VWR Signature™ Ergonomic High-Performance Pipettor

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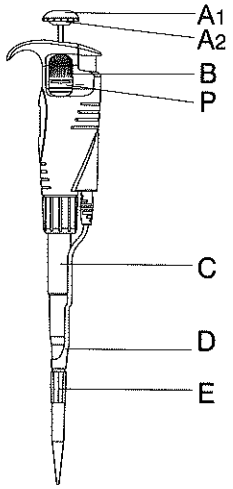

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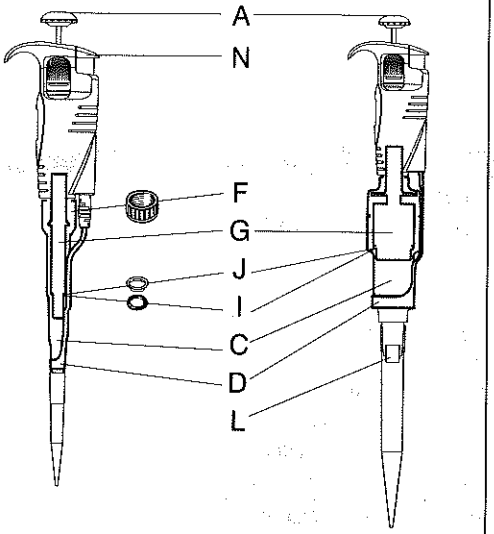

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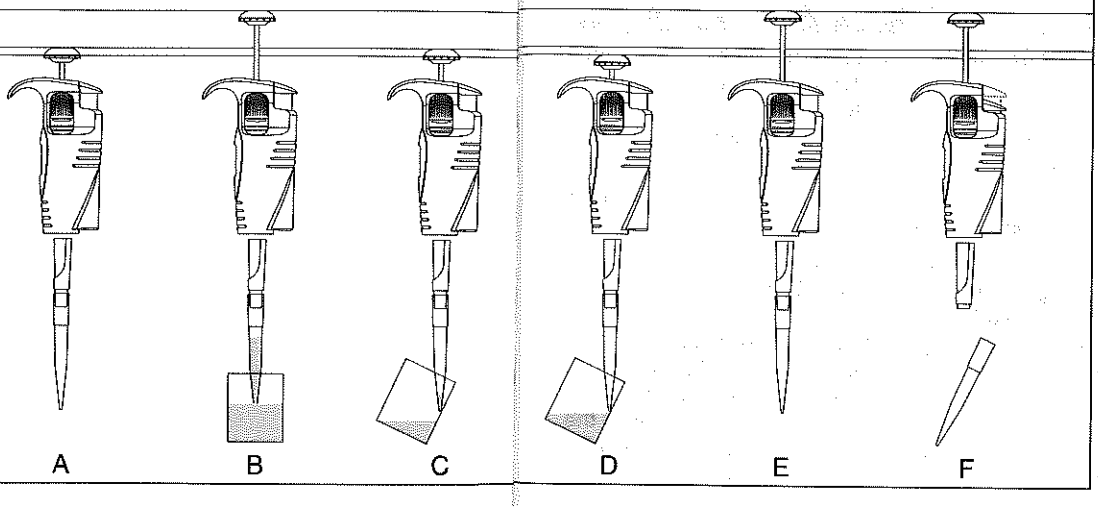

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1 – INTRODUCTION

The **VWR Signature™ Ergonomic High-Performance Pipettor** is a volumetric instrument designed to measure and transfer liquids precisely and safely. These variable volume pipettors cover the range from 0.1 µl to 10000 µl in 10 models.

VWR Signature™ Pipettors are supplied with tip ejector, designated as "VE" or without a tip ejector, "V".

The **VWR Signature™ Pipettors** have a digital counter displaying the set volume. The set volume is visible in the window situated in the hand grip of the pipettor. Volume is adjusted by turning the pipetting pushbutton (Fig. 1A2) or by turning the adjustment knob [Fig. 1B). The pipette design allows the user to lock the volume setting by pushing the locking ring upwards. The position of the ring is indicated by the symbols located on the handle. The volume range of the pipettor is shown on the pushbutton (Fig. 1A1).

Model	Volume range [µl]
VWR VE2/V2	0.1 - 2
VWR VE10/V10	0.5 - 10
VWR VE20/V20	2 - 20
VWR VE50/V50	5 - 50
VWR VE100/V100	10 - 100
VWR VE200/V200	20 - 200
VWR VE250/V250	50 - 250
VWR VE1000/V1000	100 - 1000
VWR VE5000/V5000	1000 - 5000
VWR VE10000/V10000	1000 - 10000

VWR VE2/V2, VWR VE10/V10	Measurement and transfer of micro-volumes, DNA sequencing and enzyme-assay applications.
VWR VE20/V20, VWR VE50/V50, VWR VE100/V100, VWR VE200/V200, VWR VE250/V250, VWR VE1000/V1000	Measurement and transfer of general aqueous solution, acids and bases
VWR VE5000/V5000 VWR VE10000/V10000	Measurement and transfer of large volumes

The **VWR Signature™ 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 VE series protects the user from contamination when removing the tips.

