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CE

CellTram®4m Air
CellTram®4m Oil

Instructions for use

5196 900 022-03/022021

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1 Operating instructions

1.1 Using this manual

- Read this entire manual before using the device for the first time. Also observe the manuals of any accessories if used.
- This manual is part of the product. Keep it in a place that is easily accessible.
- Include this manual when transferring the device to a third party.
- The current version of the manual for all available languages can be found on our webpage 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:

 **Hazard point**	 **Cuts**
 **Material damage**	

1.2.2 Danger levels

DANGER	*Will* lead to severe injuries or death.
WARNING	*May* lead to severe injuries or death.
CAUTION	May lead to light to moderate injuries.
NOTICE	May lead to material damage.

1.3 Symbols used

Depiction	Meaning
1. 2.	Actions in the specified order
▸	Actions without a specified order
•	List
Text	Display or software texts
	Additional information

2 Safety

2.1 User notes

The applicable user instructions are subject to the regulations of the country to which the device is sold. The availability of a CellTram 4m for clinical use depends on the approval status of the CellTram 4m in the country where the device is to be sold.

2.2 Intended use

The CellTram 4m has been designed and manufactured to support the injection and aspiration of cells or cell components during the performance of assisted reproductive technologies (ART) such as intracytoplasmic sperm injection (ICSI), or the collection of genetic material for the purpose of genetic preimplantation testing (PGT), using micro tools (e.g., microcapillaries or micro glass pipettes).

The CellTram 4m is therefore a medical device in accordance with the Directive 93/42/ EEC of the European Union. It must only be used indoors and only by sufficiently trained specialists.

2.3 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, the material safety data sheets, and the manufacturer's 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, the current edition).

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.

2.4 Warning symbols on the device

Depiction	Meaning
	**WARNING** Read the instructions for use

2.5 User profile

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

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

2.6 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 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.

2.7 Obligation to report accidental damage or damage to the device

As the operator of a medical device, you are obliged to report serious accidents or injuries to persons caused by our device to the following authorities:

- The competent local authorities
- Eppendorf AG
- Your local Eppendorf distributor

2.7.1 Manufacturer Eppendorf AG

Eppendorf AG

Barkhausenweg 1

22339 Hamburg

GERMANY

eppendorf@eppendorf.com

2.7.2 Local Eppendorf distributor

www.eppendorf.com/contact

3 Product description

3.1 Delivery package – CellTram 4m Air

Quantity	Description
1	CellTram 4m 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 distancing sleeves)
1	Removal tool
1	Cleaning stylet
1	The use of this function is not approved for medical applications. Adapter for Femtotips (including 2 o-rings)
1	Allen key (4 mm)
1	Instructions for use

3.2 Delivery package – CellTram 4m Oil

Quantity	Description
1	CellTram 4m Oil
1	Injection tube Oil (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	The use of this function is not approved for medical applications. 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	Instructions for use

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.

3.3.1 Approved accessories

The following accessories from Eppendorf are approved for use with the CellTram 4m Air/ CellTram 4m Oil:

- TransferMan 4m

The following third-party accessories are approved for use with the CellTram 4m Air/ CellTram 4m Oil:

- Capillary for medical applications (according to the specifications for the CellTram 4m Air/CellTram 4m Oil)

