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CellTram Air / CellTram Oil / CellTram vario

Operating Manual



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1 General information

CellTram Air is a manual piston pump for reliable holding of suspended cells, oocytes or blastocysts. It enables easy and simple positioning, transport and transfer of cells, spermatocytes, ES cells etc. As CellTram Air uses air for pressure transmission, clean and simple handling of the pump is guaranteed.

2 Design principle

Using a movable piston, CellTram Air generates differences in pressure which are transferred directly to a capillary via a pressure tube. Depending on piston movement, cells can be aspirated or dispensed. The capillary is inserted into a capillary holder which in turn provides the connection to the pressure tube. The capillary holder enables permanent mounting of various capillaries in the laboratory.

CellTram Air has an ergonomic design which enables easy handling, particularly in conjunction with all control units of Eppendorf Micro-manipulators.

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3 Technical data

Dial diameter:	40 am
Change in volume per revolution:	88 µl
Adjustable total volume:	2,640 µl
Entire stroke of the piston:	15 mm, corresponds to 30 revolutions
Minimum adjustment volume:	< 0.2 µl
Generation of pressure:	using piston and cylinder
Pressure tube:	length: 1 m inner diameter: 1 mm polyethylene
Maximum. rel. pressure:	2,900 hPa
Ambient temperature:	max. 40 °C
Ambient relative humidity:	max. 80 %
Space required (w/o pressure tube):	17.5 x 6 cm
Weight:	approx. 1.4 kg

Technical specifications subject to change!

4 Safety precautions and application



Never point capillaries at persons!
Very high pressures may build up in CellTram Air, e.g., due to a blocked capillary. This may cause capillaries to fly out of the capillary holder due to the "blow-pipe" effect.
For this reason, never point capillaries at persons!



Caution when mounting tools!
Mounting must not be performed with pressure. Glass capillaries can be damaged during mounting if they are not handled carefully. Wear eye protection to prevent the risk of injury from glass splinters.

The device is intended for use for in vitro applications or in the research laboratory only!

The device is to be used solely for microinjection and holding and transferring of cells in accordance with the appropriate legislative requirements!

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5 Device description

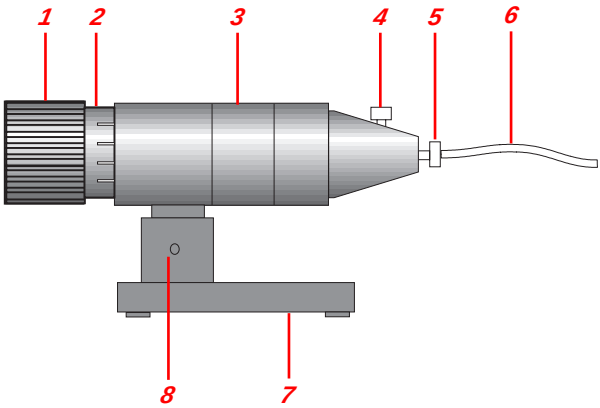


Fig. 1: CellTram Air, side view

1 Dial
2 Scale
3 Piston window
4 Ventilation screw
5 Tube connection screw
6 Pressure tube
7 Foot
8 Tilting joint

The piston is moved into the CellTram Air using a dial (Fig. 1.1). A complete revolution of the dial corresponds to a change in volume of approx. 88 µl. A clockwise rotation, i.e. to the right, results in an increase in pressure, the capillary contents are pressed out. A counterclockwise rotation, i.e. to the left, results in a decrease in pressure, aspiration into the capillary takes place. To assist fine pressure adjustment, the dial has a scale (Fig. 1.2) from 0 to 9.

The position of the piston is displayed in the piston window (Fig. 1.3) on a scale from 0 to 15 mm corresponding to the strokes.

In order to establish a pressure compensation in the capillary and in the entire system (capillary holder, pressure tube, cylinder), the ventilation screw (Fig. 1.4) is loosened slightly. Turn the screw again after balancing the capillary forces.

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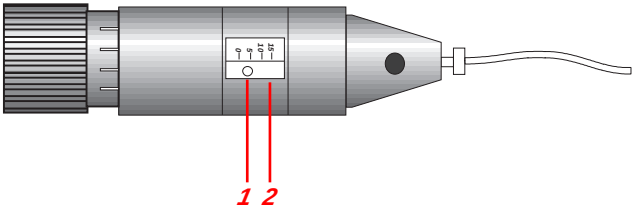


Fig. 2: CellTram Air, top view

1 Position indicator
2 Piston window with scale range

The piston can be moved between a stroke of 0 mm (home position) and 15 mm (final position). The position of the piston is indicated by a circular marker (Fig. 2.1).

