

VWR Signature™
Fixed Volume Pipettor

Production Lab

ENGLISH	1 - 12
DEUTSCH	13 - 24
FRANÇAIS	25 - 36
ESPAÑOL	37 - 48
ITALIANO	49 - 60

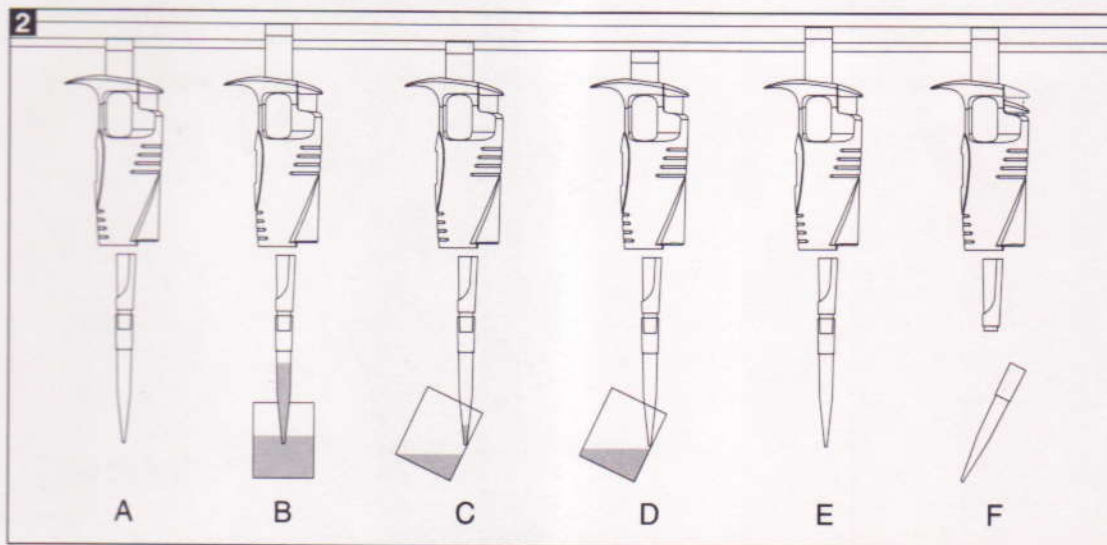
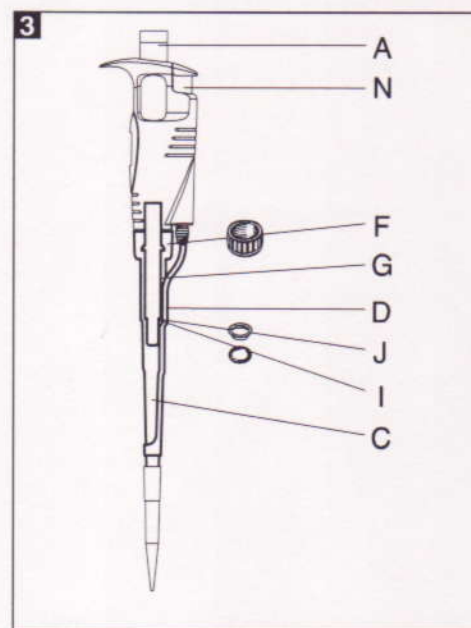
