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## CellTram<sup>®</sup>4r Air CellTram<sup>®</sup>4r Oil

**Operating manual**

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	English (EN)

## 1 Operating instructions




### 1.1 Using this manual

- ▶ Read this operating manual completely before using the device for the first time. Observe the instructions for use of the accessories where applicable.
- ▶ This operating manual is part of the product. Please keep it in a place that is easily accessible.
- ▶ Enclose this operating manual when transferring the device to third parties.
- ▶ The current version of the operating manual for all available languages can be found on our webpage [www.eppendorf.com/manuals](http://www.eppendorf.com/manuals).

### 1.2 Danger symbols and danger levels

#### 1.2.1 Danger symbols


The safety instructions in this manual have the following danger symbols and danger levels:

	<b>Hazard point</b>		<b>Cuts</b>
	<b>Material damage</b>		

#### 1.2.2 Danger levels

<b>DANGER</b>	<i>Will</i> lead to severe injuries or death.
<b>WARNING</b>	<i>May</i> lead to severe injuries or death.
<b>CAUTION</b>	May lead to light to moderate injuries.
<b>NOTICE</b>	May lead to material damage.

### 1.3 Symbols used

<b>Depiction</b>	<b>Meaning</b>
1.	Actions in the specified order
2.	
▶	Actions without a specified order
•	List
<i>Text</i>	Display text or software text
	Additional information

**2 Safety****2.1 Intended use**

CellTram 4r Air and CellTram 4r Oil are intended to be used in laboratories for research, development, industrial and routine work, training, and education. Applications include, but are not limited to the fields of life sciences and biotechnology. The devices are designed for smooth uptake/dispensing of small specimens and minimal amounts of liquids (microliters, nanoliters), for gentle aspiration of small specimens and for gentle holding of suspension cells. The devices will commonly be used in conjunction with micromanipulators and microcapillaries (as a consumable). The devices are intended exclusively for indoor use and for the operation by qualified staff.

**2.2 Warnings for intended use**

---

**WARNING! Risk of injury due to flying capillaries and glass splinters.**

If exposed to high pressures, capillaries may detach themselves from the grip heads and become projectiles.

Capillaries can crack as a result of incorrect handling.

- ▶ Wear protective goggles.
- ▶ Never aim capillaries at people.
- ▶ Use capillaries with an outer diameter that matches the grip head specifications.
- ▶ Always mount / dismount capillaries when they are depressurized.
- ▶ Mount the capillary correctly in the grip head.
- ▶ Do not touch the capillary with the Petri dish or other objects.

**WARNING! Damage to health due to infectious liquids and pathogenic germs.**

- ▶ When handling infectious liquids and pathogenic germs, observe the national regulations, the biosafety level of your laboratory, and the manufacturers' Safety Data Sheets and application notes.
- ▶ Wear your personal protective equipment.
- ▶ For comprehensive regulations about handling germs or biological material of risk group II or higher, please refer to the "Laboratory Biosafety Manual" (source: World Health Organization, Laboratory Biosafety Manual, in the currently valid version).





**WARNING! Damage to health due to toxic, radioactive or aggressive chemicals.**

- ▶ Wear your personal protective equipment.
- ▶ Observe the national regulations for handling these substances.
- ▶ Observe the material safety data sheets and manufacturer's application notes.




**CAUTION! Poor safety due to incorrect accessories and spare parts**

The use of accessories and spare parts other than those recommended by Eppendorf may impair the safety, functioning and precision of the device. Eppendorf cannot be held liable or accept any liability for damage resulting from the use of accessories and spare parts other than those recommended or from the improper use of such equipment.

- ▶ Only use accessories and original spare parts recommended by Eppendorf.

### 2.3 Warning symbols on the device

Depiction	Meaning
	<b>WARNING</b> Read the instructions for use

### 2.4 User profile

The device and accessories may only be operated by trained and skilled personnel.

Before using the device, read the operating manual and the instructions for use of the accessories carefully and familiarize yourself with the device's mode of operation.

### 2.5 Information on product liability

In the following cases, the designated protection of the device may be affected. The liability for any resulting damage or personal injury is then transferred to the owner:

- The device is not used in accordance with the operating manual.
- The device is used outside of its intended use.
- The device is used with accessories or consumables that are not recommended by Eppendorf.
- The device is maintained or repaired by persons not authorized by Eppendorf AG.
- The user makes unauthorized changes to the device.

**Product description**

CellTram®4r Air CellTram®4r Oil  
English (EN)

**3 Product description****3.1 Delivery package – CellTram 4r Air**

Quantity	Description
1	CellTram 4r Air
1	Injection tube Air (white marking ring, 130 cm, inner diameter 0.5 mm)
1	Capillary holder 4
1	Grip head 4, size 0 (including 6 o-rings, 2 spacer sleeves)
1	Removal tool
1	Cleaning stylet
1	Adapter for Femtotips (including 2 o-rings)
1	Allen key (4 mm)
1	Operating manual

**3.2 Delivery package – CellTram 4r Oil**

Quantity	Description
1	CellTram 4r Oil
1	Oil injection tube (blue marking ring, 130 cm, inner diameter 1.0 mm)
1	Capillary holder 4
1	Grip head 4, size 0 (including 6 o-rings, 2 distancing sleeves)
1	Removal tool
1	Cleaning stylet
1	Adapter for Femtotips (including 2 o-rings)
1	Filling set and cleaning set (filling tube 4 (10 cm), filling syringe, luer lock adapter)
1	Allen key (4 mm)
1	Operating manual

### 3.3 Features

The CellTrams product family are mechanical microinjectors. Using an auxiliary medium, the piston establishes pressure control in the capillary. The piston is moved by means of a coarse drive or a fine drive. The capillary is inserted using a capillary holder, which also establishes the connection to the injection tube. The capillary holder allows fixed mounting of different capillaries in the laboratory setup.

### 3.4 Exemplary set-up of a microinjection system

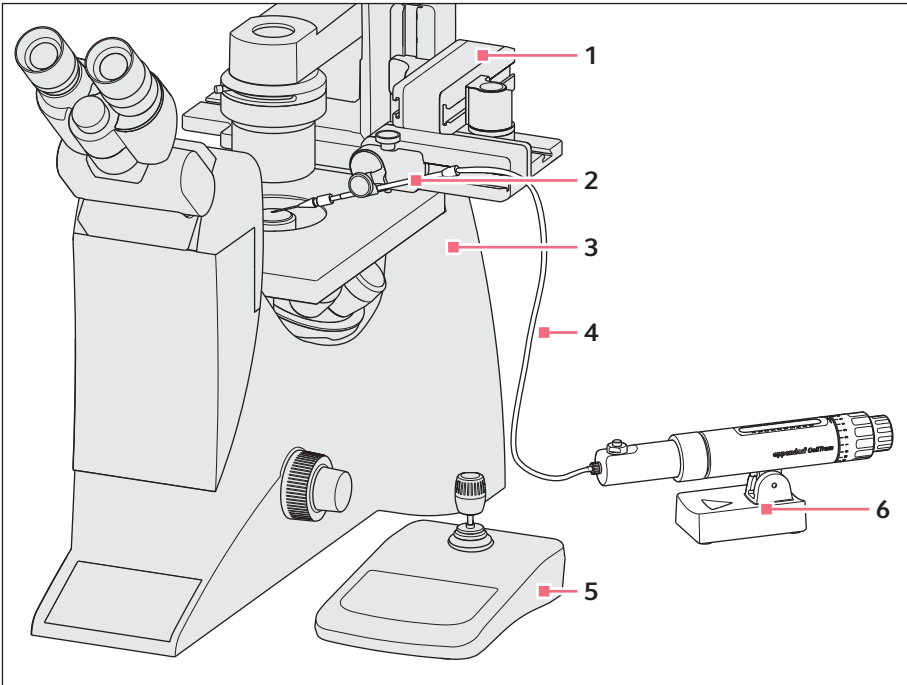


Fig. 3-1: Microinjection system – Example CellTram 4r Air

- |  |   |
|--|---|
| 1 Micromanipulator                                 | 4 Injection tube                        |
| 2 Capillary holder<br>With grip head and capillary | 5 Control board of the micromanipulator |
| 3 Inverse microscope                               | 6 Microinjector                         |

**Product description**

CellTram®4r Air CellTram®4r Oil  
English (EN)

