VWR®
Ultra High-Performance

CONTENTS

1. INTRODUCTION

VWR UHP (Ultra High-Performance) pipettors are designed for general laboratory use. Pipettors can be used for measurement and transfer of aqueous solution, acids, bases and enzyme assay applications.

These variable volume pipettors cover the range from 0.1 µl to 1000 µl in 6 models.

VWR UHP (Ultra High-Performance) pipettors operate utilizing the air cushion principle, i.e. the aspirated liquid has no contact with the shaft or plunger of the pipettor. Liquid is aspirated into disposable tips put on the pipettor.

Pipettors are equipped with a four-digit counter displaying the set volume, and the aspirated volume is set by means of the adjustment knob (fig. 1B). The pipettor design allows the user to lock the volume setting.

1.1. PRODUCT DESCRIPTION

A. Pipetting pushbutton

B. Volume adjustment knob
Apart from adjusting the volume, the volume adjustment knob is also designed to lock the volume setting.

C. Ejector button

D. Cap
It is used to cover the calibration adjustement mechanism and it can be used for pipettor identification.

E. Calibration switch
It is used to switch the pipettor from operation mode to calibration mode.

F. Volume counter
The four-digit volume counter displays the volume setting.

G. Counter cap
The cap has a printed range of aspirated volume, appropriate for the given pipettor model.

H. Tip ejector

I. Shaft
Made of high quality material it provides high chemical and mechanical strength.

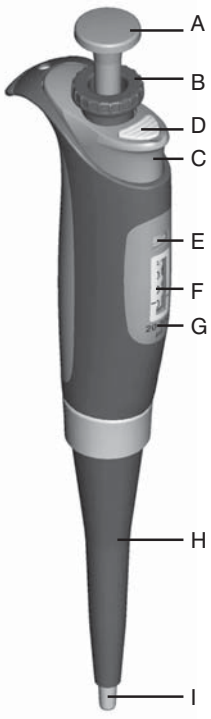


Fig. 1

Pipettor volume is identified by the color of counter cap inscription depending on the tip type. (fig.1G).

The applied colors:

2 µl and 10 µl pipettors – red,

20 µl, 100 µl and 200 µl pipettors – yellow

1000 µl pipettors – blue

1.2. WORK SAFETY INSTRUCTIONS

Used symbols:

⚠ WARNING!: Risk of injury

CAUTION: Potential damage to the device or pipetting errors

Long-lasting and faultless working of the pipettor depends to a large extent on its operation. Read the pipettor operating instructions carefully and comply with the principles included.

CAUTION:

- Pipettor is designed to work with the tips only. Do not aspirate liquids without tips attached.

  Aspirated liquid should not get into the pipettor because this may damage it.
- Use only the pipettor with the tips attached.
- One time use of a tip guarantees safety and eliminates possible contamination of the aspirated liquid.
- Keep the pipettor clean; do not cleanse it with chemically aggressive substances (e.g. acetone).
- Do not hold the pipettor horizontally if there is liquid in the tip.
- Only use pipettes in accordance with the manufacturer instruction to ensure the proper parameters of pipettes.
- The pipettor should be calibrated after replacing the plunger.
- In case of improper operation of the pipettor, clean the pipettor carefully following the instructions given or send it to the service representative.

⚠ WARNING!

- Follow the laboratory work safety regulations.
- Exercise extreme caution while pipetting chemically aggressive substances. Use the protective equipment, glasses and gloves.
- Never direct the pipette with the tip attached towards yourself or anyone else when there is the liquid in it.
- Use only the spare parts and accessories recommended by the manufacturer.

1.3. TECHNICAL PARAMETERS

VWR UHP (Ultra High-Performance) pipettors are high quality laboratory instruments, which provide the highest measurement accuracy and precision.

Accuracy errors and repeatability of liquid volume measurements depend on quality of the applied tips. The errors provided in the table have been obtained using VWR tips.

CAUTION: Only those tips guarantee correct compatibility with the pipettors and ensure accurate and repeatable liquid aspiration.

