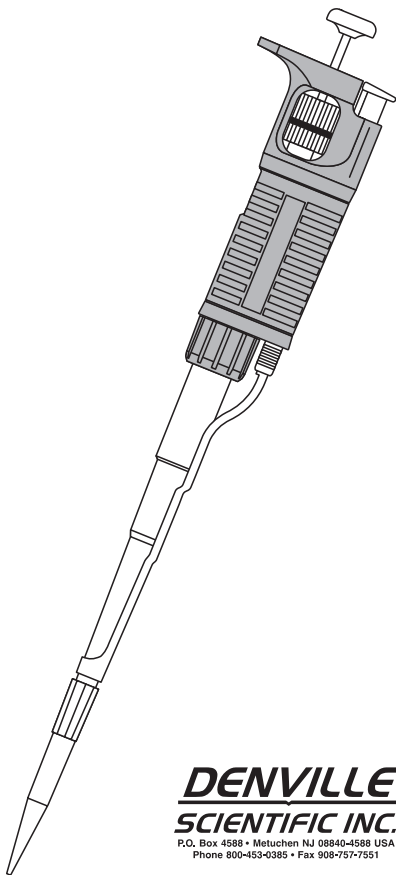
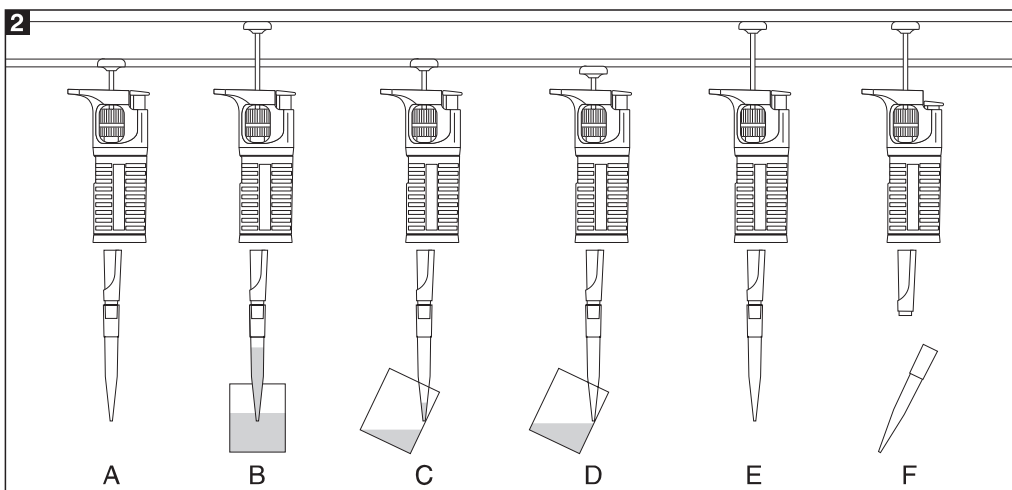
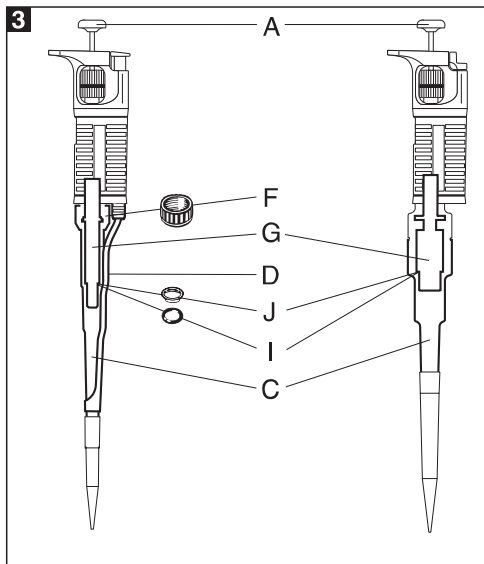
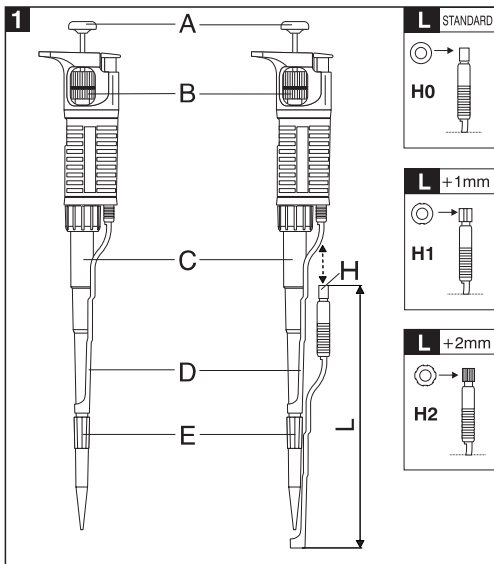


