eLINE™

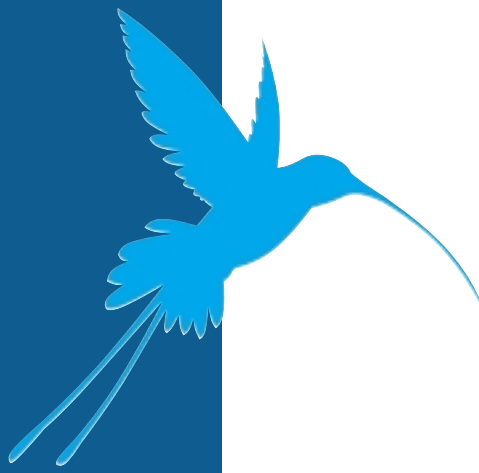
Instruction Manual

Bedienungsanleitung

Mode d' emploi

Manual de Instrucciones

Instruzioni d'impiego



BIOHIT

BIOHIT eLINE™

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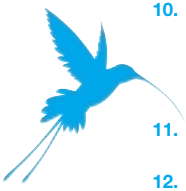


1. Biohit *e*LINE electronic pipettors

The Biohit *e*LINE electronic pipettors offer you the latest technology and innovations in the field of the hand held liquid handling devices. The attractive and ergonomic design of the *e*LINE pipettors together with electronic tip ejection operation take the effort out of pipetting and reduce the risk of repetitive strain injuries (RSI) that are common in mechanical pipetting.

The microprocessor controlled system and the superior construction of the Biohit *e*LINE pipettors enables maximum liquid handling performance with high levels of accuracy and precision. The microprocessor controlled piston movements reduces the possibility of human error and thus also contamination of the pipettor interior. The tip cone design of the Biohit *e*LINE pipettors offer the possibility to use replaceable Safe-Cone Filters to help prevent contamination and damage of the pipettor.

The *e*LINE electronic pipettors offers a comprehensive range of liquid handling protocols, typically required by laboratories currently. The simple keyboard and easy-to-read display together with user-friendly operation and programming allows these tasks to be performed quickly and effortlessly. The Biohit *e*LINE pipettors operate on the air displacement principle and use disposable tips.

1.1. Biohit *e*LINE single-channel pipettors

Cat. No.	Colour Code	Volume Range	Increment	Tip	Safe Cone Filters	
					Standard	Plus
73002X	Grey	0.2–10 µl	0.05 µl	10 µl	N/A	N/A
73004X	Yellow	5–120 µl	0.50 µl	300 µl, 350 µl	721007	721017
73006X	Orange	20–300 µl	1.00 µl	350 µl	721007	721017
73008X	Blue	50–1000 µl	5.00 µl	1000 µl	721006	721016
73010X	Green	100–5000 µl	10.0 µl	5000 µl	721006	721016

X: 0 = Without AC-adaptor
1 = With AC-adaptor, Euro plug
2 = With AC-adaptor, U.S. plug
3 = With AC-adaptor, U.K. plug
4 = With AC-adaptor, Jpn plug
5 = With AC-adaptor, Aus plug

1.2. Biohit tips

The full range of Biohit pipettor tips are recommended for use with Biohit *e*LINE pipettors. Biohit standard tips are made of virgin polypropylene. Biohit also offers a full range of filter tips along with a wide range of speciality tips including extended and wide bore varieties. (Fig. 1.)

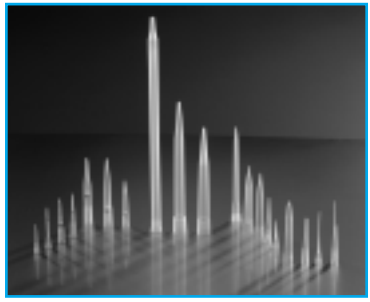


Fig. 1.

Biohit standard tips are available as bulk packages or space-saving trays. These are autoclavable (121°C, 1 bar overpressure), however pre-sterilised tips are also available.

2. Unpacking

The Biohit *e*LINE electronic pipettors may be delivered with or without an AC-adaptor, depending from the type of order. However, all Biohit *e*LINE pipettor packages contains:

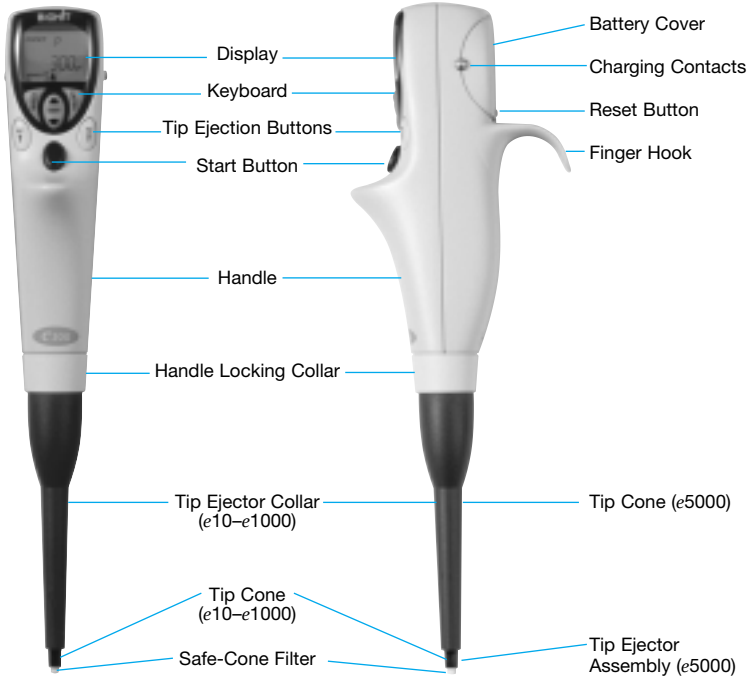
- Pipettor
- Tip
- Safe-Cone Filters and Filter Forceps (>10 µl)
- Grease
- Instructions for use
- Performance certification in accordance with ISO 8655-6

Please check that all items are included and that no damage has occurred during shipment.

Note: The pipettor leaves the factory fully charged. The battery is protected against discharging during storage with a plastic protector. BEFORE USE PLEASE REMOVE THE PLASTIC PROTECTOR UNDER THE BATTERY COVER.

Note: It is recommended to recharge the pipettor for at least two hours before initial use. The pipettor may only be charged with original Biohit *e*LINE charging stand, charging carousel or Biohit *e*LINE AC-adaptor. (See Section 4. Charging the pipettor.)