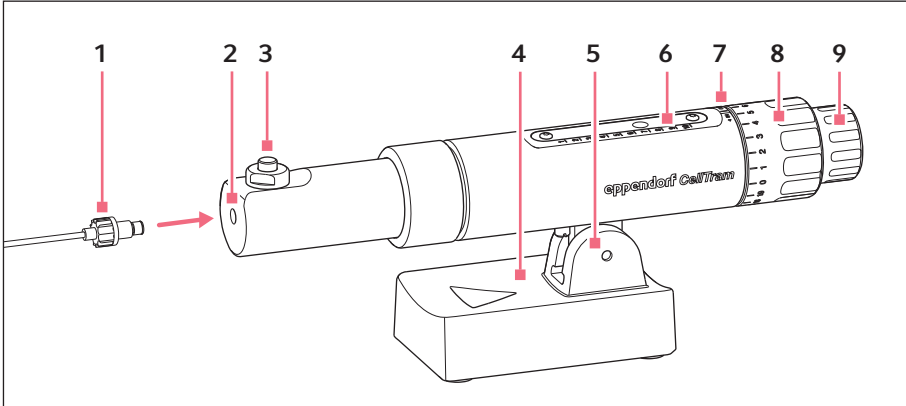
**3.5 Product overview****3.5.1 CellTram 4r Air**

Fig. 3-2: CellTram 4r Air

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1 Injection tube Air</li> <li>2 Port for injection tube</li> <li>3 Ventilation valve</li> <li>4 Device foot</li> <li>5 Joint</li> <li>6 Scale for piston position</li> </ul> | <ul style="list-style-type: none"> <li>7 Rotation direction indicator<br/>IN – aspirate<br/>OUT – dispense</li> <li>8 Coarse drive<br/>Rotary knob with scale for coarse drive</li> <li>9 Fine drive<br/>Rotary knob for fine drive</li> </ul> |
|---|--|

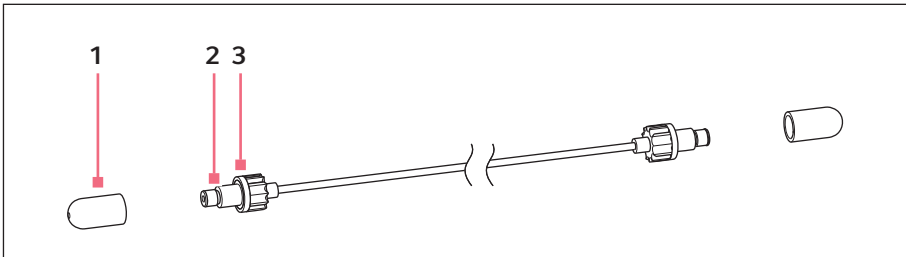


Fig. 3-3: Injection tube Air

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1 Dust cap</li> <li>2 Port for capillary holder</li> </ul> | <ul style="list-style-type: none"> <li>3 White marking ring</li> </ul> |
|---|--|

### 3.5.2 CellTram 4r Oil

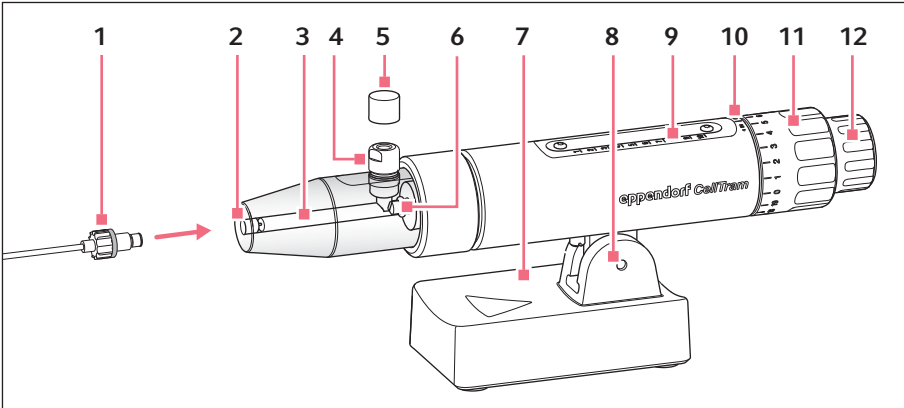


Fig. 3-4: CellTram 4r Oil

- |                                  |   |
|----------------------------------|---|
| <b>1 Injection tube Oil</b>      | <b>8 Joint</b>  |
| <b>2 Port for injection tube</b> | <b>9 Scale for piston position</b>  |
| <b>3 Cylinder</b>                | <b>10 Rotation direction indicator</b><br>IN – aspirate<br>OUT – dispense |
| <b>4 Filling valve</b>           | <b>11 Coarse drive</b><br>Rotary knob with scale for coarse drive         |
| <b>5 Dust cap</b>                | <b>12 Fine drive</b><br>Rotary knob for fine drive                        |
| <b>6 Piston</b>                  |   |
| <b>7 Device foot</b>             |   |

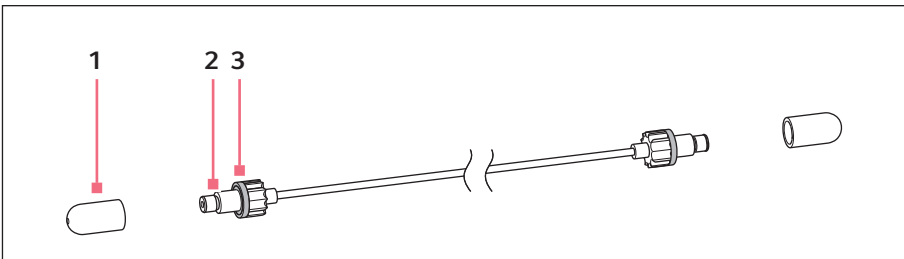


Fig. 3-5: Injection tube Oil

- |                                    |                            |
|------------------------------------|----------------------------|
| <b>1 Dust cap</b>                  | <b>3 Blue marking ring</b> |
| <b>2 Port for capillary holder</b> |                            |

**Product description**

CellTram®4r Air CellTram®4r Oil  
English (EN)

**3.6 Capillary holder 4**

In a capillary holder, a grip head is inserted to hold capillaries, or an adapter is inserted to hold a Femtotips. The scale on the capillary holder serves as an adjustment assistant on the micromanipulator.

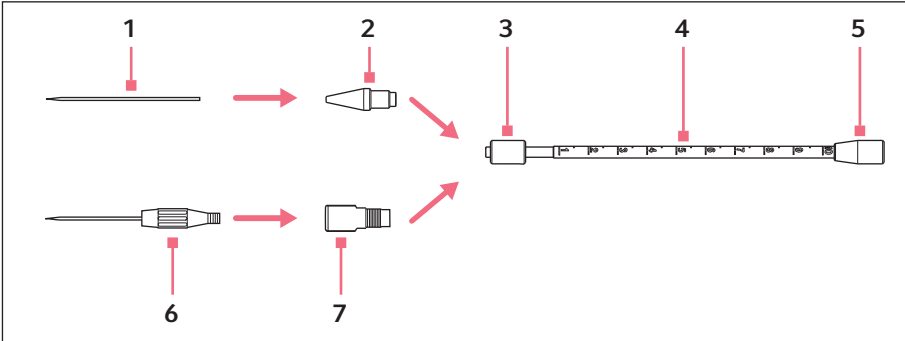


Fig. 3-6: Capillary holder 4

- |  |  |
|--|--|
| <b>1 Capillary</b><br>(not included in the delivery package) | <b>5 Port for injection tube</b>                             |
| <b>2 Grip head 4</b><br>Example with size 0                  | <b>6 Femtotips</b><br>(not included in the delivery package) |
| <b>3 Knurled screw</b>                                       | <b>7 Adapter for Femtotips</b>                               |
| <b>4 Capillary holder</b><br>With scale for positioning      |  |

### 3.7 Grip head 4

The grip head is inserted in the capillary holder. There are different grip head sizes available for different capillary diameters. Grip heads can be differentiated based on the number of grooves they have.