3.4 Exemplary set-up of a microinjection system

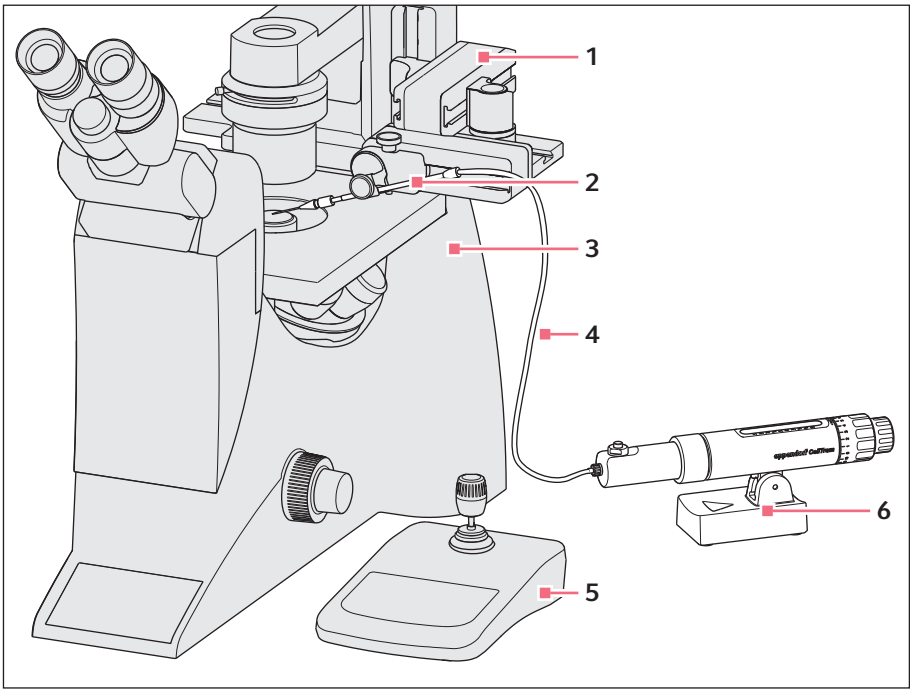


Fig. 3-1: Microinjection system – Example CellTram 4m Air

1 Micromanipulator

2 Capillary holder
With grip head and capillary

3 Inverse microscope

4 Injection tube

5 Control board of the micromanipulator

6 Microinjector

3.5 Product overview
3.5.1 CellTram 4m Air

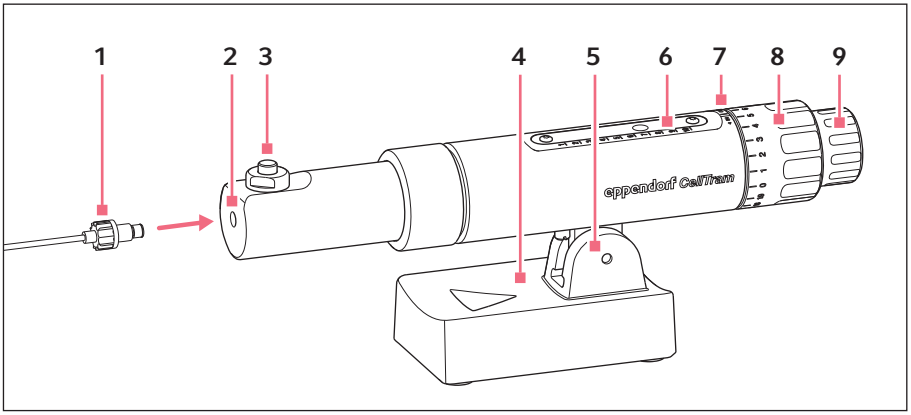


Fig. 3-2: CellTram 4m Air

1 Injection tube Air

2 Port for injection tube

3 Ventilation valve

4 Device foot

5 Joint

6 Scale for piston position

7 Rotation direction indicator
IN – aspirate
OUT – dispense

8 Coarse drive
Rotary knob with scale for coarse drive

9 Fine drive
Rotary knob for fine drive

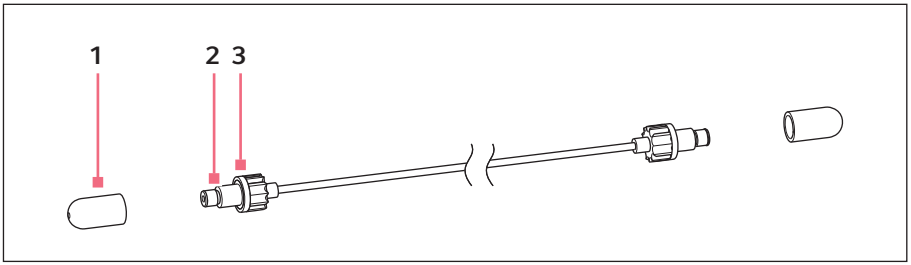


Fig. 3-3: Injection tube Air

1 Dust cap

2 Port for capillary holder 4

3 White marking ring

3.5.2 CellTram 4m Oil

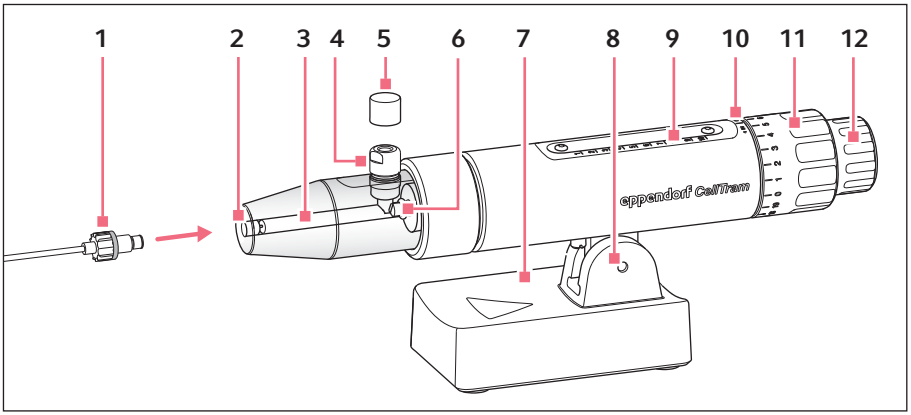


Fig. 3-4: CellTram 4m Oil

1 Injection tube Oil

2 Port for injection tube

3 Cylinder

4 Filling valve

5 Dust cap

6 Piston

7 Device foot

8 Joint

