

# Thermo Scientific Matrix Manual Pipette User Manual



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## Congratulations!

You have purchased the Thermo Scientific Matrix Manual general purpose pipette with adjustable volume range. The lightweight design and extremely light plunger force provide superior ergonomics. The Matrix Manual is mechanically durable, chemically resistant, and offers quick and easy maintenance and calibration. The color-coded plungers indicate each volume range to readily distinguish between each pipette. The easy-to-view display is centrally located with bold digital numbers to indicate the selected volume.

Before you begin...

Before using the pipette, verify the contents of the package.

The package should contain the following items:

1. Thermo Scientific Matrix Manual Pipette
2. Service tool
3. Tube of grease
4. Instruction manual
5. Calibration certificate
6. Shelf hanger
7. Warranty Certificate

## Pipette Overview

### A. Pipette Overview



## B. General Operation

### B 1. Tip Application

Center the tip fitting(s) of the pipette above the tips in the rack. Apply with slow even pressure to the tips until firmly attached to the pipette. Avoid 'banging' or applying excessive force to the tip(s), as this may cause tip levels to be uneven and/or volume levels to be inconsistent.

### B 2. Setting the Aspirate and Dispense Volume

1. Set the aspirate and dispense volume by turning the plunger on the top of the pipette. To increase the volume, turn the plunger counterclockwise. To decrease the volume, turn it clockwise.
2. Make sure the desired delivery volume clicks into place and that the digits are completely visible in the display window.
3. Do not set volumes outside the pipette's specified volume range.

Using excessive force to turn the plunger outside the range may jam the mechanism and eventually damage the pipette.

### B 3. Tip Ejection

To 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.

### B 4. Personalized Name Card/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.

## C. Calibration and Adjustment

Pipettes 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.



### C 1. 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 $\mu\text{l}$	0.001 mg
10-100 $\mu\text{l}$	0.01 mg
Above 100 $\mu\text{l}$	0.1 mg

**Test liquid:** Water, distilled or deionized, "grade 3" water conforming to ISO 3696. Perform calibration in a draft-free room at a constant ( $\pm 0.5^\circ\text{C}$ ) air temperature between  $15^\circ\text{C}$  to  $30^\circ\text{C}$ . Allow water, pipette and pipette tips enough time to equilibrate to ambient temperature and relative humidity must be above 50%. With volumes below 50  $\mu\text{l}$  the air humidity should be as high as possible to reduce the effect of evaporation loss. Special accessories, such as an evaporation trap, are recommended.

## C. Calibration and Adjustment

### C 2. Procedure to Check Calibration

Calibration is performed using the minimum and maximum volume (nominal volume) for the pipette. Pre-wet a fresh tip 3-5 times and weigh 10 aliquots of the minimum and maximum volumes, respectively. See below:

#### Procedure:

1. Weigh 10 aliquots at the minimum volume.
2. Weigh 10 aliquots at the maximum volume.
3. Calculate the inaccuracy (A) and imprecision (cv) of both series.
4. Compare the results to the limits in the Table 1.

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

**TABLE 1:** Maximum permissible errors according ISO8655

Range	Volume	Inaccuracy		Imprecision	
	µl	µl	%	s.d. µl	cv%
1-10 µl	10	±0.10	±1.0	0.08	0.8
	1	±0.035	±3.5	0.03	3.0
2-20 µl	20	±0.20	±1.0	0.08	0.5
	2	±0.06	±3.0	0.05	2.5
10-50 µl	50	±0.60	±1.2	0.2	0.4
	10	±0.30	±3.0	0.1	1.0
10-100 µl	100	±0.80	±0.8	0.2	0.2
	10	±0.30	±3.0	0.1	1.0
20-200 µl	200	±1.2	±0.6	0.6	0.3
	20	±0.6	±3.0	0.3	1.5
50-300 µl	300	±3.0	±1.0	0.9	0.3
	50	±2.3	±4.6	0.8	1.5
100-1000 µl	1000	±5.0	±0.5	2.0	0.2
	100	±1.5	±1.5	0.6	0.6

## C. Calibration and Adjustment

### C 3. Calibration Adjustment

Adjustments are performed with the service tool.

