pump, and data logging options.
- **Contamination-Free Operation**
  Closed system ensures clean and safe processing.
- **Data Recording Option**
  Digital interface for temperature and pressure tracking.
- **Quiet and Stable Running**
  Robust mechanical design minimizes vibration and noise during operation.

CFD Studies

Computational Fluid Dynamics (CFD)

CFD simulations provide detailed analysis of fluid behavior inside real tanks and mixer setups in a virtual environment. This allows process performance to be verified and optimized before physical trials. With years of field experience, Mechanimix uses advanced CFD tools to increase equipment efficiency, improve mixing patterns, and eliminate dead zones, thereby achieving reliable and homogeneous drying results.



CFD Post A

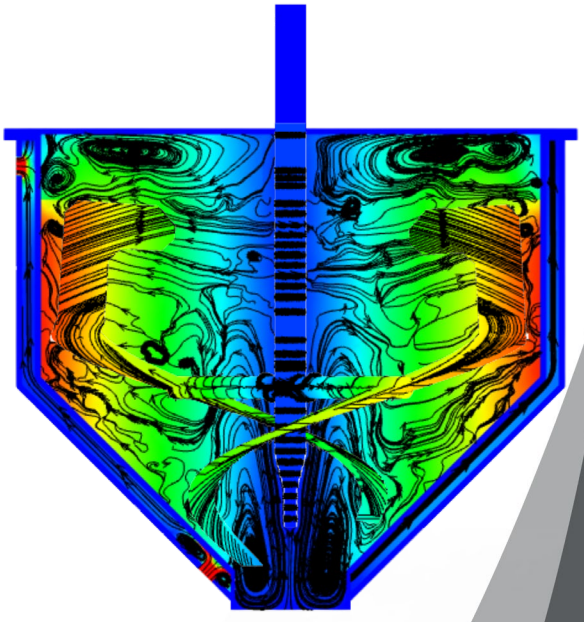
Examples of CFD Analyses for Vacuum Dryer

CFD Post A – Fluid Volume Fraction

CFD multiphase simulation reveals a stable, compact material bed in the lower cone (red) with a natural free surface layer shaped by gravity and smooth circulation from impeller agitation (green–yellow).Vacuum gas headspace appears in blue, showing clear phase separation from chamber atmosphere. Symmetry confirms bed stability without collapse, segregation, or stagnant pockets, ensuring uniform drying and reliable heat transfer for sensitive lab materials.

CFD Post B – Velocity Streamlines & Flow Symmetry

The CFD simulation shows a symmetrical internal flow field in the conical VD-P chamber driven by impeller agitation, with red/orange marking high-velocity discharge, green/yellow stable recirculation in the mid-volume, and light to dark blue low-velocity boundary flow that stays in motion without forming critical stagnant zones. Mirrored streamlines confirm flow continuity and balance, validating uniform mixing, reliable heat transfer, and stable drying conditions for sensitive laboratory materials.



CFD Post B

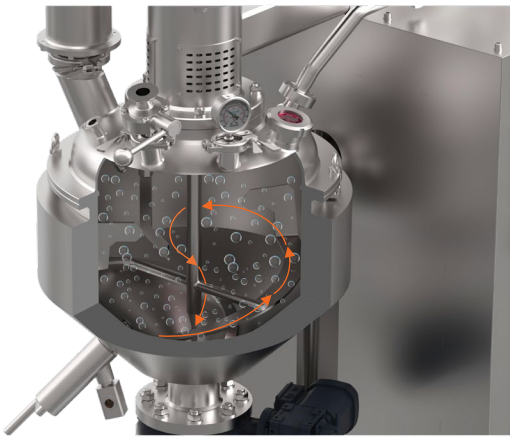
Mechanimix engineers have utilized detailed CFD analyses to design their systems so that homogenization occurs evenly and efficiently throughout all tank regions — even at the edges.