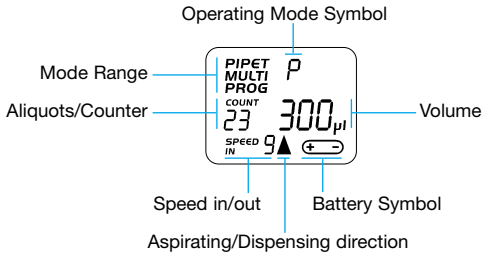
3. Pipettor Description



3.1. Display and controls

The control and programming of the Biohit *e*LINE pipettor is performed using the display, keyboard and operating buttons.

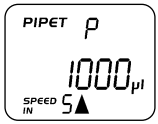
Display:



Note: The pipettor/display will automatically switch off after 10 minutes of non-use. Pipettor can be switched on by pressing any key.

Mode Ranges and Operating Mode Symbols:

PIPET



P = pipetting

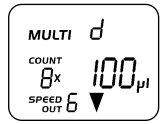
rP = reverse pipetting

P+MIXING = pipetting with mixing

P COUNT = pipetting with cycle counter

P MANUAL = manual pipetting

MULTI



d = multi-dispensing

dd = diluting

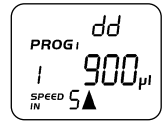
dd+MIXING = diluting with mixing

Sd = sequencial dispensing

SA = multi-aspirating

Ad = automatic multi-dispensing

PROG



PROG 1-6 = 6 storage locations

Keyboard:

Select

- Press to select the mode range or to activate/confirm setting changes

Arrow up/down

- Press to select the operating mode or to make setting changes (volume, aliquots, speed, etc.)

Enter

- Press to confirm the selections or setting changes

Operating buttons:

Start button

- Triggers all piston movements

Tip ejection buttons

- Press to remove tip

Reset button

- Press to reset the pipettor

3.2. Reset Button

To reset the pipettor, press the reset button on the battery cover. The display shows **RESET** and **PRESS TIP** in a blinking form and pressing the tip ejector button will reset the pipettor to the first programming level in **PIPET** mode.

Note: During the reset function the pipettor automatically determines the home position for the piston and tip ejector. The pipettor must never be reset with the tip attached! The attached tip can induce an error in home position determination. However, if resetting is accidentally done with the tip attached reset the pipettor again without the tip attached.

3.3. Start button

The start button triggers the aspiration and dispensing operations according to selected operating mode. Only a soft touch is required to operate the button. If the start button is held down during dispensing, the piston will stop in the lowest position until the button is released. In the operating modes with automatic blow-out (**P**, **dd**) the piston will automatically return to the home position after the start button is released.

If the start button is held down in the reverse pipetting mode or during the dispensing of the last aliquot in the multi-dispensing modes the piston direction symbol will change within one second and the pipettor will be ready to aspirate the next sample when the start button is released.

3.4. Electronic tip ejection with adjustable ejector collar

For easy and effortless tip ejection all Biohit *e*LINE electronic pipettors are equipped with the new electronic tip ejection feature (Fig. 2). There are two tip ejection buttons conveniently placed on the either side of the start button to ensure easy reach for both right and left handed users. The tip ejector collar can be adjusted to optimise the tip ejection function when other than manufacturer's original tips are used (excluding the *e*5000).

Tip ejection:
When the pipetting cycle is completed, either of the buttons can be depressed to eject the tip.

Fig. 2.

Note: The tip ejection function is frozen during the pipetting cycle and can only be activated after the tip is emptied. If needed the pipetting cycle can be interrupted by pressing the enter button. The display will show **E** (**E**=empty) and the tip is then emptied by pressing the start button.

Adjusting the tip ejector collar (excluding the *e*5000):
The tip ejector collar can be adjusted by unscrewing the collar anti-clockwise until the collar almost touches the attached tip. The adjustment range is 4 mm.

Note: The *e*5000 model is equipped with an inner tip ejection mechanism and does not have an adjustable tip ejector collar.

3.5. Biohit Safe-Cone Filters

The tip cone design of the Biohit *e*LINE pipettors (>10 µl) allows the use of Biohit Safe-Cone Filters in the tip cones. These removable filters prevent liquids and liquid vapours from entering the pipettor and thus protects the pipettor from cross contamination and damage.

The Safe-Cone Filters are available as Standard or Plus versions. It is recommended to use the Standard Filter for general applications and the Plus Filter for more demanding applications. The filters need to be changed regularly. The interval for filter changing is application dependant but the recommendation is to change the filter daily (after 50 – 250 pipetting cycles) and always in case of over-aspiration. The Biohit Filter Forceps should be used to avoid touching the soiled filters by hand (Fig. 3).

Fig. 3.

Cat. No.	Channels	Volume range	Standard Filter	Plus Filter	Pack quantity
730020	1-ch	0.2–10 µl	N/A	N/A	-
730040	1-ch	5–120 µl	721007	721017	50
730060	1-ch	20–300 µl	721007	721017	50
730080	1-ch	50–1000 µl	721006	721016	50
730100	1-ch	100–5000 µl	721006	721016	50

4. Charging of the pipettor

The Biohit *e*LINE pipettors leave the factory fully charged. The battery is protected against discharging during storage with a plastic protector. BEFORE USE PLEASE REMOVE THE PLASTIC PROTECTOR UNDER THE BATTERY COVER. However, should the battery become discharged during storage and recharging is required, a battery symbol will be observed in the bottom right corner of the display (Fig. 4).

The Biohit *e*LINE pipettors should be charged using the original Biohit *e*LINE Charging Stand or Charging Carousel. However, the Biohit *e*LINE also features direct charging by using the Biohit *e*LINE AC-adaptor.

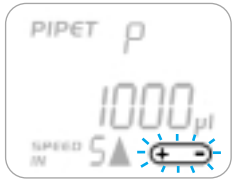


Fig. 4.

Note: If the battery is fully discharged, the display will be empty and there will be no response from the operating buttons. After a few minutes on charge, the battery symbol will be displayed and the + and – symbols will continue to blink until the battery is fully charged.

4.1. Charging with the Biohit *e*LINE Charging Stand and Carousel

The Biohit *e*LINE Charging Stands and Carousels are bench top charging units. The Charging Stand accommodates one Biohit *e*LINE pipettor and the Charging Carousel four Biohit *e*LINE pipettors. The *e*LINE Charging Stands and Carousels operate through the metal contacts placed in the sides of the pipettor and in the head of the Charging units (Fig. 5.).

Before operating the AC-adaptor must be connected to the socket at the rear of the Charging Stand (Fig. 5) or at the side of the Charging Carousel as well as to the electrical outlet. Before connecting the AC-adaptor to the electrical outlet, check that its voltage settings corresponds to the voltage settings of your electrical outlet.

Fig. 5.

