



Finnpipette® F3 Single Channel Variable & Fixed Volume Multichannel

Instructions for Use
操作指南

This product complies with the European Union Directive 98/79/EC, and it is marked with a CE-marking.

When the product is used in applications related to the directive 98/79/EC, read the additional information at www.thermofisher.com or contact the manufacturer at info.pipettes@thermofisher.com to ensure correct and safe use.

The CE-mark covers the system containing the CE-marked Finnpiquette F3 pipette and the CE-marked Finntips.

Product specifications are subject to change without prior notice. Finnpiquette® and Finntip® are registered trademarks of Thermo Fisher Scientific Oy.

本产品符合欧盟指令98/79/EC的标准，并标有CE标志。

如须依据该指令使用本移液器，使用者还应阅读 www.thermofisher.com 上的其它有关信息，或者通过 info.pipettes@thermofisher.com 邮箱联系制造商以确保正确安全地使用。

CE 标志涵盖了包括印有CE标志的Finnpiquette F3以及Finntips的整个体系。产品规格可能有变，恕不另行通知。

Finnpiquette® 和Finntip® 均为Thermo Fisher Scientific的注册商标。

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Product description

The Finnpiquette F3 is a continuously adjustable, general purpose micropipette for sampling and dispensing accurate liquid volumes.

It operates on an air displacement principle (i.e. an air interface) and uses detachable, disposable tips.

The adjusted delivery volume is displayed digitally on a readout window in the handle.

The twelve different models of Finnpiquette F3 pipettes cover a volume range from 0.2 μ l to 10 ml.

Order No.	Volume Range	Color code	Finntip
4640110	0,2 μ l to 2 μ l	pink	Flex 10, 10, 20, 50
4640000	1 μ l to 10 μ l	pink	Flex 10, 10, 20, 50
4640010	1 μ l to 10 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4640020	2 μ l to 20 μ l	turquoise	50
4640030	2 μ l to 20 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4640080	5 μ l to 50 μ l	turquoise	50
4640090	5 μ l to 50 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4640040	10 μ l to 100 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4640050	20 μ l to 200 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4640060	100 μ l to 1000 μ l	blue	Flex 1000, 1000, 1000 Ext
4640100	0,5 ml to 5 ml	green	5 ml
4640070	1 ml to 10 ml	red	10 ml, Flex 10 ml Ext

The eleven different models of Finnpiquette F3 Fixed Volume pipettes cover a volume range from 1 μ l to 10 ml.

Order No.	Volume Range	Color code	Finntip
4650000	1 μ l	dark blue	Flex 10, 10, 20, 50
4650010	5 μ l	dark blue	Flex 10, 10, 20, 50
4650020	10 μ l	dark blue	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4650090	20 μ l	dark blue	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4650030	25 μ l	dark blue	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4650040	50 μ l	dark blue	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4650050	100 μ l	dark blue	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4650100	200 μ l	dark blue	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4650060	250 μ l	dark blue	Flex 1000, 1000, 1000 Ext
4650070	500 μ l	dark blue	Flex 1000, 1000, 1000 Ext
4650080	1000 μ l	dark blue	Flex 1000, 1000, 1000 Ext

The four different models of Finnpiquette F3 Multichannel pipettes cover a volume range from 5 μ l to 300 μ l.

Order No.	Channel	Volume Range	Color code	Finntip
4660010	8	5 μ l to 50 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4660040	12	5 μ l to 50 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4660020	8	30 μ l to 300 μ l	orange	Flex 300, 300
4660050	12	30 μ l to 300 μ l	orange	Flex 300, 300

Digital display

The adjusted delivery volume is clearly indicated in the large digital display on the handle.



Raw materials

The Finnpiquette F3 is made of mechanically durable and chemically resistant materials.

The tip cone modules can be repeatedly autoclaved at 121°C.

Description of tips

Finntips are recommended for use with the Finnpiquette F3.


They are made of virgin natural colour polypropylene, generally regarded as the only contamination free material suitable for tips. Finntips are also autoclavable (121°C).

Package

The Finnpiquette F3 is shipped in a specially designed package containing the following items:

1. The Finnpiquette
2. Service tool
3. Multichannel service tool
4. Bag of grease 1g (**Order No. 3300200**)
5. Instructions for Use
6. Calibration certificate / Warranty certificate

Safety

Cautions are marked with this symbol .

Intended use

The intended use of the device is to transfer liquids in the volume range of 0,2 µl to 10 ml. The F3 Finnpiquette pipette and Finntips are designed as a component of an analyzing system for an end user, who is responsible for validating the system to ensure reliable and safe results.



Damage to health

- ▶ Follow general procedures for hazard prevention and safety instructions; e.g. wear protective clothing, eye protection and gloves.
- ▶ For use and waste disposal of hazardous (e.g. radioactive and potentially infectious) material, follow the safety instructions and general laboratory practice.
- ▶ The pipette and tips are not intended for in vivo use. Do not use the pipette for pipetting any liquid to be injected into a human body.
- ▶ Do not eject the tip towards anybody.

The Finnpiquette F3 is to be used by trained personnel with required laboratory skills. The instructions for use must be read prior to and during the use of the device (pipette and tip). The F3 pipette can be used between +4°C and +40°C.



Incorrect dispensing results

- ▶ Performance may vary due to:
 - a. pipetting method (forward pipetting technique recommended)
 - b. temperature (air, liquid, vessel, pipette, and tip)
 - c. pressure
 - d. humidity
 - e. operator, e.g. thumb movement, pipetting angle
 - f. liquid density, viscosity and vapor pressure
 - g. type of tip
- ▶ If the pipetting performance is critical to the outcome of a specific application, the result has to be assured with an alternative test, and if this is not an option, by duplicate testing. The possibility of an incorrect volume delivery during pipetting cannot be entirely mitigated.
- ▶ To avoid inaccurate dispensing and/or leakage, check that the tip is properly attached to the pipette.
- ▶ When rotating the volume adjustment button, do not exceed the volume range of the pipette. Otherwise the pipette may be damaged or affect pipetting performance.
- ▶ Pipetting performance cannot be guaranteed if the tip is reused.
- ▶ Choose only a tip and pipette with matching color coding.

Disposal of the Materials

Follow laboratory and country-specific procedures for the disposal of biohazardous or radioactive waste. Refer to local regulations for the disposal of infectious material.

Warning The tips can be potentially infectious. Dispose of all used disposable tips as biohazardous waste.

Warning Decontaminate the pipette before disposal.

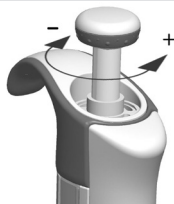
Waste disposal according to local instructions taking into account legislation in place. For more information, please contact us at info.pipettes@thermofisher.com or your local Thermo Fisher Scientific representative.

Regarding the original packaging and packing materials, use the recycling operators known to you.

Pipette operation

Setting the delivery volume

1. Set the delivery volume using the push button on the top of the pipette. To increase the delivery volume, turn the push button counterclockwise. To decrease the delivery volume, turn it clockwise.
2. Make sure that the desired delivery volume clicks into place.
3. Do not set volumes outside the pipette's specified volume range. Using excessive force to turn the push button outside the range may jam the mechanism and eventually damage the pipette.

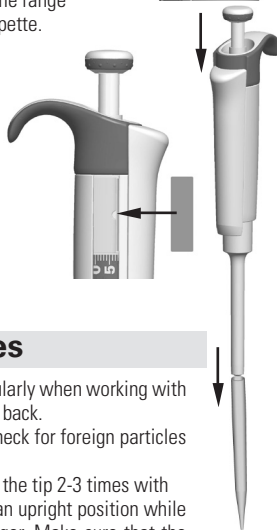


Safety Label

You can mark the pipette application, your initials, the calibration date, etc. on the safety label. Remove the old label with a sharp needle. Mark the new label with a pencil and slide the label back in place.

Tip ejection

To help eliminate the risk of contamination, each pipette is fitted with a tip ejector system. To release the tip, point the pipette at suitable waste receptacle and press the tip ejector with your thumb.



Pipetting techniques

Push and release the push button slowly at all times particularly when working with high viscosity liquids. Never allow the push button to snap back.

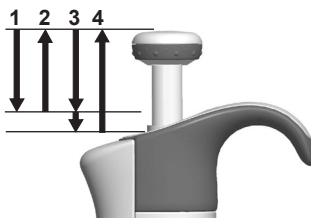
Make sure that the tip is firmly attached to the tip cone. Check for foreign particles in the tip.

Before you begin your actual pipetting work, fill and empty the tip 2-3 times with the solution that you will be pipetting. Hold the pipette in an upright position while aspirating liquid. The grippy should rest on your index finger. Make sure that the tips, pipette and solution are at the same temperature.

Forward technique

Fill a clean reagent reservoir with the liquid to be dispensed.

1. Depress the push button to the first stop.
2. Dip the tip under the surface of the liquid in the reservoir to a depth of about 1 cm and slowly release the push button. Withdraw the tip from the liquid touching it against the edge of the reservoir to remove excess liquid.

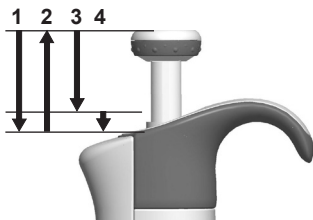


- Deliver the liquid by gently depressing the push button to the first stop. After a delay of about one second, continue to depress the push button all the way to the second stop. This action will empty the tip.
- Release the push button to the ready position. If necessary, change the tip and continue pipetting.

Reverse technique

The reverse technique is suitable for dispensing liquids that have a high viscosity or a tendency to foam easily. The technique is also recommended for dispensing very small volumes. Fill a clean reagent reservoir with the liquid to be dispensed.

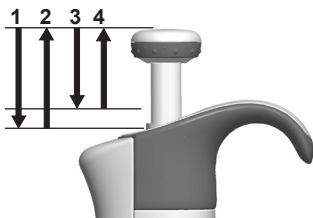
- Depress the push button all the way to the second stop.
- Dip the tip under the surface of the liquid in the reservoir to a depth of about 1 cm, and slowly release the push button. This action will fill the tip. Withdraw the tip from the liquid touching it against the edge of the reservoir to remove excess liquid.
- Deliver the preset volume by gently depressing the push button to the first stop. Hold the push button at the first stop. Some liquid will remain in the tip and this should not be included in the delivery.
- The remaining liquid should either be discarded with the tip or pipetted back into the container.



Repetitive technique

The repetitive technique offers a rapid and simple procedure for repeated delivery of the same volume. Fill a clean reagent reservoir with the liquid to be dispensed.