Model	Volume [µl]	Accuracy [%]	Precision [%]	Increment [µl]	Fits to tips [µl]
VWR VE2	Min 0.2 1.0 Max 2.0	± 12.0 ± 2.7 ± 1.5	≤ 6.0 ≤ 1.3 ≤ 0.7	0.002	10
VWR VE10	Min 0.5 5.0 Max 10.0	± 4.0 ± 1.0 ± 0.5	≤ 2.8 ≤ 0.6 ≤ 0.4	0.01	
VWR VE20	Min 2 10 Max 20	± 3.0 ± 1.0 ± 0.8	≤ 1.5 ≤ 0.5 ≤ 0.3	0.02	200
VWR VE100	Min 10 50 Max 100	± 1.6 ± 0.8 ± 0.8	≤ 0.80 ≤ 0.24 ≤ 0.20	0.1	
VWR VE200	Min 20 100 Max 200	± 1.2 ± 0.8 ± 0.6	≤ 0.60 ≤ 0.25 ≤ 0.20	0.2	
VWR VE1000	Min 100 500 Max 1000	± 0.9 ± 0.7 ± 0.6	≤ 0.40 ≤ 0.20 ≤ 0.15	1	1000

Table 1

Accuracy errors and repeatability have been determined with VWR tips, using a gravimetric method, performing at least 10 measurements of distilled water at the temperature 20°±1°C, according to EN ISO 8655 standard.

The pipettor design enables the user to perform calibration process according to the rules presented in section 5.

2. OPERATION

2.1. SETTING THE VOLUME

Setting the volume is performed by the volume adjustment knob. (fig. 1B).

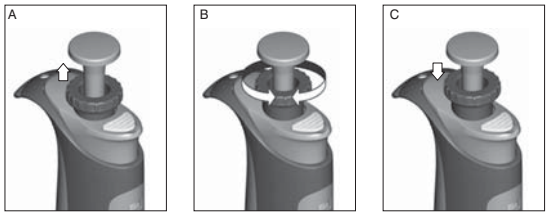


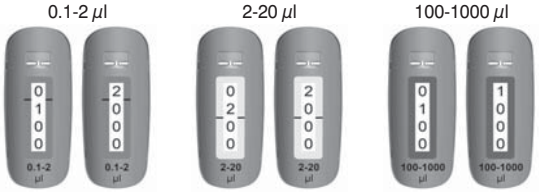
Fig. 2

The range of aspirated volume is displayed on the counter cap (fig.1G). The volume is displayed by the counter and consists of four digits, which should be read from top to bottom. The digits on the lower drum constitute minimum graduation for the particular model. Value of the minimum graduation (increment) is presented in Table 1.

Volume may be changed after setting the knob in its top position (fig.2B).

After setting the desired volume, the knob (fig.1B) should be locked by pushing into the lower position (fig. 2C).

Examples of counter indications:



0.1 µl 2 µl 2 µl 20 µl 100 µl 1000 µl

Counter indications above the horizontal indicators shown volume in [µl].

To achieve maximum accuracy, the required volume should be set from higher volume by reducing indications of the counter.

Example of correct volume setting:

- If the required volume is lower than the volume set on the counter it is necessary to reduce indications of the counter to the required value. Before achieving the required value it is necessary to reduce the speed with which you rotate the adjustment knob (fig.1B), so as not to exceed the value (fig.3).

Fig. 3

- If the required volume is higher than the volume set on the counter it is necessary to increase indications of the counter to the value which exceeds the required volume by rotating the bottom drum by about 1/3 of its circumference. Then, by slowly rotating the adjustment knob (fig. 1B), reduce the setting to the required value (fig. 3).

After setting the required volume, the knob (fig. 1B) should be moved downward to lock the set volume (fig. 2C).

2.2. PREPARATION FOR OPERATION

Place a tip on the shaft of the pipettor. See Table 1 for the appropriate tip designed for the given pipettor model. Firmly press the tip on the shaft using twisting motion to ensure airtight seal.