Cat. No.	Product
73098X	Biohit *e*LINE Charging Stand
73099X	Biohit *e*LINE Charging Carousel

X: 1 = Euro, 2 = U.S., 3 = UK., 4 = Jpn

1. Check that the battery protector is removed and the battery cover is properly closed.
2. Place the pipettor into the Charging unit. Make sure that the metal contacts at the rear of the pipettor are properly fitted to the tracks of the metal contacts in the top of the Charging unit.
3. When charging, the battery symbol will be displayed with the + and – symbols flashing. The charging time for completely discharged batteries is 4 hours.
4. When the battery is full the battery symbol disappears from the display. If display shows **RESET** and **PRESS TIP**, press the tip ejection button to reset the pipettor, the pipettor will then be ready for use.

Note: Never reset the pipettor with the tip attached as the attached tip can induce an error in the home position determination of the piston and tip ejector collar!

Note: When the pipettor is not in use it is recommended to keep the pipettor in the Charging unit. This ensures that the battery is kept charged and the pipettor is ready for use.

4.2. Charging through direct charging system

The AC-adaptor supplied with the Biohit *e*LINE pipettor or Charging Stand can be used for direct charging of the Biohit *e*LINE electronic pipettor. The socket for the AC-adaptor is placed at the back of the pipettor (Fig. 6).

Fig. 6.

1. Before connecting the AC-adaptor to the electrical outlet, check that its voltage settings corresponds to the voltage settings of your electrical outlet.
2. Check that the battery protector is removed and the battery cover is properly closed.
3. Connect the AC-adaptor to the electrical outlet as well as to the socket at the back of the pipettor.
4. The charging time is 4 hours for a completely discharged battery.

Note: It is possible to continue pipetting while the *e*LINE pipettor is charged through the AC-adaptor (Fig. 7). With fully discharged battery a 5 minute initial charging is required before continuing the pipetting.

Note: The pipettor should not be operated continuously with the AC-adaptor connected!

Fig. 7.

4.3. Electrical specifications

Battery
- Rechargeable NiMH battery pack with protection circuit
- 4.8 V, 500 mAH
- Charging time max 4 hours for empty batteries

AC-adaptor for Charging Stand or direct charging
- Input voltages and main plug according to local requirements
- Output voltage 7.5 VDC, 300 mA

AC-adaptor for Charging Carousel
- Input voltages and main plug according to local requirements
- Output voltage 9 VDC, 1200 mA

5. Programming principle

The Biohit *e*LINE pipettors features 11 different operating modes and six different storage locations for frequently used modes with user-selected settings. The operating modes are divided in to three Mode Ranges (PIPET, MULTI, PROG) and each Mode Range includes the following operating modes:

Mode Range:	Operating Modes:
PIPET	**P**, **rP**, **P+MIXING**, **P COUNT**, **P MANUAL**
MULTI	**d**, **dd**, **dd+MIXING**, **Sd**, **SA**, **Ad**
PROG	1, 2, 3, 4, 5, 6 (=storage locations)

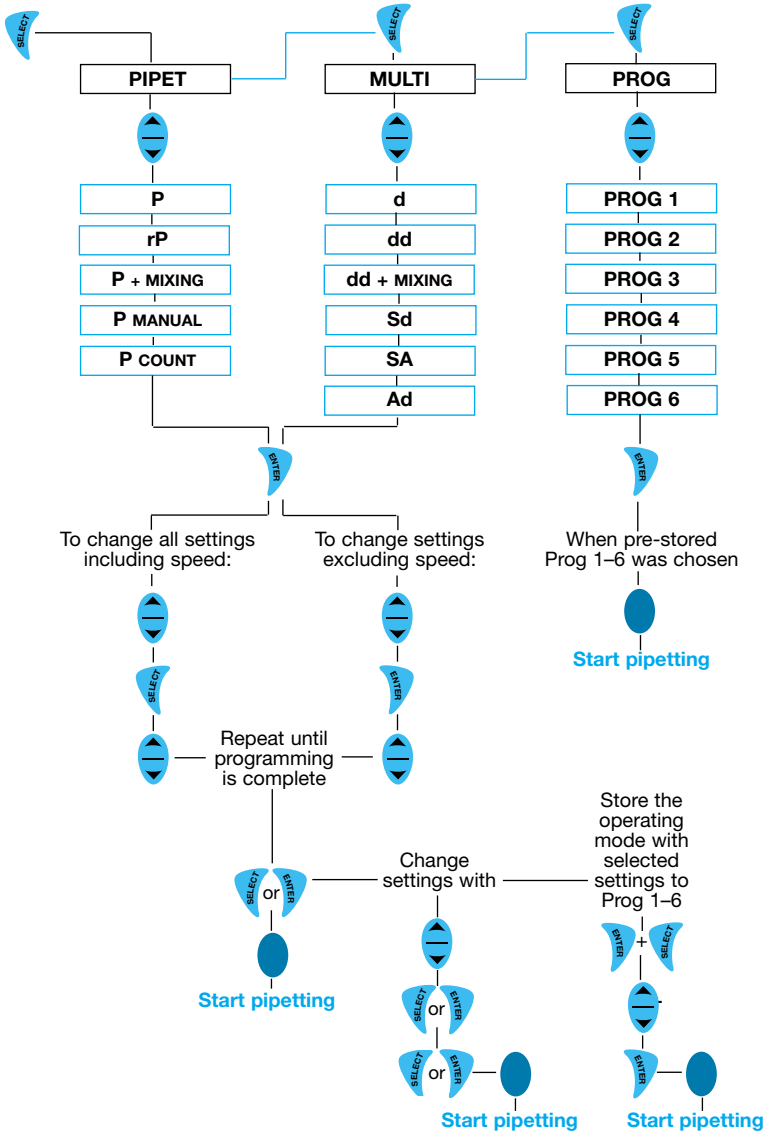
Programming is performed by using the Select, Enter and arrow keys. The mode range is selected with the Select key, the desired operating mode is then selected with the arrow key and selection confirmed with Enter key.

The setting changes (volumes, aliquots, etc.) are made with arrow keys and confirmed with either Select or Enter key. In the shortcut programming the changes are confirmed with the Enter key. In the shortcut programming the speed adjustment is not possible. The use of the Select key in confirming the setting changes enables also the speed adjustment.

Note: When the programming or pipetting cycle is completed it is possible to make the setting changes inside the operating mode simply by pressing the arrow key and confirming with Enter or Select.

The Biohit *e*LINE pipettor includes also six storage locations (Prog 1–6). The operating mode with user-selected settings can be stored in to the storage location under PROG mode for future recalls. After completing the setting changes of the selected operating mode simply press Enter and Select keys simultaneously, choose the storage location (PROG 1-6) with arrow key and press Enter. The stored operation mode can now be recalled from the PROG mode.