- Depress the push button all the way to the second stop.
- Dip the tip under the surface of the liquid in the reservoir to a depth of about 1 cm, and slowly release the push button. This action will fill the tip. Withdraw the tip from the liquid touching against the edge of the reservoir to remove excess liquid.
- Deliver the preset volume by gently depressing the push button to the first stop. Hold the push button at the first stop. Some liquid will remain in the tip and this should not be included in the delivery.
- Continue pipetting by repeating steps 3 and 4.



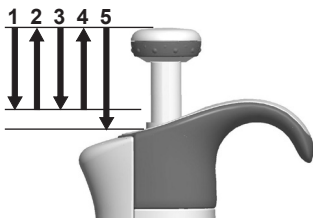
Pipetting of heterogeneous samples

(deproteinization in blood glucose determination, for example)

Use steps 1 and 2 of the forward technique to fill the tip with blood.

Wipe the tip carefully with a dry clean tissue.

- Immerse the tip into the reagent and depress the push button to the first stop, making sure the tip is well below the surface.
- Release the push button slowly to the ready position. This will fill the tip. Keep the tip in the solution.
- Depress the push button to the first stop and release slowly. Keep repeating this procedure until the interior wall of the tip is clear.
- Finally, depress the push button all the way to the second stop to completely empty the tip.



Calibration and adjustment

All Finnpiettes are factory calibrated and adjusted to give the volumes as specified with distilled or deionized water using the forward pipetting technique. It should be noted that the use of other pipetting techniques may affect the calibration results. The pipettes are constructed to permit re-adjustment for other pipetting techniques or liquids of different temperature and viscosity.

Device requirements and test conditions

An analytical balance must be used. The scale graduation value of the balance should be chosen according to the selected test volume of the pipette:

Volume range	readable graduation
under 10 μ l	0.00 1 mg
10-100 μ l	0.01 mg
above 100 μ l	0.1 mg

Test liquid: Water, distilled or deionized, "grade 3" water conforming ISO 3696. Tests are done in a draft-free room at a constant ($\pm 0.5^{\circ}\text{C}$) temperature of water, pipette and air between 15°C to 30°C . The relative humidity must be above 50%. Especially with volumes under 50 μ l the air humidity should be as high as possible to reduce the effect of evaporation loss. Special accessories, such as the evaporation trap, are recommended.

Procedure to check calibration

The pipette is checked with the maximum volume (nominal volume) and with the minimum volume. A new tip is first pre-wetted 3-5 times and a series of ten pipettings is done with both volumes. A pipette is always adjusted for delivery (Ex) of the selected volume. Use of forward pipetting technique is recommended. The maximum permissible errors are designed for forward method. It is recommended to calibrate all channels of the multichannel pipette, but a suitable method is also to calibrate only the edge channels. Adjustment check prior calibration is done using one of the middle channels. It is recommended to use the ISO8655 calibration limits presented in the following tables or user-defined specifications.

Procedure:

1. Do 10 pipettings with the minimum volume.
2. Do 10 pipettings with the maximum volume.
3. Calculate the inaccuracy (A) and imprecision (cv) of both series.
4. Compare the results to the limits.

If the calculated results are within the selected limits, the adjustment of the pipette is correct.

ISO8655 calibration specifications

Thermo Scientific Finnpiquette F3 specifications according to ISO8655 standard.

Finnpiquette F3 Variable Volume Single Channel

Range	Volume μl	Inaccuracy		Imprecision	
		μl	%	s.d. μl	cv%
0.2-2 μ l	2	± 0.080	± 4	0.040	2.0
	0.2	± 0.080	± 40	0.040	20.0
1-10 μ l	10	± 0.120	± 1.2	0.080	0.8
	1	± 0.120	± 12	0.080	8.0
2-20 μ l	20	± 0.20	± 1.0	0.10	0.5
	2	± 0.20	± 10.0	0.10	5.0
5-50 μ l	50	± 0.50	± 1.0	0.20	0.4
	5	± 0.50	± 10	0.20	4.0
10-100 μ l	100	± 0.80	± 0.8	0.30	0.3
	10	± 0.80	± 8.0	0.30	3.0
20-200 μ l	200	± 1.60	± 0.8	0.60	0.3
	20	± 1.60	± 8.0	0.60	3.0
100-1000 μ l	1000	± 8.0	± 0.8	3.0	0.3
	100	± 8.0	± 8.0	3.0	3.0
0.5-5 ml	5000	± 40.0	± 0.8	15.0	0.3
	500	± 40.0	± 8.0	15.0	3.0
1-10 ml	10000	± 60.0	± 0.6	30.0	0.3
	1000	± 60.0	± 6.0	30.0	3.0

Finnpipette F3 Fixed Volume Single Channel

Fixed Volume μl	Inaccuracy		Imprecision	
	μl	%	s.d. μl	cv%
1	± 0.050	± 5.00	0.050	5.00
5	± 0.125	± 2.50	0.075	1.50
10	± 0.120	± 1.20	0.080	0.80
20	± 0.20	± 1.00	0.10	0.50
25	± 0.50	± 2.00	0.20	0.80
50	± 0.50	± 1.00	0.20	0.40
100	± 0.80	± 0.80	0.30	0.30
200	± 1.6	± 0.80	0.60	0.30
250	± 4.0	± 1.60	1.50	0.60
500	± 4.0	± 0.80	1.50	0.30
1000	± 8.0	± 0.80	3.00	0.30

Finnpipette F3 Variable Volume Multichannel

Range	Channel	Volume μl	Inaccuracy		Imprecision	
			μl	%	s.d. μl	cv%
5-50 μl	8, 12	50	± 1.0	± 2.0	0.4	0.8
		5	± 1.0	± 20	0.4	8.0
30-300 μl	8, 12	300	± 8.0	± 2.7	3.0	1.0
		30	± 8.0	± 26.7	3.0	10.0

Manufacturer specification limits

Finnpipette F3 Variable Volume Single Channel

Range	Volume μl	Inaccuracy		Imprecision		Factory calibration tip
		μl	%	s.d. μl	cv%	
0.2-2 μl	2	$\pm 0,050$	$\pm 2,50$	0,040	2,00	Flex 10
	0,2	$\pm 0,024$	$\pm 12,00$	0,020	10,00	
1-10 μl , micro	10	$\pm 0,100$	$\pm 1,00$	0,050	0,50	Flex 10
	1	$\pm 0,025$	$\pm 2,50$	0,020	2,00	
1-10 μl	10	$\pm 0,100$	$\pm 1,00$	0,080	0,80	Flex 200
	1	$\pm 0,035$	$\pm 3,50$	0,030	3,00	
2-20 μl , micro	20	$\pm 0,20$	$\pm 1,00$	0,08	0,40	50
	2	$\pm 0,06$	$\pm 3,00$	0,05	2,50	
2-20 μl	20	$\pm 0,20$	$\pm 1,00$	0,08	0,40	Flex 200
	2	$\pm 0,06$	$\pm 3,00$	0,05	2,50	
5-50 μl , micro	50	$\pm 0,30$	$\pm 0,60$	0,15	0,30	50
	5	$\pm 0,15$	$\pm 3,00$	0,125	2,50	
5-50 μl	50	$\pm 0,30$	$\pm 0,60$	0,15	0,30	Flex 200
	5	$\pm 0,15$	$\pm 3,00$	0,125	2,50	
10-100 μl	100	$\pm 0,80$	$\pm 0,80$	0,20	0,20	Flex 200
	10	$\pm 0,30$	$\pm 3,00$	0,10	1,00	
20-200 μl	200	$\pm 1,2$	$\pm 0,60$	0,4	0,20	Flex 200
	20	$\pm 0,36$	$\pm 1,80$	0,14	0,70	
100-1000 μl	1000	$\pm 6,0$	$\pm 0,60$	2,0	0,20	Flex 1000
	100	$\pm 1,0$	$\pm 1,00$	0,6	0,60	
0,5-5 ml	5000	$\pm 25,0$	$\pm 0,50$	10,0	0,20	5 ml
	500	$\pm 10,0$	$\pm 2,00$	4,0	0,80	
1-10 ml	10000	$\pm 50,0$	$\pm 0,50$	20,0	0,20	10 ml
	1000	$\pm 20,0$	$\pm 2,00$	8,0	0,80	

Finnpipette F3 Fixed Volume Single Channel

Fixed Volume μl	Inaccuracy		Imprecision		Factory calibration tip
	μl	%	s.d. μl	cv%	
1	$\pm 0,040$	$\pm 4,00$	0,040	4,00	Flex 10
5	$\pm 0,070$	$\pm 1,40$	0,070	1,40	Flex 10
10	$\pm 0,090$	$\pm 0,90$	0,080	0,80	Flex 200
20	$\pm 0,14$	$\pm 0,70$	0,10	0,50	Flex 200
25	$\pm 0,15$	$\pm 0,60$	0,125	0,50	Flex 200
50	$\pm 0,30$	$\pm 0,60$	0,20	0,40	Flex 200
100	$\pm 0,40$	$\pm 0,40$	0,30	0,30	Flex 200
200	$\pm 0,80$	$\pm 0,40$	0,60	0,30	Flex 200
250	$\pm 1,0$	$\pm 0,40$	0,75	0,30	Flex 1000
500	$\pm 1,5$	$\pm 0,30$	1,5	0,30	Flex 1000
1000	$\pm 3,0$	$\pm 0,30$	3,0	0,30	Flex 1000

Finnpipette F3 Variable Volume Multichannel

Range	Channels	Volume μl	Inaccuracy		Imprecision		Factory calibration tip
			μl	%	s.d. μl	cv%	
5-50 μl	8, 12	50	$\pm 0,75$	$\pm 1,50$	0,35	0,70	Flex 200
		5	$\pm 0,25$	$\pm 5,00$	0,10	2,00	
30-300 μl	8, 12	300	$\pm 3,0$	$\pm 1,00$	0,9	0,30	Flex 300
		30	$\pm 1,5$	$\pm 5,00$	0,6	2,00	

Adjustment

Adjustment is done only for one volume. The recommended adjustment volume is the minimum volume or 10% of the maximum volume. Multichannel pipettes adjustment check prior calibration is done using one of the middle channels.

1. Place the service tool into the openings of the calibration nut at the top of the handle.
2. Turn the service tool clockwise to increase, or counterclockwise to decrease the volume.
3. After adjustment check the calibration according to the instructions above.



Formulas for calculating results

Conversion of mass to volume

$$V = (w + e) \times Z$$

V = volume (μl)

w = weight (mg)

e = evaporation loss (mg)

Z = conversion factor for $\mu\text{l}/\text{mg}$ conversion

Evaporation loss can be significant with low volumes. To determine mass loss, dispense water to the weighing vessel, note the reading and start a stopwatch. See how much the reading decreases during 30 seconds (e.g. 6 mg = 0.2 mg/s).

Compare this to the pipetting time from taring to reading. Typically pipetting time might be 10 seconds and the mass loss is 2 mg (10 s x 0.2 mg/s) in this example. If an evaporation trap or lid on the vessel is used the correction of evaporation is usually unnecessary.

