LABMATE+

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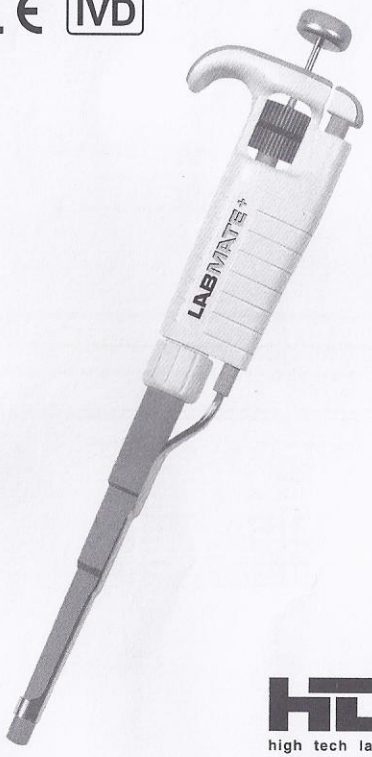

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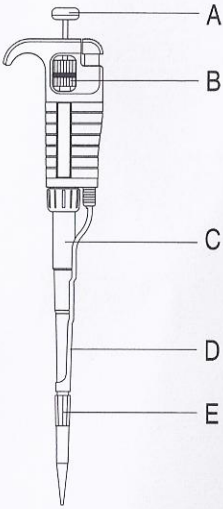

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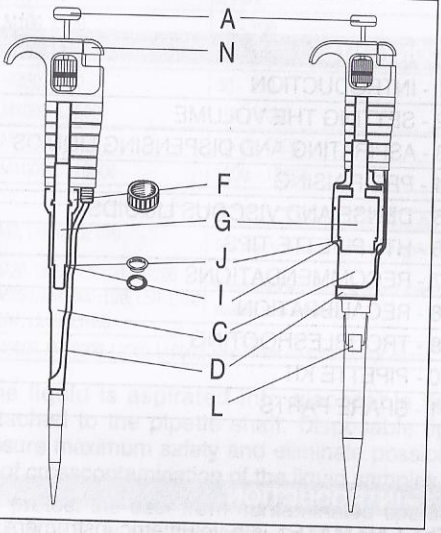

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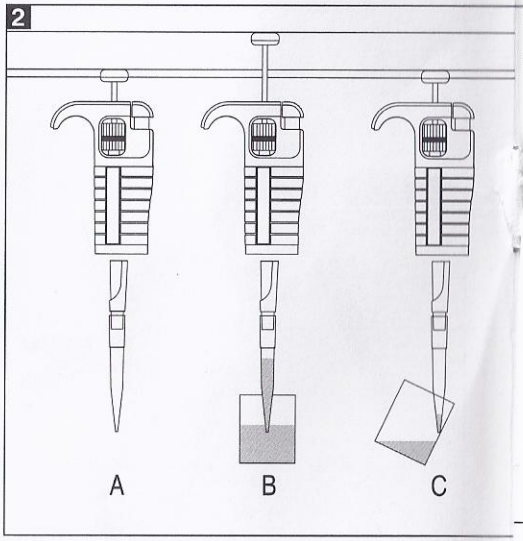
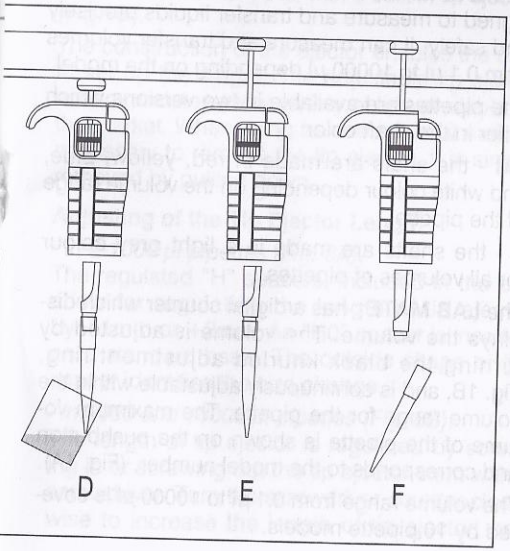




CONTENTS

1 - INTRODUCTION

The **LAB MATE+** is a volumetric instrument designed to measure and transfer liquids precisely and safely. It can measure and transfer volumes from 0.1 µl to 10000 µl depending on the model.