Advanced Mixing & Hygienic Processing

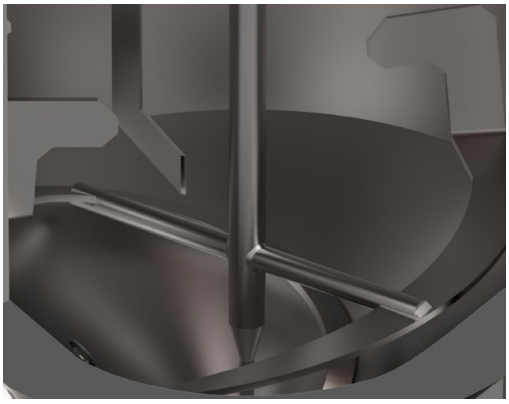
Professional Mixing Technologies

Advanced Mixing Geometry

- **Optimized Impeller Design**
  Precision-engineered impeller geometry ensures complete and uniform mixing even at low rotational speeds, preventing dead zones inside the vessel.
- **3D Flow Circulation**
  The special blade angles generate axial and radial flow patterns, promoting efficient heat and mass transfer throughout the batch.
- **Gentle Mixing for Sensitive Materials**
  The impeller's smooth motion maintains product integrity, ideal for heat-sensitive or fragile samples.
- **Easy Impeller Replacement**
  The modular impeller connection allows quick and tool-free replacement, ensuring flexible operation for different test materials.
- **With Integrated Flow Breaker (Baffle)**
  The mixing system includes an integrated baffle element to eliminate vortex formation and improve axial mixing efficiency, ensuring uniform heat and mass distribution throughout the vessel.



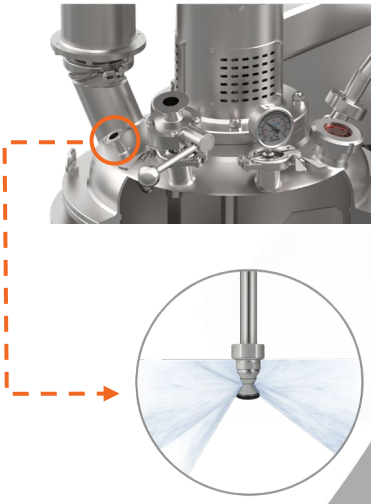
Precision mixing system with uniform flow patterns.



Hygienic design with fully polished, easy-clean surfaces.

Gentle & Hygienic Processing

- **Sanitary Clamp Connections (Tri-Clamp Fittings)**
  All process fittings use sanitary tri-clamp joints for fast, tool-free disassembly and hygienic cleaning. These fittings minimize dead zones and ensure full accessibility for inspection.
- **High-Grade Stainless-Steel Construction**
  Fully welded stainless-steel design with mirror-polished inner surfaces (Ra ≤ 0.8 µm) prevents contamination and ensures long-term corrosion resistance.
- **Hygienic Welding and Internal Geometry**
  All internal welds are ground and polished with optimized corner radii to eliminate residue buildup and ensure complete drainability.
- **Manual Cleaning Design**
  Compact vessel and smooth inner surfaces allow quick, residue-free manual cleaning with minimal effort.
- **CIP Spray Nozzle System (Optional)**
  Ensures efficient 360° in-place cleaning of the vessel without disassembly.
  Enhances process hygiene, saves cleaning time, and meets GMP standards.

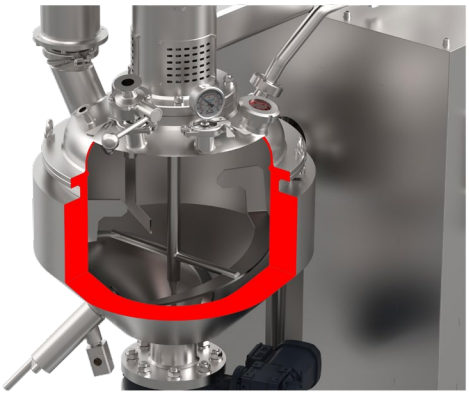


Advanced Heating, Mixing & Vessel Handling

Professional Mixing Technologies

Double-Jacket Heating & Cooling System

- **Efficient Thermal Exchange**
  Dual-layer jacket ensures uniform heat or cooling distribution across the vessel surface.
- **Indirect Heating for Sensitive Materials**
  Thermal fluid circulation prevents direct contact and preserves product quality.
- **Precise Temperature Control**
  High-accuracy sensors and PID controller maintain stable and reproducible conditions.
- **Safety and Versatility**
  Built-in pressure and temperature safeguards ensure safe, flexible use under vacuum or pressure.
- **Energy-Saving Design**
  Optimized insulation minimizes heat loss for efficient operation.



Heating Jacket

Tiltable Mixing Vessel Design

- **Adjustable Tilting Angle**
  Tilting range can be customized based on user requirements, allowing complete and efficient material discharge.
- **Easy Cleaning & Maintenance**
  Smooth inner surfaces and tiltable design simplify cleaning and reduce downtime between processes.
- **Safe and Ergonomic Operation**
  Controlled tilting mechanism and balanced structure enhance operator safety and ease of use in laboratory environments.