9 Scale for piston position

10 Rotation direction indicator
IN – aspirate
OUT – dispense

11 Coarse drive
Rotary knob with scale for coarse drive

12 Fine drive
Rotary knob for fine drive

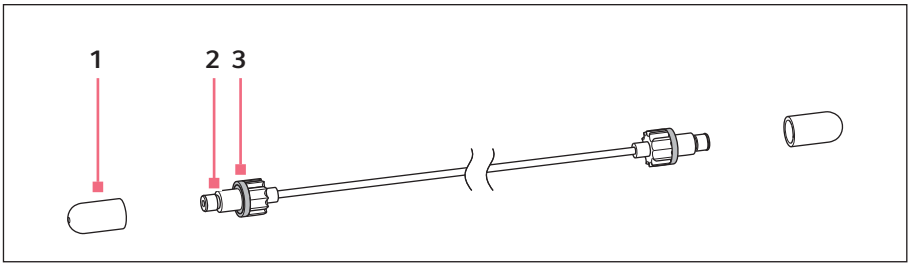


Fig. 3-5: Injection tube Oil

1 Dust cap

2 Port for capillary holder 4

3 Blue marking ring

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 use of this function is not approved for medical applications.) The scale on the capillary holder serves as an adjustment aid on the micromanipulator.

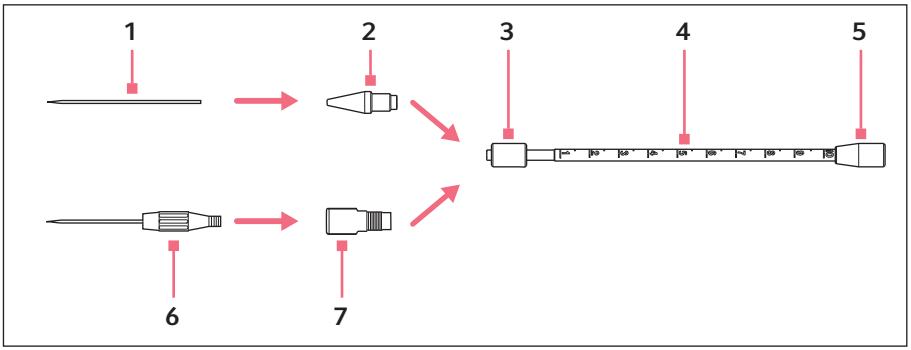


Fig. 3-6: Capillary holder 4

1 **Capillary**
(not included in the delivery package)

2 **Grip head 4**
Example with size 0

3 **Knurled screw**

4 **Capillary holder**
With scale for positioning

5 **Port for injection tube**

6 **Femtotips**
(not included in the delivery package)
The use of this function is not approved for medical applications.

7 **Adapter for Femtotips**
The use of this function is not approved for medical applications.

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.