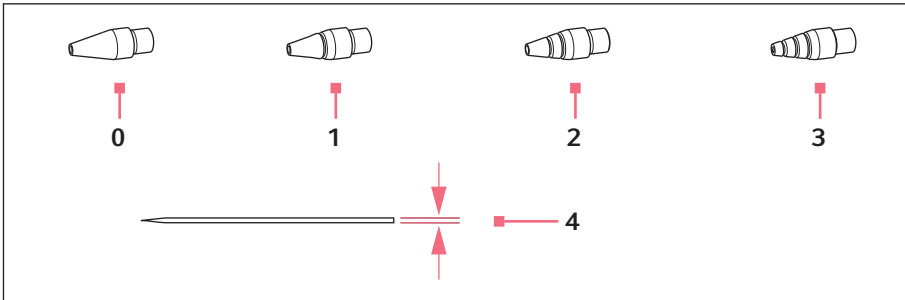


Fig. 3-7: Grip head sizes

- |   |   |
|---|---|
| <b>0 Size 0</b><br>For capillary diameters from 1.0 to 1.1 mm | <b>3 Size 3</b><br>For capillary diameters from 0.7 to 0.9 mm |
| <b>1 Size 1</b><br>For capillary diameters from 1.2 to 1.3 mm | <b>4 Capillary diameter</b>                                   |
| <b>2 Size 2</b><br>For capillary diameters from 1.4 to 1.5 mm |   |

**Product description**

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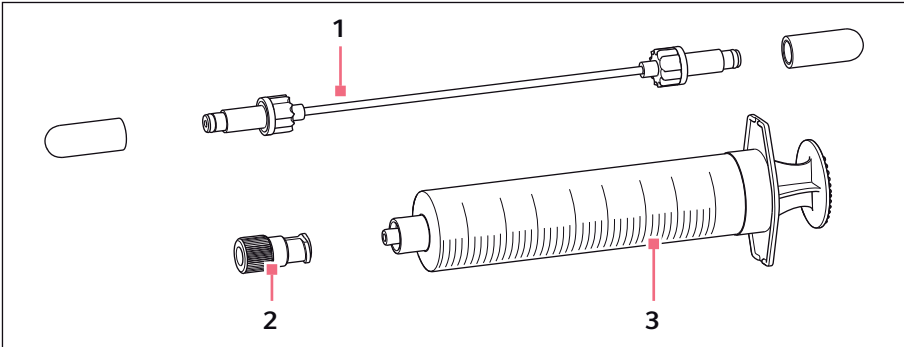
**3.8 Filling set and cleaning set – CellTram 4r Oil**

Fig. 3-8: Filling set and cleaning set

**1 Filling tube 4**

Blue marking ring, 10 cm

**2 Luer lock adapter****3 Filling syringe****3.9 Functions – CellTram 4r Air**

Air is used for pressure transmission with the CellTram Air.

The Air model is suitable for:

- Holding larger cells
- Aspirating, transferring and injecting smaller cells and particles
- Manual microinjections
- Dosing watery solutions

The movement of the piston creates negative pressure or positive pressure in the capillary. The air volume in the cylinder changes depending on the piston position. This affects the pressure behavior in the capillary due to the compressibility of the air medium. Larger pressure differences are generated between the piston positions 1 to 4. Smaller pressure differences are generated between the piston positions 7 to 10. The piston position can be used to adjust the sensitivity of the microinjector according to specific requirements. Cells are aspirated quicker and further into the capillary when the piston is in position 3 instead of position 7.



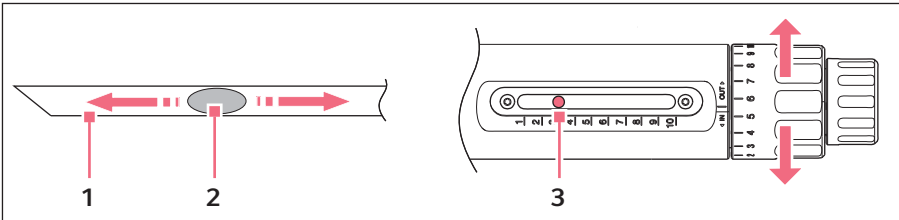


Fig. 3-9: Large pressure difference in the capillary

- 1 Capillary
- 2 Cell

- 3 Piston position between 1 – 4

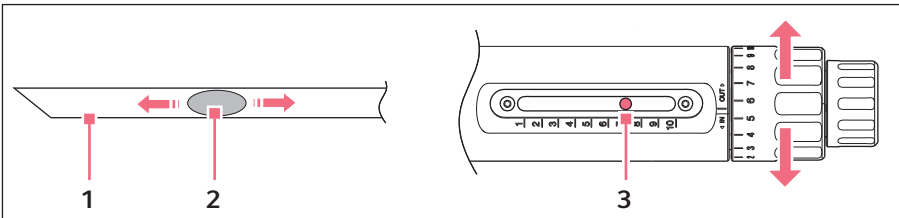


Fig. 3-10: Small pressure difference in the capillary

- 1 Capillary
- 2 Cell

- 3 Piston position between 7 – 10

### 3.9.1 Ventilation valve

Opening the ventilation valve equalizes the pressure if the pressure is too high or too low. After pressure equalization through the opened ventilation valve, only the capillary action remains effective.

**Product description**

CellTram®4r Air CellTram®4r Oil  
English (EN)

**3.10 Functions – CellTram 4r Oil**



For the CellTram Oil, mineral oil is used to transfer pressure.

This type of oil is suitable for:

- Holding larger cells
- Cell biopsy
- Aspirating, transferring and injecting smaller cells and particles
- Manual microinjection with high pressure

The movements of the piston generate positive or negative pressure in the oil medium in the capillary. The pressure differences behave in the same way for all piston positions.

The filling valve makes it easy to fill the piston chamber and the tube, including the capillary holder. The piston position indicator shows the oil filling level in the piston chamber. If the piston position is 2 to 3, oil should be refilled to ensure proper execution of the experiment.


-  The cells should not come into contact with the oil.
-  High-viscosity mineral oils, Fluorinert or double-distilled water can also be used.


**3.10.1 Filling valve**

The filling valve is used only to fill the piston chamber. When the filling tube is screwed on, the valve body is pressed down and the valve is opened. The filling tube must not be screwed to the valve during the execution of the experiment/work.

## **4 Installation**

### **4.1 Preparing installation**

 Keep the packaging and the transport securing devices for later transport or storage.

 In case of visible damage on the microinjector, the accessories, or the packaging, do not commission the microinjector.

1. Check the packaging for damage.
2. Carefully remove the microinjector and accessories from the packaging.
3. Check the delivery package.
4. Check the microinjector and the accessories for damage.

#### **4.1.1 Complaints about damages**

1. Contact customer service.

#### **4.1.2 Incomplete delivery**

- ▶ Contact customer service.

## **4.2 Selecting the location**

Please select the location according to the following criteria:

- Stable
- Level
- Horizontal
- Vibration-damped
- Draft-free

### 4.3 Inserting o-rings in the grip head

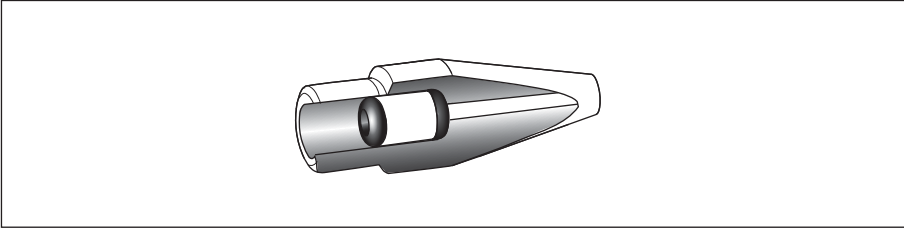
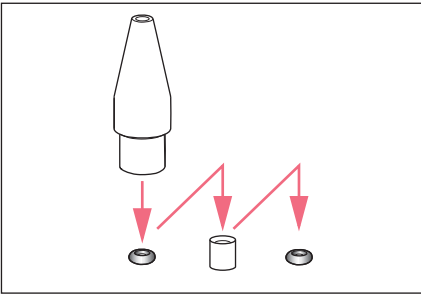


Fig. 4-1: Cross-section of the grip head with correctly inserted o-rings and distancing sleeve

#### Prerequisites

- The o-rings and the distancing sleeve are clean and free of damage.
- The grip head is clean and free of damage.
- A flat and clean surface is available.



1. Place the o-rings and the distancing sleeve on a flat surface.
2. Press the grip head vertically onto the first o-ring and push it into the grip head with the capillary holder.
3. Press the grip head vertically onto the distancing sleeve and push it into the grip head with the capillary holder.
4. Press the grip head vertically onto the second o-ring and push it into the grip head with the capillary holder.

### 4.4 Inserting the grip head in the capillary holder

#### Prerequisites

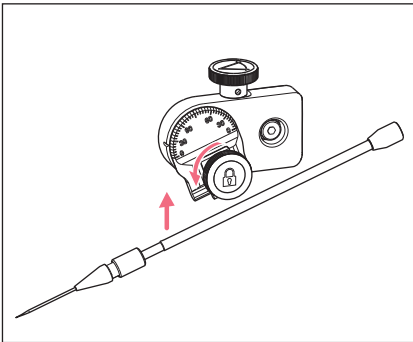
- The o-rings and distancing sleeve are inserted in the grip head.
- Capillary holder 4 is prepared.