5.1. Programming map



5.2. Speed adjustment

There are 9 speeds available for both dispensing and aspiration. The speed is indicated in the bottom left hand corner of the display. The default speed is 5 for all operating modes.

Speed can be adjusted during the programming by completing the setting changes with the select key. In every operating mode the speed adjustment is the last programming step. After adjusting the “speed out” the programming is completed with enter or select key and the pipettor is then ready for operation.

Note: The P MANUAL mode includes 5 different dispensing and aspirating speeds.

6. PIPET modes

The mode range PIPET includes 5 different operating modes.

Symbol	Description
P	Pipetting with automatic blow-out
rP	Reverse pipetting without blow-out
P + MIXING	Pipetting with blow-out followed with mixing function
P COUNT	Pipetting with blow-out and displayed cycle counter
P MANUAL	Manual pipetting with on-line volume display

6.1. Pipetting mode (P) and pipetting with mixing (P+MIXING)

In pipetting mode (P) the *e*LINE performs pipetting with blow-out. In pipetting with mixing mode (P+MIXING) pipetting is followed by a mixing function.

1. Press SELECT to display **PIPET**
2. Scroll with ▲▼ until the symbol **P** or **P+MIXING** is displayed.
3. Confirm by pressing ENTER
4. Select the desired pipetting volume by using the ▲▼

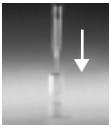
Note: When holding down the ▲▼ the volume display starts to scroll faster.

5. Press SELECT to confirm selection and to display the speed in

   or press ENTER and continue from Step 10.

6. Select the speed in with (1= Min and 9 = Max)
7. Press or to confirm selection and to display the speed out
8. Select the speed out with (1= Min and 9 = Max)
9. Press or to confirm selections
10. Position the tip to aspirate and press the START button
11. Position the tip to dispense. Press the START button to dispense the sample. The tip is emptied with blow-out and the piston returns automatically back to the home position.

Step 10.



Step 11.

Note: When the START button is held down during dispensing the piston will stop in the lowest position. When the start button is released the piston will automatically return to the home position.

To mix:

1. Position the tip in to the solution, then press and hold the START button.

   Mixing is performed automatically as long as the START button is held down.
2. Position the tip to dispense. Press START button twice

Note: The mixing is performed with about 70% of the total volume.

6.2. Reverse pipetting (**rP**)

A selected volume plus and excess is aspirated into the tip. After dispensing the selected volume the excess volume remains in the tip and is discarded.

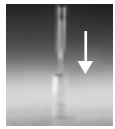
1. Press SELECT to display **PIPET**
2. Scroll with ▲▼ until the symbol **rP** is displayed.
3. Confirm by pressing ENTER
4. Select the desired pipetting volume by using ▲▼

Note: When holding down ▲▼ the volume display starts to scroll faster.

5. Press SELECT to confirm selection and to display the speed in

   or press ENTER and continue from Step 10.
6. Select the speed in with ▲▼ (1= Min and 9 = Max)
7. Press ENTER or SELECT to confirm selection and to display the speed out
8. Select the speed out with ▲▼ (1= Min and 9 = Max)
9. Press ENTER or SELECT to confirm selections
10. Position the tip to aspirate and press the START button
11. Position the tip to dispense. Press the START button
12. Position the tip to discard excess liquid and press the START button twice

Step 10



Step 11

Step 12

Note: It is also possible to continue to aspirate and dispense the same volume without the empty function. To continue, keep the START button depressed during dispensing and within one second the direction arrow will change. Continuing to hold the START button down, place the tip into the liquid again and then release the START button to aspirate the next sample.

6.3. Pipetting with cycle counter (P COUNT)

The *e*LINE performs pipetting with blow-out and the cycle counter function. The cycle counter counts up to 99 pipettings and then returns back to 0. It is possible to choose the cycle number to begin with. It is also possible to change the cycle number or reset the counter during the pipetting by using the arrow keys.

1. Press SELECT to display **PIPET**
2. Scroll with ▲▼ until the symbol **P** and **COUNT** is displayed.
3. Confirm by pressing ENTER
4. Select the desired pipetting volume by using the ▲▼

Note: When holding down ▲▼ the volume display starts to scroll faster.

5. Press ENTER or SELECT to confirm selection.
6. Cycle counter will show **1**. Use ▲▼ to select the sample number you want to begin with (0-99).
7. Press SELECT to confirm the selection and to display the speed in

   or press ENTER and continue from Step 12.
8. Select the speed in with ▲▼ (1= Min and 9 = Max)
9. Press ENTER or SELECT to confirm selection and to display the speed out
10. Select the speed out with ▲▼ (1= Min and 9 = Max)
11. Press ENTER or SELECT to confirm selections
12. Position the tip to aspirate and press the START button
13. Position the tip to dispense and press the START button . The tip is emptied with blow-out and the piston returns automatically back to the home position. The pipettor is ready for next pipetting.

Step 12

Step 13

Note: To change the cycle number or to reset the counter during the pipetting, press the ▲▼ to display the desired cycle number and confirm with ENTER .

6.4. Manual pipetting (P MANUAL)

In the manual pipetting mode the aspiration and dispensing are controlled manually. The aspiration or dispensing continues as long as the START button is held down (within the selected volume range). The aspiration/dispensing direction can be changed during pipetting by using the arrow key. In the manual pipetting mode the display always shows the actual amount of sample in the tip.

1. Press SELECT to display **PIPET**
2. Scroll with ▲▼ until the symbol **P MANUAL** is displayed.
3. Confirm by pressing ENTER
4. Select the desired pipetting volume by using ▲▼

Note: When holding down ▲▼ the volume display starts to scroll faster.

5. Press SELECT to confirm selection and to display the speed in

   or press ENTER or continue from Step 10.
6. Select the speed in with ▲▼ (1= Min and 5 = Max)
7. Press ENTER or SELECT to confirm selection and to display the speed out
8. Select the speed out with ▲▼ (1= Min and 5 = Max)
9. Press ENTER or SELECT to confirm selections
10. Position the tip to aspirate and press the START button

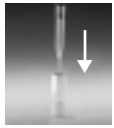
Step 10

Note: The aspiration can be interrupted at any time simply by releasing the START button and continued by pressing the START button again. The aspiration/dispensing direction can be changed at any time by pressing the arrow key.

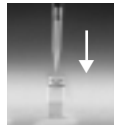
11. Press the to change the aspiraton/dispensing direction.

12. Position the tip to dispense. Press the START button

13. When the tip is empty (volume reaches **0** µl), within one second the display will show **E**. Position the tip to empty the tip with blow-out and press the START button twice.



Step 12



Step 13

7. MULTI modes

The mode range **MULTI** includes 6 different operating modes.