The VE 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

- Models VWR VE2 to VWR VE1000 pipettors (Fig. 6A):

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.

- Model VWR VE5000 and VWR VE10000 pipettors (Fig. 6B):

The length of the tip ejector can be adjusted in the range of 5 mm. To adjust the ejector, remove the tip ejector

button to expose the top of the ejector stem. Using a small screwdriver, turn counter clockwise to increase the length of the ejector and clockwise to reduce the length.

If the above method is not sufficient or the diameter of the ejector opening is too large to eject the tip properly, it is necessary to place the ejector cap "M" onto the ejector (Fig. 6C).

- Model VWR VE2 and VWR VE10 pipettors (Fig. 6D):
The 2 µl - 10 µl pipettes may require the use of an ejector cap to efficiently eject certain brands of pipette tips.
Simply place the cap, supplied with the pipette, on the bottom of the pipette shaft and slide the cap upwards until it surrounds the bottom of the tip ejector.

The **VWR Signature™ Pipettor** 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 [µl]	Accuracy [%]	Precision [%]
VWR VE2 VWR V2*	0.2 1.0 Max. 2.0	± 12.0 ± 2.7 ± 1.5	≤ 6.0 ≤ 1.3 ≤ 0.7
VWR VE10 VWR V10*	Min. 0.5 5.0 Max. 10.0	± 4.0 ± 1.0 ± 0.5	≤ 2.8 ≤ 0.6 ≤ 0.4
VWR VE20 VWR V20*	Min. 2 10 Max. 20	± 3.0 ± 1.0 ± 0.8	≤ 1.5 ≤ 0.5 ≤ 0.3
VWR VE50 VWR V50*	Min. 5 25 Max. 50	± 2.5 ± 1.0 ± 0.8	≤ 2.0 ≤ 0.6 ≤ 0.4
VWR VE100 VWR V100*	Min. 10 50 Max. 100	± 1.6 ± 0.8 ± 0.8	≤ 0.80 ≤ 0.24 ≤ 0.20
VWR VE200 VWR V200*	Min. 20 100 Max. 200	± 1.2 ± 0.8 ± 0.6	≤ 0.60 ≤ 0.25 ≤ 0.20
VWR VE250 VWR V250*	Min. 50 125 Max. 250	± 1.0 ± 0.8 ± 0.6	≤ 0.4 ≤ 0.3 ≤ 0.3
VWR VE1000 VWR V1000*	Min. 100 500 Max. 1000	± 0.9 ± 0.7 ± 0.6	≤ 0.40 ≤ 0.20 ≤ 0.15
VWR VE5000 VWR V5000*	Min. 1000 2500 Max. 5000	± 0.6 ± 0.6 ± 0.5	≤ 0.25 ≤ 0.20 ≤ 0.15
VWR VE10000 VWR V10000*	Min. 1000 5000 Max. 10000	± 2.5 ± 0.8 ± 0.5	≤ 0.6 ≤ 0.3 0.2

** no ejector*

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 **VWR Signature™ 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 8.

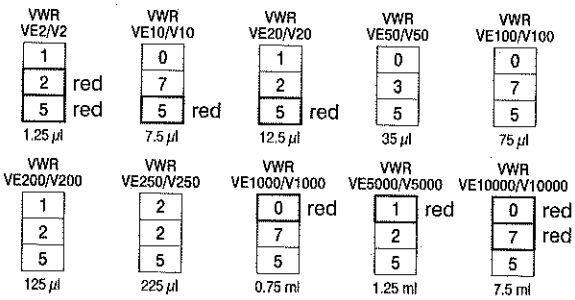
2 - SETTING THE VOLUME

The volume display consists of three numbers and is read from top to bottom. The three numbers indicate the volume selected and are colored black and red.

For the VWR VE2/V2 to VWR VE250/V250 pipettors, the numbers in black represent microliters and the numbers in red represent tenths and hundredths of microliters.

For the VWR VE1000/V1000 to VE10000/V10000 pipettors, the numbers in red represent milliliters and the numbers in black represent hundredths of milliliters.