The factor Z is for converting the weight of the water to volume at test temperature and pressure. A typical value is 1.0032 $\mu\text{l}/\text{mg}$ at 22°C and 95 kPa. See the conversion table on page 24.

Inaccuracy (systematic error)

Inaccuracy is the difference between the dispensed volume and the selected volume of a pipette.

$$A = \bar{V} - V_0$$

$\frac{A}{\bar{V}}$ = inaccuracy

\bar{V} = mean volume

V_0 = nominal volume

Inaccuracy can be expressed as a relative value: **A% = 100% x A / V₀**

Imprecision (random error)

Imprecision refers to the repeatability of the pipettings. It is expressed as standard deviation (s) or coefficient of variation (cv)

$$S = \sqrt{\frac{\sum_{i=1}^n (V_i - \bar{V})^2}{n-1}}$$

s = standards deviation
 \bar{v} = mean volume
 n = number of measurements

Standard deviation can be expressed as a relative value (CV) **CV = 100% x S / \bar{V}**

Maintenance

When the Finnpiquette F3 is not in use, make sure it is stored in an upright position. We recommend a Finnpiquette stand for this purpose.

The part # refer to exploded views beginning at page 25.

Short-term service

The pipette should be checked at the beginning of each day for dust and dirt on the outside surfaces of the pipette.

Particular attention should be paid to the tip cone. No other solvents except 70 % ethanol should be used to clean the pipette.

Long-term maintenance, single channel pipettes

Annual pipette usage varies significantly among laboratories, and the types of substances being aspirated and dispensed also vary tremendously among laboratories. In order to maintain proper care of the pipette, it is the laboratory's responsibility to develop a proper maintenance program that meets its specific needs and requirements.

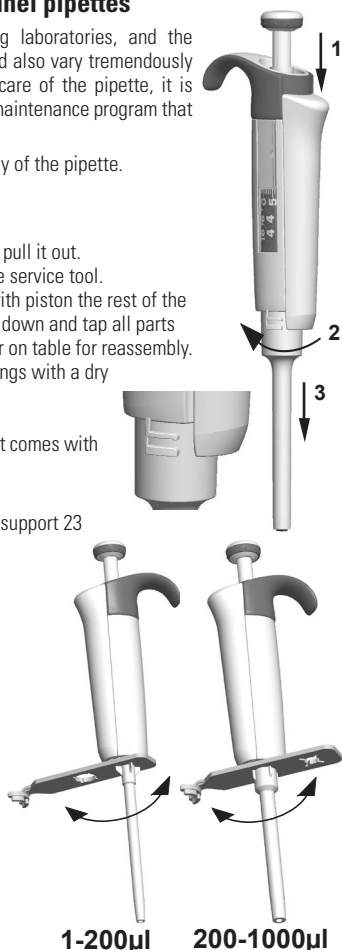
The servicing procedure starts with the disassembly of the pipette.

1-1000 μ l pipettes

1. Press the tip ejector.
2. Rotate the tip ejector 11 counterclockwise and pull it out.
3. Turn out the tip cone counterclockwise with the service tool.
4. Pull out the piston and other parts. Push out with piston the rest of the piston assembly. Then turn the tip cone upside down and tap all parts from tip cone. Remember keep all parts in order on table for reassembly.
5. Clean the piston, the piston spring and the O-rings with a dry napless cloth.
6. Check the tip cone for foreign particles.
7. Grease the cleaned parts with the lubricant that comes with the pipette.
8. Reassemble the pipette components.

0.2-2 μ l & 1-10 μ l: First, slide spring 22, o-ring support 23 and o-ring 24 on the tube 21. With the 0.2-2 μ l model insert the tube 27 into the tube 21. Then slide the spring 13, spring support 16 and tubes 17 and 18, bigger o-ring 19 and smaller sealing 20 back on the piston.

Compress the spring with fingers by pressing piston and spring support 16 against each other and slide the tube 21 with rest of the parts on the piston. Hold the spring compressed and carefully slide the entire assembly into the tip cone and release the spring.



2-20 µl & 5-50 µl: Slide the spring 13, spring support 16 and tubes 17 and 18, bigger o-ring 19 and smaller o-ring 20 back on the piston. Compress the spring with fingers by pressing piston and spring support 16 against each other and slide the bigger o-ring 19, smaller o-ring 20, spring support 21 and the spring 22 (smaller diameter against spring support 21) on the piston. Hold the spring compressed and carefully slide the entire assembly into the tip cone and release the spring.

10-100 µl & 20-200 µl: Slide the spring 13, spring support 16 and o-ring 17 back on the piston. Slide the entire assembly into the tip cone.

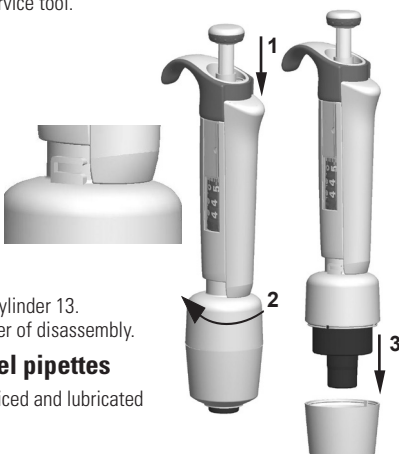
100-1000µl: Put the o-ring 17 and support ring 16 to the tip cone. Slide the spring 13 on the piston and slide the entire assembly into the tip cone.

- All:** Put the spring 15 and support 14 on top of the tip cone and carefully insert the tip cone assembly to the handle. Attach the tip cone by turning it first clockwise tight by hand, then do the final tightening with the service tool.

- Reassemble the tip ejector.

0.5-5ml & 1-10 ml pipettes

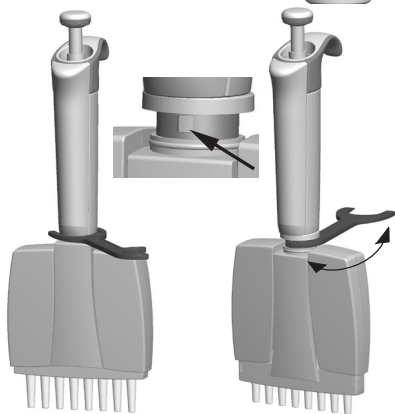
- Press the tip ejector.
- Rotate the tip ejector 10 counterclockwise to open it.
- Disassemble the lower part of the tip ejector 14 (snap fitting).
- Turn the cylinder 13 counterclockwise and pull out the tip cone assembly.
- Remove the cylinder 13 by pressing the snaps fittings of the cylinder.
- Clean and regrease the O-ring 12 and cylinder 13.
- Assemble the parts in the opposite order of disassembly.



Long-term service, multichannel pipettes

If the pipette is used daily it should be serviced and lubricated every three months.

- Place the service tool head#1 between ring 15 and ejector 23. Push the tool until the parts snap from each other.
- Check that the ejector lever is in up position and pull down the tip ejector part of the module. Place the service tool head#2 in the hole of adapter tube 46.
- Open the upper end of the tip ejector slightly and remove the tip ejector.
- Screw out the module of the handle.
- Pull out the module spring 19 and clip 22.
- Press the spring 13 and remove the locking pieces 12 from the groove. Remove the spring 13.
- Take off the locking claws 44 and 45 and pull out the adapter tube 43 and tube 46.
- Use a screwdriver to remove the four/six screws in the module cover and lift off the cover.
- Remove the piston bar and clean the pistons and tip cones with a dry nap-free cloth.
- If needed, service the tip cones:



Open the tip cone by carefully releasing the cover ring from its snap joint with the screwdriver. Remove all the parts from the tip cone. Clean all the parts. If needed, replace the o-rings. Take one piston. Slide cover ring 32 (larger hole), spring 34, support ring 35, (o-ring 37 bigger 5-50µl) and o-ring 36 (smaller) onto the piston. Grease the o-ring with the lubricant provided in the pipette package. Slide all the parts into the tip cone and close the snap joint of the cover ring. Repeat procedure to each tip cone.

11. Install the piston bar with pistons and tip cones in the cover. Place aligning studs to the same side when assembling the module. Close the cover with the four/six screws. Insert the clip 22.
12. Place the adapter tube 43 and tube 46 on the neck of the module and insert the locking claws 44 and 45. Insert the module spring 19.
13. Insert spring 13 and locking pieces 12 to the piston rod 16.
14. Place the tip ejector on the module. Push the spring 19 inside tip ejector parts and close the upper end of the ejector and keep closed with fingers.
15. Screw the module in the handle and tighten with service tool head#2.
16. Push the tip ejector lever down, until you hear a "click".

Replacing Multichannel Pipette Tip Cones

To ensure even performance between all channels in a multichannel pipette, all tip cones have to be changed at the same time, if any of them needs to be changed. Don't mix tip cones of different packages, because one bag contains a matched set of tip cones. Place aligning studs to the same side when assembling the module. See picture on page 29.

Sterilization

The tip cone module can be sterilized by autoclaving it at 121°C (252°F) (2 ata) for 20 minutes. You can use steam sterilization bags if needed.

After autoclaving the module must be cooled to room temperature for at least two hours. Before pipetting, make sure that the module is dry. We recommend that you check the calibration after every sterilization cycle.

Trouble shooting

The table below lists possible problems and their solutions.

Defect	Possible reason	Solution
<i>Leakage</i>	<i>Tip incorrectly attached</i>	<i>Attach firmly</i>
	<i>Foreign particles between tip and tip cone</i>	<i>Clean tip cones attach new tips</i>
	<i>Foreign particles between the piston, the O-ring and the cylinder</i>	<i>Clean and grease O-ring and cylinder.</i>
	<i>Insufficient amount of grease on cylinder and O-ring</i>	<i>Grease accordingly</i>
	<i>O-ring damaged</i>	<i>Change the O-ring</i>
<i>Inaccurate dispensing</i>	<i>Incorrect operation</i>	<i>Follow instructions carefully</i>
	<i>Tip incorrectly attached</i>	<i>Attach firmly</i>
	<i>Calibration altered: caused by misuse, for example</i>	<i>Recalibrate according to instructions</i>
	<i>Tip cone (Single channel) or module (Multichannel) loose</i>	<i>Tighten the tip cone or module with the service tool.</i>
<i>Inaccurate dispensing with certain liquids</i>	<i>Unsuitable calibration</i>	<i>Recalibrate with the liquids in question</i>
	<i>High viscosity liquids may require recalibration</i>	

CAUTION!

The FinnpiPETTE is designed to allow easy in-lab service. If you would prefer to have us or your local representative service your pipette, please make sure that the pipette has been decontaminated before you send it to us.

Please note that the postal authorities in your country may prohibit or restrict the shipment of contaminated material by mail.