Symbol	Description
d	Multi-Dispensing
dd	Diluting
dd + MIXING	Diluting with mixing function
Sd	Sequenced dispensing
SA	Multi-aspirating
Ad	Automatic multi-dispensing with selected interval

7.1. Multi-dispensing (d)

The pipettor performs repetitive dispensing of a selected volume. The sum of the dispensing aliquots and an automatically selected excess volume is aspirated into the tip. The excess volume is needed to ensure equal operating conditions for each dispensing step.

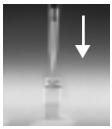
1. Press SELECT to display **MULTI**
2. Scroll with until the symbol **d** is displayed.
3. Confirm by pressing ENTER
4. Select the desired dispensing volume by using

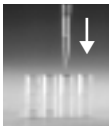
Note: When holding down the the volume display starts to scroll faster.

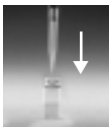
5. Press ENTER or SELECT to confirm the selection and to display the aliquots
6. Select the desired number of aliquots with
7. Press SELECT to confirm selection and to display the speed in

   or press ENTER and continue from Step 12.
8. Select the speed in with (1= Min and 9 = Max)
9. Press ENTER or SELECT to confirm selection and to display the speed out
10. Select the speed out with (1= Min and 9 = Max)
11. Press ENTER or SELECT to confirm selections
12. Position the tip to aspirate and press the START button . The display shows PRE OUT and arrow down to indicate the reset function.
13. Position the tip to discard priming excess and press the start button .
14. To dispense, position the tip, press START button and repeat until the cycle is complete.
15. Finally position the tip to discard any remaining excess and press the START button twice .


Step 12


Step 13


Step 14


Step 15

Note: It is also possible to continue to aspirate and dispense the same volume without the empty function. To continue, keep the START button pressed during the last dispensing and within one second the direction arrow will change. Keeping the START button depressed, place the tip into the liquid again and then release the START button to aspirate the next sample.

7.2. Diluting (**dd**) and diluting with mixing (**dd+MIXING**)

Two different solutions separated with an air gap are aspirated and then dispensed together with an automatic blow-out. The purpose of the air gap is to avoid contamination when aspirating the second volume but it will not prevent the two liquids from mixing in the tip. In dd+MIXING the dilution is followed with the mixing function.

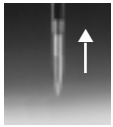
1. Press SELECT to display **MULTI**
2. Scroll with ▲▼ until the symbol **dd** or **dd+MIXING** is displayed.
3. Confirm by pressing ENTER
4. Select the desired diluent volume (volume 1) by using ▲▼

Note: When holding down ▲▼ the volume display starts to scroll faster.

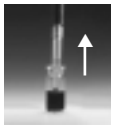
5. Press ENTER or SELECT to confirm the selection
6. Select the desired sample volume (volume 2) with ▲▼
7. Press SELECT to confirm selection and to display the speed in

   or press ENTER and continue from Step 12.
8. Select the speed in with ▲▼ (1= Min and 9 = Max)
9. Press ENTER or SELECT to confirm selection and to display the speed out
10. Select the speed out with ▲▼ (1= Min and 9 = Max)
11. Press ENTER or SELECT to confirm selections
12. Position the tip to aspirate the volume 1 and press the START button
13. With the tip in the air press the START button again to aspirate an air gap
14. Position the tip to aspirate the volume 2 and press the START button
15. Position the tip to dispense and press the START button

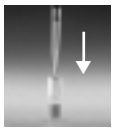
Step 12



Step 13



Step 14



Step 15

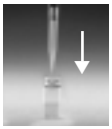
To mix:

1. Position the tip in to the solution, then press and hold the START button

   The mixing is performed automatically as long as the START button is held down.

2. Release the START button and position the tip to dispense.
3. Empty the tip by pressing the START button twice


Step 1


Step 3

Note: The mixing is performed with about 70% of the total volume.

7.3. Sequenced dispensing (**Sd**)

A series of different volumes of same solution can be delivered in any desired order. The sum of dispensed volumes can not exceed the nominal volume of the pipettor.

1. Press SELECT to display **MULTI**
2. Scroll with ▲▼ until the symbol **Sd** is displayed.
3. Confirm by pressing ENTER
4. Select the number of dispensing steps by using ▲▼
5. Press ENTER or SELECT to confirm the selection
6. Select the first dispensing volume with ▲▼

Note: When holding down ▲▼ the volume display starts to scroll faster.

7. Press ENTER or SELECT to confirm selection and to select the next dispensing volume.
8. Press SELECT to confirm the last volume selection to display speed in

   or press ENTER and continue from Step 13.

9. Select the speed in with (1= Min and 9 = Max)

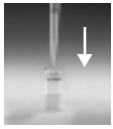
10. Press or to confirm selection and to display the speed out

11. Select the speed out with (1= Min and 9 = Max)

12. Press or to confirm selections

Step 13

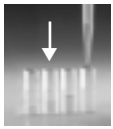
13. Position the tip to aspirate and press the START button . The display shows PRE OUT and arrow down to indicate the reset function.



Step 14

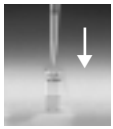
14. Position the tip to discard priming excess and press the start button

15. Position the tip to dispense and press the START button Repeat until the cycle is complete.



Step 15

16. Finally position the tip to discard any remaining excess and press the START button twice.



Step 16

Note: It is also possible to continue to aspirate and dispense the same volumes without the empty function. To continue, keep the START button pressed during the last dispensing and within one second the direction arrow will change. Keeping the START button depressed, place the tip into the liquid again and then release the START button to aspirate the next sample.

7.4. Multi-aspirating (**SA**)

The pipettor performs consecutive aspiration operations of the programmed volume. This mode allows e.g. emptying a microwell plate, sample pooling and other special applications.

1. Press to display **MULTI**

2. Scroll with until the symbol **SA** is displayed.

3. Confirm by pressing

4. Select the desired aspirating volume by using

Note: When holding down the volume display starts to scroll faster.

5. Press ENTER or SELECT to confirm the selection
6. Select the desired number of aspirations with ▲▼
7. Press SELECT to confirm selection and to display the speed in

   or press ENTER and continue from Step 12.
8. Select the speed in with ▲▼ (1= Min and 9 = Max)
9. Press ENTER or SELECT to confirm selection and to display the speed out
10. Select the speed out with ▲▼ (1= Min and 9 = Max)
11. Press ENTER or SELECT to confirm selections
12. Position the tips to aspirate and press the START button repeating the action until the cycle is complete. The total volume is displayed.
13. Position the tips to dispense and press START button twice.


Step 12


Step 13

7.5. Automatic dispensing (**Ad**)

The pipettor performs repetitive dispensing of a selected volume automatically at the specified interval (0.1 – 9.9 seconds). The sum of the dispensing aliquots and an automatically selected excess volume is aspirated into the tip. The excess volume is needed to ensure equal operating conditions for each dispensing step.

