Operating Instructions

RAININ

Pipetting 360°

Rainin Classic™

Manual Pipette



METTLER TOLEDO

DOMINIQUE DUTSCHER SA

Rainin Classic™

Continuously Adjustable Pipettes

Intent of Use

Rainin Classic air-displacement pipettes are intended for dispensing liquids in the volume ranges from 0.1 µL to 10 mL in various in-vitro liquid handling applications.

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Contents of Rainin Classic box

Rainin Classic as ordered Quick Reference Guide

Rainin Test Report / Conformance Certificate

If any item is missing please call 800-472-4646 in the US, or contact your local MT office or distributor.

Technical Assistance: 800-543-4030

E-mail: tech.support@rainin.com

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Rainin is a registered trademark and Rainin-Classic is a trademark of Mettler-Toledo Rainin LLC.

Rainin Classic pipettes are manufactured under U.S. Patent # 5,614,153.

Prices and specifications are subject to change without notice.

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Description

Eight models of the Rainin Classic continuously adjustable digital pipette cover the entire volume range from 0.1 µL to 10 mL. Rainin Classic pipettes are not limited to fixed volume increments but can be set to any volume in range, e.g. 6.6, 133.3, 377, 2228 µL. The piston stroke is set by adjusting a micrometer coupled directly to a digital volume indicator, which reads in microliters. The digital volume indicator simplifies volume setting and virtually eliminates calculation errors.
All 2 to 5000 µL Rainin Classic models are equipped with a stainless steel piston and an o-ring sealing system, which only needs a small amount of oil to function. The seal in the 10 mL model requires grease for lubrication.

A stainless steel tip ejector is provided with all models (except PR-5000 and PR-10ML) for safe disposal of used tips. The ejector has a quick-release mechanism.

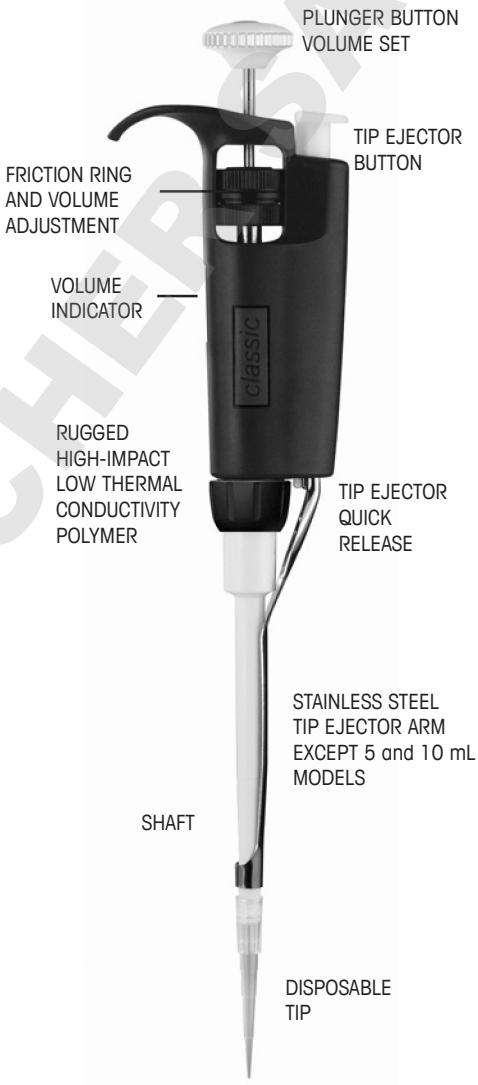


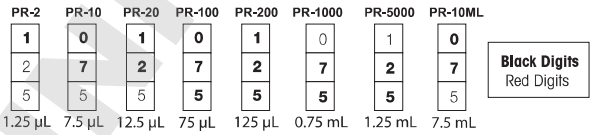
Figure 1: Rainin Classic

Autoclaving

The shaft and tip ejector are autoclavable: 121°C, 1 bar, 15–20 minutes. (PR-5000, PR-10ML do not use tip ejectors.)