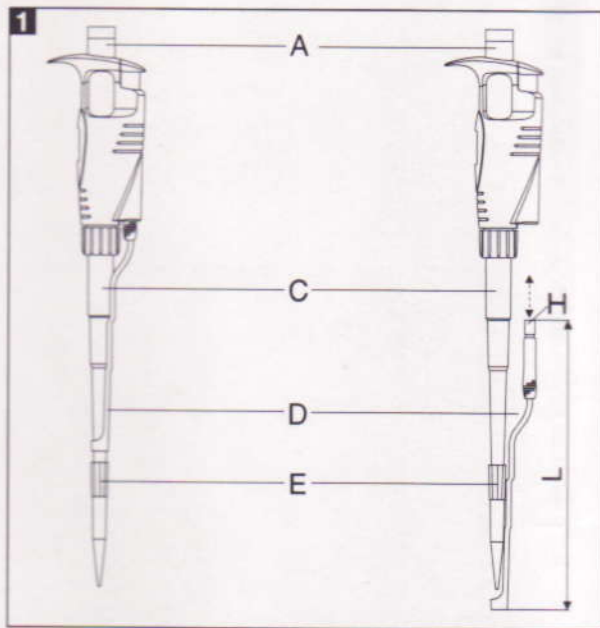
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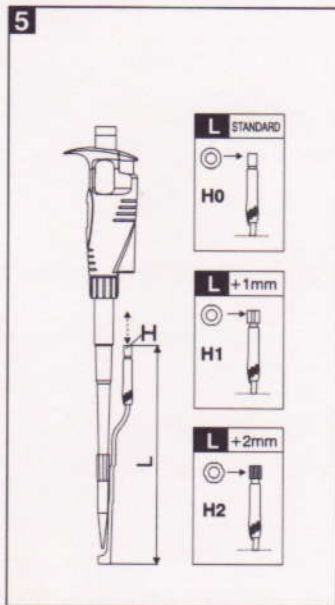
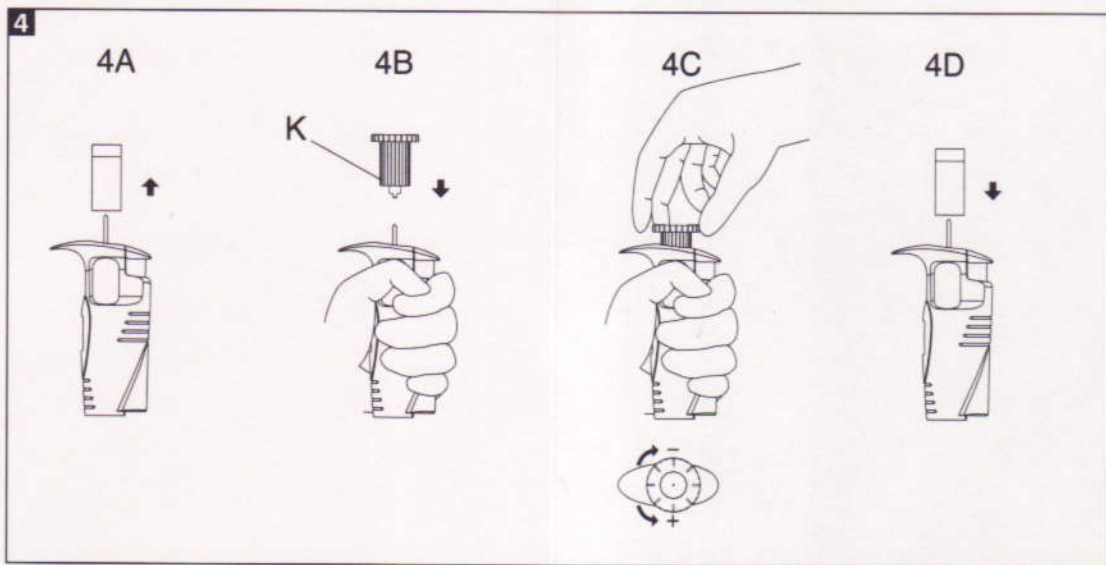
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CONTENTS

