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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 1 μ l to 300 μ l in 8 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 adjustment 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. Shafts

Made of high quality material provides high chemical and mechanical strength.

J. Module

The module consists of pistons assembly and shafts assembly which move independently.

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

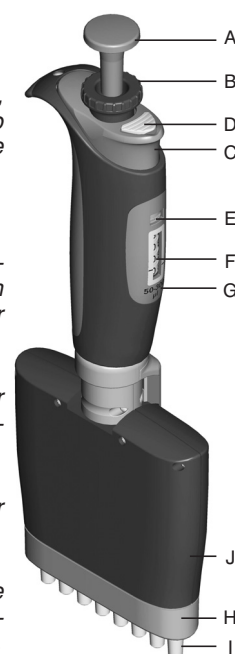


Fig. 1

**The applied colors:**

10 µl pipettors – red,

50 µl, 200 µl and 300 µl pipettors – yellow

Pipettors of volume 300 µl should be used with 300 µl tips.

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.
- 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 tips attached towards yourself or anyone else when there is 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 ME-10 VWR MT-10	Min 1 5 Max 10	± 8.0 ± 4.0 ± 2.0	≤ 6.0 ≤ 2.0 ≤ 1.2	0.01	10
VWR ME-50 VWR MT-50	Min 5 25 Max 50	± 4.0 ± 3.0 ± 1.6	≤ 2.5 ≤ 1.2 ≤ 0.6	0.05	200
VWR ME-200 VWR MT-200	Min 20 100 Max 200	± 3.0 ± 1.5 ± 1.0	≤ 1.5 ≤ 0.8 ≤ 0.6	0.2	
VWR ME-300 VWR MT-300	Min 50 150 Max 300	± 1.6 ± 1.2 ± 1.0	≤ 1.5 ≤ 1.0 ≤ 0.6	0.5	300

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 $20^{\circ} \pm 1^{\circ}\text{C}$, 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).

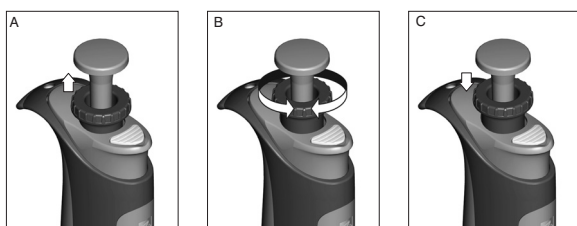


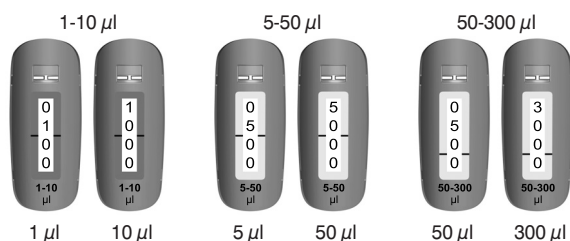
Fig. 2

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:



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

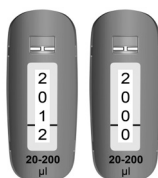


Fig. 3

with which you rotate the adjustment knob (fig.1B), so as not to exceed the value (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 the tips on the shafts of the pipettor. Holding the pipette vertically, press it against the tips in the rack box, until the shafts retreat about 1.5 mm into the multichannel module. The suspension system of the shafts ensures even and tight sealing of the tips.

The twisting motion does not have to be performed.

See Table 1 for the appropriate tips designed for the given pipettor model.

CAUTION:

- It is recommended to use the tips recommended by the manufacturer, as only those tips will ensure accurate and repeatable liquid measurements.
- Never aspirate liquid into a pipettor without tips 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 aspirating and dispensing.
- The depth of tips immersion in the aspirated liquid should be around 2-4 mm.
- While operating, the pipettor should be held in a vertical position.
- New tips should be pre-rinsed.

- The tips should be replaced with new ones if:
 - a different type of liquid is handled;
 - a different liquid volume is dispensed;
 - visible droplets of liquid remain in them.
- Pipetted liquid should not enter the pipettor shafts. 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 tips;
 - do not invert the pipettor;
 - do not set and aspirate volumes exceeding nominal values.
- Before aspirating liquid of temperature that differs from ambient temperature, it is recommended to rinse the tips several times with the aspirated liquid.

4. ASPIRATING AND DISPENSING LIQUIDS

4.1 ASPIRATING LIQUIDS

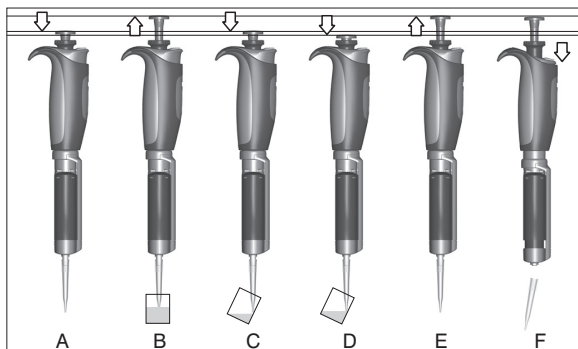


Fig. 4

- The pipetting pushbutton (fig. 1A) should be pressed to the first stop (fig. 4A),
- While holding the pipettor in a vertical position, tips should be immersed into the aspirated liquid to the depth of 2 to 4 mm, and flushed once by drawing a dose of liquid and dispensing it out with slow and steady movement. The tips may aspirate air if

immersed to a depth lower than recommended or if the pipetting pushbutton is released quickly,

- To aspirate liquid release the pipetting pushbutton smoothly (fig. 4B),
- Wait for about 1 second before withdrawing the tips from the aspirated sample, fig. 4.