Volume Indicator

The volume indicator is read from top to bottom. Up to PR-200, black digits indicate microliters and red digits tenths and hundredths of microliters. For PR-1000 and PR-5000, red digits indicate milliliters and black digits microliters. For PR-10ML, black digits indicate milliliters and red digit tenths of a milliliter.



Sample values, volume ranges, and smallest increments for Rainin Classic models are shown below:

	Range (µL)		Smallest
Model	Adjustable	Recommended	Increment µL
PR-2	0 to 2	0.1 to 2	0.002
PR-10	0 to 10	0.5 to 10	0.02
PR-20	0 to 20	2 to 20	0.02
PR-100	0 to 100	10 to 100	0.2
PR-200	0 to 200	20 to 200	0.2
PR-1000	0 to 1,000	100 to 1,000	2.0
PR-5000	0 to 5,000	500 to 5,000	2.0
PR-10ML	0 to 10 mL	1 mL to 10 mL	20.0

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Safety Filter, PR-5000 and PR-10ML

Models PR-5000 and PR-10ML use a safety filter in the shaft to help prevent liquid entering the shaft and contacting the piston. If the filter gets wet, replace it. For PR-5000 insert the small diameter into the shaft; for PR-10ML insert the large diameter into the shaft. Part numbers: 17001944 (pack of 100) and 17001945 (pack of 1000).

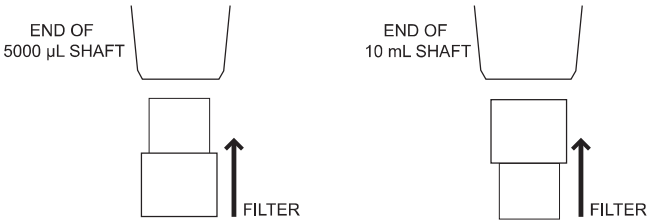


Figure 2: Safety Filter

Tip Selection

Rainin Classic pipettes are calibrated using Rainin tips. Performance to published specifications is guaranteed only when Rainin tips are used. Graduation marks on each Rainin tip are useful for quick volume checks.

Rainin pipettes and tips are designed together as a pipetting system. Molded from premium-grade virgin polypropylene, all Rainin tips are BioClean and totally inert, so you can be assured of the best pipetting results.

To mount a tip, press the shaft into the end of the tip with light force. The tip will seal properly on the shaft with minimal force — do not use more force than is required.

- Tips must seal properly on the shaft to assure an air-tight seal and avoid leaks or poor accuracy.
- Tips must be soft and flexible so that the shaft is not scratched or worn prematurely.
- Tips must be free from microscopic flash and particulates.
- The tip orifice must be the correct size, and orifice size and geometry must be consistent from tip to tip. Otherwise, accuracy and precision will be affected.
- Interior and exterior surfaces must be clear, smooth, and hydrophobic to avoid retention of liquid. Too much retention results in poor accuracy and reproducibility.

Genuine Rainin tips easily pass these requirements. Rainin cannot accept responsibility for poor performance resulting from the use of tips by other manufacturers.

Tip Immersion Depth

The recommended depth for tip insertion into the sample for each model is shown below.

Nominal Volume	Volume Range	Immersion Depth
2 µL	0.1 - 2 µL	1-2 mm
10 µL	0.5 - 10 µL	1-2 mm
20 µL	2 - 20 µL	2 - 3 mm
100 µL	10 - 100 µL	2 - 3 mm
200 µL	20 - 200 µL	3 - 6 mm
1000 µL	100 - 1000 µL	3 - 6 mm
5000 µL	500 - 5000 µL	6 - 10 mm
10 mL	1 mL - 10 mL	6 - 10 mm

Tip immersion depth is critical and should not be exceeded, or the volume measured may be inaccurate, possibly out of specification.

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Tip Angle

The tip angle is also important – the pipette should always be used in a position within 20 degrees of vertical. See Figure 3 below.