CAUTION:

- It is recommended to use the tips recommended by the manufacturer, as only those tips will ensure accurate and repeatable liquid measurements.
- Do not place tips by applying swinging motion, as this can damage the shaft and the plunger. It is particularly applied to small-volume pipettors.
- Never aspirate liquid into a pipettor without a tip attached.

3. PIPETTING RECOMMENDATIONS

Observing the following recommendations will ensure accuracy and repeatability of liquid sampling.

- While operating VWR UHP pipettor the volume setting should be locked - the adjustment knob in its lower position (fig. 2C).

- Operate the pipettor pushbutton slowly and smoothly when liquid aspiring and dispensing.
- The depth of tip immersion in the aspired liquid should be kept at necessary minimum, and should remain constant during aspiration (Table 2.)
- While operating, the pipettor should be held in a vertical position.
- Each new tip should be pre-rinsed.
- The tip should be replaced with a new one if:
  - a different type of liquid is handled;
  - a different liquid volume is dispensed;
  - visible droplets of liquid remain in it.
- Pipetted liquid should not enter the pipettor shaft. To ensure this:
  - press and release the pipetting pushbutton slowly and smoothly;
  - do not put the pipettor away if there is any liquid in the tip;
  - do not invert the pipettor;
  - do not set and aspire volumes exceeding nominal values.
- Before aspiring liquid of temperature that differs from ambient temperature, it is recommended to rinse the tip several times with the aspired liquid.

CAUTION: After pipetting acids and aggressive solutions, it is recommended to unscrew the pipettor and rinse the pipettor plunger, seal and shaft with distilled water.

4. ASPIRATING AND DISPENSING LIQUIDS

4.1 ASPIRATING LIQUIDS

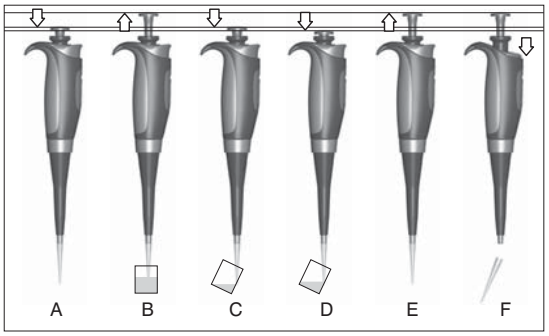


Fig. 4

- The pipetting pushbutton (fig. 1A) should be pressed to the first stop (fig. 4A),
- While holding the pipettor in a vertical position, immerse the tip into the aspired liquid. Depth of the tip immersion depends on the pipettor model. The recommended values are shown in Table 2. The tip may aspire air if immersed to a depth lower than recommended or if the pipetting pushbutton is released quickly,
- To aspire liquid release the pipetting pushbutton smoothly (fig. 4B),
- Wait for about 1 second before withdrawing the tip from the aspired sample, fig. 4.

⚠ **WARNING!** Do not touch the used tip.

Volume	2,10 µl	20, 100 µl	200, 1000 µl
Depth	<1mm	2-3mm	2-4mm

Table 2

4.2 DISPENSING LIQUIDS

- While holding the pipettor slightly inclined from 10 to 40° off the vertical, place the tip orifice against the inside wall of the receiving vessel.
- Then, press the pipetting pushbutton smoothly to the first stop, dispensing the liquid (fig. 4C).

- After about one second press the pipetting pushbutton to the final stop, blowing out the remaining liquid from the tip (fig. 4D).
- Holding the pushbutton depressed remove the pipettor, drawing it against the vessel inner wall.
- Release the pipetting pushbutton to its starting position (fig. 4E) and eject the tip by pressing the tip ejector button (fig. 4F).

CAUTION: Replace the tip with a new one whenever a different liquid is to be pipetted.

4.3 PRE-RINSING

When pipetting liquids of viscosity higher or surface tension lower than those of water (e.g. serum or organic solvents) a film of liquid is formed on the inside wall of the pipetting tip. The 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 the first pipetting. This is done by performing a full pipetting cycle of a liquid into the same vessel. After such a procedure, the film of liquid is already formed in the tips and ensures better accuracy and repeatability of successive pipetting operations.