1. Insert the grip head in the capillary holder.
2. Gently tighten the grip head.

#### 4.5 Inserting the capillary holder 4 into the TransferMan 4r micromanipulator

##### Prerequisites

- The grip head is inserted loosely in the capillary holder.



1. Loosen the fixing screw on the angle head.
2. Insert the capillary holder into the clamp.
3. Tighten the fixing screw.

#### 4.6 Mounting the injection tube – CellTram 4r Air

##### Prerequisites

- The injection tube with the white marking ring is prepared.
- The injection tube is free of damage.
- The injection tube is clean and dry.
- The fittings on the injection tube are clean and free of damage.

1. Screw the injection tube onto the microinjector.
2. Screw the injection tube onto the capillary holder.

#### 4.7 Mounting the injection tube – CellTram 4r Oil

##### Prerequisites

- The injection tube with the blue marking ring is prepared.
- The injection tube is free of damage.
- The injection tube is clean and dry.
- The fittings on the injection tube are clean and free of damage.

1. Screw the injection tube onto the microinjector.
2. Screw the injection tube onto the capillary holder.

**Installation**

CellTram®4r Air CellTram®4r Oil  
English (EN)

**4.8 Setting the angle of the microinjector**

Prerequisites

- Allen key (4 mm).
1. Undo the screw on the joint.
  2. Set the angle of the microinjector.  
The rotary knobs must be easily accessible.
  3. Tighten the screw.

**4.9 Filling oil – CellTram 4r Oil**

Observe the legal regulations for purity of the oil. Additional information can be found in the manufacturer's Material Safety Data Sheet.

The entire system must be free of air bubbles. Air bubbles in the pressure system negatively affect the precise adjustment and control of pressure differences.

**4.9.1 Filling the filling syringe with oil**

Prerequisites

- Mineral oil is prepared.



When aspirating the oil with the filling syringe, tiny air bubbles may form. Try to avoid the formation of air bubbles as they will be transferred to the microinjector and impair or slow down the filling process. If there are air bubbles in the filling syringe, allow the syringe to rest for a longer period of time so that a large air bubble forms. Large air bubbles can be pressed out during filling.

1. Screw the luer lock adapter onto the filling tube.
2. Insert the filling syringe into the luer lock adapter.
3. Insert the filling syringe into the mineral oil and slowly aspirate for at least 3 mL .
4. Hold the filling syringe vertically and push out any air bubbles.

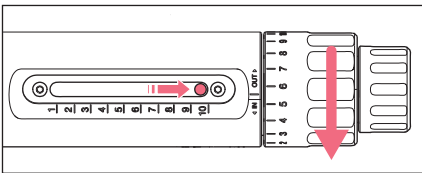
### 4.9.2 Connecting the filling tube



**NOTICE! Material damage due to operating error**

Damage to the drive due to overwinding of the piston.

- ▶ When you feel a resistance do **not** continue to wind in the same direction.
- ▶ When the piston is in piston position 1 turn the piston back in counter-clockwise direction.
- ▶ When the piston is in piston position 10 turn the piston forward in clockwise direction.

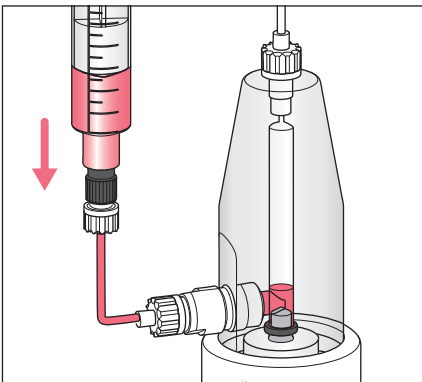


1. Move the piston to the starting position (piston position 10).
2. Remove the dust cap from the filling valve.
3. Screw the filling tube into the filling valve.

### 4.9.3 Filling the system with oil

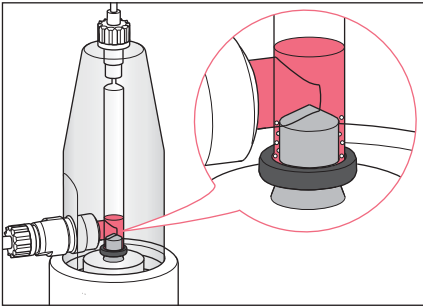
Prerequisites

- The piston is in the starting position (piston position 10).
- The oil in the filling syringe is free of air bubbles.

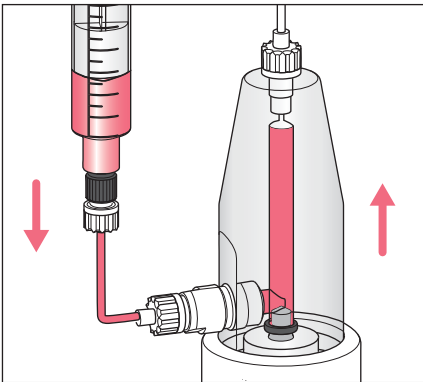


1. Hold the microinjector vertically.
2. Slowly push some oil into the piston chamber.  
 When filling the system for the first time, air bubbles often form in the ring gap between the piston and the cylinder. The air bubbles must be removed from the ring gap.

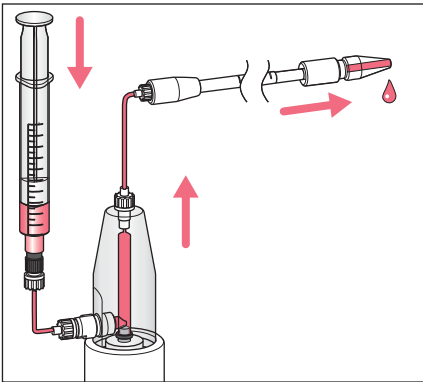
**24 Installation**  
CellTram®4r Air CellTram®4r Oil  
English (EN)



3. Rotate the coarse drive back and forth until all air bubbles have been removed from the ring gap.



4. Slowly fill the piston chamber with oil.
5. To remove more air bubbles, gently tap the side of the piston chamber. Any air bubbles will collect at the transition to the injection tube.
6. Push oil through.



7. Fill the injection tube and the capillary holder with oil.
8. Check the system for air bubbles.
9. Push oil through the system until the oil passes through the grip head free of bubbles.
10. Unscrew the filling tube.
11. Place the dust cap on the filling valve.



#### 4.10 Inserting the capillary – CellTram 4r Air

Only capillaries with an outer diameter of 1.0 mm to 1.1 mm fit into the grip head of size 0. When using different diameters, the suitable grip head size must be ordered.



**CAUTION! Risk of cuts when unpacking the capillaries**

Capillaries can break as a result of incorrect unpacking.

- ▶ Do not reach into the capillary transport protection.



Only use suitable capillaries for the application.

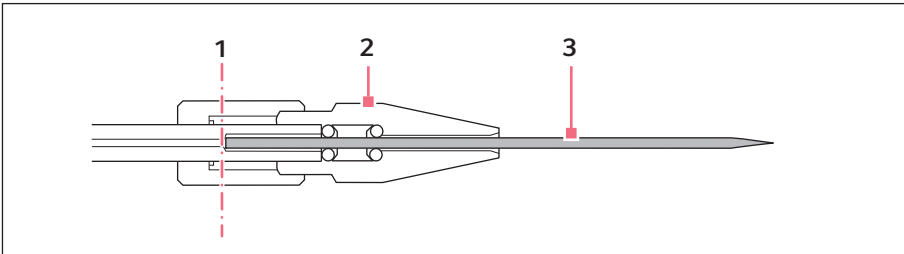


Fig. 4-2: Cross-section of capillary holder, grip head and capillary

**1 Capillary stop**

Stop for capillary

**3 Capillary**

**2 Grip head**

Prerequisites

- The grip head is inserted loosely in the capillary holder.
- The system is depressurized.
- A capillary is prepared.
- The selected capillary is suitable for the application.



**CAUTION! Risk of cuts from glass splinters**

Capillaries break easily when they are inserted.

- ▶ Carefully push the capillary all the way to the stop.



No stop (capillary stop) is felt with capillaries with an outer diameter of < 0.8 mm.

1. Continuously slide the capillary through the o-rings in the grip head until the capillary stop.
2. Tighten the grip head.

### 4.10.1 Replacing the capillary – CellTram 4r Air

#### Prerequisites

- The system is depressurized.
- A new capillary is prepared.
- The selected capillary is suitable for the application.

