FARREL

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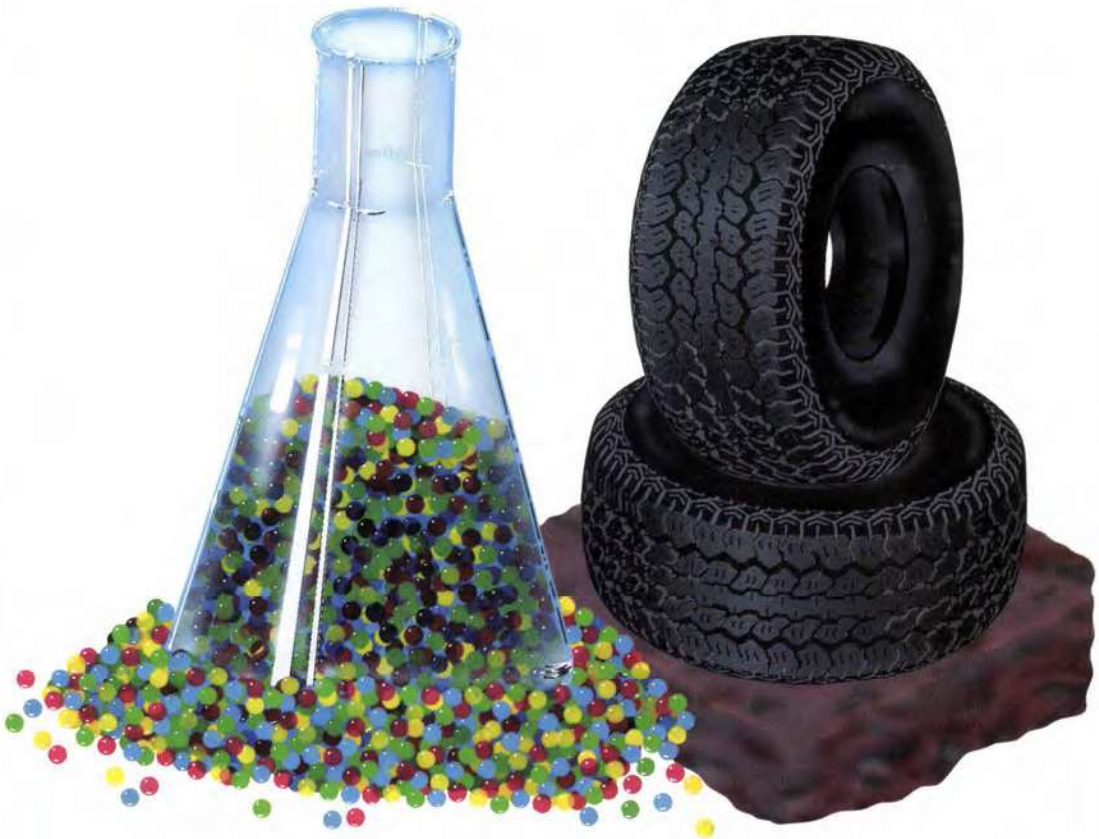
FARREL LABORATORY-SIZE PROCESS EQUIPMENT



BULLETIN NO. 214-E

BANBURY® MIXERS

Farrel Laboratory size BANBURY® Mixers are available in two models, the BR and 00C BANBURY® Mixers, for compound and process development work. The BR and 00C BANBURY® Mixers are utilized in rubber and plastics laboratories around the world. They are frequently specified by leading standards organizations, A.S.T.M., ISO and British Standards Institution for presentation of standard test mixes. Both mixers will produce mixes directly comparable with results obtained in production size machines.

MACHINE SIZE	UNITS U.S.	METRIC	BR		00C	
Net Volume of Chamber	Cu. In.	Liters	97	1.57	263	4.24
Approximate Compound Capacity, 1.0 S.G., .75 Fill Factor	LBS	KG	2.6	1.2	7	3.2
Motor Size	HP	KW	30	22	40	30
Rotor Speed	RPM		65 - 230		65 - 125	
Diameter of Air Cylinder	IN	MM	4	102	5	127
Air Pressure Maximum Minimum	 PSI PSI	 BAR BAR	 100 25 - 35	 7.0 1.7 - 2.4	 100 40 - 60	 7.0 3 - 4.2
Approximate Overall Dimensions						
Length	FT-IN	M	8′-7″	2.6	8′-8″	2.6
Width	FT-IN	M	2′-8″	0.8	3′-4″	1.0
Height	FT-IN	M	6′-0″	1.8	6′-10″	2.1
Approximate Weight	LBS	KG	4600	2090	6500	2950