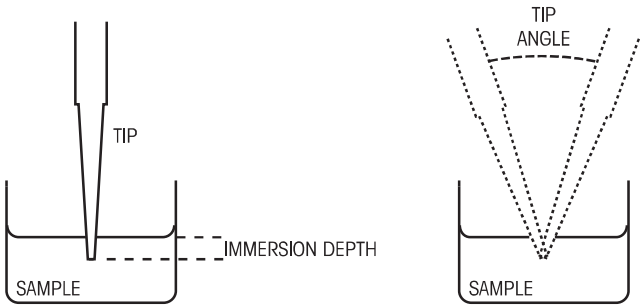


Figure 3: Tip Immersion Depth and Tip Angle

Operation

Before pipetting valuable samples, it is good to practice aspirating and dispensing water.

1. Turn the plunger button or the volume adjustment knob until the volume indicator is 1⁄3 revolution above the desired setting, then turn slowly clockwise until the desired volume shows on the indicator.
2. ALWAYS dial down to the desired volume. This prevents mechanical backlash from affecting accuracy. If you pass the desired setting, turn the dial 1⁄3 revolution higher than desired and dial down to reset the volume. The friction ring prevents unintentional volume changes.
3. Attach a new disposable tip to the pipette shaft. Press into the tip with only enough force to make a positive airtight seal.
4. Press the plunger to the FIRST STOP. This part of the stroke is the volume displayed on the indicator.
5. Holding Rainin Classic vertically, immerse the tip into the sample to the proper depth; see table on page 4.
6. Allow the plunger to return slowly to the UP position. Never let it snap up! Figure 4A.
7. Pause briefly to ensure that the full volume of sample is drawn into the tip.
8. Withdraw the tip from the sample liquid. If any liquid remains on the outside of the tip, wipe it carefully with a lint-free tissue, avoiding the tip orifice.
9. To dispense sample, touch the tip end against the side wall of the receiving vessel and depress the plunger slowly to the first stop. Figure 4B.

   Wait 1 second: PR-2 – PR-200
   1-2 secs: PR-1000,
   2-3 secs: PR-5000, PR-10ML
   (more for viscous solutions). Then press the plunger to the SECOND STOP (bottom of stroke) expelling any residual liquid in the tip.

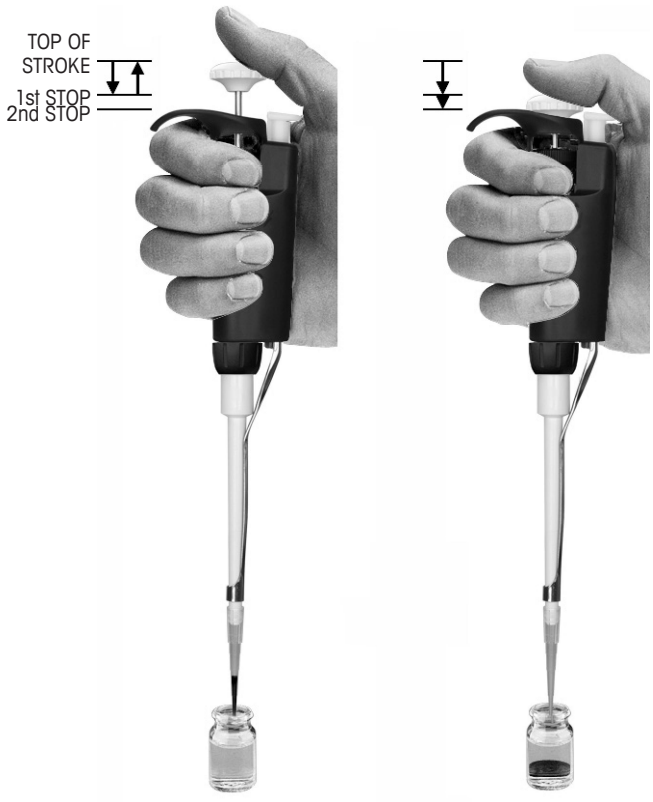


Figure 4 Operating Rainin Classic

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10. With the plunger fully pressed, withdraw the pipette from the vessel carefully, with the tip against the vessel wall.
11. Allow the plunger to return to the up position.
12. Discard the tip by depressing the tip ejector button. A fresh tip should be used for each sample to prevent sample carryover.