**WARNING! Risk of injury due to flying capillaries and glass splinters.**

If exposed to high pressures, capillaries may detach themselves from the grip heads and become projectiles.

Capillaries can crack as a result of incorrect handling.

- ▶ Wear protective goggles.
- ▶ Never aim capillaries at people.
- ▶ Use capillaries with an outer diameter that matches the grip head specifications.
- ▶ Always mount / dismount capillaries when they are depressurized.
- ▶ Mount the capillary correctly in the grip head.
- ▶ Do not touch the capillary with the Petri dish or other objects.

**CAUTION! Risk of cuts from glass splinters**

Capillaries break easily when they are inserted.

- ▶ Carefully push the capillary all the way to the stop.



No stop (capillary stop) is felt with capillaries with an outer diameter of < 0.8 mm.

1. Loosen the grip head.
2. Remove the capillary.
3. Continuously slide the new capillary through the o-rings in the grip head until the capillary stop.
4. Tighten the grip head.

### 4.10.2 Inserting the Femtotips – CellTram 4r Air

#### Prerequisites

- The adapter for Femtotips is prepared.
- The O-ring is correctly inserted in the adapter for Femtotips.

1. Unscrew the grip head.
2. Screw the adapter for Femtotips into the capillary holder.
3. Screw the Femtotips straight into the adapter.

#### 4.11 Inserting the capillary – CellTram 4r Oil

The size 0 grip head is only suitable for capillaries with an outer diameter of 1.0 mm to 1.1 mm. When using other diameters, the corresponding grip head size must be ordered.



**CAUTION! Risk of cuts when unpacking the capillaries**

Capillaries can break as a result of incorrect unpacking.

- ▶ Do not reach into the capillary transport protection.



Only use suitable capillaries for the application.

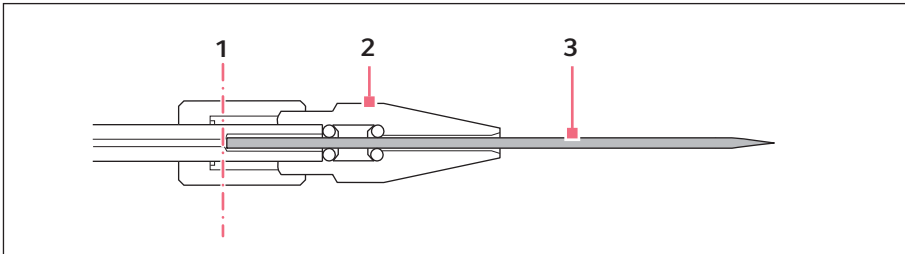


Fig. 4-3: Cross-section of capillary holder, grip head and capillary

**1 Capillary stop**

Stop for capillary

**3 Capillary**

**2 Grip head**

**Prerequisites**

- The system is filled with oil.
- The grip head is inserted loosely in the capillary holder.
- The system is depressurized.
- A capillary is prepared.
- The selected capillary is suitable for the application.
- The capillary holder is filled with oil and free of air bubbles up to the grip head.



**CAUTION! Risk of cuts from glass splinters**

Capillaries break easily when they are inserted.

- ▶ Carefully push the capillary all the way to the stop.



No stop is felt with capillaries with an inner diameter of < 0.8 mm.

**Installation**

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1. Continuously slide the capillary through the o-ring in the grip head until the capillary stop.
2. Tighten the grip head.
3. Wipe away any excess oil using a soft cellulose cloth.

**4.11.1 Replacing the capillary – CellTram 4r Oil**

Prerequisites

- The system is depressurized.
- A new capillary is prepared.
- The selected capillary is suitable for the application.

**WARNING! Risk of injury due to flying capillaries and glass splinters.**

If exposed to high pressures, capillaries may detach themselves from the grip heads and become projectiles.

Capillaries can crack as a result of incorrect handling.

- ▶ Wear protective goggles.
- ▶ Never aim capillaries at people.
- ▶ Use capillaries with an outer diameter that matches the grip head specifications.
- ▶ Always mount / dismount capillaries when they are depressurized.
- ▶ Mount the capillary correctly in the grip head.
- ▶ Do not touch the capillary with the Petri dish or other objects.

**CAUTION! Risk of cuts from glass splinters**

Capillaries break easily when they are inserted.

- ▶ Carefully push the capillary all the way to the stop.

- 
1. Loosen the grip head.
  2. Remove the capillary.  
Air bubbles appear in the grip head.
  3. Press oil through the system to remove the air bubbles.
  4. Continuously slide the new capillary through the o-ring in the grip head until the capillary stop.

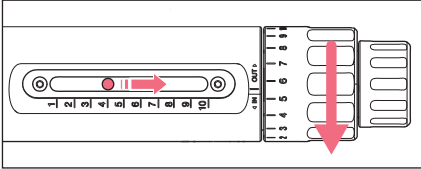


No stop is felt with capillaries with an inner diameter of  $< 0.8$  mm.

5. Tighten the grip head.
6. Wipe away any excess oil using a soft cellulose cloth.

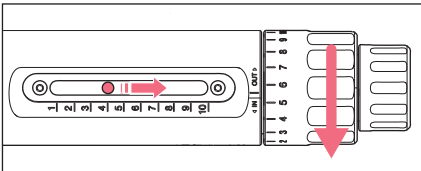
**5 Operation**

**5.1 Generating negative pressure – CellTram 4r Air**



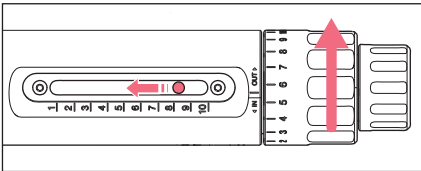
1. Rotate the rotary knob for coarse drive or fine drive anti-clockwise.  
 The piston is retracted.  
 Negative pressure is generated in the capillary.

**5.2 Generating negative pressure – CellTram 4r Oil**



1. Rotate the rotary knob for coarse drive or fine drive anti-clockwise.  
 The piston is retracted.  
 Negative pressure is generated in the capillary.

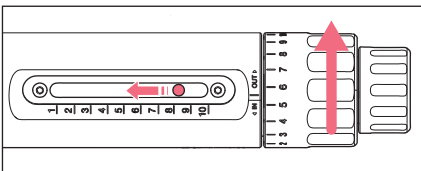
**5.3 Generating positive pressure – CellTram 4r Air**



1. Rotate the rotary knob for coarse drive or fine drive clockwise.  
 The piston moves forward.  
 Positive pressure is generated in the capillary.

**5.4 Generating positive pressure – CellTram 4r Oil**

Pressure transmission with oil can quickly generate high positive pressure. Piston movement across two scale positions (e.g., from 8 to 6) can generate a pressure of more than 20 bar.



1. Rotate the rotary knob for coarse drive or fine drive clockwise.  
 The piston moves forward.  
 Positive pressure is generated in the capillary.

## 5.5 Balancing pressure in the capillary

There are three ways to balance pressure using capillary action and counter-pressure.

### 5.5.1 Pressure balance – variation 1

1. Insert the capillary with the micromanipulator into the medium.
2. Wait until the pressure balances itself.

### 5.5.2 Pressure balance – variation 2

1. Insert the capillary with the micromanipulator into the medium.
2. Rotate the rotary knob clockwise.  
The piston moves forward.  
Counter-pressure to the capillary action is generated.  
The capillary action is balanced.

### 5.5.3 Pressure balance – variation 3 – CellTram 4r Air

After pressure equalization, the influence of the capillary action remains until the pressure balance is reached.

1. Insert the capillary with the micromanipulator into the medium.
2. Support the microinjector and press the ventilation valve.  
The capillary action begins.  
The medium is aspirated.
3. Wait until the pressure balances itself.  
The capillary action stops.  
The medium is no longer aspirated.

## 5.6 Checking the system – CellTram 4r Air

To achieve good results, the system should be checked each time before work is started.

- ▶ Tighten any loose fittings.
- ▶ Remove any liquid remaining in the injection tube or the capillary holder.
- ▶ Set the piston position to the correct position for the application.

## 5.7 Checking the system – CellTram 4r Oil

To achieve good results, the system should be checked each time before work is started.

- ▶ Tighten any loose fittings.
- ▶ Remove air bubbles from the system.
- ▶ If the piston position is lower than 2 or 3, refill oil.

## 5.8 Optimizing the piston position – CellTram 4r Air

The piston position can be optimized depending on the application. Adjust the piston position in such a way that the application can be controlled optimally.