Quick-Release Locking System

- **Fast Lock & Release Mechanism**
  Provides quick engagement and disengagement of the vessel without tools, minimizing setup time.
- **Secure Locking for Safety**
  Ensures firm fixation during operation, preventing accidental movement or vibration.
- **Enhanced Operator Efficiency**
  Reduces manual effort and simplifies vessel handling during batch change or cleaning.
- **Tool-Free Maintenance**
  Simplifies inspection and cleaning by allowing access without additional tools.

Precision-built locking interface

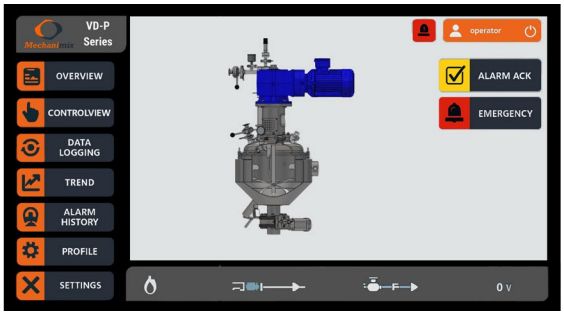
Precision Control and Smart Process Monitoring

Professional Mixing Technologies

Laboratory-Scale Precision

- **High-Accuracy Mixing & Control**
  Precision sensors and calibrated drives ensure accurate process parameters and repeatable results.
- **Reproducible Experimental Conditions**
  Each batch can be reproduced under identical temperature, speed, and vacuum settings.
- **Fine Process Adjustments**
  Precise control over mixing speed, heating rate, and vacuum level allows fine-tuning of laboratory processe.
- **Industrial Performance at Lab Scale**
  Delivers industrial-grade results in a compact, laboratory-sized system.

Control & Automation



- **PLC-Based Control**
  Automatic and stable regulation of temperature, pressure, vacuum, and mixing speed.
- **HMI Touchscreen**
  Real-time display of all parameters with quick, intuitive operation.
- **Recipe & Data Management**
  Save, recall, and track process settings for repeatable batches.
- **Safety Interlocks**
  Prevents lid opening under pressure and includes overpressure and overtemperature protection.

Smart Process Monitoring

- **Real-Time Tracking**
  Continuous monitoring of temperature, vacuum, and mixing speed during operation.
- **Predictive Maintenance**
  Early detection of mechanical wear or seal failure through sensor feedback.
- **Data Logging & Analysis**
  Collects and evaluates process data to optimize mixing and drying efficiency.
- **Remote Access (Optional)**
  Online monitoring and reporting for data collection and future Industry 4.0 integration.

Compact Design & Precision Discharge Systems

Professional Mixing Technologies

Ergonomic & Compact Design

- **Space-Efficient Layout**
  Compact structure fits perfectly in laboratory environments, allowing easy vessel replacement and maintenance access.
- **User-Friendly Operation**
  Angled control panel provides clear visibility and comfortable access to all controls during operation.
- **Easy Mobility & Maintenance**
  Integrated wheels and modular design simplify movement, cleaning, and quick vessel handling.
- **Stable & Safe Design**
  Balanced frame and optimized center of gravity ensure vibration-free, stable, and safe operation.

Electric Discharge Valve

Automatic & Clean Product Discharge

- **Automatic & Controlled Discharge**
  Motor-driven valve enables precise, timed release of material controlled by PLC system.
- **No Manual Handling Needed**
  Eliminates the need for manual opening or lifting, improving operator safety and comfort.
- **Clean & Hygienic Operation**
  Sealed valve design prevents leakage and contamination during discharge.
- **Integrated with Mixing Control**
  Fully synchronized with mixing and heating processes for smooth material flow.

Sampling Valve

Precise & Hygienic Sampling

- **Accurate In-Process Sampling**
  Allows precise sample collection during operation without interrupting the process.
- **Safe & Contamination-Free**
  Hygienic design prevents material leakage and external contamination.
- **Easy Access & Handling**
  Ergonomic placement ensures convenient reach and smooth operation for the user.
- **Ideal for Quality Control**
  Enables mid-process testing of moisture, texture, or temperature for precise process optimization.

Advanced Mixing Equipment Features

Professional Mixing Technologies

A pressure transmitter above the condenser provides real-time pressure monitoring for vacuum stability.