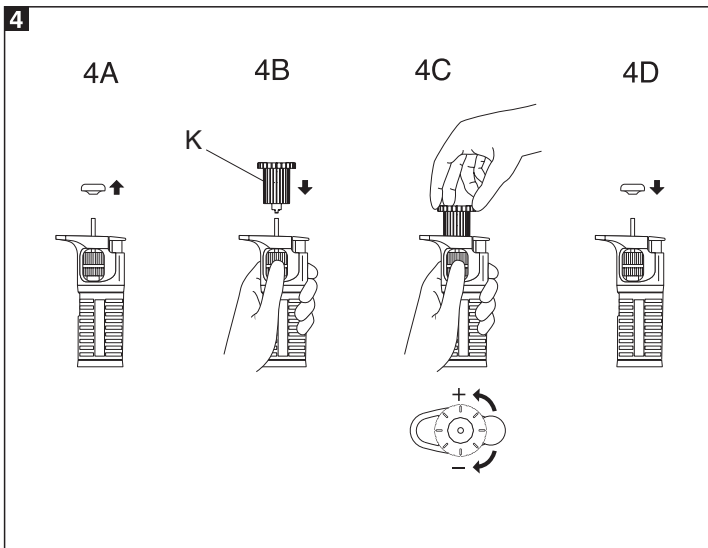
# ***XL 3000i™***



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The volume range from 0.1  $\mu\text{l}$  to 5000  $\mu\text{l}$  is covered by seven pipette models.

Model	Volume range [ $\mu\text{l}$ ]
XL2	0.1 - 2
XL10	0.5 - 10
XL20	2 - 20
XL100	10 - 100
XL200	20 - 200
XL1000	100 - 1000
XL5000	1000 - 5000

XL2, XL10	Measurement and transfer of micro-volumes, DNA sequencing and enzyme-assay applications.
XL20, XL100, XL200 and XL1000	Measurement and transfer of general aqueous solution, acids and bases
XL5000	Measurement and transfer of large volumes

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## 1 - INTRODUCTION

The **XL 3000i™** is a volumetric instrument designed to measure and transfer liquids precisely and safely. It can measure and transfer volumes from 0.1  $\mu\text{l}$  to 5000  $\mu\text{l}$  depending on the model.

The **XL 3000i™** has a digital volume display. 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 for the pipette is shown on the pushbutton and corresponds to the model number, Fig. 1A.

The **XL 3000i™** uses disposable polypropylene tips, Fig. 1E. The disposable tips ensure maximum safety for the user and no cross contamination between samples. To protect the user from contamination by the tips, the **XL 3000i™** is equipped with a built-in tip ejector, Fig. 1D.

When using very narrow test tubes, it may be necessary to remove the tip ejector. It is simply removed by pulling down.

### Adjusting Tip Ejector length

The interchangeable "H" spacers, included in the box, allow for adjusting the length of the tip ejector by +1mm or +2mm. An "HO" spacer is inserted on a standard basis. The outside shape of the spacer identifies the size change. Adjusting the length of the ejector will enable the use of a majority of tips found on the market with the pipette.

**Note:** that **XL5000** does not have a built-in tip ejector.

The **XL 3000i™** 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 **Denville** tips. These figures are only guaranteed when **Denville** tips are used.