GENERAL SPECIFICATIONS

ROTORS:
- Nitrided stainless steel (BR)
- Chrome plated alloy steel (00C)

SWING SIDES:
- Cast stainless steel
- Air operated

BEARINGS:
- Spherical roller bearings

DUST STOPS:
- Graphitar, non-lubricated
- Bronze, lubricated (Optional)

HOPPER ASSEMBLY:
- Stainless steel

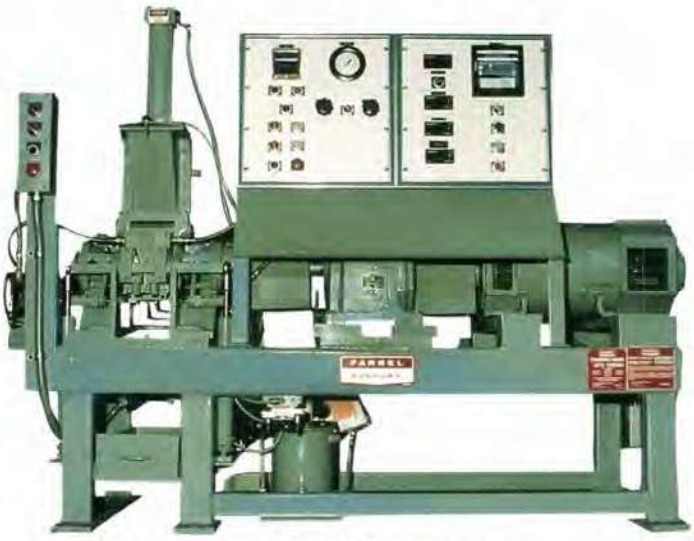
FLOATING WEIGHT:
- Stainless steel (BR)
- Steel, chrome plated (00C)
- "V" - bottom

BEDPLATE:
- Fabricated steel
- Unitized

TEMPERATURE CONTROL SYSTEMS:
- Circulating water
- Hot oil system (Optional)

CONTROL PANEL:
- Electro-pneumatic control panel
- Prewired and mounted
- Two pen recorder for temperature and kilowatts

DRIVE MOTOR:
- DC/SCR
- Adjustable speed



BR BANBURY® Mixer

GENERAL: These units are completely assembled and tested prior to shipment. No special foundation is required. Customer has only to supply and connect utilities.

FARREL CONTINUOUS MIXERS – CP-SERIES

Farrel Laboratory size continuous mixers are available in two models: The 1LM and 2LM Continuous Mixers. These two mixers have been mounted over a hot feed extruder on a common frame in the CP-Series Compact Processor. The CP-12 utilizes a 1LM Continuous Mixer mounted over a 2″ extruder, the CP-23 utilizes a 2LM Continuous Mixer mounted over a 3¼″ extruder. These machines will duplicate the mixing mechanism as found in larger production size continuous mixers. This feature makes these machines ideal for scale-up and development work.

The CP-Series is a complete processing system, duplicating large production FCM-extruder installations. The CP-Series is pre-piped and wired for ease of installation in a typical laboratory setting. Once installed the operation is simple, requiring only one operator.

SPECIFICATIONS / MODEL	UNITS U.S.	UNITS METRIC	CP-12		CP-23	
Mixer Model			1LM		2LM	
Mixer Power	HP	KW	5	3.75	30	25
Mixer Speed	RPM		1750		1150	
Extruder Size	IN	MM	2	50	3¼	82.5
Extruder Power	HP	KW	3	2.25	20	15
Extruder Speed	RPM		94		96	
Nominal Production Rates	LBS/HR	KG/HR	25	11	250	114
Approximate Overall Dimensions						
Length	FT-IN	MM	8′-1″	2464	8′-10″	2693
Height	FT-IN	MM	5′-11″	1803	6′-5″	1956
Width	FT-IN	MM	4′-1″	1245	3′-6″	1065
Floor to ℄ of extruder	FT-IN	MM	3′-6″	1067	2′-10″	863
Approximate Weight	LBS	KG	1500	906	5200	2365