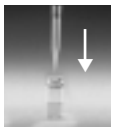
1. Press SELECT to display **MULTI**
2. Scroll with ▲▼ until the symbol **Ad** is displayed.
3. Confirm by pressing ENTER
4. Select the desired dispensing volume by using the ▲▼

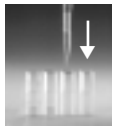
Note: When holding down ▲▼ the volume display starts to scroll faster.

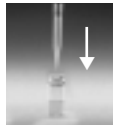
5. Press ENTER or SELECT to confirm the selection and to display the aliquots
6. Select the desired number of aliquots with
7. Press ENTER or SELECT to confirm selection
8. Select the desired dispensing pace with (0.1 - 9.9 seconds)
9. Press SELECT to confirm the selection and to display the speed in

   or press ENTER and continue from Step 14.
10. Select the speed in with (1= Min to 9 = Max)
11. Press ENTER or SELECT to confirm selection and to display the speed out
12. Select the speed out with (1= Min to 9 = Max)
13. Press ENTER or SELECT to confirm selections
14. Position the tip to aspirate and press the START button . The display shows PRE OUT and arrow down to indicate the reset function.
15. Position the tip to discard priming excess and press and hold the START button .
16. To dispense, position the tip, release the START button and the pipettor dispenses the aliquots at the specified pace.
17. Finally position the tip to discard any remaining excess and press the START button twice .


Step 14


Step 15


Step 16


Step 17

Note: It is possible to stop the second counter and interrupt dispensing at any time by pressing the START button. Releasing the START button activates the counter again and dispensing continues.

Note: It is also possible to interrupt the dispensing by pressing the START button and then ENTER key simultaneously. The display will show **E** and the tip can be emptied by pressing the START button.

Note: Furthermore it is possible to continue to aspirate and dispense the same volume without the empty function. To continue, press the START button immediately after E is displayed and within one second the direction arrow will change. Keeping the START button depressed, place the tip into the liquid again and then release the START button to aspirate the next sample.

8. PROG mode

The Prog mode includes six different storage locations (Prog 1 – 6). The favourite operating modes with user-selected settings can be stored to these locations for future recalls.

8.1. Store operating mode to storage locations:

To store an operating mode to Prog 1–6 locations

1. Complete the programming of the selected operating mode as described in paragraphs 6 and 7
2. Press first ENTER and then simultaneously SELECT to display the **PROG 1**
3. Choose the desired storage location (Prog 1–6) with

Note: The display shows simultaneously the mode symbol of the previously stored mode in the storage location in question.

4. Press ENTER to store the operating mode in to the selected storage location

Note: This procedure overwrites the possible previously stored mode from the selected storage location.

8.2. Recall stored mode from the storage location

To recall a stored mode from Prog 1–6:

1. Press SELECT to display **PROG**
2. Scroll with until the desired storage location is displayed (1–6)

Note: The display shows simultaneously the mode symbol of the operating mode stored in to the storage location in question.

3. Confirm by pressing ENTER

4. The pipettor is ready to perform according to the stored mode. Position the tip to aspirate and press START button  .

9. Pipetting recommendations

The wide selection of different operating modes makes is possible to perform several different liquid handling tasks with Biohit *e*LINE pipettors. The operating modes **P**, **P+MIXING**, **P COUNT**, **dd**, **dd+MIXING** and **SA** feature an automatic blow-out and others leave an excess liquid in the tip. The user should follow the recommendations below to ensure optimal performance.

9. 1. Dispensing with blow-out

The automatic blow-out function, in different pipetting and diluting modes, is followed by an immediate return of the piston to the home position. To avoid accidental aspiration of the liquid back into the tip, it is recommended that the dispensing is always performed above the liquid surface.

By holding the START button down during dispensing the piston will stop in the lowest position. This allows the tip to be placed under the liquid surface or against the bottom or the wall of the container during dispensing. Once the liquid is dispensed, the tip can be removed from the container and the START button released.

9.2. Dispensing without blow-out

The pipettor will not perform the blow-out function in modes **rP**, **P MANUAL**, **d**, **Ad**, and **Sd**. Therefore it is recommended that dispensing in these modes is always performed with the tip set against the wall or bottom of the container.

9.3. Other recommendations

- Hold the pipettor vertically when aspirating the liquid and place the tip only a few millimetres into the liquid.
- Pre-rinse the tip before aspirating the liquid by filling and emptying the tip for three to five times. This is important especially when pipetting liquids with a viscosity and density greater than water.
- Check that the pipettor, tip and liquid are at the same temperature.
- To avoid the contamination, do not rest the pipettor on its side especially when the tip attached.
- Change the tip cone filter regularly.
- Always place the pipettor in the charging unit when not in use.

- Never strike the tip cone against the tip tray when mounting the tips as this can damage several internal components.
- Do not use excessive force when mounting the tips as this can hamper the tip ejection.
- Avoid rough handling, light pressure is all that is required when using the keyboard or mounting the tips.
- Do not drop the pipettor or charging unit as this may cause excessive shock.
- Avoid exposing the unit to extreme temperature changes, humidity and dust (operating temperature from 15°C to 40°C and maximum humidity 80%).

10. Maintenance

To ensure trouble-free operation it is recommended to apply regular maintenance and cleaning to Biohit *e*LINE electronic pipettors.

Note: Remove the battery pack from the pipettor prior to servicing!

It is recommended always to use gloves when cleaning the pipettor.

Change the tip cone filter regularly with the tool provided.

10.1. Cleaning the outer surface of the pipettor

To clean and decontaminate the outer surface use Proline® Biocontrol (Cat.no. 724004, 5 litres) and a soft lint-free cloth. Gently clean the surface of the pipettor with moistened cloth and wipe dry. It is also possible to use ethanol (70%) isopropanol (60%) or a mild detergent as a cleaning agent.

Note: Do not let the liquid enter the pipettor handle!

10.2. Cleaning, decontaminating and autoclaving the lower part of the pipettor

The lower parts of the *e*LINE pipettors are autoclavable (see Fig. 8. Note: The *e*5000 model does not have parts no. 2, 3, and 5). To clean, decontaminate or autoclave the lower parts of the pipettor follow these steps:

Disassembling:

1 . Remove the battery pack (1).

2. *e*10, *e*120, *e*300, *e*1000: Unscrew the tip ejector collar (2) anti-clockwise and remove it.

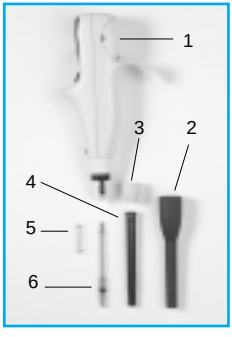


Fig. 8.