1 – INTRODUCTION
2 – OPERATION
3 – PRE-RINSING
4 – VWR PIPETTOR TIPS
5 – RECOMMENDATIONS
6 – RECALIBRATION
7 – TROUBLESHOOTING
8 – CLEANING AND STERILIZATION
9 – PIPETTOR KIT AND ACCESSORIES
10 – SPARE PARTS

1 – INTRODUCTION

The **VWR Signature™ Fixed Volume Pipettor (FE pipettor)** is a volumetric instrument designed to measure and transfer liquids precisely and safely. These fixed volume pipettors are available in standard volumes from 5 μ l to 1000 μ l. The volume of the pipettor is shown on the pushbutton (Fig. 1A). The label in the pushbutton is color coded to correspond to the proper disposable pipette tip to be used.

The **VWR Signature™ Fixed Volume Pipettor** are supplied with tip ejector.

VWR FE5, VWR FE10	Measurement and transfer of micro-volumes, DNA sequencing and enzyme-assay applications.
VWR FE20 to VWR FE1000	Measurement and transfer of general aqueous solution, acids and bases

The **VWR Signature™ Fixed Volume Pipettors** use disposable polypropylene tips, (Fig. 1E). Disposable tips eliminate cross contamination between samples and ensure maximum user safety. The tip ejector built in to the pipettor protects the user from contamination when removing the tips.

The FE pipettor series features an adjustable, removable tip ejector. The tip ejector adjusts to accommodate a wide variety of tips. When pipetting in narrow tubes, it may be necessary to remove the tip ejector. To remove, grasp the ejector by the finger grip located near where the ejector attaches to the body of the pipettor. While pressing down on the ejector button, pull the ejector down, (Fig. 1D)

Adjusting Tip Ejector Length (Fig. 5):

The interchangeable "H" spacers provided with the pipettor allow for adjusting the length of the tip ejector by +1mm or +2mm. The pipettors are supplied with the H0 spacer in place. To change the spacer, remove the ejector as described above. Replace the H0 spacer with either the H1 or H2 spacer. Reverse the removal process to fit the ejector back in place.

The **VWR Signature™ Fixed Volume Pipettors** is a high quality instrument, which offers excellent accuracy and precision. The figures for accuracy and precision given in the following table were obtained using **VWR™** tips. These figures are only guaranteed when **VWR™** tips are used.

Model	Volume [μ l]	Accuracy [%]	Precision [%]	Volume change ΔV for full turn of the calibration key [μ l] (24 increments)	Tip volume
VWR FE5	5	± 1.0	≤ 0.8	0.33	10 μ l
VWR FE10	10	± 0.5	≤ 0.4	0.33	
VWR FE20	20	± 0.8	≤ 0.4	0.63	200 μ l
VWR FE25	25	± 0.8	≤ 0.4	0.63	
VWR FE50	50	± 0.8	≤ 0.4	2.50	
VWR FE100	100	± 0.8	≤ 0.3	2.50	
VWR FE200	200	± 0.6	≤ 0.3	6.30	1000 μ l
VWR FE250	250	± 0.6	≤ 0.3	25.00	
VWR FE500	500	± 0.5	≤ 0.3	25.00	
VWR FE1000	1000	± 0.4	≤ 0.3	25.00	

These specifications are obtained in forward mode, using a gravimetric method with the temperature of the distilled water, tips and all other conditions stabilized between 19°C and 21°C. Number of measurements - minimum 10. The values given include all components of error due to both normal handwarming and the changing of the tip.

Performance tests: The **The VWR Signature™ Fixed Volume Pipettor** is calibrated based on EN ISO 8655. Performance can be verified by checking the pipette using the procedures outlined in the EN ISO 8655 standard.

The pipettor design enables the user to perform the recalibration process according to the rules presented in section 6.

2 - OPERATION

Place a tip on the shaft of the pipettor. See Section 4 for the appropriate tip. Press the tip on firmly using a slight twisting motion to ensure a positive, airtight seal.

Note: Never handle a liquid with VWR Signature™ Fixed Volume Pipettor, which has not been fitted with a tip.

Aspiration

Press the pushbutton to the first positive stop, Fig. 2A. Holding the pipettor vertically, immerse the tip into the sample liquid. The depth to which the tip is immersed in the sample liquid depends on the model.

VWR FE5, VWR FE10,	≤ 1 mm
VWR FE20, VWR FE25, VWR FE50, VWR FE100	2 - 3 mm
VWR FE200, VWR FE250, VWR FE500, VWR FE1000	2 - 4 mm

Release the pushbutton slowly and smoothly to aspirate the sample, Fig. 2B. Wait one second and then withdraw the tip from the liquid. Wipe any droplets away from the outside of the tip using a medical wipe.

Avoid touching the orifice of the tip.

Dispensing

- Place the end of the tip against the inside wall of the vessel at an angle of 10 to 40 degrees.
- Press the pushbutton smoothly to the first stop, Fig. 2C. Wait one second.