GENERAL SPECIFICATIONS

MIXER

ROTORS:
- Chrome plated alloy steel

MIXING CHAMBER:
- Tool steel
- Tool steel/chrome
- Hinged clamshell opening
- Downstream openings (inserts)

ORIFICE:
- Teflon
- Handwheel positioning

POLYMER SEALS:
- Labyrinth (feed end)
- Viscoseal (discharge end)

TEMPERATURE CONTROL:
- Electric heat in chamber

EXTRUDER

SCREW:
- Chrome plated
- 10:1 L/D

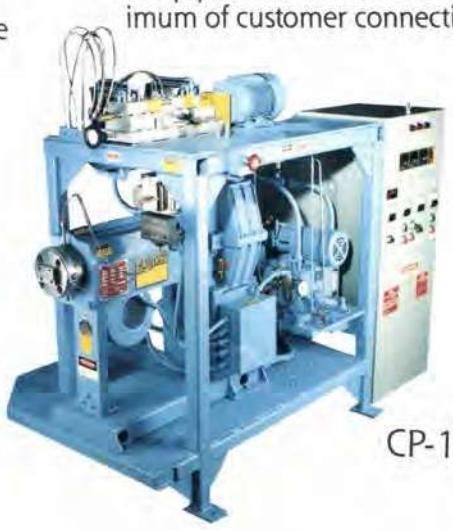
BARREL:
- Tool steel wear surface
- Cast aluminum heater bands

HOPPER CYLINDER:
- Chrome plated steel
- Feed undercut

HEAD AND ADAPTOR:
- Strand die
- Electric heat

GENERAL

- Unitized support frame
- Control panel with instrumentation and motor controls
- Pre-piped and wired for a minimum of customer connections



CP-12

LABORATORY CALENDERS

Development calenders are available with three rolls or four rolls in the inverted "L" design, or any roll arrangement. Both types are offered with either 6″ × 13″ or 8″ × 16″ rolls, or as needed. Normal operating temperature is 250F - 350F, with the rolls steam heated at 150 psi. or by hot oil. Special laboratory calenders can be supplied for operating temperatures from 350F to 500F.

For processes requiring a calender of exceptional versatility, Farrel has developed the special inclined "Z" machine and other designs. Each roll is individually driven by an adjustable speed drive. This individual type roll drive can be supplied for the other calenders listed. Steel plate frames with roller bearings are available for these machines and in any special roll arrangement desired.

Type of Calender	Size of Rolls	Roll Speed (Ft per Min)	Motor HP	Roll Temp	Approx. Weight
3-roll Vertical	6″ × 13″	4 to 30	7½	350F	6,400
	8″ × 16″	6 to 50	15	350F	10,000
4-roll Inverted "L"	6″ × 13″	4 to 30	7½	350F	9,500
	8″ × 16″	6 to 50	15	350F	13,000

4-roll Inverted "L"

GENERAL SPECIFICATIONS

The following data applies to the three-roll vertical and four-roll calenders listed in the table. Specifications for high-temperature machines and for the four-roll inclined "Z" calender will be furnished on request

ROLLS:
- Chilled iron or forged steel ground on face and journals
- Bored for uniform heating and cooling

JOURNAL BOXES:
- Solid cast bronze, or roller bearings are available

FRAME:
- Solid grey iron castings or plate steel mounted on fabricated-steel base

CONNECTING GEARS:
- Cast steel double helical gears with fine-pitch teeth and oiltight guards
- Three-roll calenders have three even and three friction gears
- Four-roll calenders have five connecting gears usually arranged for minimum friction as required for film or sheeting

ROLL ADJUSTMENT:
- Manual by rachet wrench through steel screws and iron nuts
- Adjustments have cross shafts through worm and worm gear, with clutches for individual adjustment when desired

GUIDES:
- One pair of aluminum guides in cast iron holders

SAFETY:
- Cable type with switch for motor control

LUBRICATION:
- Self-contained system with pump and strainer for continuous oil flow to gears and bearings or grease packed roller bearings

BEDPLATE:
- High, fabricated-steel base, supporting calender and motor and housing lubrication system

ELECTRICAL EQUIPMENT:
- Packaged adjustable-speed units consisting of an SCR power unit with controls, and direct-current drive motor with controls
- Variable frequency or AC motors and mechanical speed variator are also available

FARREL LABORATORY MILLS

Farrel offers four sizes of Laboratory Mills for experimental and development work as outlined in the chart below. The drive options available provide a choice of fixed or variable roll speeds and friction ratios over a wide range to suit specific customer applications.