1. Set the piston position to 5.
2. Aspirate cell with fine drive.
3. Perform error evaluation.

### 5.8.1 Error evaluation – cell is aspirated too quickly

1. Increase piston position to 7 to 8.
2. Test the application.

### 5.8.2 Error evaluation– cell is aspirated too slowly

1. Use coarse drive or reduce piston position to 2 to 3.
2. Test the application.

## 5.9 Holding cells

Prerequisites

- The capillary holder is clamped into the micromanipulator and positioned.
- A holding capillary is inserted and aligned.
- A Petri dish containing cells to be held is prepared.



CellTram 4r Air: Do not press the ventilation valve if there are cells inside or in front of the capillary. The pressure equalization may suddenly dispense or aspirate liquid.

Do not heat the front part of the device with your hand. The heat increases the inside pressure and may cause the medium or sample material to escape.

1. Insert the capillary into the medium.
2. Check the location of the capillary with the microscope.
3. Establish a pressure balance.
4. Move the capillary close to the desired cell.
5. Rotate the rotary knob counterclockwise.  
 This generates a negative pressure in the capillary.  
 The cell is aspirated by the capillary.
6. Once the cell reaches the capillary, reduce the negative pressure.  
 The cell is held in the capillary by the remaining negative pressure.
7. For a secure hold, adjust to the optimal negative pressure.

## 5.10 Transferring cells



CellTram 4r Air: Do not press the ventilation valve if there are cells inside or in front of the capillary. The pressure equalization may suddenly dispense or aspirate liquid.

Do not heat the front part of the device with your hand. The heat increases the inside pressure and may cause the medium or sample material to escape.



To aspirate a cell into the capillary, it is important to evenly reduce the initially increased negative pressure. This way the cell is gently aspirated into the capillary and can easily be stabilized in a specific location in the capillary.

### 5.10.1 Aspirating cells

#### Prerequisites

- The capillary holder is clamped into the micromanipulator and positioned.
  - A transfer capillary is inserted and aligned.
  - A Petri dish containing cells to be transferred is prepared.
1. Insert the capillary with the micromanipulator into a cell-free area of the medium.
  2. Check the location of the capillary with the microscope.
  3. Establish a pressure balance.
  4. Move the capillary close to the desired cell.
  5. Rotate the rotary knob counterclockwise.  
This generates a negative pressure in the capillary.  
The cell is aspirated by the capillary.
  6. Once the cell reaches the capillary, reduce the aspirating pressure.  
The cell is aspirated into the capillary.
  7. Stabilize and position the cell in the capillary.  
The cell can now be injected.



## 5.10.2 Injecting cells

### Prerequisites

- The cell to be transferred has been aspirated into the transfer capillary.



CellTram 4r Air: Do not press the ventilation valve if there are cells inside of the capillary. The pressure equalization may suddenly dispense or aspirate liquid. Do not heat the front part of the device with your hand. The heat increases the inside pressure and may cause the medium or sample material to escape.

1. Position the cell at the front of the transfer capillary.
2. Pierce the target object with the capillary.
3. Carefully rotate the rotary knob clockwise.  
The cell is injected into the target object.

## 5.11 Aspirating liquid – CellTram 4r Air

1. Dip the capillary into the liquid that is to be aspirated.
2. Rotate the fine drive anti-clockwise (e.g., 2 revolutions).  
The capillary aspirates liquid.
3. Wait until enough liquid has been aspirated.
4. To stop the liquid flow, rotate the fine drive clockwise.

## 6 Troubleshooting

### 6.1 Error search – CellTram 4r Air and CellTram 4r Oil

Problem	Cause	Solution
Uncontrolled aspiration	<ul style="list-style-type: none"> <li>Rotary knobs rotated too far in anti-clockwise direction. This causes too much negative pressure.</li> </ul>	<ul style="list-style-type: none"> <li>Establish a pressure balance.</li> </ul>
	<ul style="list-style-type: none"> <li>System has a leak.</li> <li>A fitting is loose.</li> </ul>	<ul style="list-style-type: none"> <li>Tighten the fittings on the injection tube.</li> <li>Tighten the fitting on the grip head.</li> </ul>
	<ul style="list-style-type: none"> <li>O-ring is defective.</li> </ul>	<ul style="list-style-type: none"> <li>Check the o-rings in the grip head.</li> <li>Exchange defective o-rings.</li> </ul>
	<ul style="list-style-type: none"> <li>Injection tube is defective.</li> </ul>	<ul style="list-style-type: none"> <li>Check the injection tube.</li> <li>Exchange the injection tube.</li> </ul>
	<ul style="list-style-type: none"> <li>O-rings in grip head do not sit properly.</li> </ul>	<ul style="list-style-type: none"> <li>Check the o-rings and distancing sleeve in the grip head.</li> <li>Insert the o-rings and distancing sleeve in the correct order.</li> </ul>
	<ul style="list-style-type: none"> <li>O-rings do not match the size of the grip head.</li> </ul>	<ul style="list-style-type: none"> <li>Check the o-rings.</li> <li>Insert the o-rings which match the size of the grip head.</li> <li>Size 0 = o-ring inner diameter of 1.0 mm</li> <li>Size 1 = o-ring inner diameter of 1.5 mm</li> <li>Size 2 = o-ring inner diameter of 1.5 mm</li> <li>Size 3 = o-ring inner diameter of 1.0 mm</li> </ul>
Sharp pressure rise or pressure loss	<ul style="list-style-type: none"> <li>The meniscus of the aspirated medium is in an unfavorable diameter range of the capillary.</li> </ul>	<ul style="list-style-type: none"> <li>Check the meniscus of the aspirated medium.</li> <li>Shift the meniscus.</li> </ul>

**6.2 Error search – CellTram 4r Air**

<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
Sharp pressure rise or pressure loss	• Drops of liquid in the injection tube.	<ul style="list-style-type: none"> <li>▶ Check the injection tube for trapped liquid.</li> <li>▶ Clean and dry the injection tube.</li> </ul>
	• Drops of liquid in the capillary holder.	<ul style="list-style-type: none"> <li>▶ Check the capillary holder.</li> <li>▶ Clean and dry the capillary holder.</li> </ul>
	• Holding the front part of the device or the tube has caused the air in the device to heat up and expand.	<ul style="list-style-type: none"> <li>▶ Do not hold the device or the tube during the experiment.</li> </ul>
System responds slowly	• Wrong injection tube.	<ul style="list-style-type: none"> <li>▶ Connect the injection tube with the white marking ring.</li> </ul>
	• Poor piston position.	<ul style="list-style-type: none"> <li>▶ Adjust the piston position by a small value.</li> </ul>

**6.3 Error search – CellTram 4r Oil**

<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
Sharp pressure rise or pressure loss	• Air bubble in the injection tube.	<ul style="list-style-type: none"> <li>▶ Remove the air bubble from the system.</li> </ul>
	• Air bubble in the capillary holder.	<ul style="list-style-type: none"> <li>▶ Remove the air bubble from the system.</li> </ul>
	<ul style="list-style-type: none"> <li>• Air bubbles in the capillary.</li> <li>• Air bubbles in the grip head.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Replace the capillary.</li> <li>▶ Review working procedure if errors arise repeatedly.</li> <li>▶ Remove the air bubble from the system.</li> </ul>
Oil is difficult to fill.	• Wrong injection tube attached.	<ul style="list-style-type: none"> <li>▶ Attach the injection tube with the blue marking ring.</li> </ul>

**7****Maintenance****7.1****Refilling oil – CellTram 4r Oil**

Observe the legal regulations for purity of the oil. Additional information can be found in the manufacturer's Material Safety Data Sheet.



Change the oil in the CellTram completely if you notice contamination in the system or the oil is contaminated.

## Prerequisites

- The filling syringe is filled with oil.



Aspirating oil with the syringe may lead to the formation of tiny air bubbles. Try to avoid the formation of air bubbles as they will be transferred to the microinjector and impair or slow down the filling process. If there are air bubbles in the syringe, allow the syringe to rest for a longer period of time so that a large air bubble forms. Large air bubbles can be pressed out during filling.

**NOTICE! Material damage due to operating error**

Damage to the drive due to overwinding of the piston.

- ▶ When you feel a resistance do **not** continue to wind in the same direction.
- ▶ When the piston is in piston position 1 turn the piston back in counter-clockwise direction.
- ▶ When the piston is in piston position 10 turn the piston forward in clockwise direction.

1. Remove the dust cap from the filling valve.
2. Screw the filling tube into the filling valve.  
An air bubble is trapped between the filling tube and the filling valve.
3. Draw the trapped air bubble into the filling syringe.
4. Turn the piston to the starting position (piston position 10).
5. Fill the system with oil.
6. Remove air from the system.