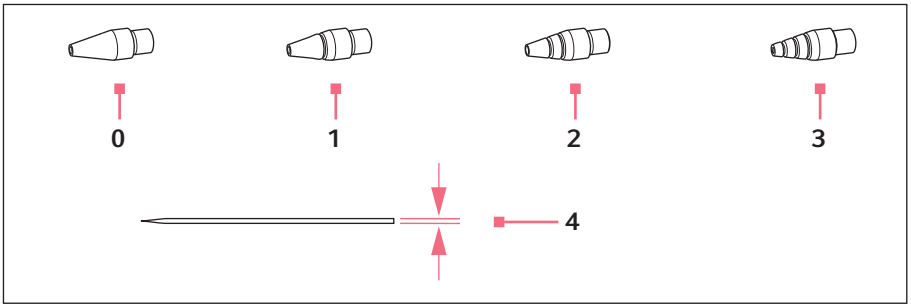


Fig. 3-7: Grip head sizes

0 Size 0
For capillary diameters from 1.0 to 1.1 mm

1 Size 1
For capillary diameters from 1.2 to 1.3 mm

2 Size 2
For capillary diameters from 1.4 to 1.5 mm

3 Size 3
For capillary diameters from 0.7 to 0.9 mm

4 Capillary diameter

3.8 Filling set and cleaning set – CellTram 4m Oil

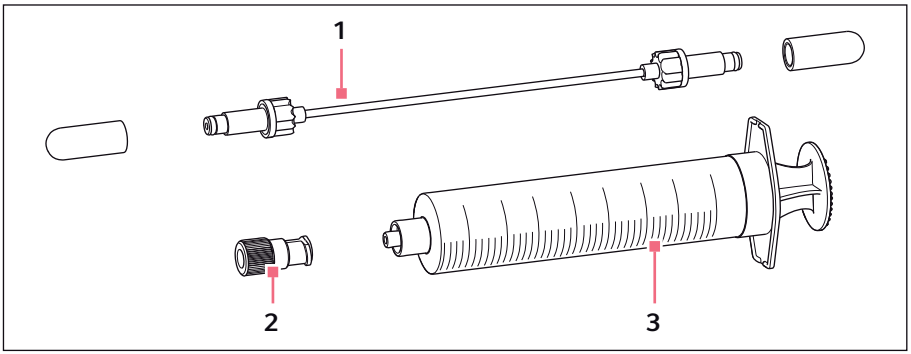


Fig. 3-8: Filling set and cleaning set

1 Filling tube 4
Blue marking ring, 10 cm

2 Luer lock adapter

3 Filling syringe

3.9 Functions – CellTram 4m 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
- Manual microinjections

The movement of the piston creates positive pressure or negative 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 piston positions 1 to 4. Smaller pressure differences are generated between piston positions 7 to 10. The piston position can be used to adjust the sensitivity of the microinjector to specific requirements. Cells are moved quicker and further in the capillary when the piston is in position 3 instead of position 7.

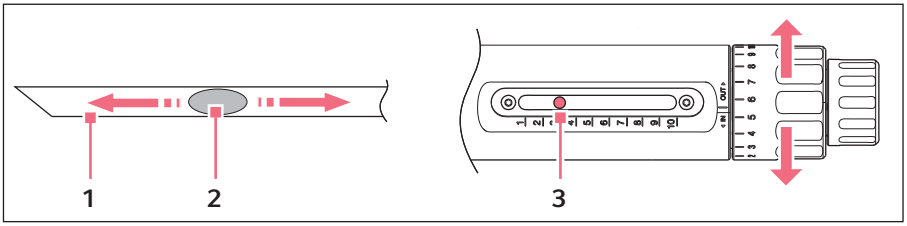


Fig. 3-9: Large pressure difference in the capillary

1 Capillary

2 Cell

3 Piston position between 1 – 4

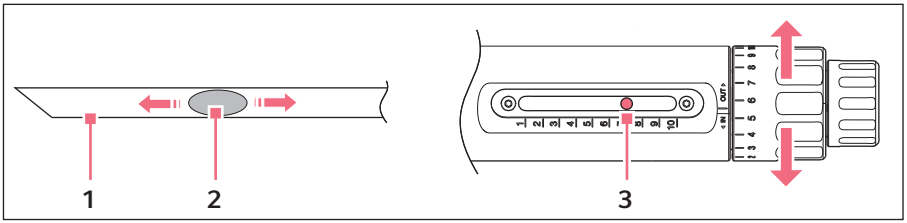


Fig. 3-10: Small pressure difference in the capillary

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.

3.10 Functions – CellTram 4m Oil

Mineral oil is used for pressure transmission with the CellTram Oil.

This type of oil is suitable for:

- Holding larger cells
- Cell biopsy
- Aspirating, transferring and injecting smaller cells
- 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 cell should not come into contact with the oil.

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

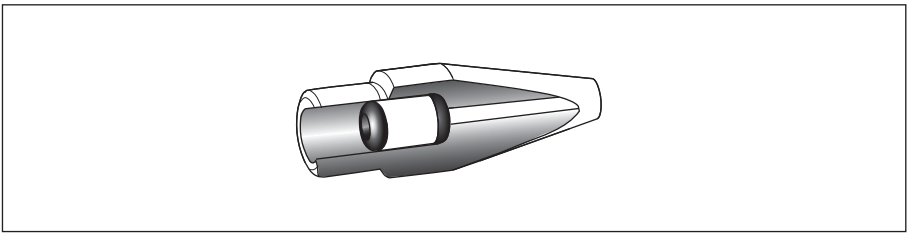
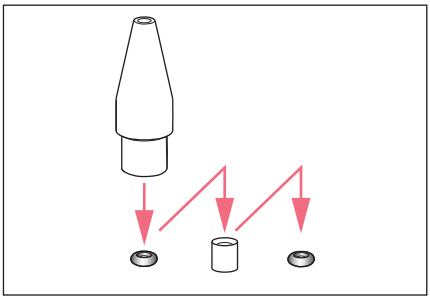


Fig. 4-1: Cross-section of the grip head with correctly inserted o-rings and distancing sleeve

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

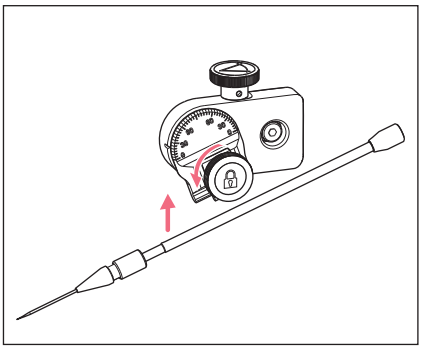
- The o-rings and distancing sleeve are inserted in the grip head.
- Capillary holder 4 is prepared.