The pipettes are available in two versions which differ in the shaft color:

LM - the shafs are made in red, yellow, blue, and white colour depending on the volume range of the pipette.

L - the shafts are made in a light grey colour for all volumes of pipettes.

The **LAB MATE+** has a digital counter which displays the volume. The volume is adjusted by turning the black knurled adjustment ring, Fig. 1B, and is continuously adjustable within the volume range for the pipette. The maximum volume of the pipette is shown on the pushbutton and corresponds to the model number, (Fig. 1A).

The volume range from 0.1 µl to 10000 µl is covered by 10 pipette models.

Model	Volume range [µl]
LM2, L2	0.1 - 2
LM10, L10	0.5 - 10
LM20, L20	2 - 20
LM50, L50	5 - 50
LM100, L100	10 - 100
LM200, L200	20 - 200
LM250, L250	50 - 250
LM1000, L1000	100 - 1000
LM5000, L5000	1000 - 5000
LM10000, L10000	1000 - 10000

LM2, LM10, L2, L10	Measurement and transfer of micro-volumes, DNA sequencing and enzyme-assay applications.
LM20, LM50, LM100, LM200, LM250, LM1000, L20, L50, L100, L200, L250, L1000	Measurement and transfer of general aqueous solution, acids and bases
LM5000, LM10000, L5000, L10000	Measurement and transfer of large volumes.

The liquid is aspirated into disposable tips attached to the pipette shaft. Disposable tips ensure maximum safety and eliminate possibility of crosscontamination of the liquid samples.

To protect the user from contaminated tips the **LAB MATE+** is equipped with a built-in tip ejector, (Fig.1D).

The construction of the ejector enables the user to set up the length. The adjustable tip ejector accommodates every variety of tips available on the market. When using narrow tubes, it may be necessary to remove the tip ejector. It is simply removed by pulling down.

Adjusting of the Tip Ejector Length

- in 2-1000 µl pipettes (Fig. 6A).

The regulated "H" spacers, included in the box allow for regulating the length of tip ejector by +1mm or +2mm. An "H0" spacer is inserted on a standard basis. The outside shape of the spacer identifies the size change.

- in 5000 and 10000 µl pipettes (Fig. 6B).

The length of tip ejector is regulated by screwing in or screwing out the tip ejector stem with a screwdriver. Turn the screwdriver counter clockwise to increase the length of tip ejector, and

clockwise to reduce the length of tip ejector. The ejector can be adjusted in the range of 5 mm. If above described method of ejector adjustment is not sufficient or the diameter of the ejector opening is too large to dispose the tip it is necessary to put the ejector cap "M" onto the ejector, (Fig. 6C).

The **LAB MATE+** is a high quality instrument which offers excellent accuracy and precision.

The accuracy and precision (repeatability) of liquid volume depend on the quality of tips used. The values for accuracy and precision given in the table below were obtained using **HTL** tips. Only those tips guarantee correct operation of the pipettes and ensure accuracy and precision of liquid sampling.

Model	Cat. no.	Volume [µl]	Accuracy [%]	Precision [%]	Tip µl	Shafts color for LM
LM2 L2	4601 4611	0.2 1.0 Max 2.0	± 12.0 ± 2.7 ± 1.5	± 6.0 ± 1.3 ± 0.7	10µl	red
LM10 L10	4602 4612	Min 0.5 5.0 Max 10.0	± 4.0 ± 1.0 ± 0.5	± 2.8 ± 0.6 ± 0.4		
LM20 L20	4603 4613	Min 2 10 Max 20	± 3.0 ± 1.0 ± 0.8	± 1.5 ± 0.5 ± 0.3	200µl	yellow
LM50 L50	4607 4617	Min 5 25 Max 50	± 2.5 ± 1.0 ± 0.8	± 2.0 ± 0.6 ± 0.4		
LM100 L100	4604 4614	Min 10 50 Max 100	± 1.6 ± 0.8 ± 0.8	± 0.80 ± 0.24 ± 0.20		
LM200 L200	4605 4615	Min 20 100 Max 200	± 1.2 ± 0.8 ± 0.6	± 0.60 ± 0.25 ± 0.20		
LM250 L250	4600 4610	Min 50 125 Max 250	± 1.0 ± 0.8 ± 0.6	± 0.4 ± 0.3 ± 0.3	300µl	yellow
LM1000 L1000	4606 4616	Min 100 500 Max 1000	± 1.6 ± 0.7 ± 0.6	± 0.40 ± 0.20 ± 0.15	1000µl	blue
LM5000 L5000	4608 4618	Min 1000 2500 Max 5000	± 0.6 ± 0.6 ± 0.5	± 0.25 ± 0.20 ± 0.15	5000µl	white
LM10000 L10000	4609 4619	Min 1000 5000 Max 10000	± 2.5 ± 0.8 ± 0.5	± 0.6 ± 0.3 ± 0.2	10000µl	white