Pipetting Guidelines and Precautions

Consistency in all aspects of pipetting procedure will significantly contribute to optimum reproducibility. Use a:

- Consistent pickup/dispense rhythm while pipetting.
- Consistent speed and smoothness when you press and release the plunger button.
- Consistent plunger button pressure at the first stop.
- Consistent immersion depth.
- Minimal angle (< 20° from vertical).

Prevent liquids from being drawn into the shaft by taking the following precautions:

- Use Rainin aerosol-resistant tips, with an internal filter which acts as a barrier to aerosols and liquids.
- Never invert or lay the pipette down if liquid is in the tip.
- Pipette slowly, holding the pipette < 20° from vertical.
- For PR-5000 and PR-10ML, always use the special safety filters supplied. Part numbers: 17001944 (pack of 100) and 1701945 (pack of 1000).

More information on Good Pipetting Technique can be found at www.mt.com/GPP

Pre-Rinsing Recommended

Some solutions (e.g. serum, protein-containing solutions, and organic solvents) can leave a film on the inside tip wall, resulting in an error larger than the tolerance specified. Since this film remains relatively constant in successive pipettings with the same tip, excellent precision may be obtained by refilling the tip and using the refilled volume as the sample. Successive samples from this same tip will exhibit good reproducibility (low variance).

Reverse Mode Pipetting

Another way of reducing error due to film retention is reverse mode pipetting; the operating sequence is reversed compared to forward pipetting:

1. Mount a disposable tip on the pipette shaft.
2. Press the plunger button fully to the SECOND STOP.
3. Immerse the tip in liquid and return the plunger slowly to the full up position. Wait a moment for the liquid column to reach equilibrium in the tip.
4. Wipe any excess liquid from the outside of the tip without touching the orifice.
5. To dispense, rest the end of the tip against the vessel wall and press the plunger to the FIRST STOP only. Hold at the FIRST STOP for a few seconds – long enough for the liquid column to reach equilibrium again.
6. Remove the tip from the receiving vessel without blowing out the remaining liquid.
7. Return excess sample in the tip to the original sample container, if desired. Discard the used tip.

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Pipetting Liquids of Varying Density

Rainin Classic lets you compensate for solutions of density much different from water, by setting the volume slightly higher or lower than that required. The compensation amount must be determined empirically.

E.g., if pipetting 10 µL of CsCl solution, you determine that the volume delivered is actually 8.5 µL (average of 5 samples). Try increasing the volume setting to 11.8 µL and repeat the measurements. If the volumes delivered are still not close enough to 10 µL, make another slight volume adjustment until the measurements are as desired.

Very dense liquids may not be suitable for air displacement pipetting. Use Rainin Pos-D positive displacement pipettes for these liquids.

Temperature Considerations

Warm or cold liquids can be pipetted with good precision by using a consistent pipetting rhythm. This will help minimize any differences in heating or cooling effects within the pipette. Use a new tip each time for best accuracy and precision when measuring samples with temperatures greatly different from ambient, and do not pre-rinse. You will get best results if there is no delay between picking up the sample and dispensing it. If working in a cold room, allow the pipette to stabilize at ambient temperature before operation.

Acids and Corrosives

After pipetting concentrated acids or highly corrosive solutions you should disassemble Rainin Classic and inspect and clean (if necessary) the piston, shaft, and seal assemblies. Extensive contact with corrosive fumes may corrode the piston. This will result in premature seal wear and may require refinishing or replacement of the piston. Exposure of internal components to corrosive fumes can be reduced by using aerosol-resistant tips. These tips have an internal filter which acts as an aerosol barrier.