AN EXAMPLE FOR EACH OF THESE PIPETTORS IS GIVEN BELOW



The volume of the pipette is set by the knob in the pipetting pushbutton (Fig. 1A2) or by the adjustment knob (Fig. 1B). The volume adjustment can be performed when the locking ring is set in the lower position (Fig. 5A). When the desired volume is selected, the locking ring should be set in the upper position (Fig. 5B).

To attain the maximum accuracy, set volume must be approached from a higher value. If the desired value is lower than the previous value, simply use the knob in the pushbutton (Fig. 1A2) or the adjustment knob (Fig. 1B) to adjust the value down to 1/3 turn above the required setting. If the desired value is higher than the previous value, use the knob in the pushbutton or the adjustment knob to adjust the value to 1/3 turn above the required value. The setting should then be performed in the following manner:

With the volume set to 1/3 above the required setting, slowly turn the pipetting pushbutton knob or the adjustment knob to the required volume.

If the knob is accidentally turned too far, ie is set lower than the required value, the process must be repeated. The approach to the set volume must always be made in the order of decreasing value.

Following volume adjustment, set the locking ring into the upper position, thus locking the knob and preventing accidental volume change.

3 - OPERATION

Place a tip on the shaft of the pipettor. See Section 6 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™ 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.

Model	Immersion depth (mm)
VWR VE2/V2 und VWR VE10/V10	≤ 1 mm
VWR VE20/V20, VWR VE50/V50 and VWR VE100/V100	2 - 3 mm
VWR VE200/V200, VWR VE250/V250 and VWR VE1000/V1000	2 - 4 mm
VWR VE5000/V5000	3 - 6 mm
VWR VE10000/V10000	5 - 7 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.

Filters

A replaceable filter installed in a seat in the bottom part of the shaft is used in 5000 µl and 10000 µl pipettors (Fig. 3L). The filter prevents the aspirated liquid from entering into the shaft and thus from polluting the inside of the shaft and the piston. Using the filter is especially important when aspirating and dispensing large volumes of liquid.

If the filter becomes wet during liquid aspiration it should be replaced with a new one.

4 - 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.

5 - DENSE AND VISCOUS LIQUIDS

For moderately dense or viscous liquids, compensation is possible by setting the volumeter higher than the required value.

For liquids, which are less, dense than water, compensation is possible by setting the volumeter lower than the required value.

Example: to transfer 10 µl of serum using ***VWR Signature™ Pipettor****, model VWR VE20/V20.*

Set the volumeter to 10 µl. Aspirate a volume of liquid and measure it gravimetrically. If the corresponding volume is measured as 9.5 µl, the error is 0.5 µl. Increase the volumeter setting by 0.5 µl to 10.5 µl and repeat the measurement.

If the second measurement is not accurate enough, adjust the volumeter up or down to take account of the remaining error.

When dispensing dense or viscous liquids, wait one or two seconds longer at the first stop before expelling the residual liquid.

6 - VWR PIPETTOR TIPS

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

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

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

Tips 10
These tips are used for volumes between 0.1 µl and 10 µl. They are used with the VWR VE2/V2 and the VWR VE10/V10 models.

Tips 200
These tips are used for volumes between 2 µl and 200 µl. They are used with the VWR VE20/V20, VWR VE50/V50, VWR VE100/V100, VWR VE200/V200 models.

Tips 300
These tips are used for volumes between 50 µl and 250 µl. They are used with the VWR VE250/V250 model.

Tips 1000
These tips are used for volumes between 100 µl and 1000 µl. They are used with the VWR VE1000/V1000 model.

Tips 5000
These tips are used for volumes between 1000 µl and 5000 µl. They are used with the VWR VE5000/V5000 model.

Tips 10000
These tips are used for volumes betwen 1000 and 10000 µl. They are used with the VWR VE10000/V10000 model.

7 - RECOMMENDATIONS

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

- When pipetting, the **VWR Signature™ Pipettor** should have the volume setting locked with the locking ring in the upper position.
- Make sure to operate the **VWR Signature™ 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™ Pipettor** should be held in a vertical position.
- Change the tip when volume setting is changed or 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™ 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.
- Never force the volumeter beyond its recommended limits.
- When pipetting liquids with temperatures different from

the ambient temperature, it is recommended to pre-rinse the tip several times before use.

- Do not pipet liquids with temperatures above 70°C.
- When pipetting acids or corrosive solutions which emit vapors, it is recommended to disassemble the shaft and to rinse the piston and seal with distilled water after finishing the pipetting operation.

8. RECALIBRATION

The pipettor is calibrated by gravimetric method, using VWR tips and distilled water, at the temperature 20±1°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 3 and 7 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 ± 0.5°C
- Measurements should be conducted using distilled water
- Balance sensitivity should be suitable for the volume to be controlled.