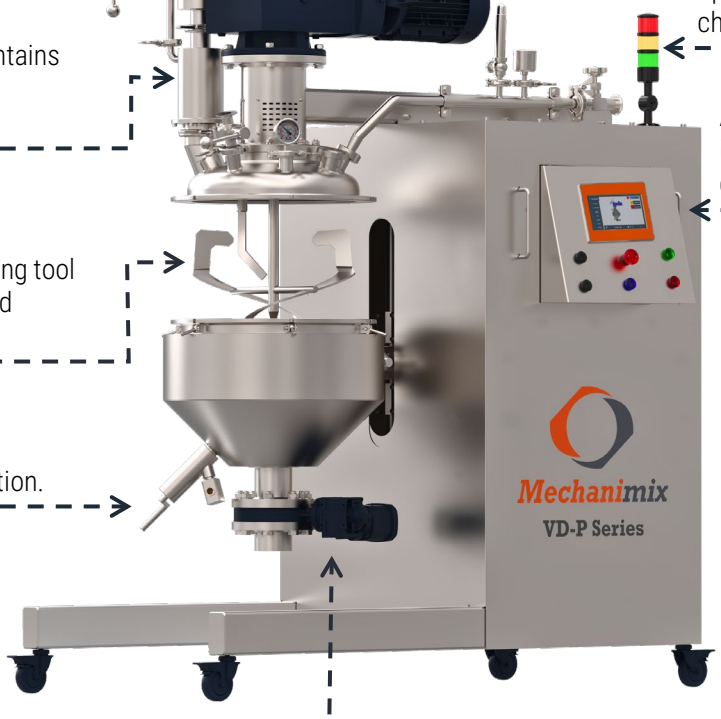
The motor–gearbox unit ensures steady torque and smooth mixing for all material types.

The integrated vacuum system removes air efficiently, ensuring bubble-free mixing and protecting heat-sensitive materials.

Multi-color alarm light indicates system status and alerts operators to any fault or process change.

Integrated filter system maintains product purity and protects downstream components.

An angled control panel offers improved visibility and user comfort during operation.



Temperature-controlled mixing tool for superior homogeneity and efficient discharge.

The tank is resistant to vacuum and pressure and can be heated with steam, thermal oil, or water. It can also be supplied with insulation upon request.

Sampling valve designed for vacuum and pressure operation.

The electric discharge valve automatically controls the release of materials, ensuring precise, on-demand discharge without manual intervention.

Hygienic top hatch with sanitary fittings ensures clean, easy access for loading and inspection.

Clear sight glass allows safe visual monitoring of the process without opening the vessel.

Technical Configurations of Laboratory Vacuum Dryers

Professional Mixing Technologies

Vacuum Dryer VD-P Series – Technical Configurations

Type	VD-P5	VD-P25	VD-P50	VD-P100
Effective Volume [L]	5	25	50	100
Total Volume [L]	7	33	65	132
Addition Port [DN]	DN 15	DN 25	DN 32	DN 50
Discharge Valve [DN]	DN 40	DN 80	DN 100	DN 125
Weight [Kg]	360	440	570	800
Discharge Type	Manual	Automatic	Automatic	Automatic
Control System	Semi-Automatic	HMI + PLC	HMI + PLC	HMI + PLC
Quick-Change Agitator Design	✓	✓	✓	✓
Baffle Installation	✗	✓	✓	✓
Tilting Mechanism	✓	✓	✗	✗
Liftable Vessel System	✓	✓	✓	✓
CIP - Clean-In-Place Spray Nozzles	✗	✓	✓	✓
Explosion-Proof Design (Optional)	✗	✗	✓	✓
Vacuum System	✓	✓	✓	✓
Hot Water / Thermal Oil Heating System	✗	✓	✓	✓

- The features listed under "Design Options" (e.g., CIP - Clean-In-Place Spray Nozzles, XP Electrics, etc.) are configurable based on customer requirements. ✓ indicates the feature is included, ✗ indicates it is not included by default, and availability may vary depending on the specific model configuration or customization.
- Technical specifications such as volume, dimensions, and weight are based on standard VD-P Series designs and may vary according to customer requirements.
- Each unit can be customized in tilting angle, heating method (hot water or thermal oil), control system (manual or PLC), and discharge configuration.
- Designed for laboratory and pilot-scale use, the system can be tailored to meet any process complexity, ensuring precise control and repeatable performance.

Laboratory Vacuum Dryer Technologies

Professional Mixing Technologies

The Vacuum Dryer VD-P Series processes sensitive materials safely and uniformly under controlled temperature and vacuum. It is ideal for laboratory and pilot applications in the pharmaceutical, food, and chemical industries.

The Vacuum Dryer VD-P Series offers a versatile solution for efficient drying and mixing of sensitive materials, providing reliable performance across laboratory and pilot applications.