TORONTECH

LABORATORY INTERNAL MIXER

Laboratory Internal Mixer - ToronMix™ 300

ToronMix™ 300 Laboratory Internal Mixer compounds rubber, plastics, and chemical raw materials inside a closed, pressurized chamber. Two counter-rotating rotors work the batch against the chamber wall while a ram holds it down in the high-shear zone. Chamber sizes of 1, 3, and 5 L cover formulation trials from a few hundred grams up to several kilograms. Both high-viscosity and low-viscosity feedstocks run on the same platform, which suits laboratories that switch between elastomers and filled thermoplastics.

Rotors are machined from SKD chromium-molybdenum alloy with a hard chrome-plated surface at HRC60, holding profile and finish through abrasive filler work. Electric heating takes the chamber from ambient to 300°C, and water cooling removes the heat that shear itself generates during a run. Frequency-conversion drive controls rotor speed from 0 to 50 rpm, so shear input matches the compound rather than a fixed setting. The upper ram runs on 0.5 to 0.8 MPa shop air, with hydraulic locking available as an alternative.

A PLC and touch-screen interface run the mixing cycle automatically and plot temperature, time, and torque as live curves. That torque trace is what turns a mixing run into data, since it shows when filler incorporates and when dispersion levels off. A USB port on the panel connects the mixer to a computer for cycle control and data export. Discharge happens by tilting the body or opening the chamber as a clamshell, depending on configuration.

APPLICATIONS

Laboratory Internal Mixer - ToronMix™ 300 Applications

The ToronMix™ 300 handles the compounding step that precedes molding, extrusion, or property testing in a development laboratory.

- Rubber Compound Development: masticates natural and synthetic elastomers, then works in fillers, oils, accelerators, and curatives to build trial recipes
- Carbon Black and Silica Dispersion: incorporates reinforcing filler at high loading under ram pressure, where an open mill would struggle
- Thermoplastic Compounding: blends resins with additives, impact modifiers, and compatibilizers into homogeneous batch material
- Masterbatch Preparation: produces concentrated pigment and additive batches for later dilution and evaluation
- Thermoplastic Elastomer and TPV Work: mixes blends and runs dynamic vulcanization trials under controlled temperature
- Highly Filled and Mineral-Loaded Systems: handles calcium carbonate, talc, and flame-retardant loadings that need enclosed high-shear mixing
- Silicone and Reactive Systems: mixes reactive stock under temperature control to hold off premature cure
- Recycled Rubber and Devulcanization Studies: reprocesses ground rubber with virgin stock and additives to assess property recovery
- Chemical and Specialty Raw Material Blending: combines high-viscosity and low-viscosity chemical feedstocks where open mixing would lose material
- Mixing Behavior Characterization: records torque and temperature curves to compare processability between candidate formulations
- University Teaching and Research Programs: gives students and research groups a production-representative mixing method at laboratory scale


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FEATURES

Laboratory Internal Mixer - ToronMix™ 300 Key Features

Feature selection on the ToronMix™ 300 targets controlled shear, an objective mixing end point, and repeatable batch conditions.

- Closed Pressurized Mixing Chamber: contains the batch and powder additives, cutting dust loss and improving incorporation over open mixing
- Chamber Sizes of 1, 3, and 5 L: matches available material quantity, from early formulation work to larger validation batches
- Live Torque, Temperature, and Time Curves: shows filler incorporation and the point where dispersion levels off, giving a data-based end point
- PLC Automatic Cycle Control: runs a stored mixing program so different operators reproduce the same conditions
- USB Data Export and PC Connection: moves cycle data off the panel for formulation records and comparison between trials
- Frequency-Conversion Rotor Drive: 0 to 50 rpm adjustment tunes shear input to elastomers, filled compounds, or shear-sensitive stock
- HRC60 Hard Chrome-Plated Rotors: SKD chromium-molybdenum alloy resists the abrasion of mineral and reinforcing fillers
- Pneumatic Upper Ram, 0.5 to 0.8 MPa: presses the charge into the rotor path for consistent incorporation, with hydraulic locking as an alternative
- Chamber Heating to 300°C: covers rubber compounding through higher-temperature thermoplastic work
- Water Cooling Circuit: removes shear-generated heat to protect curative packages and temperature-sensitive polymers
- Flip or Clamshell Discharge: tilting or split-chamber options for batch removal and cleaning between materials
- Touch-Screen Interface: single panel for temperature, speed, ram, and cycle timing
- Mobile Frame: castors allow repositioning within a laboratory
- High and Low Viscosity Capability: the same chamber handles stiff elastomer stock and thinner chemical blends

THEORY & METHOD

Theory and Method

Internal mixing concentrates shear where it does the most work. Two rotors turn toward each other inside a figure-eight chamber, and the tightest clearance sits between each rotor tip and the chamber wall. Material forced through that gap sees a stress spike high enough to tear filler agglomerates apart, which is the dispersive part of the job. Rotor wings also drive material along the chamber axis and across the rotor gap, folding separate regions of the batch together for distributive mixing.

Ram pressure decides whether that shear reaches the material at all. Without downward force, a loose charge of rubber and powder rides above the rotors and never enters the clearance zone. Air at 0.5 to 0.8 MPa on the upper ram presses the batch into the rotor path and drives loose filler into the polymer. Fill factor works the same way, since operators normally charge 60% to 75% of chamber volume.

Torque and temperature together describe what happened inside the closed chamber. Rotor torque climbs as solid polymer compacts, peaks while filler incorporates, then flattens as the compound becomes homogeneous, giving an objective end point instead of a clock time. Shear work converts almost entirely to heat, so stock temperature rises through the cycle and water cooling must remove that energy before curatives react. Reading both curves lets an operator stop a batch on torque, temperature, or specific energy

TECHNICAL SPECIFICATIONS

Laboratory Internal Mixer - ToronMix™ 300 Technical Specifications

Parameter	Specification

Chamber Capacity	1 L / 3 L / 5 L
Temperature Range	Ambient to 300°C
Heating Method	Electric
Cooling Method	Water cooling (water source and connection supplied by customer)
Rotor Speed	0 to 50 rpm, frequency-conversion regulation
Rotor Material	SKD chromium-molybdenum alloy
Rotor Surface Hardness	HRC60, hard chrome plated
Upper Ram	Pneumatic, 0.5 to 0.8 MPa air pressure, or hydraulic locking
Discharging Method	Flip type or clamshell type
Controller	PLC program control with touch-screen operation
Data Interface	USB, for PC connection and data extraction
Recorded Data	Temperature, time, and torque curves

Configuration Options

Item	Description
Chamber Volume	1 L, 3 L, or 5 L
Ram Actuation	Pneumatic at 0.5 to 0.8 MPa, or hydraulic locking
Discharge Arrangement	Flip type (tilting body) or clamshell type (opening chamber)
Cooling Connection	Customer-supplied water source and plumbing connection

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