4.4 ASPIRATING HIGH DENSITY LIQUIDS

The accuracy errors provided in Table 1 have been determined using distilled water. When pipetting liquids whose properties (density, viscosity, surface tension) differ from the properties of water, it may be necessary to compensate for volume settings.

CAUTION: Aspiration differences can be avoided if the pipetting operation is conducted slowly, so that the liquid can slowly adjust to the changing pressure. Wait for about 2 seconds after each aspirating and dispensing, without changing the position of the pipettor.

If the above procedure does not provide accurate results, pipettor recalibration is required according to section 5.

After calibration, it is recommended to record recalibration and the adjustment value, which will facilitate return calibration to the standard liquid.

5. RECALIBRATION

VWR UHP pipettors are calibrated by gravimetric method, using VWR tips and distilled water, at the temperature 20°±1°C, according to EN ISO 8655 standard.

It is recommended to conduct periodic inspection of the pipettor operation, with the interval between inspections being dependent on the type of load (aspirated liquids) and other conditions (load intensity and autoclave sterilization, replacement of subassemblies) in which the pipettor is used.

The pipettor recalibration procedure should be carried out if during the 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 Table 1.

Checking the pipettor parameters

To determine accuracy error of the pipettor, the following requirements must be fulfilled:

- The ambient temperature of the pipettor, tip and the test liquid (typically distilled water) should be within the range of 20-25°C and stabilized during weighing within the range ±0.5°C,
- The density of the liquid used should be close to that of distilled water,
- The balance sensitivity should be appropriate to the tested volume (Table 3),
- The mg/µl conversion factor, dependent on temperature and pressure, should be taken into account (Table 4).

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

Table 3

Temperature [°C]	Pressure [kPa]		
	95	101.3	105
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

Table 4

CAUTION: The pipetting procedure should be conducted in accordance with the rules described in sections 3 and 4.

Recalibration procedure:

- Set the dose volume depending on the pipetted volume according to Table 5.

Model	Range of the pipettors volumes [µl]	Preset volume [µl]	Permissible volumes [µl]
VWR VE2	0.1 - 2	0.2	0.176 - 0.224
VWR VE10	0.5 - 10	0.5	0.48 - 0.52
VWR VE20	2 - 20	2	1.92 - 2.08
VWR VE100	10 - 100	10	9.84 - 10.16
VWR VE200	20 - 200	20	19.76 - 20.24
VWR VE1000	100 - 1000	100	99.1-100.9

Table 5

- Perform 5 aspirations, weigh each one and calculate the average value of the aspirations.
- Calculate average aspirated volume in [µl] by multiplying the average aspiration amount [mg] by the distilled water density coefficient [µl/mg], which depends on temperature and pressure (Table 4).
- If the average aspirated volume exceeds the permissible values, pipettor recalibration should be conducted.

Pipettor recalibration consists in setting the real value obtained during weighing on the counter. To do so, the following should be conducted:

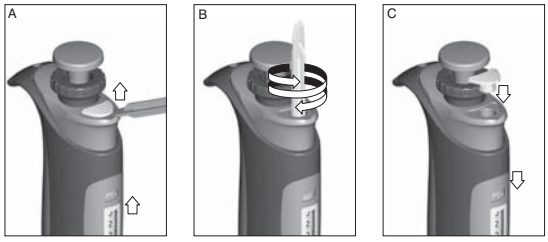


Fig. 5

- Set the lower range of the preset volume according to table 5,
- Set the adjustment knob (fig. 1B) in its lower position,
- Remove the cap (fig. 1D) using the calibration key (fig. 5A),
- Set the calibration switch (fig. 1E) in its upper position (fig. 5A),
- Insert the calibration key into the ejector orifice (fig. 1C) and place it in the calibration screw of the counter (fig. 5B),
- Turn the key so as the volume indicated by the counter is equal to the average calculated volume.
- Remove the calibration key and set the calibration switch in its lower position (fig. 5C), thus going to the pipetting mode,
- Place the cap of the ejector pushbutton (fig. 5C).

After conducted the calibration procedure it is recommended to record recalibration.