Recalibration procedure:

- Set the dose volume depending on the pipettor volume according to the following table:

Model	Range of the pipette volumes [µl]	Preset volume [µl]	Permissible volumes [µl]	Volume change ΔV for full turn of the calibration key [µl] (24 increments)
VWR VE2/V2	0.1 - 2	0.2	0.176 - 0.224	0.06
VWR VE10/V10	0.5 - 10	0.5	0.48 - 0.52	0.33
VWR VE20/V20	2 - 20	2	1.94 - 2.06	0.63
VWR VE50/V50	5 - 50	5	4.875 - 5.125	2.50
VWR VE100/V100	10 - 100	10	9.84 - 10.16	2.50
VWR VE200/V200	20 - 200	20	19.76 - 20.24	6.30
VWR VE250/V250	50 - 250	50	49.5 - 50.5	6.30
VWR VE1000/V1000	100 - 1000	100	99.1 - 100.9	25.00
VWR VE5000/V5000	1000 - 5000	1000	994 - 1006	125.00
VWR VE10000/V10000	1000 - 10000	1000	975 - 1025	250.00

- 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 [µl/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).

Warning: The pipetting pushbutton consists of 2 parts: the knob (Fig. 1A2) and the pushbutton (Fig. 1A1). After removal of pushbutton, both parts are separated.

- Holding the volume setting knob to protect it against rotation, 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

- Take out the key and fix the pipetting pushbutton, (Fig. 4D). The pipetting pushbutton should be fixed in opposite order.

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

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

In case of pipetting the liquids with physical properties considerably different from those of water, follow the rules given in section 5.

9 - 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 pushbutton.
- 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) in the models VWR VE2/V2 -VWR VE1000/V1000
  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 12). When reassembling the pipette, the nut should be hand tightened.
  In the models VWR VE2/V2 - VWR VE20/V20, the damage of the shaft may also cause a damage of the piston assembly. Replace the damaged parts (see Section 12). When reassembling the pipette, the nut should be hand tightened.
  To remove the tip ejector in models VWR VE5000 and VWR VE10000, remove the ejector pushbutton (Fig. 3N) and using a screwdriver unscrew the tip ejector by turning the screwdriver counter-clockwise.
- 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 12). 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 VE2/V2 and VWR VE10/V10 pipette should be lubricated evenly with a minimum amount of lubricant.
- The pipette is reassemled 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 10)

The shaft of the 5000 and 10000 models should be autoclaved without the filter.

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.

10 - CLEANING AND STERILIZATION

Cleaning:

External surfaces of the pipetting pushbutton, the ejector pushbutton, the handgrip, the shaft nut and the adjustment knob 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.
- prior to sterilization to unscrew the shaft nut slightly in the VWR VE/V2-VWR VE/V1000 pipettes, and unscrew the shaft slightly in the VWR VE/V5000 and VWR VE/V10000. After autoclaving these parts should be screwed tight again.
- to set the locking ring in lower (unlocked)position prior to sterilisation
- to test pipettor calibration every 10 sterilization cycles.

Note: VWR pipettors should be autoclaved with the filter removed (VWR VE5000/V5000 and VWR VE10000/ V10000).

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

11 - PIPETTOR KIT AND ACCESSORIES

Pipettor kit:

The pipettors are delivered in the kits including:

- Pipettor
- Instruction manual
- Calibration key
- Ejector regulation spacers (for 2 µl to 1000 µl pipettors)
- Ejector cap (for 2 µl, 10 µl, 5000 µl and 10000 µl pipettors)
- Identification labels
- Filters (for 5000 µl and 10000 µl pipettors)
- Lubricant

Accessories

Model	Tip Choice	Cat. No. US	Cat. No. EU
VWR VE2/V2, VWR VE10/V10	10 µl	53509-130	613-0334
VWR VE20/V20, VWR VE50/V50, VWR VE100/V100, VWR VE200/V200	200 µl	53508-783	613-0241
VWR VE250/V250	300 µl	53509-126	613-0266
VWR VE1000/V1000	1000 µl	53508-918	613-0273
VWR VE5000/V5000	5000 µl	53503-826	613-0226
VWR VE10000/V10000	10000 µl	16466-000	732-0507

12 - SPARE PARTS

All the spare parts indicated in Fig. 3, 4, 5, 6:

A: Pushbutton A1: Pushbutton A2: Knob
B: Adjustment knob
C: Shaft
D: Ejector
F: Shaft nut
G: Piston assembly
H: Spacer
I: O-ring
J: Seal
K: Calibration key
L: Filter
M: Tip ejector cap
N: Ejector pushbutton
P: Locking ring

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 8.

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