- Press the pushbutton to the second stop to expel any remaining liquid, Fig. 2D.
- Keeping the pushbutton pressed to the end, remove the pipettor by drawing the tip along the inside surface of the vessel.
- Release the pushbutton, Fig. 2E.
- Eject the tip by pressing the tip ejector button, Fig. 2F. It is only necessary to change the tip if a different liquid is being sampled or if the volumeter setting is changed.

3 - PRE-RINSING

When pipetting liquids which have a viscosity and density different than water, for example organic solvents, a film of liquid is formed on the inside wall of the pipettor tip. This film can create an error. Since the film remains relatively constant in successive pipetting operations with the same tip, this error can be avoided by forming the film before transferring the first sample. This is done by aspirating a sample and dispensing it back into the same vessel. Since the film is already formed, all of the following samples will have better accuracy and repeatability.

This pre-rinsing operation should be repeated when the volume to be aspirated is changed or when a new tip is used.

4 - VWR PIPETTOR TIPS

VWR tips are made from high performance polypropylene and their quality guarantees the precision and accuracy associated with the **VWR Signature™ Fixed Volume Pipettor**.

Strict control is maintained throughout the manufacturing process to ensure the highest quality.

The accuracy and precision figures for the **VWR Signature™ Fixed Volume Pipettor** are only guaranteed when VWR tips are used. The use of inferior quality tips will seriously degrade the performance of the **VWR Signature™ Fixed Volume Pipettor**.

10 µl tips

These tips are used with the VWR FE5 and VWR FE10 models.

200 µl tips

These tips are used with model from VWR FE20 to VWR FE200 models.

1000 µl tips

These tips are used with model for VWR FE250 to VWR FE1000 models.

5 - RECOMMENDATIONS

The recommendations below will ensure maximum accuracy and precision from your **VWR Signature™ Fixed Volume Pipettor**.

- Make sure to operate the **VWR Signature™ Fixed Volume Pipettor** slowly and smoothly.
- The depth of immersion in the sample liquid should be the minimum necessary and should remain constant during aspiration.
- The **VWR Signature™ Fixed Volume Pipettor** should be held in a vertical position.
- Change the tip when a different liquid is to be aspirated.
- Change the tip if a droplet remains on the end of the tip from the previous pipetting operation.
- Each new tip should be pre-rinsed with the liquid to be pipetted.
- Liquid should never enter the **VWR Signature™ Fixed Volume Pipettor** shaft. To prevent this:
 - Press and release the pushbutton slowly and smoothly
 - Never turn the pipettor upside down
 - Never lay the pipettor on its side when there is liquid in the tip.
- When pipetting liquids with temperatures different from the ambient temperature, it is recommended to pre-rinse the tip several times before use.
- When pipetting liquids with different physical qualities than those of water (ie density, viscosity and surface tension), it is recommended to aspirate and dispense that liquid more slowly. When aspirating, the tip should be kept in the liquid for at least 2 seconds. When dispensing, wait a minimum of 2 seconds before pressing the pipetting pushbutton to its ultimate end.
- Do not pipet liquids with temperatures above 70°C.

- When pipetting acids or corrosive solutions which emit vapors, it is recommended to dis assemble the shaft and to rinse the piston and seal with distilled water after finishing the pipetting operation.

6 - RECALIBRATION

The pipettor is calibrated by gravimetric method, using VWR tips and distilled water, at the temperature $20 \pm 1^\circ\text{C}$, based on EN ISO 8655 standard.

If during pipettor operation you find that the accuracy error (the difference between the real aspirated volume and the preset volume) exceeds the permissible value given in the table in section 1, the pipettor recalibration procedure should be carried out.

Before starting the recalibration it is necessary to check whether the following requirements have been fulfilled during error determination:

- the ambient temperature, and the temperature of the pipettor, tips and water was identical
- the density of the liquid used was close to that of distilled water
- the balance with appropriate sensitivity has been used

Volume checked [µl]	Balance sensitivity [mg]
0.1 - 10	≤ 0.001
10 - 100	≤ 0.01
> 100	≤ 0.1

- mg/µl conversion factor has been taken into account
- the requirements given in sections 2 and 5 have been fulfilled

If the above conditions are satisfied and the accuracy error for selected volume given in section 1 exceeds the permissible value, the pipettor recalibration procedure should be carried out.