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 4m 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 4m Air

Prerequisites
- The injection tube with the white marking ring is prepared.
- The injection tube is free of damage.
- 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 4m Oil

Prerequisites
- The injection tube with the blue marking ring is prepared.
- The injection tube is free of damage.
- 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.

4.8 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 4m Oil

Observe the legal regulations and the manufacturer's material safety data sheet on the use of the oil in medical applications.

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.

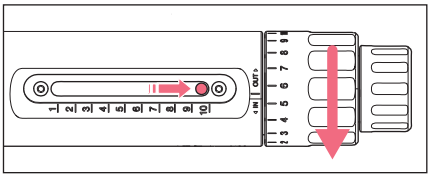
When aspirating the oil with the filling syringe, tiny air bubbles may form. Try to avoid the formation of air bubbles, as they will be transferred to the microinjector and impair or slow down the filling process. If the syringe contains air bubbles, these should be collected via long-term storage. Large 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 at least 3 mL .
4. Hold the filling tube 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.

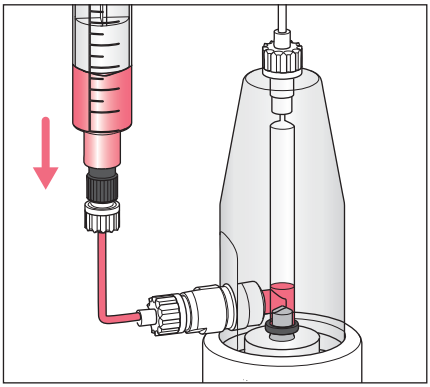


1. Move the pistons to the starting position (piston position 10).
2. Remove the dust cap from the filling valve.
3. Screw the filling tube onto the filling valve.

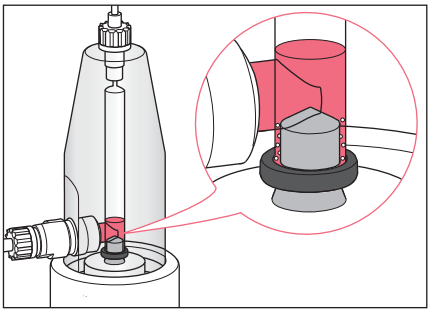
4.9.3 Filling the system with oil

Prerequisites

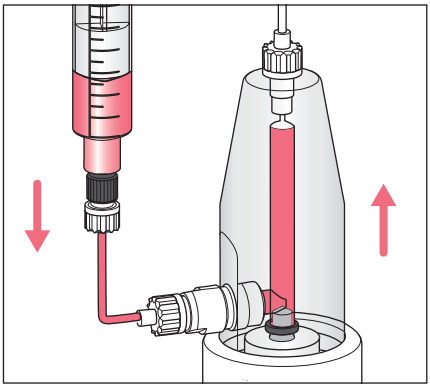
- The pistons are in the starting position (piston position 10).
- The oil in the filling syringe is free of air bubbles.



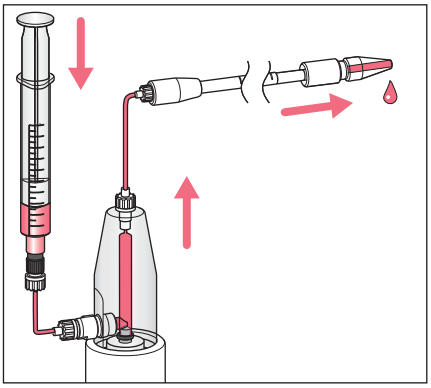
1. Hold the microinjector vertically.
2. Slowly push some oil into the piston chamber.
   When filling the system for the first time, air bubbles often form in the ring gap between the piston and the cylinder.
   The air bubbles must be removed from the ring gap.



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 4m 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.

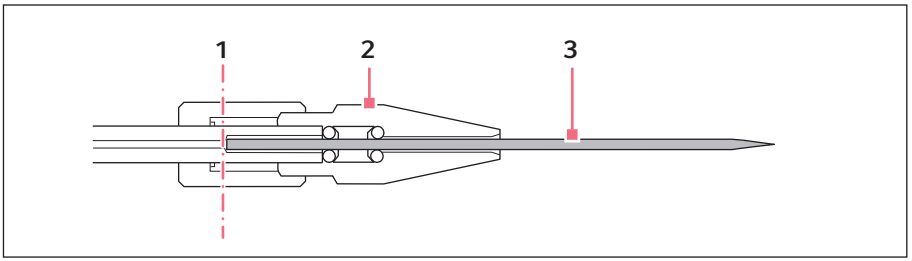


Fig. 4-2: Cross-section of capillary holder, grip head and capillary

1 Capillary stop
Stop for capillary

2 Grip head

3 Capillary

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 4m 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.