产品简介

Finnpipette F3是一种一般用途的微量移液器，可通过连续调节准确吸取和转移液体。

它利用空气置换原理（即使用空气作为分隔），并使用可拆卸、一次性使用的吸嘴。手柄上的读数窗口可对经过调节的移液量进行数字显示。

Finnpipette F3可调量程移液器的十二种不同型号涵盖了1 μ l至10 ml之间的所有量程范围。

订购号码	量程范围	色标	Finntip
4640110	0,2 μ l to 2 μ l	pink	Flex 10, 10, 20, 50
4640000	1 μ l to 10 μ l	pink	Flex 10, 10, 20, 50
4640010	1 μ l to 10 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4640020	2 μ l to 20 μ l	turquoise	50
4640030	2 μ l to 20 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4640080	5 μ l to 50 μ l	turquoise	50
4640090	5 μ l to 50 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4640040	10 μ l to 100 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4640050	20 μ l to 200 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4640060	100 μ l to 1000 μ l	blue	Flex 1000, 1000, 1000 Ext
4640100	0,5 ml to 5 ml	green	5 ml
4640070	1 ml to 10 ml	red	10 ml, Flex 10 ml Ext

Finnpipette F3固定量程移液器的十一种不同型号涵盖了1 μ l至10 ml之间的所有量程范围。

订购号码	量程范围	色标	Finntip
4650000	1 μ l	dark blue	Flex 10, 10, 20, 50
4650010	5 μ l	dark blue	Flex 10, 10, 20, 50
4650020	10 μ l	dark blue	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4650090	20 μ l	dark blue	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4650030	25 μ l	dark blue	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4650040	50 μ l	dark blue	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4650050	100 μ l	dark blue	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4650100	200 μ l	dark blue	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4650060	250 μ l	dark blue	Flex 1000, 1000, 1000 Ext
4650070	500 μ l	dark blue	Flex 1000, 1000, 1000 Ext
4650080	1000 μ l	dark blue	Flex 1000, 1000, 1000 Ext

Finnpipette F3多通道移液器的四种不同型号涵盖了5 μ l至300 μ l之间的所有量程范围。

订购号码	道数	量程范围	色标	Finntip
4660010	8	5 μ l to 50 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4660040	12	5 μ l to 50 μ l	yellow	Flex 200, 250 Univ., 200 Ext, 300, Flex 300
4660020	8	30 μ l to 300 μ l	orange	Flex 300, 300
4660050	12	30 μ l to 300 μ l	orange	Flex 300, 300

数码显示

手柄上的大号字体显示屏可清晰显示经过调节后的移液量。



原材料

Finnpipette F3由耐用、抗化学腐蚀的原材料制造而成。吸嘴连件可在121°C下重复进行高温消毒。

吸嘴简介

建议将Finntips与Finnpipette F3配合一起使用。


由全新的纯聚丙烯制成，聚丙烯通常被认为是适于制造吸嘴的唯一一种无污染材料。Finntips可耐高温高压消毒（121°C）。

包装

Finnpipette F3的包装经过特别设计，套装内包括以下物品：

1. Finnpipette移液器
2. 工具
3. 多道工具
4. 油脂 1g (订货号: 3300200)
5. 说明书
6. 校准证书

安全

此符号代表注意 

用途

此设备的用途是用来移取范围在0,2 µl 到 10 ml之间的液体

Finnpipette F3 以及 Finntips的设计是作为分析系统的一部分，为那些负责校验系统的终端客户可以得到可靠及安全的结果。



对健康的危害

- ▶ 对于危害的预防以及安全说明请遵循一般流程，例如：穿防护服，配带防护眼镜及手套。
- ▶ 对于有害物质的使用以及废弃物的处理（例如：带有辐射的或者有潜在传染性的物质），请遵循相关的安全说明或者一般实验室规范。
- ▶ 移液器以及吸嘴不能在体内使用。请不要使用移液器吸取液体后再注入人体内。
- ▶ 请不要在弹出吸嘴时，将吸嘴对着任何人。

Finnpipette F3 的使用者需要具备实验室操作技术并通过培训的人员。在使用移液器及吸嘴之前或者使用过程中必须先阅读使用说明。 F3 移液器可以在 +4° C 到 +40° C之间进行使用



错误的移液结果

- ▶ 由于以下因素，可能会对性能造成偏差：
 - a. 移液方式（推荐使用正向的移液方法）
 - b. 温度（空气，液体，容器，移液器以及吸嘴）
 - c. 气压
 - d. 湿度
 - e. 操作人员，例如：拇指的运动，移液时的角度
 - f. 液体的稠密度，粘度以及蒸气压力
 - g. 吸嘴的型号
- ▶ 如果移液器的性能对于某个特定应用的输出至关重要，那么必须用其他可替代的测试对结果进行确认。
如果没有这样的替代选择，那么需要通过重复测试来进行确认。移液过程中不正确移液量的可能性还是无法完全避免的。
- ▶ 为了避免错误的注入或者漏液，请检查吸嘴是否完全安装到移液器上。
- ▶ 当旋转移液量调整按钮时，请不要超出移液器的液量范围。否则会导致移液器的损坏或者影响移液性能。
- ▶ 如果吸嘴再次被使用，那么移液器的性能将无法保证。
- ▶ 使用时，请选择颜色标记相匹配的吸嘴与移液器。

材料的处理

请遵循实验室或者国家特定的流程来处理具有生物危害或者带有辐射的废弃物。处理具有传染性的物质，请参考当地法规。

警告 吸嘴可能具有潜在的传染性。请将所有使用过的一次性吸嘴按照生物危害废弃物的要求处理。

警告 在处理移液器前请先进行消毒。

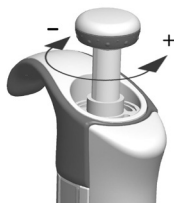
如果想要将之废弃，请与当地环保部门联系。如果想要了解更多信息，请联系我们 info.pipettes@thermofisher.com，或者联系当地 Thermo Fisher Scientific（赛默飞世尔科技）代表。

关于原包装和包装材料，请使用您所知道的回收经营者。

移液器的操作

设定移液量

1. 使用移液器顶部的按钮设定移液量。如需增加移液量，应按逆时针方向旋转按钮。如需减少移液量，应按顺时针方向旋转按钮。
2. 应确保移液量设定到位且完整读取显示窗口上的读数。
3. 勿将液量设定在移液器指定的容量允许范围以外。使用蛮力过度旋转按钮可能会导致卡壳并最终使移液器受损。

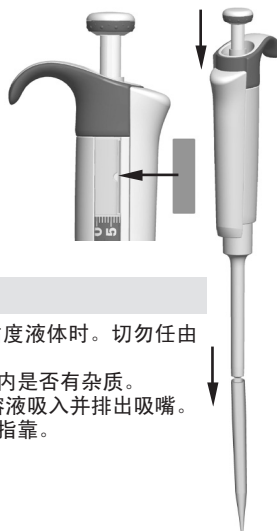


安全标签

可在安全标签上记下移液器的用途、使用者姓名缩写、校准日期等。可用较细的针将标签取下。用笔在标签上书写，然后将标签放回原处。

吸嘴的卸除

为防止污染，移液带有管嘴推出器。如需卸下吸嘴，应将移液器指向适当的废液槽，然后用拇指按下管嘴推出器。



移液方法

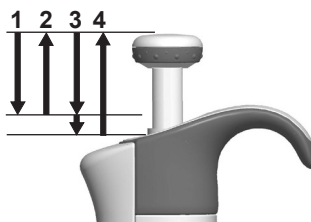
始终应缓慢按动和释放按钮，尤其是在处理高粘度液体时。切勿任由按钮自动反弹。

应确保将吸嘴牢固安装在管嘴连件上。检查吸嘴内是否有杂质。在进行实际的移液操作前，应先重复2-3次将该溶液吸入并排出吸嘴。吸液时应使移液器保持竖直。应用食指抵住放松指靠。务必使吸嘴、移液器和溶液保持同一温度。

正向移液方法

用于将液体注入干净的试剂容器内。

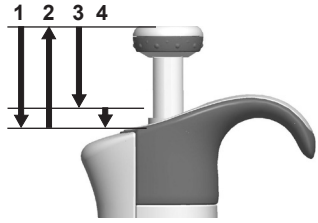
1. 按下按钮至第一停点处。
2. 将吸嘴探入容器内液体表面下约1 cm处，然后慢慢释放按钮。将吸嘴从液体中取出并靠在容器边缘以去除多余的液体。
3. 轻轻按下按钮至第一停点即可获得所需的液体容量。大约等候1秒钟以后，即可继续将按钮按到底。这样做可排空吸嘴内的液体。
4. 释放按钮使其还原至备用状态。如有必要，可更换吸嘴然后继续进行移液操作。



反向移液方法

反向移液方法比较适合用于粘度较大或较容易产生泡沫的液体。也建议在微小的移液操作中使用此技巧。将液体注入干净的试剂容器内。

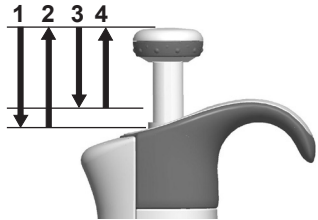
1. 按下按钮到底。
2. 将吸嘴探入容器内液体表面下约1 cm处，然后慢慢释放按钮。这样做可以将液体吸入吸嘴。将吸嘴从液体中取出并靠在容器边缘以去除多余的液体。
3. 轻轻按下按钮至第一停点即可获得事先设定的液量。在第一停点处按住按钮。吸嘴内会有部分残留液体，不应将其计入实际的移液量。
4. 应将残留液体与吸嘴一起丢弃或将其重新注入原容器内。



反复移液方法

反复移液方法是用于重复提取相同容量液体的一种快速简单的方法。将用于移液的液体注入干净的试剂容器内。

1. 按下按钮到底。
2. 将吸嘴探入容器内液体表面下约1 cm处，然后慢慢释放按钮。这样做可以将液体吸入吸嘴。将吸嘴从液体中取出并靠在容器边缘以去除多余的液体。
3. 轻轻按下按钮至第一停点即可获得事先设定的液体容量。在第一停点处按住按钮。吸嘴内会有部分残留液体，不应将其计入实际的移液量。
4. 可通过重复第2和第3步操作继续进行移液。



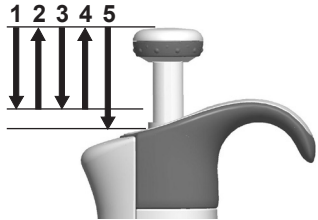
非均质液样的移液操作

(全血移液法)