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

Formula 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 mg/µl 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. Determine the amount the volume 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 µl/mg at 22°C and 95 kPa.

Inaccuracy (systematic error)

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

$$A = V - V_0$$

A = inaccuracy

V = mean volume

V<sub>0</sub> = nominal volume

Inaccuracy is expressed as a relative value:  $A\% = 100\% \times A / V_0$

Imprecision (random error)

Imprecision refers to the repeatability of 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
v	=	mean volume
n	=	number of measurements

Standard deviation can be expressed as a relative value (CV)  $CV = 100\% \times S / V$

## D. Maintenance

### D 1. Routine Maintenance

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 cylinder. When the pipette is not in use, make sure it is stored in a pipette stand and away for lab surfaces. The exterior of the pipette can be wiped clean periodically with a soft cloth moistened with 70 % ethanol.

### D 2. Preventive Maintenance

The Matrix manual pipette should be serviced every three months. The servicing procedure is as follows:

#### Single Channel:

1. Press the tip ejector lever.
2. Then rotate the ejector sleeve counterclockwise and pull it out.
3. Turn the cylinder counterclockwise with the service tool.
4. Pull out the piston and other parts. Remove the rest of the piston assembly. Then turn the cylinder upside down and tap out all the parts. Remember to keep all parts in order on table for reassembly.
5. Clean the piston, the pipetting spring and the o-rings with a dry smooth cloth.
6. Check the cylinder for foreign particles.
7. Grease the cleaned parts with the lubricant that comes with the pipette.
8. Reassemble the pipette components:

**1-10 µl:** Slide the spring, o-ring support and o-ring onto the tube. Then slide the spring, spring support and tubes, bigger o-ring, and smaller o-ring back on the piston. Then slide the support spring, support sleeve and tubes, large o-ring, and small o-ring back on the piston. Compress the spring with fingers by pressing the piston and spring support against each other and slide the tube with rest of the parts on the piston. Hold the spring compressed and carefully slide the entire assembly into the cylinder and release the spring.

**5-50 µl:** Slide the spring, spring support and tubes, bigger o-ring, and smaller o-ring, back on the piston. Compress the spring with fingers by pressing piston and spring support against each other and slide the bigger o-ring, smaller o-ring, spring support and the spring (smaller diameter against spring support) on the piston. Hold the spring compressed and carefully slide the entire assembly into the cylinder and release the spring.

**10-100 µl, 20-200 µl & 50-300 µl:** Slide the spring, spring support, and o-ring back on the piston. Slide the entire assembly into the cylinder.

**100-1000µl:** Put the o-ring and support ring to the cylinder. Slide the spring on the piston and slide the entire assembly into the cylinder.

9. All Pipettes: Put the spring and support on top of the cylinder and carefully insert the cylinder assembly to the handle and turn it tight by hand.
10. Reassemble the tip ejector.

**Multichannel:**

1. Place the service tool head between the ejector ring and ejector. Push the tool until the parts snap from each other.
2. Check that the ejector lever is in up position and pull down the tip ejector part of the module. Place the service tool head in the hole of adapter tube.
3. Open the upper end of the tip ejector slightly and remove the tip ejector.
4. Screw the module out of the handle.
5. Pull out the ejector spring and housing spring.
6. Take off the locking claws and pull out the adapter tube and tube.
7. Press the pipetting spring and remove the locking tabs from the groove. Remove the pipetting spring.
8. Use a screwdriver to remove the four/six screws in the lower housing and lift off the lower housing (top) cover.
9. Remove and clean the piston bar, pistons and tip bases with a dry, smooth cloth.
10. If needed, service the tip bases:
 