*e*5000: Unscrew the green tip cone (4) anti-clockwise and remove it. Release the black tip ejector assembly from the tip cone by turning it anti-clockwise and then pull it out. Remove the tip cone filter if fitted and continue from Step 4.

3. Unscrew the tip cone holder (3) anti-clockwise and remove the tip cone holder (3), tip cone (4) and spring (5). Remove the tip cone filter if fitted.
4. Unscrew the exposed piston (6) anti-clockwise and remove it.

Cleaning:

To clean the exposed parts use Proline® Biocontrol, ethanol (70%), isopropanol (60%) or mild detergent and soft lint-free cloth. The interior of the tip ejector collar and tip cone can be cleaned with a cotton swab. Rinse with distilled water if needed. Let the parts dry. Grease the piston thinly with the grease provided.

Decontaminate:

For complete decontamination place the tip ejector collar (2), tip cone holder (3), tip cone (4), spring (5) and piston (6) into a beaker containing Biohit Proline® Biocontrol and leave for at least 30 minutes (Fig. 9), rinse the parts with distilled water.

Fig. 9.

Note: The corresponding parts in the *e*5000 model are the green tip cone (4), the black tip ejector assembly and the piston (6).

Let the parts dry. Grease the piston thinly with the grease provided.

Autoclaving:

The tip ejector collar (2), tip cone holder (3), tip cone (4), spring (5) and piston (6) of the *e*LINE pipettor can be steam autoclaved (121°C, 1 bar overpressure for 20 minutes), see Fig. 8. These parts can be autoclaved as one unit or separately as individual parts. It is also possible to clean the parts and grease the piston prior to autoclaving.

Note: The autoclavable parts in the *e*5000 model are the green tip cone (4), the black tip ejector assembly and the piston (6).

Note: Avoid excess grease. Use only the grease provided with the pipettor.

Note: Before reassembling check that no lint or particles are on the surface of the piston.

Reassembling:

1 . Screw the piston (6) clockwise into position.

2. *e*10, *e*120, *e*300, *e*1000: Place the spring (5) around the piston.

   *e*5000: Attach the green tip cone by screwing it clockwise. Place the tip ejector assembly to the tip cone and attach by turning it clockwise. Replace the tip cone filter with the tool provided and continue from Step 5.

3. Push the tip cone (4) into position and attach it by screwing the tip cone holder (3) back. Replace the tip cone filter with the tool provided.

4. Attach the tip ejector collar (2) by screwing it clockwise.

5. Replace the battery pack (1). Reset the pipettor and press the start button several times to test the movement. Test the tip ejection operation.

Note: When reassembling the pipettor do not over tighten the parts.

Note: It is always necessary to check the performance of the pipettor after in-house service or maintenance (see paragraph 11).

10.3. Battery replacement

The design of the Biohit *e*LINE pipettors enables fast and easy battery replacement. The battery replacement pack includes 4 NiMH batteries fixed to the battery cover. If the batteries do not hold a sufficient charge for proper operation follow these steps for replacement of the battery pack.

1. Hold the pipettor in a horizontal position with the display facing up.
2. Press the two charging contacts simultaneously to release the battery pack. (Fig. 10.)
3. Place the new battery pack into the battery compartment and close the battery cover by pressing it lightly.

Fig. 10.

Note: The battery pack fits in to the compartment one way only. If the pack is inserted incorrectly the battery cover will not close properly.

Note: Only use battery packs supplied by the manufacturer. The use of any other type of battery will immediately invalidate the warranty!

Note: Dispose the used battery pack in accordance of your local regulations.

10.4. Storage

When not in use it is recommended that the pipettor is always stored in the *e*LINE Charging Stand or Carousel. However, during long storage periods (several months) it is recommended to disconnect the Charging Stand and Carousel from the mains outlet.

It is also advisable to remove the battery pack from the pipettor. This protects the batteries against discharging during the long storage period.

11. Performance Testing

It is recommended to check the performance of your Biohit *e*LINE pipettors regularly (e.g. every 3 months) and always after in-house maintenance. However, users should establish a regular testing routine for their pipettors having regard to the accuracy requirements of the application, frequency of use, number of operators using the pipettor, nature of the liquid dispensed and the acceptable maximum permissible errors established by the user. (ISO 8655-1.)

Performance test should take place in a draught-free room at 15–30°C, constant to ±0.5°C and relative humidity above 50%. The pipettor, tips and the test water should have stood in the test room sufficient time (at least 2 hours) to reach equilibrium with the room conditions. Use distilled or de-ionised water (grade 3). (ISO 8655-6.)

Weighting:

1. Adjust the desired test volume V_s.
2. Carefully fit the tip onto the tip cone.
3. Fill the tip with test water and expel to waste five times to reach a humidity equilibrium in the dead air volume.
4. Replace the tip. Pre-wet the tip by filling it once with the test water and expel to waste.
5. Aspirate the test water, immersing the tip only 2–3 mm below the surface of the water. Keep the pipettor vertical.
6. Withdraw the pipettor vertically and touch the tip against the side wall of the test water container.
7. Pipette the water into the weighing vessel, touching the tip against the inside wall of the vessel just above the liquid surface at an angle of 30° to 45°. Withdraw the pipettor by drawing the tip 8–10 mm along the inner wall of the weighing vessel.
8. Read the weight in mgs (m_i).
9. Repeat the test cycle until 10 measurements have been recorded.
10. Convert the recorded masses (m_i) to volumes (V_i) by multiplying the mass with the correction factor Z (Z-values in the table below):
    $V_i = m_i * Z$

11. Calculate the mean volume ($\bar{V}$) delivered:
    $\bar{V} = (\Sigma V_i)/10$

12. For conformity evaluation calculate the systematic error e_s of the measurement:
    in µl: $e_s = \bar{V} - V_s$ V_s = selected test volume
    V_0 = nominal volume
    or in %: $e_s = 100\ (\bar{V} - V_s)/V_0$

13. For conformity evaluation calculate the random error of the measurement:
    as standard deviation $s = \sqrt{\frac{\Sigma(V_i - \bar{V})^2}{n-1}}$ n = number of measurement (10)
    or as coefficient of variation $CV = (100s/\bar{V}) * (V_s/V_0)$

14. Compare the results to the values in the Maximum permissible errors - table below (ISO 8655-2).

Note: Systematic error is the difference between the dispensed volume and the selected test volume. Random error is the scatter of the dispensed volumes around the mean of the dispensed volume. (ISO 8655-1.)

Note: Users should establish acceptable maximum permissible errors based on the field of use and the accuracy requirements placed on the pipettor (ISO 8655-1).