使用正向移液方法的第1和第2步骤将血液吸入吸嘴。

使用清洁干燥的薄纸仔细将吸嘴擦干。

1. 将吸嘴伸入试剂内并按动按钮至第一停点，同时应保证吸嘴始终处于液面以下。
2. 慢慢释放按钮使其还原至备用状态。这样做可将液体吸入吸嘴。使吸嘴始终处于溶液中。
3. 按动按钮至第一停点，然后慢慢释放按钮。重复此步骤直至吸嘴的内壁变得清晰。
4. 最后，将按钮按到底以将吸嘴内的液体完全排出。



校准与调节

所有的Finnpipette产品均已在工厂经过校对和调节，以便通过正向移液方法提供规定容量的蒸馏水或去离子水。使用其它移液方法可能会影响校准结果。因此移液器在使用其它移液方法或用于不同温度和粘度的液体时，可进行重新调节。

仪器与试验要求

必须使用分析天平。应根据移液器内的试验液量选定天平的刻度精确度：

液量范围	刻度精确度
少于10 μl	0.001 mg
10-100 μl	0.01 mg
多于100 μl	0.1 mg

试验液：经蒸馏或去离子、ISO 3696标准3级水。试验应在无空气流动的室内进行，并应使水、移液器和空气温度恒定在15°C与30°C之间，误差在±0.5°C上下。相对湿度必须大于50%。特别是液量在50µl以下时，空气湿度越高越好，以便减少蒸发作用对液量产生的影响。建议使用专门的辅助仪器，如加湿器。

校准检查的步骤

应检查移液器的最大液量（标定液量）和最小液量。新的吸嘴应预湿3-5次，并对最大和最小两种液量各进行十次移液操作。每次移液（Ex）时都应对移液器进行调节以获得所需的液量。建议使用正向移液方法。允许的最大误差值专为正向操作方法而设计。建议对多道移液器的每一个通道都进行校准，但是仅去校准两边最外侧的通道是比较合适的校准方法。在校准之前，请先通过使用中间的某一个通道来进行调整检查。建议使用下表中ISO8655的校验标准或者用户自定义标准。

步骤：

1. 进行一系列10次最小液量的移液操作。
2. 进行一系列10次最大液量的移液操作。
3. 计算以上两个系列操作的错误率（A）和不精确率（cv）。
4. 将结果与表1内的限值进行对照。

如果计算值在对应的限值范围内，则表示对移液器进行了正确的调节。

ISO8655 校验规格

Thermo Scientific Finnpiptette F3 的规格符合ISO8655的标准。

Finnpiptette F3 可调式量程单道

量程	液量 µl	错误率		不精确率	
		µl	%	s.d. µl	cv%
0.2-2 µl	2	±0.080	±4	0.040	2.0
	0.2	±0.080	±40	0.040	20.0
1-10 µl	10	±0.120	±1.2	0.080	0.8
	1	±0.120	±12	0.080	8.0
2-20 µl	20	±0.20	±1.0	0.10	0.5
	2	±0.20	±10.0	0.10	5.0
5-50 µl	50	±0.50	±1.0	0.20	0.4
	5	±0.50	±10	0.20	4.0
10-100 µl	100	±0.80	±0.8	0.30	0.3
	10	±0.80	±8.0	0.30	3.0
20-200 µl	200	±1.60	±0.8	0.60	0.3
	20	±1.60	±8.0	0.60	3.0
100-1000 µl	1000	±8.0	±0.8	3.0	0.3
	100	±8.0	±8.0	3.0	3.0
0.5-5 ml	5000	±40.0	±0.8	15.0	0.3
	500	±40.0	±8.0	15.0	3.0
1-10 ml	10000	±60.0	±0.6	30.0	0.3
	1000	±60.0	±6.0	30.0	3.0

Finnpipette F3 固定式量程单道

固定液量 μl	错误率		不精确率	
	μl	%	s.d. μl	cv%
1	± 0.050	± 5.00	0.050	5.00
5	± 0.125	± 2.50	0.075	1.50
10	± 0.120	± 1.20	0.080	0.80
20	± 0.20	± 1.00	0.10	0.50
25	± 0.50	± 2.00	0.20	0.80
50	± 0.50	± 1.00	0.20	0.40
100	± 0.80	± 0.80	0.30	0.30
200	± 1.6	± 0.80	0.60	0.30
250	± 4.0	± 1.60	1.50	0.60
500	± 4.0	± 0.80	1.50	0.30
1000	± 8.0	± 0.80	3.00	0.30

Finnpipette F3 可调式量程多道

量程	道数	液量 μl	错误率		不精确率	
			μl	%	s.d. μl	cv%
5-50 μl	8, 12	50	± 1.0	± 2.0	0.4	0.8
		5	± 1.0	± 20	0.4	8.0
30-300 μl	8, 12	300	± 8.0	± 2.7	3.0	1.0
		30	± 8.0	± 26.7	3.0	10.0

生产商的规格范围

Finnpipette F3 可调式量程单道

量程	液量 μl	错误率		不精确率		工厂用校 验吸嘴
		μl	%	s.d. μl	cv%	
0.2-2 μl	2	$\pm 0,050$	$\pm 2,50$	0,040	2,00	Flex 10
	0,2	$\pm 0,024$	$\pm 12,00$	0,020	10,00	
1-10 μl , micro	10	$\pm 0,100$	$\pm 1,00$	0,050	0,50	Flex 10
	1	$\pm 0,025$	$\pm 2,50$	0,020	2,00	
1-10 μl	10	$\pm 0,100$	$\pm 1,00$	0,080	0,80	Flex 200
	1	$\pm 0,035$	$\pm 3,50$	0,030	3,00	
2-20 μl , micro	20	$\pm 0,20$	$\pm 1,00$	0,08	0,40	50
	2	$\pm 0,06$	$\pm 3,00$	0,05	2,50	
2-20 μl	20	$\pm 0,20$	$\pm 1,00$	0,08	0,40	Flex 200
	2	$\pm 0,06$	$\pm 3,00$	0,05	2,50	
5-50 μl , micro	50	$\pm 0,30$	$\pm 0,60$	0,15	0,30	50
	5	$\pm 0,15$	$\pm 3,00$	0,125	2,50	
5-50 μl	50	$\pm 0,30$	$\pm 0,60$	0,15	0,30	Flex 200
	5	$\pm 0,15$	$\pm 3,00$	0,125	2,50	
10-100 μl	100	$\pm 0,80$	$\pm 0,80$	0,20	0,20	Flex 200
	10	$\pm 0,30$	$\pm 3,00$	0,10	1,00	
20-200 μl	200	$\pm 1,2$	$\pm 0,60$	0,4	0,20	Flex 200
	20	$\pm 0,36$	$\pm 1,80$	0,14	0,70	
100-1000 μl	1000	$\pm 6,0$	$\pm 0,60$	2,0	0,20	Flex 1000
	100	$\pm 1,0$	$\pm 1,00$	0,6	0,60	
0,5-5 ml	5000	$\pm 25,0$	$\pm 0,50$	10,0	0,20	5 ml
	500	$\pm 10,0$	$\pm 2,00$	4,0	0,80	
1-10 ml	10000	$\pm 50,0$	$\pm 0,50$	20,0	0,20	10 ml
	1000	$\pm 20,0$	$\pm 2,00$	8,0	0,80	

Finnpipette F3 固定式量程单道

固定液量 μl	错误率		不精确率		工厂用校 验吸嘴
	μl	%	s.d. μl	cv%	
1	$\pm 0,040$	$\pm 4,00$	0,040	4,00	Flex 10
5	$\pm 0,070$	$\pm 1,40$	0,070	1,40	Flex 10
10	$\pm 0,090$	$\pm 0,90$	0,080	0,80	Flex 200
20	$\pm 0,14$	$\pm 0,70$	0,10	0,50	Flex 200
25	$\pm 0,15$	$\pm 0,60$	0,125	0,50	Flex 200
50	$\pm 0,30$	$\pm 0,60$	0,20	0,40	Flex 200
100	$\pm 0,40$	$\pm 0,40$	0,30	0,30	Flex 200
200	$\pm 0,80$	$\pm 0,40$	0,60	0,30	Flex 200
250	$\pm 1,0$	$\pm 0,40$	0,75	0,30	Flex 1000
500	$\pm 1,5$	$\pm 0,30$	1,5	0,30	Flex 1000
1000	$\pm 3,0$	$\pm 0,30$	3,0	0,30	Flex 1000

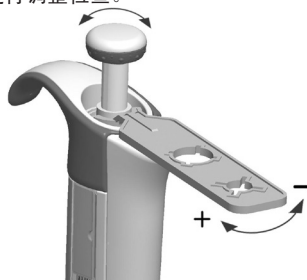
Finnpipette F3 可调式量程多道

量程	道数	液量 μl	错误率		不精确率		工厂用校 验吸嘴
			μl	%	s.d. μl	cv%	
5-50 μl	8, 12	50	$\pm 0,75$	$\pm 1,50$	0,35	0,70	Flex 200
		5	$\pm 0,25$	$\pm 5,00$	0,10	2,00	
30-300 μl	8, 12	300	$\pm 3,0$	$\pm 1,00$	0,9	0,30	Flex 300
		30	$\pm 1,5$	$\pm 5,00$	0,6	2,00	

调节

调整量程时建议从最小量程或者从最大量程的10%开始调节。多道移液器在校准之前，请先通过使用中间的某一个通道来进行调整检查。

1. 将工具放入手柄上端的校准螺开口内。
2. 顺时针旋转辅件即可增加容量，逆时针旋转可减少容量。
3. 调节后应按上述说明进行校准检查。



计算公式

质量与体积的转换

$$V = (w + e) \times Z$$

V = 体积 (μl)
 w = 质量 (mg)
 e = 蒸发量 (mg)
 Z = mg/ μl 转换中的换算

因数

蒸发量对较小的液量而言有重要的影响。需确定蒸发量，可将水注入量杯，记下读数，然后开始按下计时器。观察读数在30秒内的变化（即，6 mg = 0.2 mg/s）。将此数据与移液操作中从配衡到读数间所需时间进行比较。对于上述情况，一般移液操作可能需要10秒钟时间，蒸发量为2 mg (10 s x 0.2 mg/s)。如果在容器上加盖了盖子或使用了加湿器，则一般不必再对蒸发量进行修正。

因数Z用于在试验温度和压力的条件下，将水的质量换算成体积。在22°C和95 kPa的条件下，其值通常为1.0032 $\mu\text{l}/\text{mg}$ 。参见第24页上的转换表。