## SPECIFICATIONS

Model	Volume [µl]	Accuracy [%]	Precision [%]
XL2	0.2	±12.0	≤ 6.0
	1.0	±2.7	≤ 1.3
	Max. 2.0	±1.5	≤ 0.7
XL10	Min. 0.5	±4.0	≤ 4.0
	5.0	±1.0	≤ 0.8
	Max. 10.0	±0.5	≤ 0.4
XL20	Min. 2	±4.0	≤ 3.0
	10	±1.0	≤ 0.7
	Max. 20	±0.8	≤ 0.4
XL100	Min. 10	±1.6	≤ 0.8
	50	±1.0	≤ 0.4
	Max. 100	±0.8	≤ 0.3
XL200	Min. 20	±1.2	≤ 0.6
	100	±1.0	≤ 0.3
	Max. 200	±0.6	≤ 0.3
XL1000	Min. 100	±0.9	≤ 0.45
	500	±0.7	≤ 0.25
	Max. 1000	±0.6	≤ 0.25
XL5000	Min. 1000	±0.6	≤ 0.3
	2500	±0.6	≤ 0.3
	Max. 5000	±0.5	≤ 0.2

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 specifications for the volumetric performance of the **XL 3000i™** are derived from extensive gravimetric tests as prescribed by the Deutsches Institut für Normung e.V. To verify the performance of your pipette, request document DIN 12650.

The pipette 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 XL2, XL10, XL20, XL100 and XL200 pipettes, the numbers in black represent microliters and the numbers in red represent tenths and hundredths of microliters.

*AN EXAMPLE FOR EACH OF THESE PIPETTES IS GIVEN BELOW*

XL 2	XL 10	XL 20	XL 100	XL 200
1	0	1	0	1
2 red	7	2	7	2
5 red	5 red	5 red	5	5
1.25 µl	7.5 µl	12.50 µl	75 µl	125 µl

For the XL1000 and XL5000 pipettes, the numbers in red represent milliliters and the numbers in black represent microliters.

*AN EXAMPLE FOR EACH OF THESE PIPETTES IS GIVEN BELOW*

XL 1000	XL 5000
0 red	1 red
7	2
5	5
0.75 ml	1.25 ml

The volume of the pipette is set by turning the black knurled adjustment ring, Fig. 1B. To obtain maximum accuracy when changing the volumeter setting, follow the recommendations below.

- When decreasing the volume setting, turn the adjustment ring slowly to reach the required setting, making sure not to overshoot the mark.
- When increasing the volume setting, turn the adjustment ring until you are 1/3 of a turn above the required setting. Turn the adjustment ring slowly to decrease the volume to reach the required setting, making sure not to overshoot the mark.

## 3 - OPERATION

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.

Note: Never handle a liquid with a **XL 3000i™** which has not been fitted with a tip.

### 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.

XL2 and XL10	≤1 mm
XL20 and XL100	2 - 3 mm
XL200 and XL1000	2 - 4 mm
XL5000	3 - 6 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 pipette 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.

## 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 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.

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 XL 3000i™ model XL20*

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 - DENVILLE PIPETTE TIPS

**Denville** tips are made from high performance polypropylene and their quality guarantees the precision and accuracy associated with the **XL 3000i™**.

Strict control is maintained throughout the manufacturing process to ensure the highest quality. The accuracy and precision figures for the **XL 3000i™** are only guaranteed when **Denville** tips are used. The use of inferior quality tips will seriously degrade the performance of the **XL 3000i™**.

Some **Denville** tips are color coded and correspond to the color on the pushbutton.

## White tips 10

These tips are used for volumes between 0.1  $\mu\text{l}$  and 10  $\mu\text{l}$ . They are used with the XL2 and the XL10 models.

## Yellow tips 200

These tips are used for volumes between 2  $\mu\text{l}$  and 200  $\mu\text{l}$ . They are used with the XL20, XL100, and the XL200 models.

## Blue tips 1000

These tips are used for volumes between 100  $\mu\text{l}$  and 1000  $\mu\text{l}$ . They are used with the XL1000 model.

## White tips 5000

These tips are used for volumes between 1000  $\mu\text{l}$  and 5000  $\mu\text{l}$ . They are used with the XL5000 model.

## 7 - RECOMMENDATIONS

The recommendations below will ensure maximum accuracy and precision from your **XL 3000i™**.