Nominal volume	Maximum permissible systematic errors		Maximum permissible random errors	
	±%	±µl	±%	±µl
10	1.2	0.12	0.8	0.08
120	1.3	1.6	0.5	0.6
300	1.3	4.0	0.5	1.5
1000	0.8	8.0	0.3	3.0
5000	0.8	40	0.3	15.0

Note: For the variable volume pipettors the absolute maximum permissible errors for the nominal volume of the pipettor apply to every selectable volume throughout the useful range of the pipettor (ISO 8655-2).

Z-values (µl/mg):				
Temp. (°C)	Air Pressure (kPa)			
	95	100	101.3	105
20.0	1.0028	1.0028	1.0029	1.0029
20.5	1.0029	1.0029	1.0030	1.0030
21.0	1.0030	1.0031	1.0031	1.0031
21.5	1.0031	1.0032	1.0032	1.0032
22.0	1.0032	1.0033	1.0033	1.0033
22.5	1.0033	1.0034	1.0034	1.0034
23.0	1.0034	1.0035	1.0035	1.0036
23.5	1.0036	1.0036	1.0036	1.0037

Note: This method is based on ISO 8655.

11.1 Recalibration

The Biohit *e*LINE electronic pipettor's calibration has been factory checked and certified at 22°C using grade 3 distilled water according to ISO 8655. The pipettor's specifications are guaranteed only with genuine Biohit tips.

Note: Biohit offers an accredited calibration service. Please contact your local Biohit representative for further information.

The length of the piston stroke is electronically monitored and the pipettor does not normally need recalibration. However, for special applications the Biohit *e*LINE pipettors can be recalibrated in **PIPET** modes (excluding **P MANUAL**) for one selected volume at a time as follows:

1. Press SELECT to display **PIPET**
2. Scroll with ▲▼ until the desired mode (**P**, **rP**, **P+MIXING** or **P COUNT**) is displayed
3. Confirm the selection by pressing ENTER
4. Select the pipetting volume to be recalibrated by using ▲▼
5. Press START and ENTER simultaneously to enter the recalibration mode

Note: When pressing the both buttons the display will be blank except for the µl and **CAL** sign. Releasing the buttons will display the volume to be recalibrated.

6. Use the  to increase or decrease the volume in incremental steps (±4 increments).
7. Press  to confirm the recalibration and to display speed in ***or*** press  and continue from point 12.
8. Select the speed in with  (1= Min to 9 = Max)
9. Press  or  to confirm selection and to display the speed out
10. Select the speed out with  (1= Min to 9 = Max)
11. Press  or  to confirm selections
12. Position the tip to aspirate and press the START button 
13. Position the tip to dispense and press the START button 

Note: After recalibration the display will show the operating mode symbol followed with letters CAL to indicate that the mode and the volume in question is recalibrated to give out the new volume.

Note: Changing the mode will reset the recalibration. However, it is possible to store the recalibrated mode to the storage location in PROG mode as described in paragraph 8.

12. Trouble shooting

The Biohit *e*LINE pipettors have a onboard monitoring program to control the performance of each pipetting action. If any error message appears to the display it means that the pipettor has been unable to perform the attempted action properly. In case of an error the display will show **Error** and **PRESS Ent.** message. To clear the message please follow these steps:

1. As this procedure will reset the pipettor and the tip ejector please first remove the tip by hand.
2. Recharge the pipettor for 15 minutes.
3. Clear the error message by pressing  . The display will show **RESET** and **PRESS TIP**.
3. Reset the pipettor by pressing either of the tip ejector buttons  .

Note: Repeated occurrence of error messages indicates an internal error causing failure of the *e*LINE to complete the execution of the pipetting. The *e*LINE therefore needs to be returned to the nearest Biohit Service Centre or your local Biohit service representative for repair.

Symptom	Possible cause	Solution
Droplets left inside the tip	Unsuitable tip	Use original tips
Leakage or pipetted volume too small	Non uniform wetting of the plastic	Attach new tip
	Tip incorrectly attached	Attach firmly
	Unsuitable tip	Use original tips
	Foreign particles between tip and cone	Clean the tip cone, attach new tip
	Instrument contaminated	Clean and grease the piston and the tip cone
	Insufficient amount of grease on a piston and o-ring	Grease accordingly
Pipettor out of established specifications	Instrument damaged	Return to your Biohit service representative for servicing
Pipettor blocked, aspirated volume too small	Liquid has penetrated tip cone and dried	Clean and grease the piston and the tip cone
Tip ejector jammed or moves erratically	Tip ejector collar has been contaminated	Remove and clean ejector collar and tip cone
Continuous error messages	Instrument damaged	Return to your Biohit service representative for servicing

13. Warranty information

Biohit *e*LINE electronic pipettors are covered by a warranty for one year against defects in materials and workmanship. (Battery packs are covered for three months.) Should your *e*LINE pipettor fail to function according to specifications at any time, please contact your local Biohit representative immediately. The warranty does not cover defects caused by excessive wear and tear or by a breach of the manufacturer's recommendations given in this manual, or if other than original spare parts supplied by the manufacturer have been used.

Each Biohit *e*LINE electronic pipettor is tested before shipping by the manufacturer. The Biohit Quality Assurance Procedure guarantees that the Biohit *e*LINE electronic pipettor you have purchased is ready for use.
Each Biohit *e*LINE electronic pipettor is CE marked, fulfilling the requirements of the EN 55014, 1993 and EN 55104, 1995.

14. Performance specifications

Note: The manufacturer's specifications below should be used as guidelines when establishing your own performance specifications in accordance with ISO 8655.

Cat.No.	Channels	Volume Range	Test Volume	Inaccuracy	Imprecision	Number of Dispensings
730020	1-ch	0.2–10 µl	10 µl	0.90%	0.40%	
			5 µl	1.00%	0.70%	
			1 µl	2.50%	1.50%	1–50
730040	1-ch	5–120 µl	120 µl	0.40%	0.15%	
			60 µl	0.60%	0.20%	
			12 µl	2.00%	1.00%	
			5 µl	3.50%	1.50%	1–24
730060	1-ch	20–300 µl	300 µl	0.40%	0.15%	
			150 µl	0.60%	0.20%	
			30 µl	1.50%	0.80%	
			20 µl	2.50%	1.00%	1–15
730080	1-ch	50–1000 µl	1000 µl	0.40%	0.15%	
			500 µl	0.60%	0.20%	
			100 µl	1.50%	0.50%	
			50 µl	2.00%	1.00%	1–20
730100	1-ch	100–5000 µl	5000 µl	0.50%	0.15%	
			2500 µl	0.80%	0.20%	
			500 µl	1.00%	0.40%	1–50

Notes