The colour of the shafts for the **L** versions are light grey for all volumes of the pipettes.

The accuracy and precision are obtained with **HTL** tips, using a gravimetric method, performing at least 10 measurements of distilled water at a temperature of 20±1°C, according to EN ISO 8655 standard.

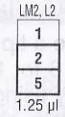
The pipette design enables the user to perform the recalibration process according to the rules presented in section 8.

2 - SETTING THE VOLUME

The counter displays three figures to be read from top to bottom. Additional to the figures on the lower wheel are printed graduations to enable a volume setting in the range increment of each pipette model.

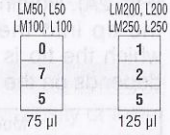
Examples of the meaning of the black and red figures:

Pipettes **LM2, L2**
Red figures at the bottom = 1/100 µl
Increment = 0.002 µl

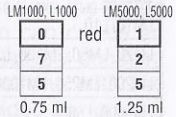


Pipettes **LM10, LM20, L10, L20**
Red figures at the bottom = 1/10 µl
Increment = 0.02 µl

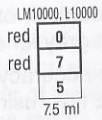
Pipettes **LM50, LM100, LM200, LM250 L50, L100, L200, L250**
Black figures only = 1 µl
Increment = 0.2 µl



Pipettes **LM1000, LM5000, L1000, L5000**
Red figures at the top - ml
Increment = 2 µl 10 µl



Pipettes **LM10000, L10000**
Red figures at the top - ml
Increment = 20 µl



The volume of the pipette is set by turning the black knurled adjustment ring, (Fig. 1 B). To obtain maximum accuracy and repeatability always change the volume from the higher to the lower value:

- For decreasing the volume turn the adjustment ring slowly to the required setting, making sure not to undergo the mark.
- When increasing the volume turn the adjustment ring until the lower figure wheel comes 1/3 of a turn above the required setting. Now turn the ring slowly backward until the setting reaches the desired value. Be sure not to undergo this mark.

3 - ASPIRATING AND DISPENSING LIQUIDS

Place a tip on the shaft of the pipette. See Section 6 for the appropriate tip. Press the tip on firmly using a slight twisting motion to ensure a positive, airtight seal.

Important: Never aspirate liquids into the **LAB MATE+** without a tip attached.

Aspiration

Press the pushbutton to the first positive stop, (Fig. 2A). Holding the pipette 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)
LM2, L2	≤ 1
LM10, L10	≤ 1
LM20, LM50, LM100, L20, L50, L100	2 ÷ 3
LM200, LM250, LM1000, L200, L250, L1000	2 ÷ 3
LM5000, L5000	3 ÷ 6
LM10000, L10000	5 ÷ 7

Release the pushbutton slowly and smoothly to aspirate the sample, (Fig. 2B). Wait one second and then withdraw the tip from the liquid. When the pipette tip is immersed not as deeply as the recommended depth or when the pipetting pushbutton is rapidly released air may enter the disposable tip.

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 depressed to the very end, remove the pipette by drawing the tip against the inside surface of the receiving vessel.
- Release the pushbutton to its starting position, (Fig. 2E).
- Eject the tip by pressing the tip ejector button, (Fig. 2F). Remember to change the tip whenever a different kind of liquid is to be sampled.