Tip: Fill the cylinder with oil while simultaneously turning back the piston. This prevents air from being aspirated.

### 7.1.1 Removing air bubbles from the cylinder

#### Prerequisites

- The filling syringe is filled with oil.
- The filling tube and the filling syringe are attached.

1. Hold the microinjector vertically.  
The air bubbles rise to the top.
2. Push oil through to remove air bubbles from the system.
3. Check the cylinder and the injection tube for air bubbles.
4. Unscrew the filling tube.
5. Place the dust cap on the filling valve.

### 7.2 Exchanging the o-rings in the grip head

If you notice leaks on the grip head, the o-rings must be exchanged.

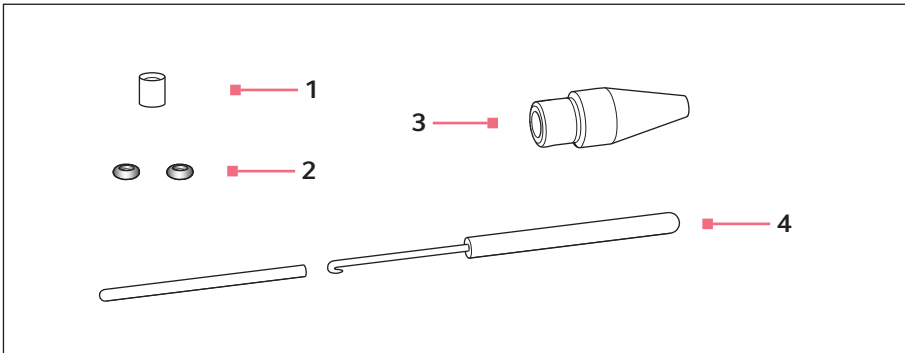


Fig. 7-1: Grip head 4 with removal tool

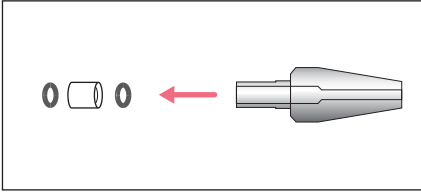
- |   |  |
|---|--|
| <b>1 Distance sleeve</b>                  | <b>3 Grip head 4 size 0</b>                          |
| <b>2 O-rings</b><br>Inner diameter 1.0 mm | <b>4 Removal tool</b><br>Hook with protective sleeve |

### 7.2.1 Remove the o-rings and distancing sleeves

#### Prerequisites

- The grip head has been unscrewed from the capillary holder.
- The capillary has been removed from the grip head.

The hook of the removal tool is used to pull out the o-rings and the distance sleeve.



1. Pull out the first o-ring.
2. Pull out the distance sleeve.
3. Pull out the second o-ring.

### 7.2.2 Inserting the o-rings and the distance sleeve

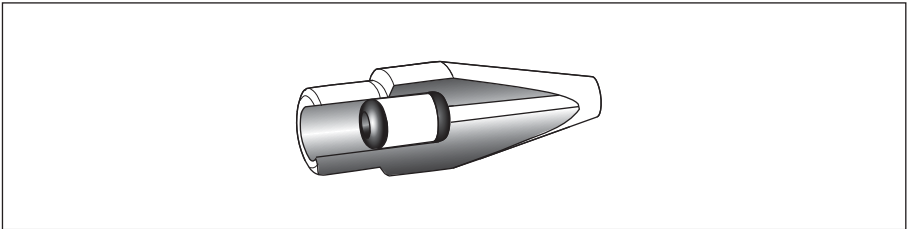
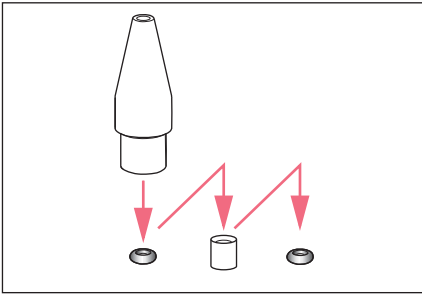


Fig. 7-2: Cross section with correctly positioned o-rings and spacing sleeve

#### Prerequisites

- The o-rings are clean and free of damage.
- The grip head is clean and free of damage.
- A clean and flat surface is available.
- O-rings matching the grip head size are available.



1. Place the new o-rings and the distance sleeve on a flat surface.
2. Press the grip head vertically onto the first o-ring and push the o-ring into the grip head using the capillary holder.
3. Press the grip head vertically onto the distance sleeve and push the distance sleeve into the grip head using the capillary holder.
4. Press the grip head vertically onto the second o-ring and push the o-ring into the grip head using the capillary holder.

### 7.3 Exchanging the o-ring in the Femtotips adapter

If the o-ring is defective and leaky, it must be exchanged.

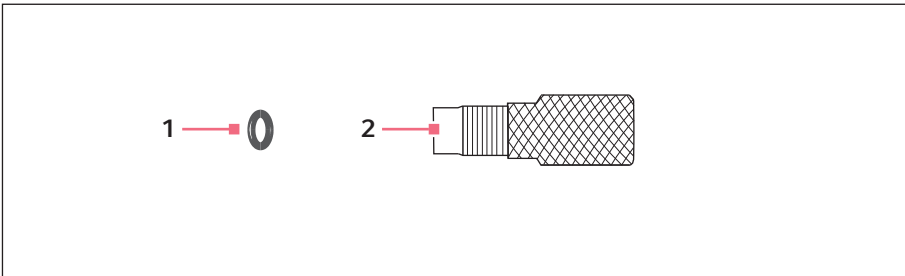


Fig. 7-3: Adapter for Femtotips

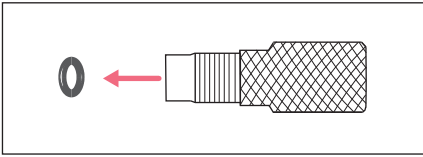
**1 O-ring**  
Inner diameter 1.5 mm

**2 Adapter**

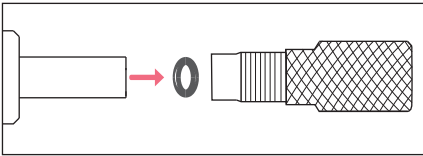
#### 7.3.1 Exchanging the o-ring

Prerequisites

- An o-ring with an inner diameter of 1.5 mm is prepared.
- Femtotips is removed.



► Extract the o-ring with the hook of the removal tool.



► Insert the new o-ring and push it into the adapter with the capillary holder.

#### 7.4 Cleaning the capillary holder

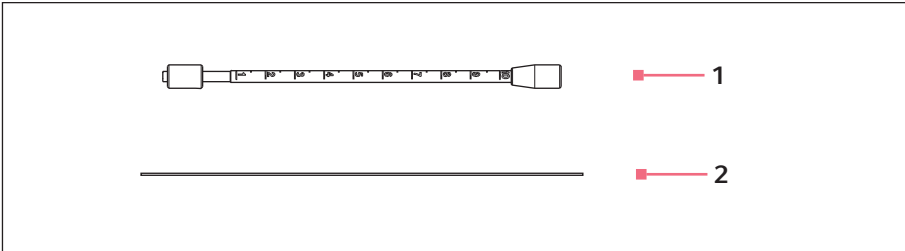


Fig. 7-4: Capillary holder 4 and cleaning stilet

##### Prerequisites

- The cleaning stilet is prepared.
  - The injection tube is screwed off.
  - The grip head is screwed off.
- Push the cleaning stilet through the capillary holder.



## 7.5 Cleaning

---



### **NOTICE! Damage from the use of aggressive chemicals.**

- ▶ Do not use any aggressive chemicals on the device or its accessories, such as strong and weak bases, strong acids, acetone, formaldehyde, halogenated hydrocarbons or phenol.
- ▶ If the device has been contaminated by aggressive chemicals, clean it immediately using a mild cleaning agent.



- ▶ Select disinfection methods that comply with the legal regulations and guidelines for your area of application.
- ▶ If you have any questions regarding cleaning, disinfection and decontamination, please contact Eppendorf AG.

### 7.5.1 Cleaning the microinjector and accessories

1. Wipe down the microinjector, the injection tube and the capillary holder with water or a mild laboratory cleaner.
2. Blow off the capillary holder with compressed air.  
This removes and remaining liquid.



After cleaning, no liquid should remain in the capillary holder. Remaining liquid compromises the balanced pressure behavior.