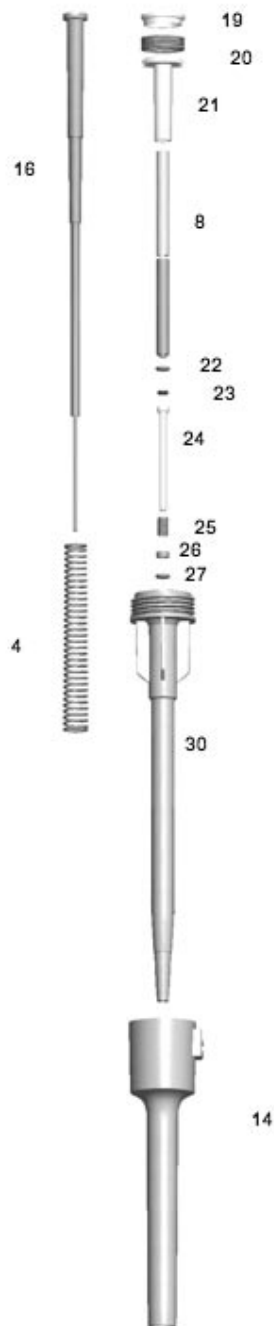
**1–10 µl:** Open the tip base by carefully releasing the cover ring from its snap joint with a screwdriver. Remove all the parts from the tip base and clean. If needed, replace the o-rings. Slide the cover ring (larger hole), support spring, support sleeve, large o-ring, and small o-ring onto the piston. Then slide o-ring support spring, spring support (sharp edges first) and spring support o-ring onto the o-ring support. Grease the o-ring with the lubricant provided in the pipette package. Slide all the parts into the tip base and close the snap joint of the cover ring.

**50–300 µl & 5–50 µl:** Open the tip base by carefully releasing the cover ring from its snap joint with a screwdriver. Remove all the parts from the tip base and clean. If needed, replace the o-rings. To reassemble: Slide the cover ring (larger hole), support spring, support sleeve, large o-ring, and small o-ring onto the piston. Grease the o-ring with the lubricant provided in the pipette package. Slide all the parts into the tip base and close the snap joint of the cover ring.
11. Install the piston rod with pistons and tip bases in the lower housing (bottom) and close the lower housing (top) cover with the four/six screws. Insert the housing spring.
12. Place the adapter tube and tube on the neck of the lower housing and insert the locking claws. Insert the ejector spring.
13. Insert pipetting spring and locking tabs onto the piston rod.
14. Place the tip ejector on the lower housing. Push the ejector spring inside tip ejector parts and close the upper end of the tip ejector and keep closed with fingers.

15. Screw the lower housing (top and bottom) into the upper handle and tighten with service tool.
16. Push the tip ejector lever down, until you hear a “click”.

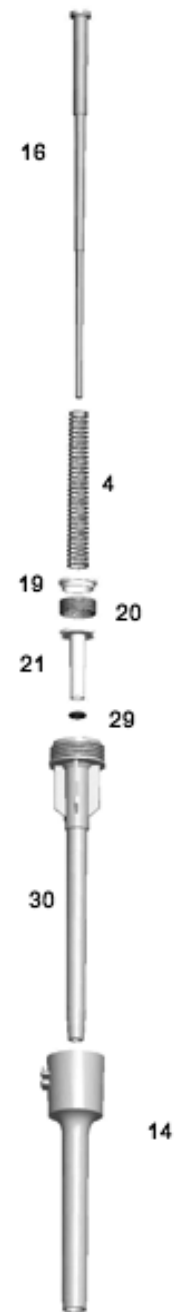
**Note:** To ensure even performance between all channels in a multichannel pipette, all tip bases have to be changed at the same time, if any of them need to be changed. Don't mix tip bases of different packages, because one bag contains a matched set of tip bases.