- Make sure to operate the **XL 3000i™** slowly and smoothly.
- The depth of immersion in the sample liquid should be the minimum necessary and should remain constant during aspiration.
- The **XL 3000i™** 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 **XL 3000i™** 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 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 pipette 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 pipette is calibrated by gravimetric method, using distilled water, at the temperature  $20 \pm 1^\circ\text{C}$ , according to DIN 12650.

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 was close to that of distilled water
- the balance with appropriate sensitivity has been used

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

- mg/ $\mu\text{l}$  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 stabilized during weighing within  $\pm 0.5^\circ\text{C}$
- Measurements should be conducted using distilled water
- Balance sensitivity should be suitable for the volume to be controlled

#### Recalibration procedure:

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

Model	Range of the pipette volumes [ $\mu\text{l}$ ]	Preset volume [ $\mu\text{l}$ ]	Permissible volumes [ $\mu\text{l}$ ]	Volume change $\Delta V$ for full turn of the calibration key [ $\mu\text{l}$ ] (24 increments)
XL2	0.1 - 2	0.2	0.176 - 0.224	0.06
XL10	0.5 - 10	0.5	0.48 - 0.52	0.33
XL20	2 - 20	2	1.92 - 2.08	0.63
XL100	10 - 100	10	9.84 - 10.16	2.50
XL200	20 - 200	20	19.76 - 20.24	6.30
XL1000	100 - 1000	100	99.1 - 100.9	25.00
XL5000	1000 - 5000	1000	994 - 1006	125.00

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

Temperature [ $^\circ\text{C}$ ]	Pressure [hPa]		
	960	1013	1067
20	1.0028	1.0029	1.0029
21	1.0031	1.0032	1.0032
22	1.0032	1.0033	1.0033
23	1.0035	1.0035	1.0036
24	1.0037	1.0038	1.0038
25	1.0039	1.0040	1.0041

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



## 9 - TROUBLESHOOTING

If there is a leak or the pipette is not accurate, check for the following.

- The connecting nut is loose, Fig. 3F.  
**Tighten the connecting nut.**
- The shaft is cracked or scored.  
**Remove the tip ejector and inspect the shaft. For the XL2, XL10 and XL20 models, if the shaft is damaged, the piston may also be damaged. Replace the damaged parts (see Section 11). When reassembling the pipette, the nut should be hand tightened.**
- Chemical damage to the piston and seals.  
**Replace the piston and seals (See Section 11). Wash the inside of the shaft using distilled water.**
- Improper reassembly.  
**Disassemble the pipette and reassemble the pipette correctly, Fig. 3.**

If there is liquid in the shaft, clean the pipette as follows.

- Remove the tip ejector. Unscrew the shaft nut and rinse the shaft, piston, seal and O-ring with distilled water. Dry these parts and reassemble the pipette.

**Note: If necessary, the shaft, shaft nut and the tip ejector can be autoclaved for 20 minutes at 121°C and at 1 bar pressure. The seal and the O-ring should not be autoclaved.**

The outside of the XL 3000i™ can be cleaned using a cloth dampened with isopropanol.

If there is an air bubble when the sample is aspirated.

- Eject the sample into its original vessel.
- Check that the tip is properly immersed in the same liquid.
- Aspirate the sample more slowly.  
If the bubble appears for the second time, replace the tip.

If a problem continues after carrying out the above steps, send the pipette to your Denville representative.

Before returning a pipette to a Denville representative, please ensure that the instrument is completely free of any contamination (chemical, microbial or radioactive).

## 10 - PIPETTE KIT AND ACCESSORIES

### Pipette kit:

The pipettes are delivered in the kits including:

- Pipette
- Instruction manual
- Calibration key
- Ejector regulation spacers
- Identification labels

### Accessories

Cat. No.	Description
P 1095-CP	White tips 10 µl
P 4104	Yellow tips 200 µl
P 4026	Blue tips 1000 µl
P 2286	White tips 5000 µl
P 3988	Stand for 6 pipettes

## 11 - SPARE PARTS

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

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

can be ordered from a Denville representative (type of the pipette and name of the part for this pipette should be specified).

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