CAUTION: Do not rotate the volume adjustment knob during calibration (fig. 1B).

6. MAINTENANCE

The pipettor requires periodic maintenance, depending on the applications performed and intensity of use. The subassemblies subject to action of aggressive solution vapors, such as shaft elements, should be regularly inspected and cleaned.

To conduct correct maintenance procedure, familiarize with the structure of the shaft set described in section 8 and observe the instructions given in this section.

⚠ WARNING!

Do not use sharp tools during the maintenance. It may damage the device and impair your safety.

6.1. CLEANING

External surfaces of the handgrip, knob and pushbuttons may be cleaned with a tissue dipped in isopropyl alcohol. The remaining elements removed from the pipettor during disassembly can be washed with distilled water or isopropyl alcohol.

CAUTION:

Use of cleaning solutions not recommended by the manufacturer may impair the safety of the user and damage the device.

Descriptions of the parts are given in fig. 1, 6, 7 and 8. Fig. 6, 7 and 8 can be found in section 8.

- While holding the Ejector unscrew the Shaft from the handle (fig. 1.8),
- While holding the Ejector bush **N**, unscrew Ejector **K**

Then proceed depending in the pipettor type:

2-100 µl pipettors (fig.6)

It is not necessary to disassemble the entire set to inspect and clean the shaft. Unscrew the Shaft **B** from the Shaft holder set **C**, remove the Seal **D** and the O-ring **E**.

To clean other elements:

- Unscrew the Shaft cap **J**,
- Remove from the Shaft the Plunger **A**, the Pipetting spring **I**, the Blocking bush **H**, the Compression spring **G** and the Compression bush **F**,
- Inspect the elements and proceed according to the recommendations;
- Replace elements if they are damaged.

CAUTION: While disassembling, behave caution to prevent the plunger from coming off due to the pipetting spring.

200 µl pipettors (fig. 7)

- Unscrew the Shaft cap **J**,
- Remove from the Shaft the Plunger **A**, the Pipetting spring **I**, the Blocking bush **H**, the Compression spring **G**, the Compression bush **F**, the Seal **D** and the O-ring **E**,
- Inspect the elements and clean them according to the recommendations,
- Replace elements if they are damaged.

CAUTION: While disassembling, behave caution to prevent the plunger from coming off due to the pipetting spring.

1000 µl pipettors (fig. 8)

- Unscrew the Shaft cap **J**,
- Remove from the shaft the Plunger **A**, the Compression spring **G**, the Compression washer **M**, the Seal **D** and the O-ring **E**.

Reassemble the elements in the reverse order. After cleaning the plunger, apply a thin film of lubricant on its surface. The lubricant is delivered with every pipettors.

CAUTION: Recalibrate the pipettor after replacing the plunger. If the pipettor does not work properly, check whether it has been reassembled correctly.

6.2 STERILIZATION

The pipettor can be sterilized in the autoclave at the temperature of 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 initial vacuum and drying cycle.

CAUTION:

- Sterilization in other conditions may cause the damage of the pipettor,
- Set the volume adjustment knob in its upper (unlocked) position before sterilization.

Repeatability of obtained results does not change if the pipettor is operated properly and the autoclaving procedure is conducted appropriately. As there can be a slight change in the dosing accuracy it is recommended:

- To check calibration of the pipettor after 1st, 3rd and 5th autoclaving procedures, and every 10 autoclaving cycles during further operation of the pipettor.

7. TROUBLESHOOTING

If you notice an improper pipettor 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 pipettor use.