### 10 µl Single Channel

- 16 piston
- 4 pipetting spring
- 19 cover ring
- 20 support spring
- 21 support sleeve
- 8 tube(s)
- 22 large o-ring
- 23 small o-ring
- 24 o-ring support
- 25 o-ring support spring
- 26 spring support
- 27 spring support o-ring
- 30 cylinder

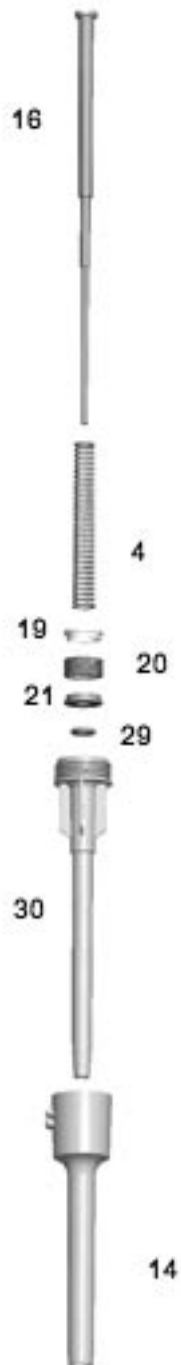


### 100 µl Single Channel

- 16 piston
- 4 pipetting spring
- 19 cover ring
- 20 support spring
- 21 support sleeve
- 29 o-ring
- 30 cylinder
- 14 ejector sleeve

**200 µl Single Channel**

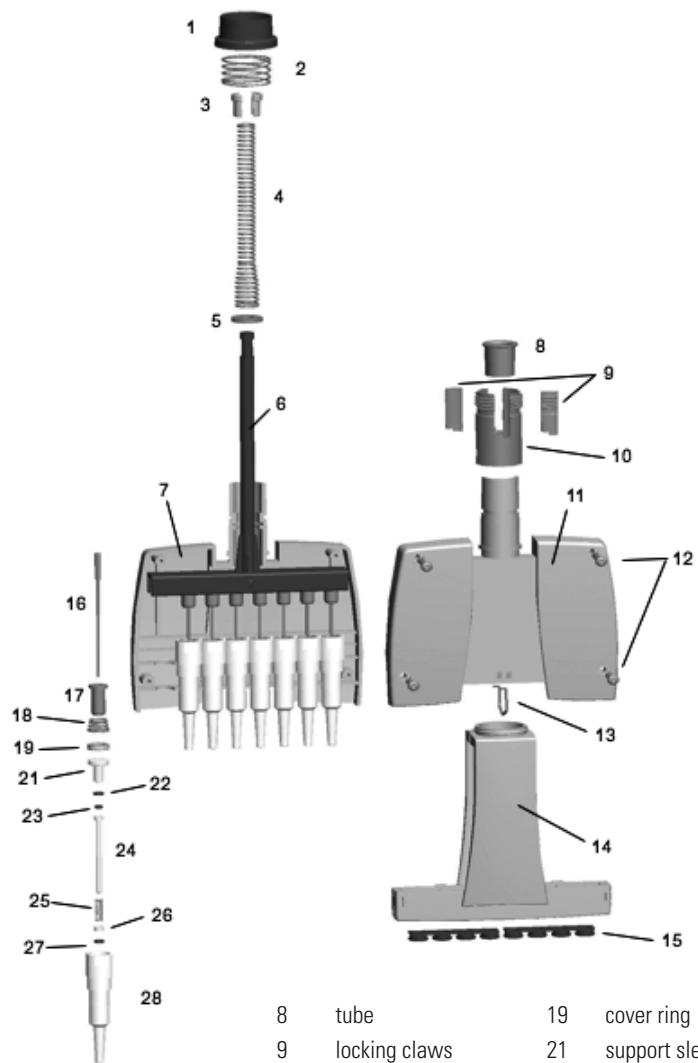
- 16 piston
- 4 pipetting spring
- 19 cover ring
- 20 support spring
- 21 support sleeve
- 29 o-ring
- 30 cylinder
- 14 ejector sleeve