Storage

Rainin Classic is a precision instrument and should be treated with the level of care appropriate for laboratory instrumentation. Several hangers are available to hold Rainin Classic securely when not in use.



HU-M3: Set of 3 magnetic Hang-Ups™ for mounting on ferrous surfaces. Includes adhesive disks. (Part# 17003024)



HU-S3: 3 Hang-Ups attached to a clamp to mount on a shelf. (Part# 17004992)



CR-7: Free-standing carousel holds 7 Rainin pipettes. (Part# 17001255)

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Removing the Tip Ejector Arm

The tip ejector on Rainin Classic (2-1000 µL models) can be removed easily using the quick-release tabs. Refer to the figure below.

1. Press and hold the tip ejector button fully down.
2. With the other hand, press in the quick-release tabs on the tip ejector arm and pull the tip ejector arm straight down.

Replacing the Tip Ejector Arm

1. Press and hold the tip ejector button fully down.
2. Hold Rainin Classic in one hand and the tip ejector arm in the other hand.
3. Insert the end of the shaft through the large opening in the tip ejector arm.
4. Align the top end of the tip ejector arm with the pushrod inside the handle and push the tip ejector arm into the handle until the tip ejector arm snaps in place.
5. Make sure that tips fit securely on the shaft.



Figure 5: Removing Tip Ejector Arm

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Troubleshooting and Repairs

Rainin Classic pipettes give excellent performance and long-term service. Use these procedures in the case of physical or chemical damage. Refer to the exploded diagrams later in the manual. When removing the shaft from the pipette body, make sure the spring, seal and o-ring do not detach from the piston, especially on the smaller models, and note that PR-2 and PR-10 models have small, fragile components that can be broken or misplaced. Be careful not to bend the piston on these small models. Recalibration of Rainin Classic is only required when the piston is replaced.

Sample Splash (liquid inside the mechanism)

1. Remove the tip ejector, if fitted. Unscrew the shaft coupling nut holding the shaft to the body.
2. Remove the shaft and inspect the seal assembly and piston for contamination. The piston should be shiny and free of corrosion. Clean with distilled water or isopropyl alcohol.
3. Dry with a lint-free tissue and reassemble after inspecting the interior of the shaft for contaminants.
4. If staining and/or corrosion of the piston is evident, do not use the pipette. Return to Rainin for service (see p. 14).
5. Use oil (not grease) to lubricate Rainin Classic components. The only exception is the PR-10ML model, which uses a sealing system that requires grease.

Leaks, Inaccurate Sampling

1. Loosened shaft. Tighten coupling by hand.
2. Split or cracked shaft. Remove the tip ejector and inspect the shaft for fracture or split end. Replace if necessary. If the shaft was dropped, remove it and the seal assembly to see if the piston is bent. If so, you should return the instrument: call 800-543-4030 for assistance.
3. Worn seal and / or o-ring. Dismantle as described in "Sample Splash". Replace the seal and o-ring, referring to the drawing on page 12 or 13. Pull off the old seal and o-ring, position the new seal and o-ring on the piston as shown in the drawing, and reassemble the pipette.
4. Bent plunger / damaged friction ring. Call 800-543-4030.
5. Improper reassembly. Remove the tip ejector and shaft. Check the position of the internal assemblies, especially the seal, against the illustrations.

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Specifications

Each Rainin Classic is factory calibrated and carefully checked gravimetrically before shipment using distilled water and an analytical balance. Water temperature and ambient conditions are stabilized at 21.5°C ± 1°C. Volumetric corrections are made for both the density of water and evaporation where applicable.

Consult the free Rainin publication "Procedure for Evaluating Pipette Accuracy and Precision" (AB-15) for further information, or download a copy from the RAININ website: http://www.rainin.com/pdf/ab15.pdf

When used in accordance with the pipetting procedures in this manual AND using Rainin tips, Rainin Classic pipettes will perform to the following specifications.