4.11 Inserting the capillary – CellTram 4m 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.

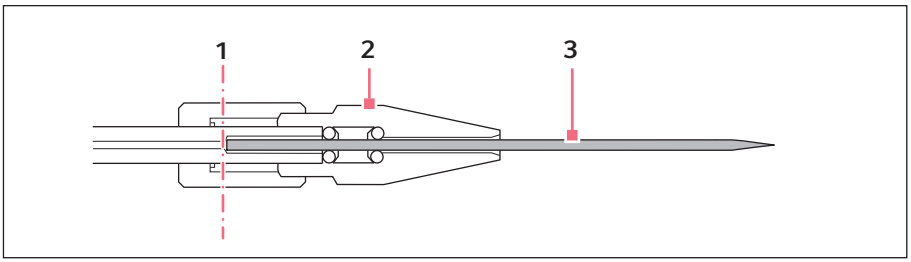


Fig. 4-3: Cross-section of capillary holder, grip head and capillary

1 Capillary stop
Stop for capillary

2 Grip head

3 Capillary

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.

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 4m 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.

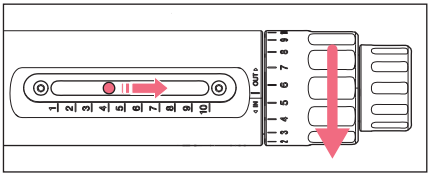
4. Continuously slide the new capillary through the o-ring in the grip head until the capillary stop.

   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.

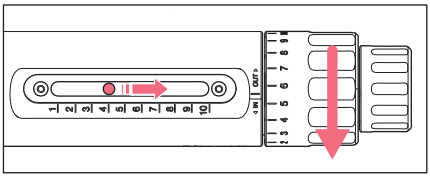
5 Operation

5.1 Generating negative pressure – CellTram 4m Air



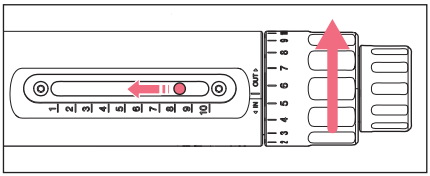
1. Rotate the rotary knob for coarse drive or fine drive anti-clockwise.
   The piston is retracted.
   Negative pressure is generated in the capillary.

5.2 Generating negative pressure – CellTram 4m 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.

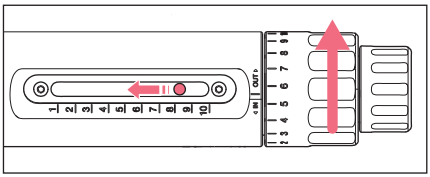
5.3 Generating positive pressure – CellTram 4m Air



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 4m 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 4m 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 4m 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 4m 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, refill oil.

5.8 Optimizing the piston position – CellTram 4m 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.
- The Petri dish containing the cells to be held is prepared.

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

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 anti-clockwise.
   This generates 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

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

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.
- The Petri dish containing the 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 anti-clockwise.
   This generates 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 in the transfer capillary.

Do not press the ventilation valve if there are cells inside of the capillary. The pressure equalization may suddenly dispense or aspirate liquid.

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 4m 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 4m Air and CellTram 4m Oil

Problem	Cause	Solution
Uncontrolled aspiration	• Rotary knobs rotated too far in anti-clockwise direction. This causes to much negative pressure.	▸ Establish a pressure balance.
	• System has a leak. • A fitting is loose.	▸ Tighten the fittings on the injection tube. ▸ Tighten the fitting on the grip head.
	• O-ring is defective.	▸ Check the o-rings in the grip head. ▸ Exchange defective o-rings.
	• Injection tube is defective.	▸ Check the injection tube. ▸ Exchange the injection tube.
	• O-rings in grip head do not sit properly.	▸ Check the o-rings and distancing sleeve in the grip head. ▸ Insert the o-rings and distancing sleeve in the correct order.
	• O-rings do not match the size of the grip head.	▸ Check the o-rings. ▸ Insert the o-rings which match the size of the grip head. • Size 0 = o-ring inner diameter of 1.0 mm • Size 1 = o-ring inner diameter of 1.5 mm • Size 2 = o-ring inner diameter of 1.5 mm • Size 3 = o-ring inner diameter of 1.0 mm
Sharp pressure rise or pressure loss	• The meniscus of the aspirated medium is in an unfavorable diameter range of the capillary.	▸ Check the meniscus of the aspirated medium. ▸ Shift the meniscus.

6.2 Error search – CellTram 4m Air

Problem	Cause	Solution
Sharp pressure rise or pressure loss	• Drops of liquid in injection tube.	▸ Check the injection tube for trapped liquid. ▸ Clean and dry the injection tube.
	• Drops of liquid in the capillary holder.	▸ Check the capillary holder. ▸ Clean and dry the capillary holder.
System responds slowly	• Wrong injection tube.	▸ Connect the injection tube with the white marking ring.
	• Poor piston position.	▸ Adjust the piston position by a small value.