**1000 µl Single Channel**

- 16 piston
- 4 pipetting spring
- 19 cover ring
- 20 support spring
- 21 support sleeve
- 29 o-ring
- 30 cylinder
- 14 ejector sleeve



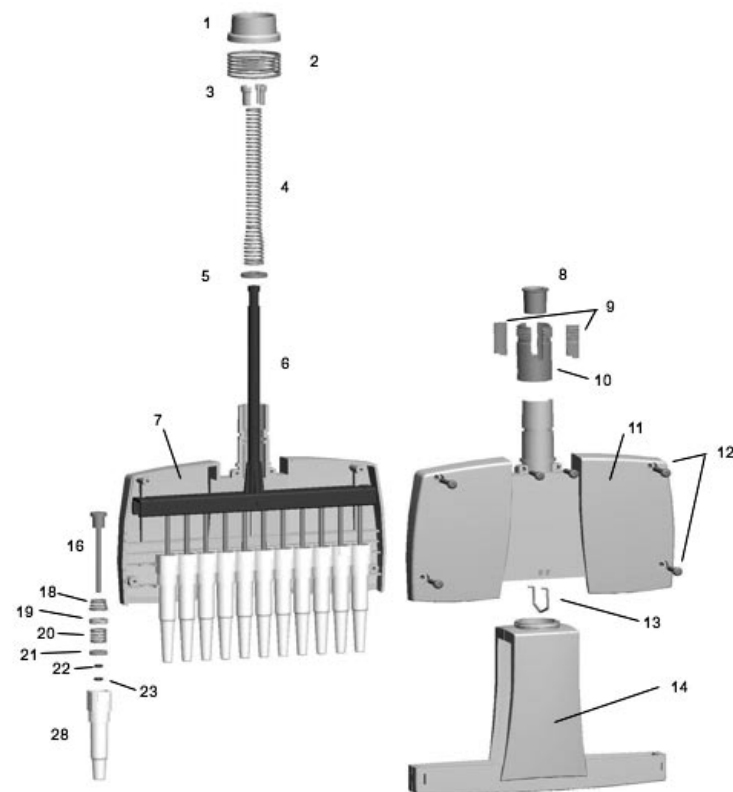
## Maintenance



### 8 Channel

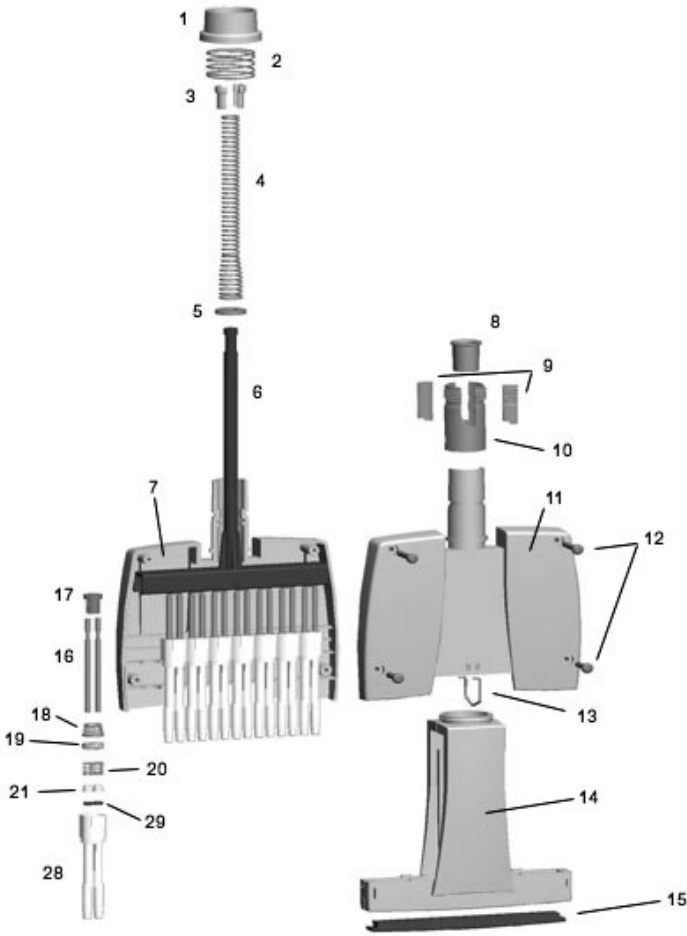
1	ejector ring	11	lower housing (top)	19	cover ring
2	ejector spring	12	housing screws (4)	21	support sleeve
3	locking tabs	13	housing spring	22	large o-ring
4	pipetting spring	14	ejector sleeve	23	small o-ring
5	stabilizing washer	15	ejector bar	24	o-ring support
6	piston rod	16	piston	25	o-ring support spring
7	lower housing (bottom)	17	piston adapter	26	spring support
		18	piston spring	27	spring support o-ring
		28	tip base		