These manufacturer's specifications should be used as guidelines when establishing your own performance specification.

	Volume	Increment	Accuracy		Precision	
Model	µL	µL	%	µL (±)	%	µL (≤)
PR-2	0.2	0.002	12	0.024	6	0.012
	1.0		2.7	0.027	1.3	0.013
	2.0		1.5	0.030	0.7	0.014
PR-10	1.0	0.02	2.5	0.025	1.2	0.012
	5.0		1.5	0.075	0.6	0.03
	10.0		1	0.1	0.4	0.04
PR-20	2	0.02	7.5	0.15	2	0.04
	5		3	0.15	0.9	0.045
	10		1.5	0.15	0.5	0.05
	20		1	0.2	0.3	0.06
PR-100	10	0.2	3.5	0.35	1	0.1
	50		0.8	0.4	0.24	0.12
	100		0.8	0.8	0.15	0.15
PR-200	20	0.2	2.5	0.5	1	0.2
	100		0.8	0.8	0.25	0.25
	200		0.8	1.6	0.15	0.3
PR-1000	100	2	3	3	0.6	0.6
	500		0.8	4	0.2	1
	1000		0.8	8	0.15	1.5
PR-5000	500	5	2.4	12	0.6	3
	2500		0.6	15	0.2	5
	5000		0.6	30	0.16	8
PR-10ML	1 mL	20	5	50	0.6	6
	5 mL		1	50	0.2	10
	10 mL		0.6	60	0.16	16

Specifications are subject to change without notice.

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Replacement Parts

The commonly-replaced parts are shown here for each volume range of Rainin Classic pipettes.

Model and Product Part Number

	Model	PR-2	PR-10	PR-20	PR-100	PR-200	PR-1000	PR-5000	PR-10ML
	Part	**17008648**	**17008649**	**17008650**	**17008651**	**17008652**	**17008653**	**17008654**	**17008655**
A	Plunger Button	17008613	17008616	17008615	17008617	17008618	17008619	17008620	17008621
B	Plunger Rod	17007869	17007869	17007869	17007869	17007869	17007869	17007869	17007869
C	Shaft Coupling	17008416	17008416	17008416	17008416	17008416	17008416	N/A	N/A
D	Shaft	17004985	17004982	17004986	17004983	17004987	17004984	17004877	17004836
E	Tip Ejector	17007734	17007734	17007735	17007732	17007731	17007733	N/A	N/A
F	O-Ring	17003441	17003441	17003447	17003448	17003454	17003458	17003465	17003469
G	Seal	17004782	17004779	17008418	17008419	17008420	17008421	17004785	N/A
H	Seal Assembly Holder	17004437	17004437	17004438	17004435	17004439	*	*	*
I	Small Spring	17008440	17008440	17008440	17008440	17008440	*	*	*
J	Small Spring Positioner	17005044	17005044	17005044	17005044	17005044	*	*	*
K	Large Spring	17008437	17008437	17008437	17008438	17008438	*	*	*
L	Large Spring Positioner	17002710	17002710	17002710	17002710	17002710	*	*	*
M	Filters (100)	N/A	N/A	N/A	N/A	N/A	N/A	17001944	17001944
M	Filters (1000)	N/A	N/A	N/A	N/A	N/A	N/A	17001945	17001945