⚠ WARNING! Do not touch the used tips.

4.2 DISPENSING LIQUIDS

- While holding the pipettor slightly inclined from 10 to 40° off the vertical, place the tips 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 tips (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 tips by pressing the tip ejector button (fig. 4F).

CAUTION: Replace the tips 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 tips. The film can create an error. Since the film remains relatively constant in successive pipetting operations with the same tips, 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.



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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 $20^{\circ}\pm 1^{\circ}\text{C}$, 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, tips and the test liquid (typically distilled water) should be within the range of $20\text{--}25^{\circ}\text{C}$ and stabilized during weighing within the range $\pm 0.5^{\circ}\text{C}$,
- 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 2),
- The $[\text{mg}/\mu\text{l}]$ conversion factor, dependent on temperature and pressure, should be taken into account (Table 3).

Volume $[\mu\text{l}]$	0.1 - 10	10 - 100	> 100
Balance sensitivity $[\text{mg}]$	≤ 0.001	≤ 0.01	≤ 0.1

Table 2

Temperature $^{\circ}\text{C}$	Pressure $[\text{kPa}]$		
	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 3

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 4.

Model	Range of the pipettors volumes $[\mu\text{l}]$	Preset volume $[\mu\text{l}]$	Permissible volumes $[\mu\text{l}]$
VWR ME-10, VWR MT-10	1-10	1	0.92-1.08
VWR ME-50, VWR MT-50	5-50	5	4.8-5.2
VWR ME-200, VWR MT-200	20-200	20	19.4-20.6
VWR ME-300, VWR MT-300	50-300	50	49.2-50.8

Table 4

- Perform 5 aspirations, weigh each one and calculate the average value of the aspirations.
- Calculate average aspirated volume in $[\mu\text{l}]$ by multiplying the average aspiration amount $[\text{mg}]$ by the distilled water density coefficient $[\mu\text{l}/\text{mg}]$, which depends on temperature and pressure (Table 3).
- 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:



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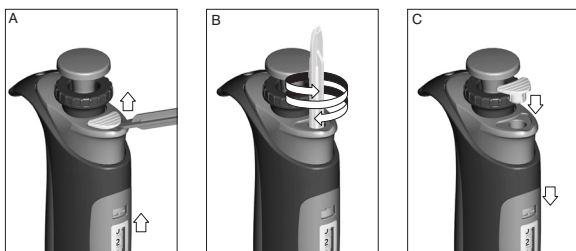


Fig. 5

- 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 shafts elements, should be regularly inspected and cleaned.

External surfaces of the handgrip, knob and pushbuttons may be cleaned with a tissue dipped in isopropyl alcohol.

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

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 tem-

perature. 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 tips	The liquid is dispensed too fast	Decrease the dispensing speed
	The tips wettability has increased due to extensive use	Replace the tips with new ones
Air bubbles appear in the liquid aspirated into the tips	The pipettor tips immersion is too shallow	Immerse the tips deeper according to the instruction
	The pipettor tips are incorrectly pressed onto the pipettor shafts	Press the tips firmly
	The tip is damaged or worn out due to extensive use	Replace the tips with new ones



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Problem	Cause	Instructions
The pipettor incorrectly aspirates the liquid or the liquid drops out from the tips	The pipettor tips are incorrectly pressed onto the pipettor shafts	Press the tips firmly
	The shafts surface are damaged or contaminated at the sealing site	Clean the shafts or send the pipettor for service in order to replace the shafts
	The plungers or the seals are damaged due to prolonged aspiration of aggressive liquids	Send the pipettor for service
	The inside of the pipettor is contaminated	
	The inside of the pipettor is contaminated	
Uneven work of the pipetting set, the pipetting pushbutton gets blocked	The inside of the pipettor is contaminated due to aspiration of aggressive substances	Send the pipettor for service
	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.

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.

8. ACCESSORIES AND TIPS

Accessories:

Pipettors are delivered with the following elements

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

Tips:

Model VWR	Tip Choice	Cat. No. US	Cat. No. EU
VWR ME10 VWR MT10	10 µl	53509-130	613-0334
VWR ME50 VWR MT50 VWR ME200 VWR MT200	200 µl	53508-783	613-0241
VWR ME300 VWR MT300	300 µl	53509-126	613-0266



9. 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.