错误率（系统性错误）

错误率是指移液量与移液管设定液量间的差异。

$$A = \bar{V} - V_0$$

A = 不精确率
 \bar{V} = 平均液量
 V_0 = 标定液量

不精确率可用相对数值表示： $A\% = 100\% \times A / V_0$

不精确率（随机性错误）

不精确率与移液操作的可重复性有关。它可用标准偏差 (s) 或变异系数 (cv) 来表示。

$$S = \sqrt{\frac{\sum_{i=1}^n (V_i - \bar{V})^2}{n-1}}$$

s	=	标准偏差
\bar{v}	=	平均液量
n	=	测量次数

标准偏差可用相对值 (CV) 来表示: $CV = 100\% \times S / \bar{V}$

维护保养

不使用 Finn timer F3 移液器时, 务必将其竖直存放。建议使用 Finn timer 专用存放架。

零部件号码参见第25页的部件展示图。

短期维护保养措施

每天早上都应检查移液器表面是否有灰尘和污垢。

尤其应重视管嘴连件的清洁状况。除70%乙醇以外, 不得使用任何其它溶剂对移液器进行清洁。

长期维护保养措施

在不同的实验室, 每年对移液器的使用情况各不相同, 而且应用的物质种类也有很大差异。为了保证对移液器的正确维护, 实验室应当制定一套适合自己特殊情况和需求的维护保养程序。

进行维护保养前, 应先将移液器的各个部件全部拆卸下来。

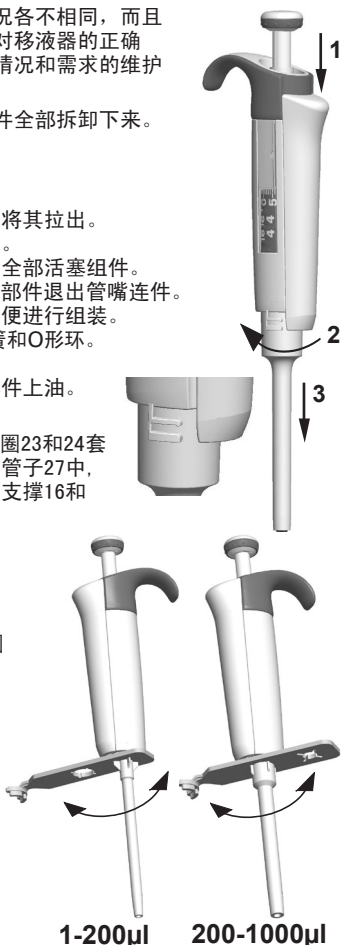
1-1000 μ l 移液器

1. 按下管嘴推出器。
2. 按逆时针方向旋转管嘴推出器11, 然后将其拉出。
3. 使用辅件按逆时针方向将管嘴连件旋出。
4. 将活塞和其它部件拉出。轻推活塞退出全部活塞组件。然后将管嘴连件倒置, 轻轻拍打将所有部件退出管嘴连件。切记要将所有部件按顺序排列在桌上以便进行组装。
5. 使用没有绒毛的干布清洁活塞、活塞弹簧和O形环。
6. 检查管嘴连件是否留有异物。
7. 使用移液器配套的润滑油为已清洁的部件上油。
8. 重新装好移液器的各个组件。

0.2-2 μ l 和 1-10 μ l: 首先, 将弹簧22, O型圈23和24套在管子21上面, 把0.2-2 μ l 的活塞插入到管子27中, 然后再插到管子21中。然后弹簧13, 弹簧支撑16和管子17和18, 大的O型圈19和小的密封圈20套在活塞上面。用手向后收缩活塞的弹簧和弹簧支撑件16和管子21, 把住弹簧并小心的将活塞装进管嘴并松开弹簧。

2-20 μ l 和 5-50 μ l: 将弹簧13、弹簧垫圈16、导管17和18、大O形环19和小O形环20重新套在活塞上。用手指挤压活塞和弹簧垫圈16间的弹簧, 并将大O形环19、小O形环20、弹簧垫圈21和弹簧22 (直径比弹簧垫圈21小) 套在活塞上。继续挤压弹簧, 小心将整个部件装入管嘴连件, 然后松开弹簧。

10-100 μ l 和 20-200 μ l: 将弹簧13、弹簧垫圈16和O形环17重新套在活塞上。将整个组件装在管嘴连件上。



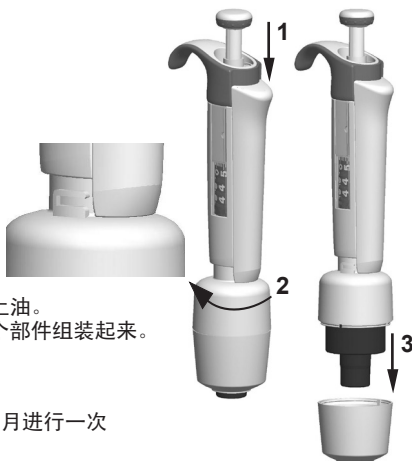
100-1000 μl : 将O形环17和垫环16放入管嘴连件内。将弹簧13套在活塞上, 再将整个组件装入管嘴连件。

- 全部: 将弹簧15和垫圈14放在管嘴连件上, 并小心将管嘴连件插入手柄, 首先通过手动顺时针方向旋转管嘴连件, 将其固定, 然后再使用维修工具最终将管嘴连件拧紧。

- 将管嘴推出器重新装好。

0. 5-5ml和1-10 ml移液器

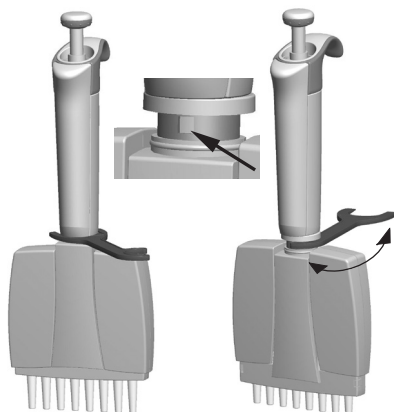
- 按下管嘴推出器。
- 逆时针旋转管嘴推出器10, 将其打开。
- 将管嘴推出器的底座14 (卡锁) 卸下。
- 逆时针旋转管柱13并将管嘴连件拆下。
- 按下管柱的卡锁将管柱拆下。
- 清洁O形环12和管柱13并重新上油。
- 按照与拆卸时相反的顺序将各个部件组装起来。



延长多道移液器使用寿命

如果每天使用移液器, 应每隔三个月进行一次保养和上油。

- 将工具放入环15和吸嘴23之间1号端口内。轻推, 直至部件相互扣接受当为止。
- 检查吸嘴手柄是否朝上, 然后向下轻拉仪器上的吸嘴部件。将工具放入接管46孔中的2号端口内。
- 轻微用力打开吸嘴上端, 并取下吸嘴。
- 从手柄上拧出仪器。
- 拉出仪器弹簧19和夹子22。
- 按压弹簧13, 并从凹槽中取下闭锁片12。取下弹簧13。
- 卸下锁爪44和45, 再拉出接管43和导管46。
- 用螺丝起子从仪器盖子上卸下4或6颗螺丝钉, 然后取下盖子。
- 卸下活塞杆, 再用干燥无绒布清洁活塞和吸嘴座。
- 必要时, 可按以下步骤对吸嘴座进行保养:



用螺丝起子从快速扣接头上小心地松开盖环, 然后打开吸嘴座。取下吸嘴座上的所有部件。清洁所有这些部件。必要时, 可更换O形环。取下一个活塞。将盖环32 (大孔)、弹簧34、垫环35 (大O形环37, 5至50 μl) 和小O形环36依次套在活塞上。使用移液管包装中随附的润滑油为O形环上油。将所有部件装在吸嘴座上, 然后闭合盖环上的快速扣接头。对每个吸嘴座均重复以上步骤。

- 在外壳里面安装活塞杆和吸嘴连杆, 然后将外壳合并起来并用一个卡口卡紧, 然后用4/6颗螺丝固定, 最后插入夹子22。
- 将接管43和导管46置于仪器颈部, 然后插入锁爪44和45。插入仪器弹簧19。
- 将弹簧13和闭锁片12插入活塞杆16中。
- 将吸嘴置于仪器上。将弹簧19推入吸嘴部件内, 然后关闭吸嘴上端并用手指使其闭合妥当。
- 将仪器拧在手柄上, 并用辅件2号端口拧紧。
- 向下推吸嘴手柄, 直至听到“咔嗒”一声为止。

更换多道移液器吸嘴座

为了确保多道移液器的所有通道间保持稳定的流通性能，当任一吸嘴座需要更换时，务必同时更换所有吸嘴座。不要混用取自不同包装的吸嘴座，因为同一包装会提供一组配套的吸嘴座。将外壳合并起来并用一个卡口卡紧，请看29页的图。

消毒

吸嘴座可在121° C (252° F) (2个绝对大气压) 下进行高温消毒20分钟。必要时，可使用蒸汽消毒包。

吸嘴座经高温消毒后必须经过至少两个小时时间冷却至室温才可使用。移液前务必确保仪器的干燥。建议在每次消毒之后检查校准情况。

故障检修

下表列出了可能会出现的问题及其解决办法。

故障	可能的原因	解决方法
渗漏	吸嘴安装不正确。 在吸嘴与管嘴连件之间有异物。	必须妥善安装。 清洁管嘴连件后，装上新的吸嘴。
	在活塞、O形环和缸体之间有异物。	清洁O形环和缸体，并上好润滑油。
	缸体和O形环上的润滑油不够。	应适当润滑。
	O形环已损坏。	更换O形环。
移液结果不准确	操作不正确。	按说明进行各步骤操作。
	吸嘴安装不正确。	必须妥善安装。
	校准结果被更改：比如，因使用方法错误，导致校准结果发生变化。	按说明重新进行校准。
某些液体的移液结果不准确	吸嘴连杆(单道)或者多道外壳松动校准方法不合适。	使用维修工具去锁紧吸嘴连件和外壳。
	使用粘度较高的液体时，可能需要重新进行校准。	对该液体重新进行校准。

注意！

Finnpipette 的设计旨在提供实验室内的便利服务。如果希望我们或当地办事处能够对您的移液器进行维修，请务必在将移液器送给我们之前，把它消毒干净。

请注意，您所在国家的邮政机构可能禁止或限制通过邮件递送被污染的物品。

Conversion table

Value of the conversion factor Z ($\mu\text{l}/\text{mg}$), as a function of temperature and pressure, for distilled water.