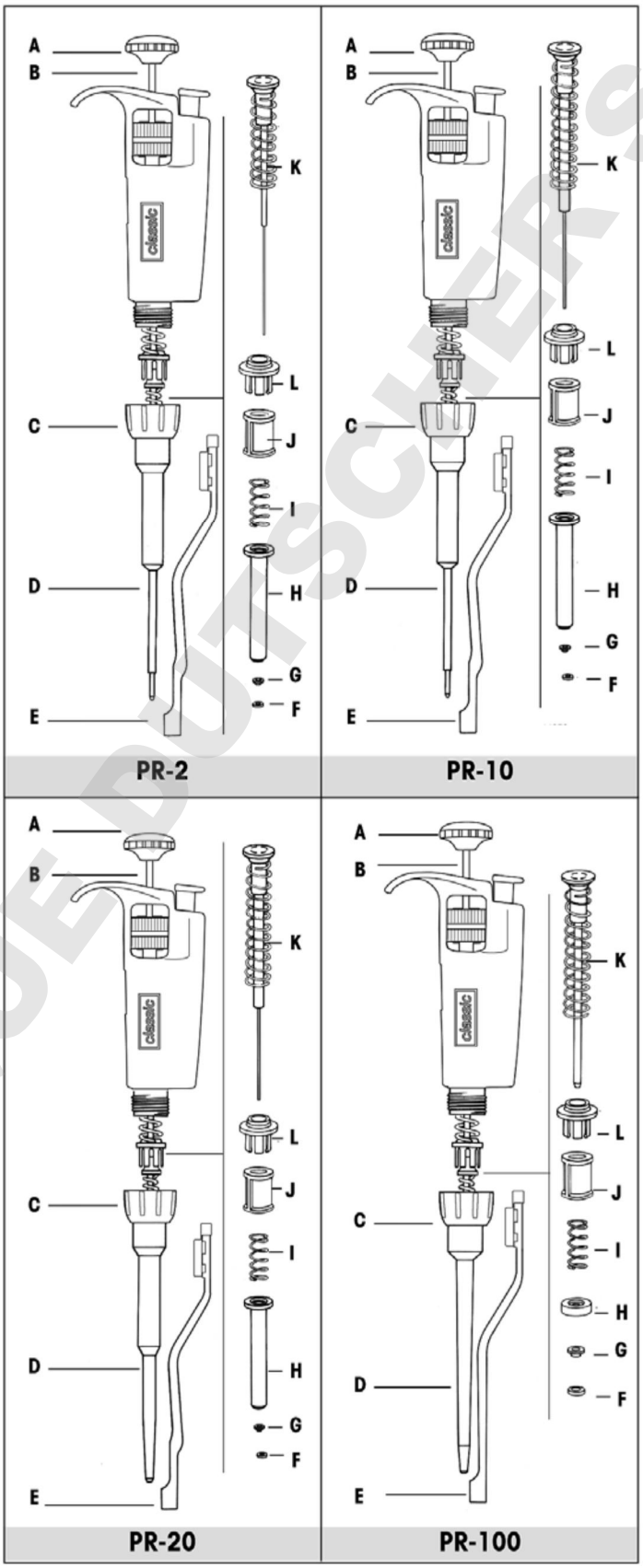
* Part of one-piece piston assembly. Replacement will require recalibration.

Rainin is the only organization authorized to calibrate Rainin Classic pipettes. Please call 800-662-7027 for information.

See replacement parts diagrams on page 12 and 13.