Problem	Cause	Instructions
Droplets of liquid remain in the pipettor tip	The liquid is dispensed too fast	Decrease the dispensing speed
	The tip wettability has increased due to extensive use	Replace the tip with a new one
Air bubbles appear in the liquid aspirated into the tip	The pipettor tip immersion is too shallow	Immerse the tip deeper according to the instruction (Table 2)
	The pipettor tip is incorrectly pressed onto the pipettor shaft	Press the tip firmly
	The tip is damaged or worn out due to extensive use	Replace the tip with a new one
The pipettor incorrectly aspirates the liquid or the liquid drops out from the tip	The pipettor tip is incorrectly pressed onto the pipettor shaft	Press the tip firmly
	The shaft surface is damaged or contaminated at the sealing site	Clean the shaft or replace it with a new one
The pipettor incorrectly aspirates the liquid or the liquid drops out from the tip	The plunger or the seal is damaged due to prolonged aspiration of aggressive liquids	Disassemble the shaft set; wash the shaft, the plunger and the seal according to point 6.1. Replace the elements with new ones if necessary. Apply a small amount of lubricant onto the plunger and reassemble the set in the correct order.
	The inside of the pipettor is contaminated	
	No lubrication on the sealing elements	

Problem	Cause	Instructions
Uneven work of the pipetting set, the pipetting pushbutton gets blocked	The inside of the pipettor is contaminated due to aspiration of aggressive substances	Unscrew the shaft set, wash the parts. Replace the elements with new ones if necessary. Apply a small amount of lubricant on the plunger and reassemble the set in the correct order.
	The inside of the pipettor is contaminated due to the liquid entering the pipettor	
	No lubrication on the sealing elements, e.g. after repeated autoclaving procedures	

If the problem continues after carrying out the above steps, contact your pipettor supplier to conduct repairs.

CAUTION: Before returning the pipettor, please ensure that the pipettor is completely free of any aggressive chemical, radioactive, microbiological contamination which could pose a threat during transport and repair. Clean the pipettor as far as it is possible.

8. SPARE PARTS

While ordering spare parts for the pipettor please specify the pipettor type, the serial numbers located on the handgrip, and specify the name of the part ordered.

CAUTION: Replacement of the plunger set requires recalibration of the pipettor according to section 5.

Spare parts are shown on fig. 1:

A: Pipetting pushbutton
D: Cap

and on fig. 6, 7, 8:

A: Plunger
B: Shaft
C: Shaft holder set
D: Seal
E: O-ring
F: Compression bush
G: Compression spring
H: Blocking bush
I: Pipetting spring
J: Shaft cap
K: Ejector
M: Compression washer
N: Ejector bush

⚠ WARNING!
Use only accessories recommended by **VWR** and original spare parts.

Technical service

Web Resources

Visit the VWR's website at **www.vwr.com** for:

- Complete technical service contact information
- Access to VWR's Online Catalogue, and information about accessories and related products
- Additional product information and special offers

Contact us For information or technical assistance contact your local VWR representative or visit: **www.vwr.com**.