6.3 Error search – CellTram 4m Oil

Problem	Cause	Solution
Sharp pressure rise or pressure loss	• Air bubble in the injection tube.	▸ Remove the air bubble from the system.
	• Air bubble in the capillary holder.	▸ Remove the air bubble from the system.
	• Air bubbles in the capillary. • Air bubbles in the grip head.	▸ Replace the capillary. ▸ Review working procedure if errors arise repeatedly. ▸ Remove the air bubble from the system.
Oil is difficult to fill.	• Wrong injection tube attached.	▸ Attach the injection tube with the blue marking ring.

7 Maintenance

7.1 Refilling oil – CellTram 4m Oil

Observe the legal regulations for purity of the oil. Additional instructions can be found in the manufacturer's material safety data sheet.

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 block or slow down the filling process. If the syringe contains air bubbles, these should be collected via long-term storage. 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 onto the filling valve.
   An air bubble is trapped between the filling tube and the filling valve.
3. Pull the trapped air bubble into the filling syringe.
4. Rotate 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 bubble 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 bubble rise to the top.
2. Press oil through the system to remove the air bubbles.

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.

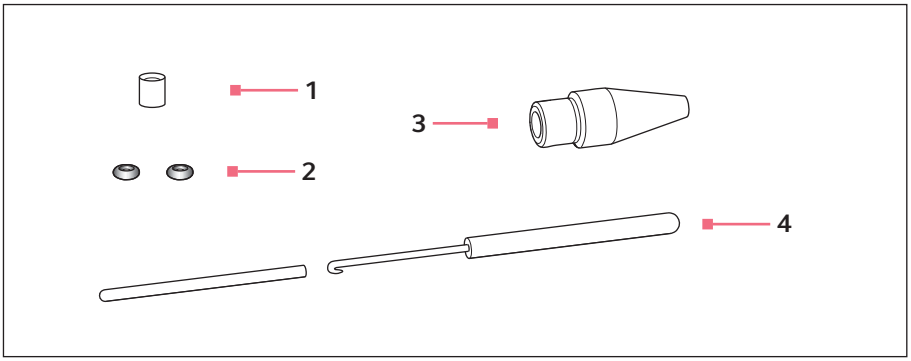


Fig. 7-1: Grip head 4 with removal tool

1 Distance sleeve

2 O-rings
Inner diameter 1.0 mm

3 Grip head 4 size 0

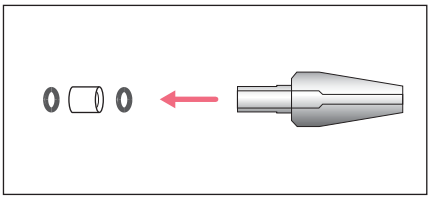
4 Removal tool
Hook with protective sleeve

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

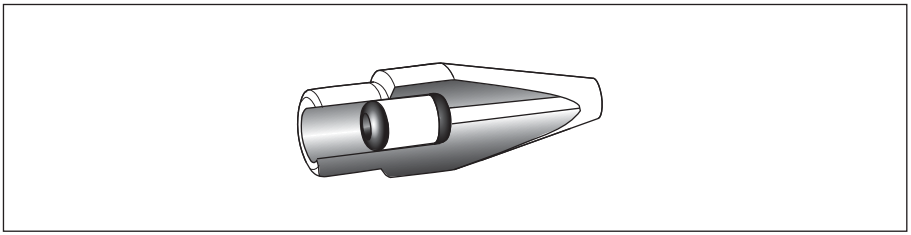
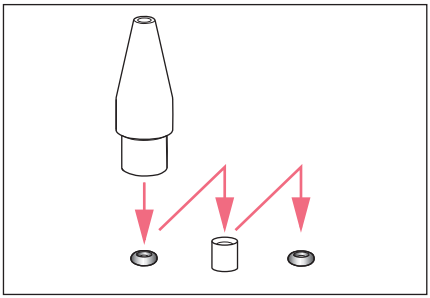


Fig. 7-2: Cross section with correctly positioned o-rings and spacing sleeve

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 Cleaning the capillary holder

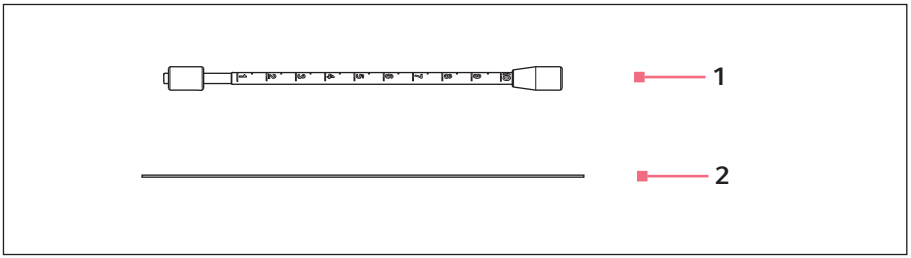


Fig. 7-3: Capillary holder 4 and cleaning stylet

Prerequisites

- The cleaning stylet is prepared.
- The injection tube is screwed off.
- The grip head is screwed off.