Filters

Replaceable filter installed in a seat in the bottom part of the shaft is used in 5000 µl and 10000 µl pipettes (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 of higher viscosity or lower surface tension than water (e.g. sera or organic solvents), a film of liquid is formed on the inside wall of the pipette 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.

- 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 **LAB MATE+** shaft. To prevent this:
  - Press and release the pushbutton slowly and smoothly.
  - Never turn the pipette upside down.
  - Never lay the pipette on its side when there is liquid in the tip.
- Never force the volume setting 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 pipette liquids with temperatures above 70°C.
- When pipetting acids or corrosive solutions which emit vapours, it is recommended to disassemble the shaft and to rinse the piston and seal with distilled water after finishing the pipetting operation.

8 - RECALIBRATION

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

If during pipette 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 pipette 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 pipette, tips and water was identical
- the density of the liquid used is 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 pipette 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 pipette, tips and liquid should be within the range 20-25°C and stabilised 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 pipette 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)
LM2, L2	0.1 - 2	0.2	0.176 - 0.224	0.06
LM10, L10	0.5 - 10	0.5	0.48 - 0.52	0.33
LM20, L20	2 - 20	2	1.94 - 2.06	0.63
LM50, L50	5 - 50	5	4.875 - 5.125	2,50
LM100, L100	10 - 100	10	9.84 - 10.16	2.50
LM200, L200	20 - 200	20	19.76 - 20.24	6.30
LM250 L250	50 - 250	50	49,5 - 50,5	6.30

LM1000, L1000	100 - 1000	100	98.4-101.6	25.00
LM5000, L5000	1000 - 5000	1000	994 - 1006	125.00
LM10000, L10000	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	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

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

- Remove the pipetting pushbutton, (Fig. 4A),
- 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. One full turn of the calibration key changes the pipette aspiration volume by the amount given in the table, (Fig. 4C),
- 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 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.

More information on calibration procedure can be found on *www.htl.com.pl*

9 - TROUBLESHOOTING

If you notice an improper pipette operation identify the cause and eliminate the fault. Doing this, follow the instruction in the sequence provided. Replacement of elements into new ones may be required only exeptionally, 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).
  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 11. When reasembling the pipette, the nut should be hand tightened.
  In the models LM2, LM10, LM20, L2, L10 and L20, the damage of the shaft may also cause a damage of the piston assembly. Replace the damaged parts (see Section 11).

When reasembling the pipette, the nut should be hand tightened.
To remove the tip ejector in models LM5000, L5000, LM10000 and L10000, remove the ejector pushbutton (Fig. 3N) and using a screwdriver unscrew the tip ejector by turning the screwdriver counter-clockwise.

- Damage of 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 11). 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 calibration procedure.
  Note: The parts of LM2, LM10, L2 and L10 pipette should be lubricated evently with the 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 attached 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.

Note: The shaft, shaft nut, ejector, piston assembly, seal and O-ring may be autoclaved at a temperature of 121°C for 20 minutes at pressure 1 bar.

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

The handle and the outside of the pipette may be cleaned using a cloth damped in isopropanol.

If the pipette malfunction persists after carring out the above steps, send the pipette to your **HTL** service representative.

Before returning the pipette, make sure that it is free from any chemical, radioactive or microbiological contamination that might pose any danger during transportation and repairing. Clean the pipette as thoroughly as possible.

10 - PIPETTE KIT

The pipettes are delivered in the kits including:

- Pipette
- Instruction manual
- Calibration key
- Pipette stand
- Ejector regulation spacers (for pipette models LM/L2 – LM/L1000)
- Ejector cap (for pipette models LM/L5000, LM/L10000)
- Tips
- Identification labels
- Filters (for pipette models LM/L5000, LM/L10000)
- Lubricant

The stand assembly diagram is shown in Fig. 5.

11 - SPARE PARTS

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

A: Pushbutton
B: Calibration knob
C: Shaft
D: Ejector
F: Shaft nut
G: Piston assembly
H: Spacer
I: O-ring
J: Seal
K: Calibration key
L: Filter
M: Ejector cap
N: Ejector pushbutton

can be ordered from your **HTL** representative (type of pipette and name of the part for this pipette should be specified).

Warning: The replacement of the piston requires conducting of calibration procedure according to section 8.