## Maintenance



### 12 Channel

1	ejector ring	8	tube	18	piston spring
2	ejector spring	9	locking claws	19	cover ring
3	locking tabs	10	tube adapter	20	support spring
4	pipetting spring	11	lower housing (top)	21	support sleeve
5	stabilizing washer	12	housing screws (6)	22	large o-ring
6	piston rod	13	housing spring	23	small o-ring
7	lower housing (bottom)	14	ejector sleeve	28	tip base
		16	piston		



16 Channel

- |   |                        |    |                     |    |                |
|---|------------------------|----|---------------------|----|----------------|
| 1 | ejector ring           | 8  | tube                | 17 | piston adapter |
| 2 | ejector spring         | 9  | locking claws       | 16 | piston         |
| 3 | locking tabs           | 10 | tube adapter        | 18 | piston spring  |
| 4 | pipetting spring       | 11 | lower housing (top) | 19 | cover ring     |
| 5 | stabilizing washer     | 12 | housing screws (4)  | 20 | support spring |
| 6 | piston rod             | 13 | housing spring      | 21 | support sleeve |
| 7 | lower housing (bottom) | 14 | ejector sleeve      | 29 | o-ring         |
|   |                        | 15 | ejector bar         | 28 | tip base       |

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

E. Technical Support

Please contact technical support direct in North America at 888-363-6631 or [matrix.technicalservice@thermofisher.com](mailto:matrix.technicalservice@thermofisher.com), and in Europe at +44 (0) 161 486 2112 or [matrix.eu.support@thermofisher.com](mailto:matrix.eu.support@thermofisher.com)

## Warranty

### F. Warranty

The Thermo Scientific Matrix manual pipette is warranted to the original purchaser by Thermo Fisher Scientific to be free of defects in materials and workmanship for a period of three (3) years to registered purchasers, from the date of purchase, providing that it has been operated according to the instructions, not abused or misused, that the serial number has not been removed, and that the instrument has not been disassembled (except for preventive maintenance). No other warranty is expressed or implied. Upon receipt of your instrument, please complete and return the warranty card.

No instrument should be returned without a prior Return Good Authorization from Thermo Scientific. Should a unit need to be returned, the purchaser must pay insurance and shipping charges. Thermo Fisher Scientific will assume the cost of returning the repaired unit to the purchaser. This product's packaging is capable of withstanding normal shipping hazards. If an instrument needs to be repaired, please return it in its original shipping carton, if possible. Should a unit need to be returned, contact technical support in North America at 888-363-6631; Europe at +44 (0) 161 486 2112 for instructions.

## Recommended Equipment Decontamination Methods

The following table lists the proper decontamination procedures for returning equipment to Thermo Fisher Scientific for service.