The recalibration can be performed within one full turn of the key to the right or to the left only.

Recalibration conditions:

- Ambient temperature and the temperature of the pipettor, tips and liquid should be within the range 20-25°C and stabilized during weighing within $\pm 0.5^\circ\text{C}$

- Measurements should be conducted using distilled water
- Balance sensitivity should be suitable for the volume to be controlled.
- Perform 5 aspirations, weigh each one and calculate the average value of the aspirations
- Calculate average aspirated volume in μl multiplying the average aspiration amount [mg] by the distilled water density coefficient [$\mu\text{l}/\text{mg}$], which depends on temperature and pressure according to the following table:

Temperature [°C]	Pressure [kPa]		
	95.0	101.3	105.0
20	1.0028	1.0029	1.0029
21	1.0030	1.0031	1.0031
22	1.0032	1.0033	1.0033
23	1.0034	1.0035	1.0036
24	1.0037	1.0038	1.0038
25	1.0039	1.0040	1.0040

If the average aspirated volume exceeds the permissible value, the following should be done:

- Take off the pipetting pushbutton, (Fig. 4A) by pulling it straight up.
- Insert the calibration key into the cuts of the calibration screw, (Fig. 4B)
- Turn the key clockwise to reduce the aspirated volume, or counter-clockwise to increase the volume, (Fig. 4C).

One full turn of the calibration key changes the pipettor aspiration volume by the amount given in the table in section 1.

- Take out the key and fix the pipetting pushbutton, (Fig. 4D).

Determine the average aspirated volume. The average volume should be within the permissible range.

If the volume exceeds the values stated, the recalibration procedure should be repeated.

7 - TROUBLESHOOTING

If you notice an improper pipette operation identify the cause and eliminate the fault. To do this, follow the instruction in the sequence provided. Replacement of parts should be required only occasionally, and should not occur under normal pipette use.

Droplets of liquid remain in the pipette tip.

- The tip is emptied too fast.
Decrease the speed of pressing the pipette push-button.
- The tip wettability has increased due to extensive use.
Replace the tip with a new one.

Droplets of air appear in the liquid aspirated into the tip.

- The pipette tip immersion is too shallow.
Immerse the tip deeper according to the instructions.
- The pipette tip is incorrectly pressed onto the pipette shaft.
Press the pipette firmly.
- The tip is damaged or worn out due to extensive use.
Replace the tip with a new one.

The pipette incorrectly aspirates the liquid or liquid drops out from the tip.

- The pipette tip is incorrectly pressed onto the pipette shaft.
Press the pipette tip firmly.
- The shaft nut is loose (Fig. 3F)
Tighten the shaft nut.
- The sealing surface of the shaft is cracked or scored.
Remove the tip ejector. Unscrew the shaft nut, inspect the shaft and the piston assembly. Replace the damaged parts (see Section 10). When reassembling the pipette, the nut should be hand tightened. In the models VWR FE5-VWR FE25, the damage of the shaft may also cause a damage of the piston assembly. Replace the damaged parts (see Section 10). When reassembling the pipette, the nut should be hand tightened.
- Damage to the piston or seal due to prolonged use with the aggressive liquids.
Disassemble the pipette as described above. Replace the piston, seal and O-ring (see Section 10). Rinse the inside of the shaft in distilled water and dry. Lubricate the seal and O-ring with the lubricant, that has been included with each pipette.

The replacement of the piston requires conducting of the calibration procedure.

Note: The parts of VWR FE5 and VWR FE10 pipette should be lubricated evenly with a minimum amount of lubricant.

- The pipette is reassembled improperly.
Disassemble the pipette and reassemble it, observing the proper sequence of steps (Fig. 3).

- No lubricant on the sealing elements.

Remove the tip ejector. Unscrew the shaft nut, remove the shaft, piston assembly, seal and O-ring. Rinse the removed parts in distilled water and dry thoroughly. Lightly lubricate the inside surfaces of the seal and the O-ring with the included lubricant. Reassemble the pipette in the reverse order.