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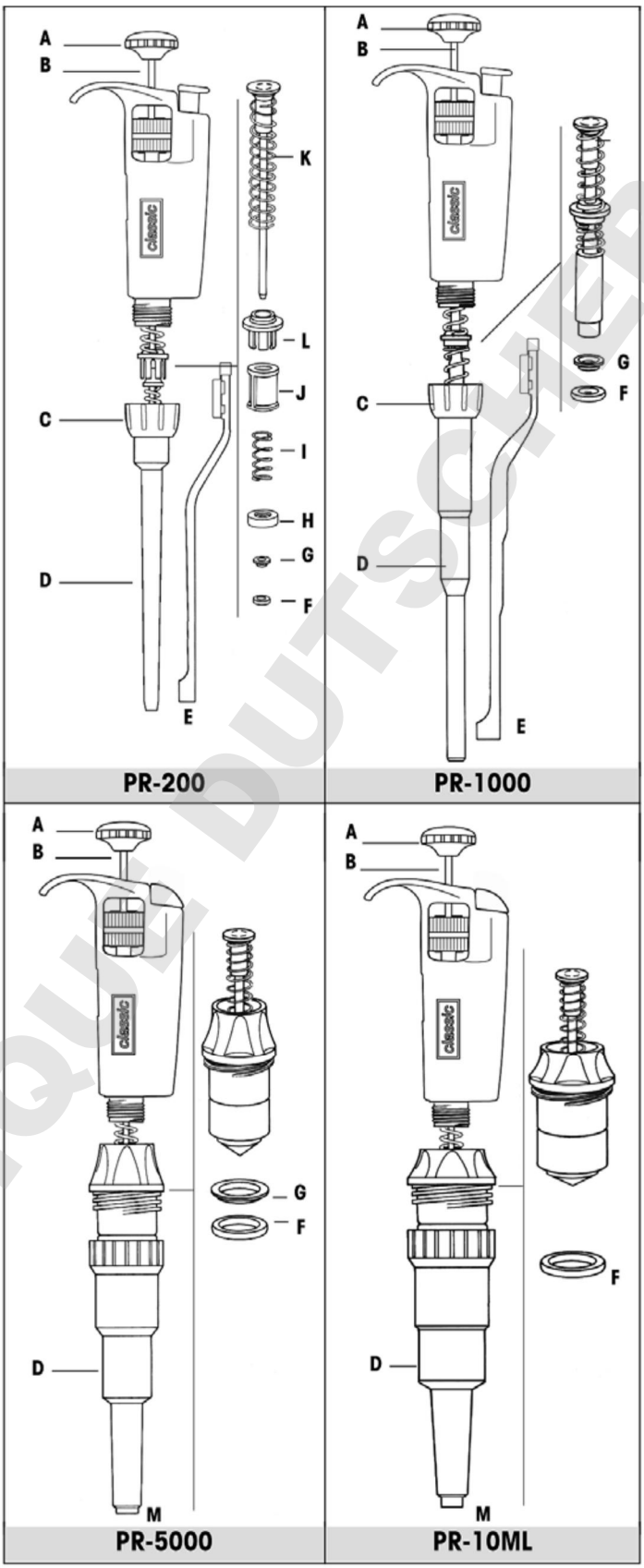
Parts Diagrams, PR-2 to PR-100



	Replacement Parts Legend
A	Plunger Button
B	Plunger Rod
C	Shaft Coupling
D	Shaft
E	Tip Ejector
F	O-Ring
G	Seal
H	Seal Assembly Holder
I	Small Spring
J	Small Spring Positioner
K	Large Spring
L	Large Spring Positioner
M	Filter (PR-5000, PR-10ML)

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Parts Diagrams, PR-200 to PR-10ML



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Service, Calibration and Repair

It is recommended to use only genuine Rainin replacement parts such as seals, o-rings, and shafts. It is NOT necessary to recalibrate the pipette after changing the seal, o-ring, or shaft. Recalibration of the pipette is only necessary when the piston is replaced, and should be done only by qualified factory-trained personnel in a Rainin approved facility.

For pipettes under warranty, please note that the warranty will be voided if the pipette has been damaged as a result of physical or chemical abuse, or if the pipette has been repaired or recalibrated by any service facility which is not authorized by Rainin.

In the US, call 800-543-4030 for service.
Service is also available outside the US. See www.mt.com/rainin for more information.

Limited Warranty

See the Limited Warranty and Limitations of Liability Statement on the enclosed Rainin Test Report / Conformance Certificate. Please complete and return the Warranty Registration Card on receipt of your pipette.

Rainin pipettes are calibrated with Rainin tips. To assure excellent reproducibility and performance, use only Rainin tips as recommended in this manual. Specified performance is guaranteed only when Rainin tips are used.

Contacting Rainin

Technical Information: T: 800-543-4030 F: 510-564-1617 tech.support@rainin.com

Pipette Service: T: 800-662-7027 F: 781-935-7631 service@rainin.com

Direct Order Line: T: 800-472-4646 F: 510-564-1617 pipets@rainin.com

Rainin website: www.shoprainin.com

Outside North America: www.mt.com/rainin

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