Product/Component	Heat at 65°C/ 10 Hr.	70%/30% IPA/Water	10% Bleach	Ethylene Oxide	Autoclave 121°C/ 15 min.
<b>Multichannel Matrix Electronic Pipettes</b>					
Pipette Exterior	YES	Wipe	Wipe	YES	NO
Piston/Cylinder Assembly	YES	YES	NO	YES	YES
Tip Manifold	YES	YES	NO	YES	YES
Battery	NO	Wipe	NO	NO	NO
Power Supply	NO	Wipe	NO	NO	NO
Pipette Exterior	NO	Wipe	Wipe	NO	NO
<b>Single Channel Matrix Electronic Pipettes</b>					
Pipette w/Battery Removed	Yes	Wipe	Wipe	YES	YES
Lower cylinder	YES	YES	YES	YES	YES
Piston (do not remove)	YES	YES	NO	YES	NO
Power Supply	NO	Wipe	NO	NO	NO
<b>Matrix Hybrid Pipettes</b>					
Housing Exterior	YES	Wipe	Wipe	YES	NO
Power Supply	NO	Wipe	NO	NO	NO
<b>Matrix Memowell</b>					
Power Supply	NO	Wipe	NO	NO	NO
Housing Exterior	YES	Wipe	NO	YES	YES
<b>Matrix Manual Pipettes</b>					
Lower assembly	YES	Wipe	NO	YES	YES
Housing Exterior	YES	Wipe	Wipe	YES	NO
<b>Matrix Serological Pipettes</b>					
Nosecone	YES	YES	YES	YES	YES
Silicone Rubber Holder	YES	YES	Wipe	YES	YES
Filter	Replace	Replace	Replace	Replace	Replace
Battery	NO	Wipe	NO	NO	NO
Power Supply	NO	Wipe	NO	NO	NO
Housing Exterior	YES	Wipe	NO	NO	NO

WARNING: Do not expose batteries to temperatures above 60° C.

## Equipment Decontamination Verification Form

### Equipment Decontamination Verification Form

Serial # \_\_\_\_\_  
RP# \_\_\_\_\_  
PO# \_\_\_\_\_

Prior to service of equipment that may be contaminated with biohazardous materials, potentially biohazardous materials or radioactivity, the user must first decontaminate it. This decontamination procedure will include the following as appropriate (please check one):

☐ This equipment has not been used in a laboratory/location exposing it to biohazards or radioactive materials.

☐ This equipment was APPROPRIATELY DECONTAMINATED\* FROM BIOHAZARDOUS MATERIALS WITH: \_\_\_\_\_  
\*Example: Autoclave, 10% Bleach, Ethylene Oxide.  
Instruments must be decontaminated both externally and internally.

☐ This equipment was APPROPRIATELY DECONTAMINATED & TESTED FOR RADIOACTIVITY\* BY: \_\_\_\_\_  
\*Example: wipe test with results (3H, 14C,a-emitters), Geiger counts, etc.

NAME (print) \_\_\_\_\_  
PHONE # \_\_\_\_\_  
SIGNATURE \_\_\_\_\_  
DATE \_\_\_\_\_

Federal regulations require that all instruments sent for service shall be free of radioactivity and biohazards. The Technical Service group reserves the right to refuse to work on this equipment if these procedures are not performed.

Customer Return Shipping

Address: \_\_\_\_\_  
\_\_\_\_\_  
Return fax# 603-577-7682 \_\_\_\_\_

The consumables you use are as important as your instruments. Innovation is more than just our pipettes — we produce Thermo Scientific consumables on highly polished molds and every lot is rigorously controlled for superior quality and consistency.



Certified free of DNA, DNase, RNase, Endotoxins, and Cytotoxins.



### Matrix Sample Storage and Microplates

Choose from a wide variety of sample storage solutions, including our unique 2D barcoded tubes, storage plates, blocks and tubes, or assay microplates. All of these consumables are PureFect tested to be free of RNase, DNase, Endotoxins and Contamination, and are designed for efficient, effective sample storage, shipping, sampling, tracking and assaying.

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