- Contamination of the inside of the pipette caused by extensive aspiration of chemically aggressive liquids or because liquid got inside the pipette.

Remove the tip ejector. Unscrew the nut, remove the shaft, piston assembly, seal and O-ring. Rinse the removed parts with distilled water and dry thoroughly. Lightly lubricate the inside surfaces of the seal and the O-ring with the lubricant. Reassemble the pipette in the reverse order.

If you find an increase in the pipetting force, which could happen after repetitive autoclaving of the pipette:

Remove the tip ejector. Unscrew the shaft nut, and then remove the shaft, piston assembly, seal and O-ring. Rinse the removed parts in distilled water and dry. Lubricate the internal surfaces of the seal and O-ring with lubricant that has been included with each pipette. Reassemble the pipette in opposite order.

Note: All parts of the pipette can be autoclaved (see Section 8)

If the problem continues after carrying out the above steps, contact your VWR representative.

Before returning the pipette, please ensure that the pipette is completely free of any chemical, radioactive or microbiological contamination which could pose a threat during transport and repair. As far as it is possible, clean the pipette.

8 - CLEANING AND STERILIZATION

Cleaning:

External surfaces of the pipetting pushbutton, the ejector pushbutton, the handgrip, the shaft nut and the adjustment ring may be cleaned using a cloth dampened in isopropyl alcohol. Remaining parts removed from the pipettor during pipettor disassembly may be washed with distilled water or isopropyl alcohol.

Sterilization:

The pipettors can be sterilized in the autoclave at 121°C for 20 minutes. After sterilization, the pipettor should be dried and cooled down to room temperature.

It is recommended:

- to sterilize the pipettors in autoclave with an initial vacuum and drying cycle.
- to test pipettor calibration every 10 sterilization cycles.

Note: After autoclaving, check that the shaft nut is tightly fitted to the pipettor handle.

9 - PIPETTOR KIT AND ACCESSORIES

Pipettor kit:

The pipettors are delivered in the kits including:

- Pipettor
- Instruction manual
- Calibration key
- Ejector regulation spacers
- Identification labels
- Lubricant

Accessories:

Model	Tip Choice	Cat. No. US	Cat. No. EU
VWR FE5, VWR FE10	10 µl	53509-130	613-0334
VWR FE20, VWR FE25, VWR FE50, VWR FE100, VWR FE200	200 µl	53508-783	613-0241
VWR FE250, VWR FE500, VWR FE1000	1000 µl	53508-918	613-0273

10 - SPARE PARTS

All the spare parts indicated in Fig. 3, 4, 5:

- A: Pushbutton**
- C: Shaft**
- D: Ejector**
- F: Shaft nut**
- G: Piston assembly**
- H: Spacer**
- I: O-ring**
- J: Seal**
- K: Calibration key**
- N: Ejector pushbutton**

Spare parts can be ordered from a **VWR** representative (type of the pipettor and name of the part for this pipettor should be specified).

Warning: The replacement of the plunger requires conducting of calibration procedure according to section 6.

Contact your local **VWR** office via the internet at vwr.com.

Part No.	Description	Part No.	Description
100000	Pushbutton	100000	Pushbutton
100000	Shaft	100000	Shaft
100000	Ejector	100000	Ejector
100000	Shaft nut	100000	Shaft nut
100000	Piston assembly	100000	Piston assembly
100000	Spacer	100000	Spacer
100000	O-ring	100000	O-ring
100000	Seal	100000	Seal
100000	Calibration key	100000	Calibration key
100000	Ejector pushbutton	100000	Ejector pushbutton

The pipette and the plunger are made of high quality materials. The plunger is made of stainless steel and is resistant to corrosion. The pipette body is made of polycarbonate and is resistant to impact. The pipette is designed for accurate and precise measurements. The pipette is easy to use and requires minimal maintenance. The pipette is suitable for use in a laboratory setting. The pipette is available in various volumes and is suitable for use in a wide range of applications. The pipette is a reliable and accurate instrument for laboratory use.

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