### 7.5.2 Flushing the injection tube

#### Prerequisites

- 70 % alcohol is prepared.
  - A clean filling syringe is prepared.
1. Aspirate alcohol into the filling syringe.
  2. Screw the luer lock adapter onto the injection tube.
  3. Insert the filling syringe into the luer lock adapter.
  4. Flush the injection tube with alcohol.
  5. Empty the filling syringe.
  6. Push air though the injection tube multiple times.
  7. Remove the luer lock adapter and the filling syringe.
  8. Allow the injection tube to dry.



After flushing there should be no remaining liquid in the injection tube. Remaining liquid compromises the balanced pressure behavior.

## 7.6 Disinfection/decontamination



- ▶ Select disinfection methods that comply with the legal regulations and guidelines for your area of application.
- ▶ If you have any questions regarding cleaning, disinfection and decontamination, please contact Eppendorf AG.

### Prerequisites

- All device parts are cleaned.
- A disinfectant with an alcohol base (e.g., isopropyl alcohol or spirits) is prepared.
- ▶ Wipe down all devices with a cloth and the disinfectant.

### 7.6.1 Autoclaving

#### Prerequisites

- The capillary is removed from the grip head.
- The grip head is screwed off.

The capillary holder, grip head and distancing sleeve can be autoclaved.

The o-rings can be autoclaved up to 5 times.

1. Remove the o-rings and distancing sleeves.
2. Autoclave the capillary holder, grip head, distancing sleeve and o-rings.
3. Allow the capillary holder, grip head, distancing sleeve and o-rings to dry.

**8 Technical data**  
**8.1 CellTram 4r Air**  
**8.1.1 Ambient conditions**

Ambiance	For indoor use only
Ambient temperature	15 °C – 40 °C
Temperature change	< 2 K/h
Max. relative humidity	30 % – 65 %
Atmospheric pressure	80 kPa – 106 kPa

**8.1.2 Weights/dimensions**

Footprint	261 mm × 60 mm
Weight	approx. 1.7 kg
Coarse drive rotary knob diameter	40 mm
Fine drive rotary knob diameter	30 mm

**8.1.3 Injection tube Air**

Material	FEP
Length	1300 mm
Inner diameter	0.5 mm
Outer diameter (OD)	2 mm

**8.1.4 Device parameters**

Coarse/fine transmission ratio	10:1
Generation of pressure	Piston and cylinder system
Total volume	10 mL
Minimum fine drive volume	< 0.1 µL/0.5°
Coarse drive volume change (per revolution)	600 µL
Fine drive volume change (per revolution)	60 µL
Piston stroke	50 mm
Maximum pressure	3000 hPa
Auxiliary medium	Air

**Technical data**

CellTram®4r Air CellTram®4r Oil  
English (EN)

**8.2 CellTram 4r Oil****8.2.1 Ambient conditions**

Ambiance	For indoor use only
Ambient temperature	15 °C – 40 °C
Temperature change	< 2 K/h
Max. relative humidity	30 % – 65 %
Atmospheric pressure	80 kPa – 106 kPa

**8.2.2 Weights/dimensions**

Footprint	264 mm × 60 mm
Weight	approx. 1.6 kg
Coarse drive rotary knob diameter	40 mm
Fine drive rotary knob diameter	30 mm

**8.2.3 Injection tube Oil**

Material	FEP
Length	1300 mm
Inner diameter	1 mm
Outer diameter (OD)	2 mm

**8.2.4 Device parameters**

Coarse/fine transmission ratio	10:1
Generation of pressure	Piston and cylinder system
Total volume	1000 µL
Minimum fine drive volume	< 0.0015 µL/0.5°
Coarse drive volume change (per revolution)	10 µL
Fine drive volume change (per revolution)	1 µL
Piston stroke	50 mm
Maximum pressure	20000 hPa
Auxiliary medium	Mineral oil
Mineral oil filling volume (incl. injection tube and capillary holder)	approx. 2 mL

## 9 Transport, storage and disposal

### 9.1 Storage

	Air temperature	Relative humidity	Atmospheric pressure
In transport packing	-25 °C – 55 °C	10 % – 95 %	70 kPa – 106 kPa
Without transport packing	5 °C – 40 °C	10 % – 95 %	70 kPa – 106 kPa

### 9.2 Decontamination before shipment

If you are shipping the device to the authorized Technical Service for repairs or to your authorized dealer for disposal please note the following:



**WARNING! Risk to health from contaminated device.**

1. Observe the information in the decontamination certificate. It is available as a PDF document on our webpage ([www.eppendorf.com/decontamination](http://www.eppendorf.com/decontamination)).
2. Decontaminate all the parts to be shipped.
3. Include the fully completed decontamination certificate in the shipment.

**Ordering information**CellTram®4r Air CellTram®4r Oil  
English (EN)**10 Ordering information****10.1 CellTram 4r Air**

Order no. (International)	Order no. (North America)	Description
5196 000.013	5196000013	CellTram 4r Air

**10.2 CellTram 4r Oil**

Order no. (International)	Order no. (North America)	Description
5196 000.030	5196000030	CellTram 4r Oil

**10.3 Accessories**

Order no. (International)	Order no. (North America)	Description
5196 081.005	5196081005	<b>Capillary holder 4</b> for mounting microcapillaries
5196 082.001	5196082001	<b>Grip head set 4</b> for capillary holder 4 and universal capillary holder Size 0, capillary diameters from 1.0 mm to 1.1 mm (O.D.)
5196 083.008	5196083008	Size 1, capillary diameters from 1.2 mm to 1.3 mm (O.D.)
5196 084.004	5196084004	Size 2, capillary diameters from 1.4 mm to 1.5 mm (O.D.)
5196 085.000	5196085000	Size 3, capillary diameters from 0.7 mm to 0.9 mm (O.D.)
5196 086.007	5196086007	<b>O-ring set 4</b> incl. 10 o-rings large, 10 o-rings small, 2 distance sleeves, o-ring removal tool for grip head set 4
5196 088.000	5196088000	<b>Filling and Cleaning set</b> incl. filling tube, Luer lock adapter, 2 syringes CellTram 4
5196 061.004	5196061004	<b>Injection tube Air</b> White ring mark, I.D. 0.5 mm, length 1.3 m
5196 089.006	5196089006	<b>Injection tube Oil</b> Blue ring mark, I.D. 1.0 mm, length 1.3 m
5196 062.000	5196062000	<b>Capillary holder 4, slim shape</b> incl. grip head set 4, for capillaries with outer diameter 1.0 mm

Order no. (International)	Order no. (North America)	Description
5196 063.007	5196063007	<b>Grip head set 4, slim shape</b> for Capillary holder 4 (slim shape), incl. 6 o-rings and 2 distance sleeves, for capillaries with outer diameter 1.0 mm
5176 208.009		<b>Adapter</b> for Femtotips fitting on universal capillary holder
5176 220.009	5176220009	<b>Tube coupling</b> for extending or connecting injection tubes

#### 10.4 Capillaries

Order no. (International)	Order no. (North America)	Description
5195 000.052	5195000052	<b>Biopsy Tip I</b> 25 pieces, sterile
5195 000.060	5195000060	<b>Biopsy Tip II</b> 25 pieces, sterile
5195 000.087	5195000087	<b>Piezo Drill Tip ICSI</b> 25 pieces, sterile
5195 000.095	5195000095	<b>Piezo Drill Tip ES</b> 25 pieces, sterile
5195 000.001	5195000001	<b>TransferTip F (ICSI)</b> 25 pieces, sterile
5195 000.010	5195000010	<b>TransferTip RP (ICSI)</b> 25 pieces, sterile
5195 000.028	5195000028	<b>TransferTip R (ICSI)</b> 25 pieces, sterile
5195 000.079	5195000079	<b>TransferTip ES</b> 25 pieces, sterile
5195 000.036	5195000036	<b>VacuTip I</b> 25 pieces, sterile
5195 000.044	5195000044	<b>VacuTip II</b> 25 pieces, sterile

**Ordering information**CellTram®4r Air CellTram®4r Oil  
English (EN)**10.5 Femtotips**

<b>Order no. (International)</b>	<b>Order no. (North America)</b>	<b>Description</b>
5242 952.008	930000035	<b>Femtotips</b> 20 pieces
5242 957.000	930000043	<b>Femtotip II</b> 20 pieces
5242 956.003	930001007	<b>Microloader</b> Eppendorf Quality, 2 racks of 96 tips 0.5 - 20 µL, light gray, length: 100 mm







# Evaluate Your Manual

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[eppendorf@eppendorf.com](mailto:eppendorf@eppendorf.com) · [www.eppendorf.com](http://www.eppendorf.com)