换算表

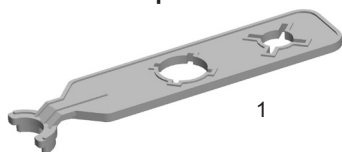
在不同温度和气压的作用下，蒸馏水的换算值 Z ($\mu\text{l}/\text{mg}$)。

Temperature 温度 °C	Air pressure 气压 kPa						
	80	85	90	95	100	101,3	105
15,0	1,0017	1,0018	1,0019	1,0019	1,0020	1,0020	1,0020
15,5	1,0018	1,0019	1,0019	1,0020	1,0020	1,0020	1,0021
16,0	1,0019	1,0020	1,0020	1,0021	1,0021	1,0021	1,0022
16,5	1,0020	1,0020	1,0021	1,0021	1,0022	1,0022	1,0022
17,0	1,0021	1,0021	1,0022	1,0022	1,0023	1,0023	1,0023
17,5	1,0022	1,0022	1,0023	1,0023	1,0024	1,0024	1,0024
18,0	1,0022	1,0023	1,0023	1,0024	1,0025	1,0025	1,0025
18,5	1,0023	1,0024	1,0024	1,0025	1,0025	1,0026	1,0026
19,0	1,0024	1,0025	1,0025	1,0026	1,0026	1,0027	1,0027
19,5	1,0025	1,0026	1,0026	1,0027	1,0027	1,0028	1,0028
20,0	1,0026	1,0027	1,0027	1,0028	1,0028	1,0029	1,0029
20,5	1,0027	1,0028	1,0028	1,0029	1,0029	1,0030	1,0030
21,0	1,0028	1,0029	1,0029	1,0030	1,0031	1,0031	1,0031
21,5	1,0030	1,0030	1,0031	1,0031	1,0032	1,0032	1,0032
22,0	1,0031	1,0031	1,0032	1,0032	1,0033	1,0033	1,0033
22,5	1,0032	1,0032	1,0033	1,0033	1,0034	1,0034	1,0034
23,0	1,0033	1,0033	1,0034	1,0034	1,0035	1,0035	1,0036
23,5	1,0034	1,0035	1,0035	1,0036	1,0036	1,0036	1,0037
24,0	1,0035	1,0036	1,0036	1,0037	1,0037	1,0038	1,0038
24,5	1,0037	1,0037	1,0038	1,0038	1,0039	1,0039	1,0039
25,0	1,0038	1,0038	1,0039	1,0039	1,0040	1,0040	1,0040
25,5	1,0039	1,0040	1,0040	1,0041	1,0041	1,0041	1,0042
26,0	1,0040	1,0041	1,0041	1,0042	1,0042	1,0043	1,0043
26,5	1,0042	1,0042	1,0043	1,0043	1,0044	1,0044	1,0044
27,0	1,0043	1,0044	1,0044	1,0045	1,0045	1,0045	1,0046
27,5	1,0045	1,0045	1,0046	1,0046	1,0047	1,0047	1,0047
28,0	1,0046	1,0046	1,0047	1,0047	1,0048	1,0048	1,0048
28,5	1,0047	1,0048	1,0048	1,0049	1,0049	1,0050	1,0050
29,0	1,0049	1,0049	1,0050	1,0050	1,0051	1,0051	1,0051
29,5	1,0050	1,0051	1,0051	1,0052	1,0052	1,0052	1,0053
30,0	1,0052	1,0052	1,0053	1,0053	1,0054	1,0054	1,0054

Spare parts

备件

1062800 1 μ l-10ml



1

100-1000 μ l
250/500/1000 μ l
Fixed

100-1000 μ l
250 / 500 / 1000 μ l Fixed

- 2. 2210470 **100-1000 μ l**
- 3. 2210140 **100-1000 μ l**
- 3. 2210210 **Fix 250 μ l**
- 3. 2210220 **Fix 500 μ l**
- 3. 2210230 **Fix 1000 μ l**
- 17. 1030020
- 42. 2210280

Fixed

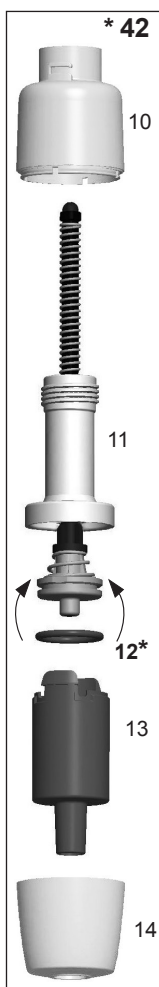
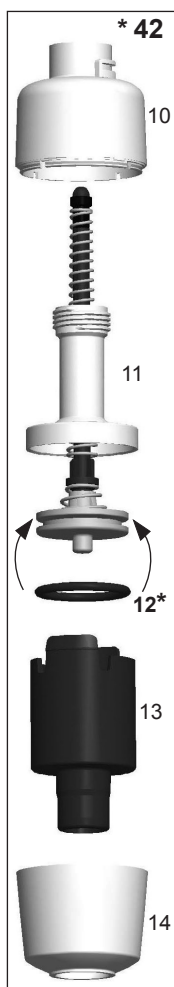


2*

3*

1-10 ml

0.5-5 ml



- * 2. Cap
- * 3. Handle
- * 12. O-ring
- * 42. Tip Cone assy

1-10 ml
0.5-5 ml

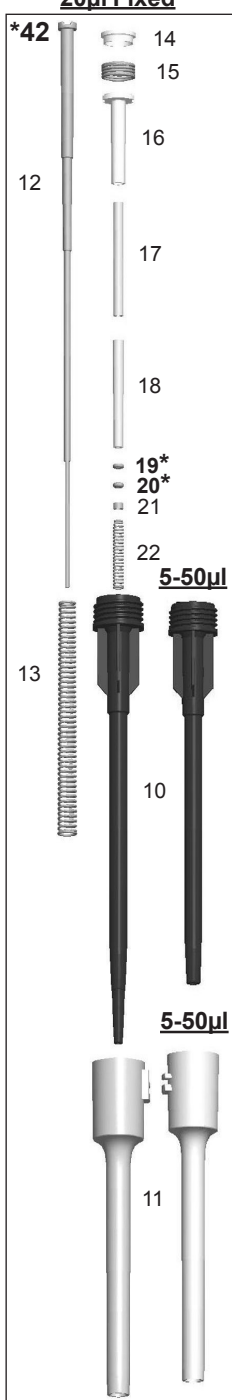
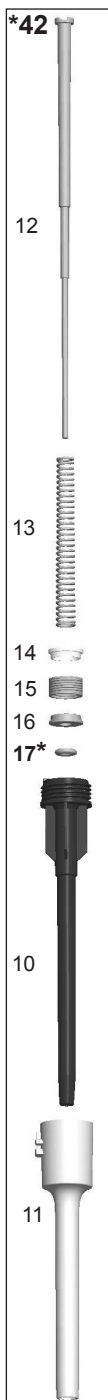
- 2. 2210670 **Fixed 1-1000 μ l**
- 2. 2214770 **5 ml**
- 2. 2210480 **10 ml**
- 3. 2214780 **5 ml**
- 3. 2210150 **10 ml**
- 12. 1030230 **5 ml**
- 12. 1033050 **10 ml**
- 42. 2214800 **5 ml**
- 42. 2210290 **10 ml**

20-200µl
200µl Fixed

10-100µl
25/50/100µl
Fixed

2-20µl / 2-20µl Micro
5-50µl / 5-50µl Micro
20µl Fixed

- * **2. Cap**
- * **3. Handle**
- * **17. O-ring**
- * **42. Tip Cone assy**



20-200µl
200 µl Fixed

- 2. 2210460 **20-200µl**
- 3. 2210130 **20-200µl**
- 3. 2213540 **Fix 200µl**
- 17. 1030160
- 42. 2210270

10-100 µl
25 µl Fixed
50 µl Fixed
100 µl Fixed

- 2. 2210460 **10-100µl**
- 3. 2210120 **10-100µl**
- 3. 2210180 **Fix 25µl**
- 3. 2210190 **Fix 50µl**
- 3. 2210200 **Fix 100µl**
- 17. 1030510
- 42. 2210260

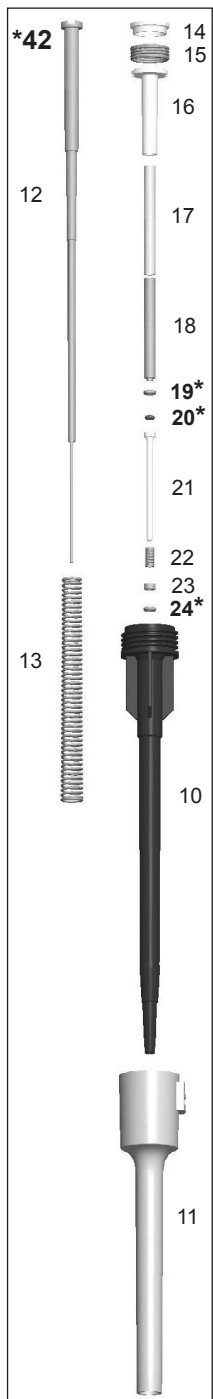
2-20 µl
2-20 µl Micro
20 µl Fixed

- 2. 2210460 **2-20µl**
- 2. 2210500 **2-20µl Micro**
- 3. 2210110 **2-20µl**
- 3. 2210440 **2-20µl Micro**
- 3. 2213530 **Fix 20µl**
- 19. 1030380
- 20. 1033110
- 42. 2210250 **2-20µl/Fix 20µl**
- 42. 2210390 **2-20µl Micro**

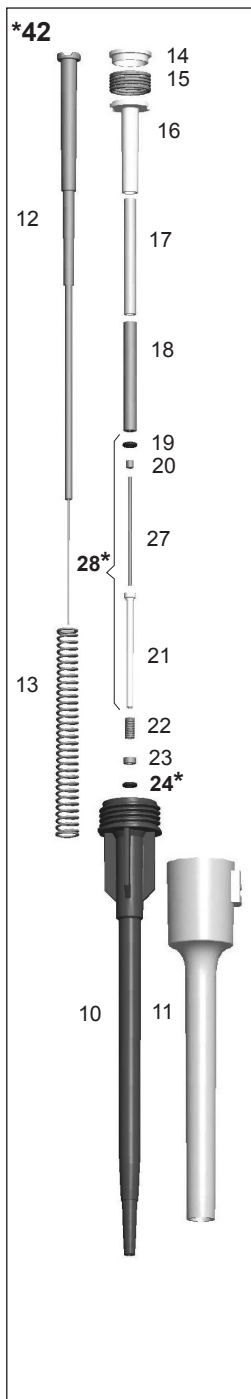
5-50 µl
5-50 µl Micro

- 2. 2210460 **5-50µl**
- 2. 2210500 **5-50µl Micro**
- 3. 2212960 **5-50µl**
- 3. 2212940 **5-50µl Micro**
- 19. 1030500
- 20. 1033060
- 42. 2212970 **5-50µl**
- 42. 2212950 **5-50µl Micro**