2 - 100 µl pipettors

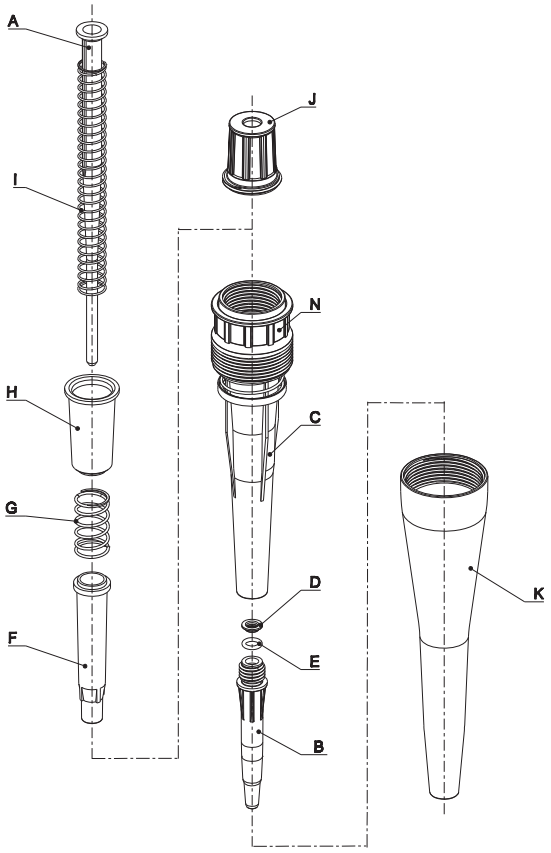


Fig. 6

200 µl pipettors

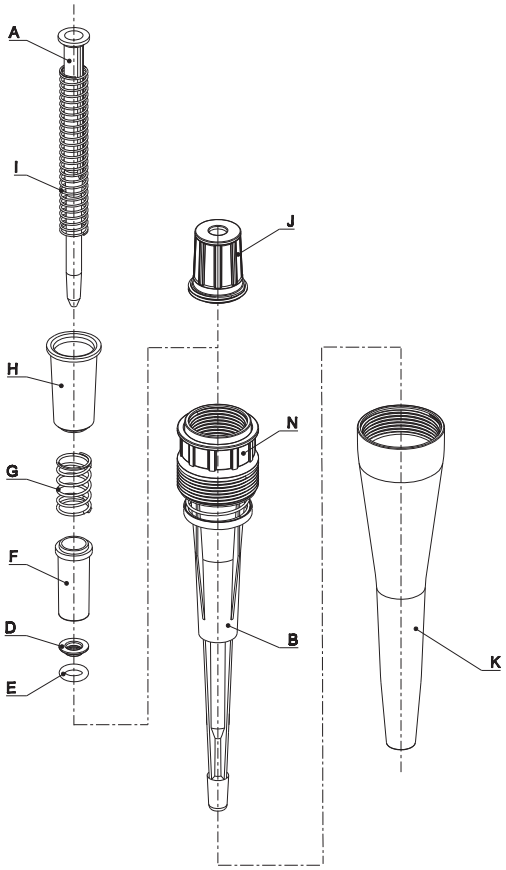


Fig. 7

1000 µl pipettors

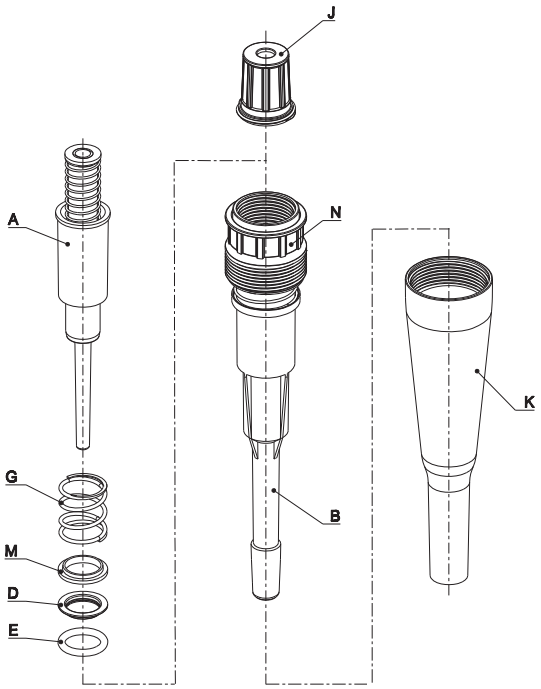


Fig. 8

9. ACCESSORIES AND TIPS

Accessories:

Pipettors are delivered with the following elements

Description	Pcs.
Instruction manual + certificate	1
Calibration key	1
Pipettor stand	1
Lubricant	1
Identification labels	8

Tips:

Model VWR	Tip Choice	Cat. No. US	Cat. No. EU
VWR VE2, VWR VE10	10 µl	53509-130	613-0334
VWR VE20, VWR VE100 VWR VE200	200 µl	53508-783	613-0241
VWR VE1000	1000 µl	53508-918	613-0273

10. WARRANTY

VWR International warrants that this product will be free from defects in material and workmanship for a period of three (3) years from date of purchase. If a defect is present, VWR will, at its option, repair, replace, or refund the purchase price of this product at no charge to you, provided it is returned during the warranty period. This warranty does not apply if the product has been damaged by accident, abuse, misuse, or misapplication, or from ordinary wear and tear.

For your protection, items being returned must be insured against possible damage or loss. This warranty shall be limited to the replacement of defective products. IT IS EXPRESSLY AGREED THAT THIS WARRANTY WILL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND IN LIEU OF THE WARRANTY OF MERCHANTABILITY.