MILL SIZE	UNITS US	UNITS METRIC	6 × 13		8 × 16		9 × 18		10 × 20	
Working Capacity (1)										
a) Sheet out only (2)	LBS	KG	3.0	1.4	7.0	3.2	8.0	3.6	9.2	4.2
b) Mixing & Milling (3)	LBS	KG	1.3	0.6	2.1	0.9	2.7	1.2	4.0	1.8
Roll Diameter	IN	MM	6	152	8	203	9	228	10	254
Roll Face Width	IN	MM	13	330	16	406	18	457	20	508
Usable Face (Between Guides)	IN	MM	12	305	15	381	16.5	419	18	457
Roll Speeds, Typical Back Roll	RPM		34		28		22		20	
Front Roll	RPM		17 to 34		14 to 28		11 to 22		10 to 20	
Friction Ratio			1:1 to 2:1		1:1 to 1.9:1		1:1 to 2:1		1:1 to 1.9:1	
Roll Surface Speed Range	FPM	MPM	27-54	8-16	29-59	9-18	26-52	8-16	26-52	8-16
Motor Size	HP	KW	10	7.5	15	11.2	20	15	25	18.7
Maximum Roll Temp.	°F	°C	350	177	350	177	350	177	350	177
Approx. Overall Dimensions										
Length	IN	MM	72	1900	84	2140	96	2500	102	2600
Width	IN	MM	45	1150	54	1380	55	1400	60	1525
Height	IN	MM	57	1500	59	1500	67	1700	69	17600
Weight	LBS	KG	2800	1270	6200	2820	7800	3545	9600	4365

NOTES: 1) Working capacity is based upon a compound specific gravity of 1.0
2) Sheet out only is for single pass through from mixer for cooling.
3) Mixing and Milling allows for blending, addition of materials, and/or additional mixing.

GENERAL SPECIFICATIONS

ROLLS:
- Hardened forged steel
- Ground on face and journals
- Chamber bored for uniform heating and cooling

ROLLER BEARING:
- Antifriction roller bearings with spring loaded preload between bearing boxes

GUIDES:
- Cast aluminum with steel guide plates

ROLL ADJUSTMENT:
- Steel adjusting screws
- Manually operated

STOCK PAN:
- Sheet aluminum

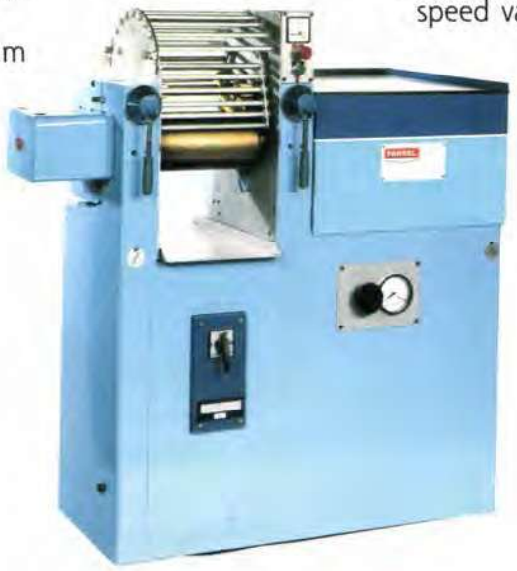
SAFETY:
- Cage type safety throwout on both sides of mill

LUBRICATION:
- Self-contained lube system

DRIVE:
- AC motor with mechanical speed variator

ACCESSORIES AND OPTIONS

- Chrome plateds rolls
- Roll scrapers: adjustable swinging type, fixed spring loaded, air operated
- DC/SCR controlled motor for variable speed operation
- Temperature control; circulating water or hot oil system
- Unitized construction, no special foundation is required, customer has only to supply and connect utilities



6″ × 13″ Laboratory Mill

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Contact above for location of Regional offices

Farrel Corporation manufactures and rebuilds machinery, and designs complete facilities for the polymer processing industries. Products include BANBURY® Mixers, DISKPACK® Processors, Continuous Mixers, Extruders, Mills, and Calenders.

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