1-10µl / 1-10µl Micro
10µl Fixed



0.2-2µl



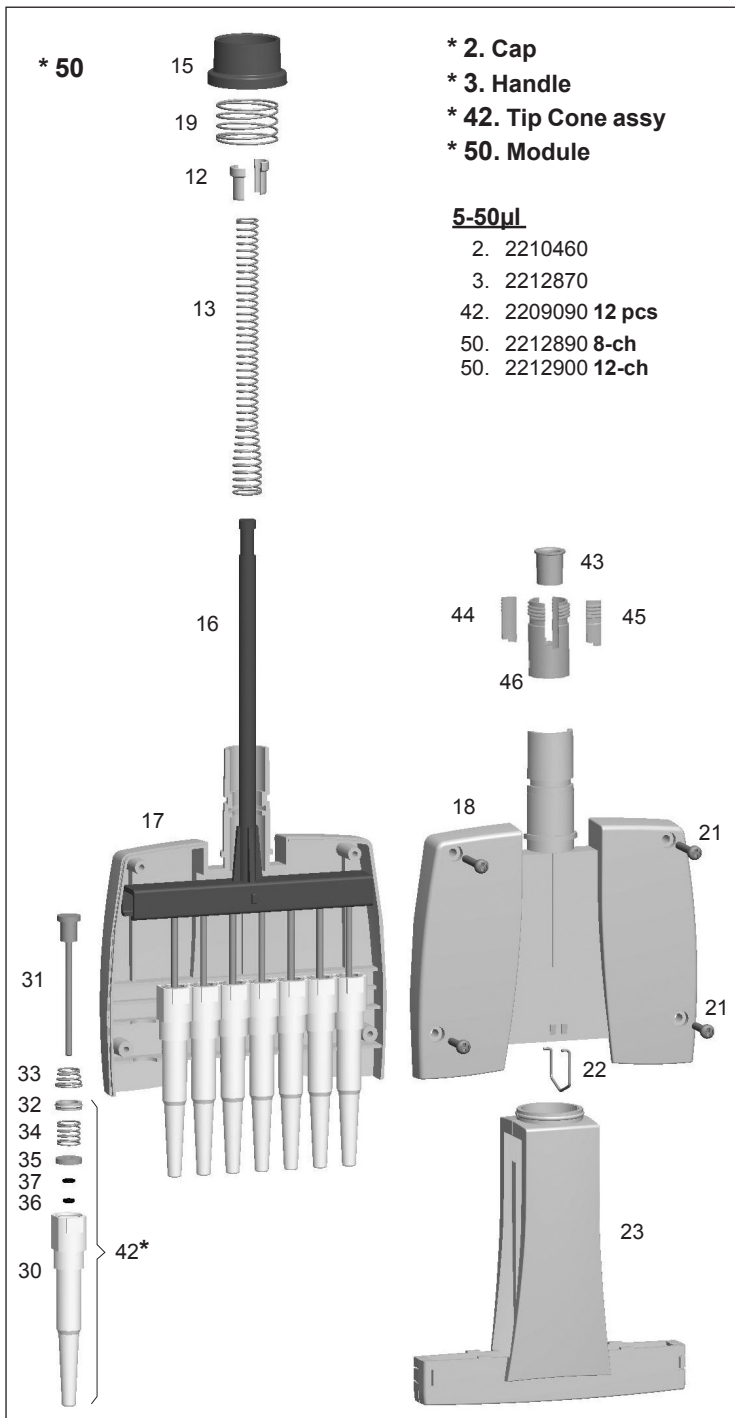
- * 2. Cap
- * 3. Handle
- * 19. O-ring
- * 20. O-ring
- * 24. O-ring
- * 42. Tip Cone assy

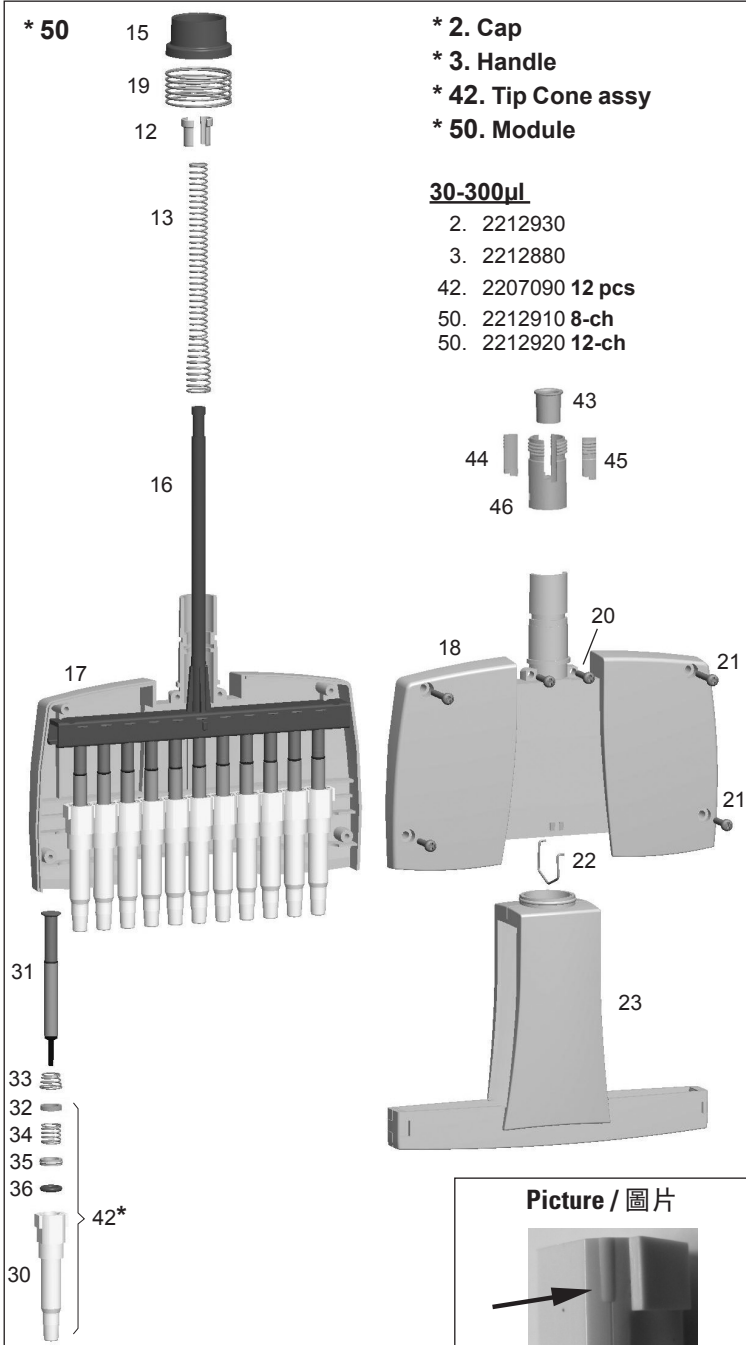
1-10 µl / 10 µl Fixed
1-10 µl Micro
1µl Fixed
5 µl Fixed

- 2. 2210460 1-10µl
- 2. 2210490 1-10µl Micro
- 3. 2210100 1-10µl
- 3. 2210430 1-10µl Micro
- 3. 2210450 Fix 1µl
- 3. 2210160 Fix 5µl
- 3. 2210170 Fix 10µl
- 19. 1030380
- 20. 1030060
- 24. 1030170
- 42. 2210240 1-10µl/Fix 10µl
- 42. 2210380 1-10µl Micro/Fix 1 / 5 µl

0.2-2 µl

- 2. 2210490 0.2-2µl
- 3. 2215560 0.2-2µl
- 24. 1030170
- 28. 2205730
- 42. 2215550 0.2-2µl





Tip Ordering Information

Code	Finntip	Volume	Qty
* 9400300	10 Micro	0,2-10 µl	10x96/rack
9400303	10 Micro sterile	0,2-10 µl	10x96/rack
* 94060100	Flex 10	0,2-10 µl	10x96/rack
94060103	Flex 10 sterile	0,2-10 µl	10x96/rack
* 9400610	20 Micro	0,2-20 µl	10x384/rack
9400613	20 Micro sterile	0,2-20 µl	10x384/rack
* 9400370	50 Micro	0,2-50 µl	10x384/rack
9400373	50 Micro sterile	0,2-50 µl	10x384/rack
* 9400130	200 Ext	5-200 µl	10x96/rack
9400133	200 Ext sterile	5-200 µl	10x96/rack
* 94060310	Flex 200	1-200 µl	10x96/rack
94060313	Flex 200 sterile	1-200 µl	10x96/rack
* 9400260	250 Univ.	0,5-250 µl	10x96/rack
9400263	250 Univ. sterile	0,5-250 µl	10x96/rack
* 9401250	300	5-300 µl	10x96/rack
9401253	300 sterile	5-300 µl	10x96/rack
* 94060510	Flex 300	5-300 µl	10x96/rack
94060513	Flex 300 sterile	5-300 µl	10x96/rack
* 9401110	1000	100-1000 µl	10x96/rack
9401113	1000 sterile	100-1000 µl	10x96/rack
* 94060710	Flex 1000	100-1000 µl	10x96/rack
94060713	Flex 1000 sterile	100-1000 µl	10x96/rack
* 9402070	5 ml	1-5 ml	5x54/rack
9402073	5 ml sterile	1-5 ml	5x54/rack
* 9402160	10 ml	1-10 ml	5x24/rack
9402163	10 ml sterile	1-10 ml	5x24/rack
94060970	Flex 10ml Ext	1-10 ml	100 pcs/bag
94060973	Flex 10ml Ext sterile	1-10 ml	50 pcs/bag

*** Also available in bags**

Code	Finntip Filter	Volume	Qty
94052000	10 Micro sterile	0,2-10 µl	10x96/rack
94056980	Flex 10 sterile	0,2-10 µl	10x96/rack
94052100	10 sterile	0,5-10 µl	10x96/rack
94052020	20 Micro sterile	0,2-20 µl	10x384/rack
94052150	20 sterile	0,5-20 µl	10x96/rack
94052160	30 sterile	0,5-30 µl	10x96/rack
94056510	Flex 30 sterile	5-30 µl	10x96/rack
94052060	50 Micro sterile	0,2-50 µl	10x384/rack
94052200	100 µl sterile	0,5-100 µl	10x96/rack
94052310	100 µl Ext sterile	5-100 µl	10x96/rack
94056520	Flex 100 sterile	5-100 µl	10x96/rack
94052300	200 µl sterile	0,5-200 µl	10x96/rack
94052320	200 µl Ext sterile	5-200 µl	10x96/rack
94056380	Flex 200 sterile	1-200 µl	10x96/rack
94052350	300 µl sterile	5-300 µl	10x96/rack
94056580	Flex 300 sterile	5-300 µl	10x96/rack
94052410	1000 µl sterile	100-1000 µl	10x96/rack
94052430	1000 µl Ext sterile	100-1000 µl	5x96/rack
94056710	Flex 1000 sterile	100-1000 µl	10x96/rack
94052550	5 ml sterile	1-5 ml	5x54/rack
94052600	10 ml sterile	1-10 ml	5x24/rack
94056970	Flex 10 ml Ext sterile	1-10 ml	50/bag

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