▸ Push the cleaning stylet thorough the capillary holder.

7.4 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.

7.4.1 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.

7.4.2 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.

7.5 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.

7.5.1 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.

7.6 Service and maintenance

The user is not required to carry out servicing or safety inspections.

The Eppendorf AG service team is available to service and certify your device.

Service provisions:

- Service
- Operational qualification (OQ) according to manufacturer specifications

Information on the services offered can be found on our webpage www.eppendorf.com/epServices.

8 Technical data
8.1 CellTram 4m 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

8.2 CellTram 4m 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 Transport and storage

Air temperature	Relative humidity
-40 C° – 60 C°	10 % – 95 %

9.2 Contact details

9.2.1 Manufacturer Eppendorf AG

Eppendorf AG

Barkhausenweg 1

22339 Hamburg

GERMANY

eppendorf@eppendorf.com

9.2.2 Local Eppendorf distributor

www.eppendorf.com/contact

9.3 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).
2. Decontaminate all the parts you are going to dispatch.
3. Include the fully completed decontamination certificate in the shipment.

9.4 Disposal

Observe the relevant legal regulations when disposing of the device.

10 Ordering information

10.1 CellTram 4m Air

Order no. (International)	Description
5196 000.021	**CellTram 4m Air (EU, EFTA)**
5196 000.056	**CellTram 4m Air (Australia)**

10.2 CellTram 4m Oil

Order no. (International)	Description
5196 000.048	**CellTram 4m Oil (EU, EFTA)**
5196 000.064	**CellTram 4m Oil (Australia)**

10.3 Accessories

Order no. (International)	Description
5196 081.005	**Capillary holder 4** for mounting microcapillaries
	Grip head set 4 for capillary holder 4 and universal capillary holder
5196 082.001	Size 0, capillary diameters from 1.0 mm to 1.1 mm (O.D.)
5196 083.008	Size 1, capillary diameters from 1.2 mm to 1.3 mm (O.D.)
5196 084.004	Size 2, capillary diameters from 1.4 mm to 1.5 mm (O.D.)
5196 085.000	Size 3, capillary diameters from 0.7 mm to 0.9 mm (O.D.)
	O-ring set 4 incl. 10 o-rings large, 10 o-rings small, 2 distance sleeves, o-ring removal tool
5196 086.007	for grip head set 4
	Filling and Cleaning set incl. filling tube, Luer lock adapter, 2 syringes
5196 088.000	CellTram 4
5196 061.004	**Injection tube Air** White ring mark, I.D. 0.5 mm, length 1.3 m
5196 089.006	**Injection tube Oil** Blue ring mark, I.D. 1.0 mm, length 1.3 m

10.4 Micromanipulator

Order no. (International)	Description
	TransferMan 4m
5191 000.015	Mains/Power plug Europe

10.4.1 Microscope adapter

Order no. (International)	Description
	Adapter for microscope Leica 1
5192 301.000	DMi8, DMI3000 B, 3000 M, 4000 B, 5000 B, 5000 M, 6000 B, DM IRB E, DM IRE 2
	Adapter for microscope Leica 2
5192 302.007	DM IL LED, HC
	Adapter for microscope Olympus 1
5192 306.002	IX50, IX51, IX70, IX80, IX81
	Adapter for microscope Olympus 2
5192 307.009	IX53 IX3-ILL, IX73 IX3-ILL, IX83 IX3-ILL
	Adapter for microscope Olympus 3
5192 308.005	IX53 IX2-ILL30
	Adapter for microscope Nikon 1
5192 316.008	Eclipse Diaphot 200, 300, Eclipse Ti-E, Ti-U, Ti-S, TE200, TE300, TE2000
	Adapter for microscope Nikon 2
5192 317.004	Eclipse Ts2R
	Adapter for microscope Nikon 3
5192 318.000	Eclipse Ti2-U, Ti2-A, Ti2-E
	Adapter for microscope Zeiss 1
5192 311.006	AxioObserver 3, 5, 7, AxioObserver A1, D1, Z1, Axiovert 200
	Adapter for microscope Zeiss 2
5192 312.002	Axio Vert.A1

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Declaration of Conformity

The product named below fulfills the requirements of directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid. This declaration of conformity is issued under the sole responsibility of the manufacturer.

Product name:

CellTram® 4m Air, CellTram® 4m Oil

including accessories

Product type:

Manual Microinjector

Relevant directives / standards:

93/42/EEC: EN 14971, EN 1041, EN 15223-1, EN 13485, EN 62366

classification 93/42/EEC: I

Hamburg, August 17, 2020

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