Universal capillary holder

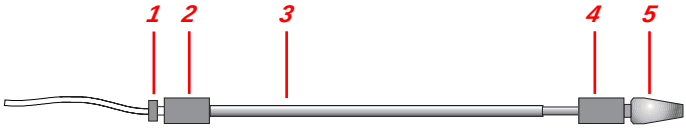


Fig. 3: Universal capillary holder

1 Tube connection
2 Rear knurled screw
3 Tension piece
4 Front knurled screw, rotatable
5 Grip head 0 for capillaries with an outer diameter of 1.0 to 1.1 mm; transparent plastic

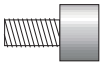
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Accessories for universal capillary holder



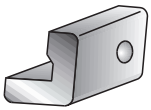
Grip head 0,
plus two sets of O-rings
and sealing washer





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Adapter for Femtotips®
(microcapillaries for microinjection),
incl. two spare O-rings



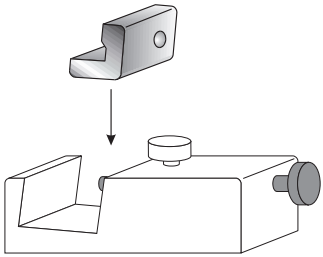
Clamping piece
for fastening the universal capillary holder

Capillaries with an outer diameter of 1.0 to 1.1 mm can be used in the universal capillary holder. The transparent grip head allows the user to visually monitor the position of the capillary.

The capillary is fixed in the universal capillary holder via the grip head (Fig. 3.5). The mounted capillary can be rotated about its own axis by turning the front knurled screw (Fig. 3.4).

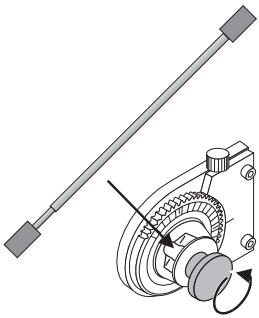
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Micromanipulator with an old tool holder
The universal capillary holder is mounted by placing the clamping piece into the tool holder of the Eppendorf Micromanipulator and then tightening it with the fastening screw.



The universal capillary holder is positioned with the correct length into the tool holder and then fixed into position. The position of the capillary can be changed by loosening the fastening screw.

Micromanipulator with new cannula holder, adjustable
The universal capillary holder is clamped directly.



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6 Startup

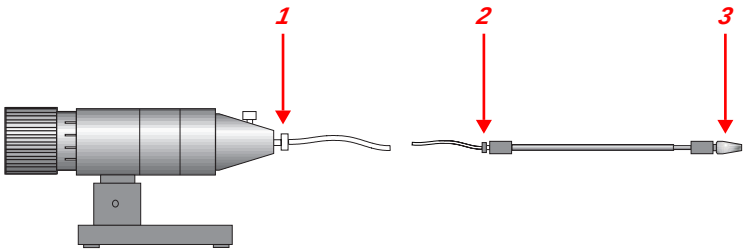


Fig. 4: Startup

1 Screw pressure tube onto CellTram Air
2 Screw pressure tube onto the universal capillary holder
3 Mount capillary:
  – Loosen grip head slightly
  – Insert capillary and slide through the inner O-rings into the universal capillary holder
  – Tighten grip head

Important: Only use capillaries with an outer diameter of 1.0 to 1.1 mm. Other capillaries may only be used with the corresponding grip head (see Sec. 10 "Ordering information").

The angle of CellTram Air can be set individually via the tilting joint. This requires the fastening screw in the tilting joint to be loosened and then retightened using an offset screwdriver (4-mm Allen key).

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7 Modes of operation

7.1 Hold mode

1. Fix capillary holder into the tool holder of the Eppendorf Micro-manipulator.
2. Determine the correct length and rotation of the capillary.
3. Move the micromanipulator upwards
   (see Operating Manual of the micromanipulator).
4. Position Petri dish.
5. Move capillary into the medium and observe it with the naked eye and then under a microscope.
6. Establish pressure equilibrium in the capillary.
   – Wait until equilibrium has been established
   or
   – Loosen ventilation screw; tighten screw again after pressure compensation
   or
   – Establish counter pressure which compensates the active capillary force by moving the piston (clockwise, to the right).
7. Move capillary near to the desired cell.
8. Generate vacuum by turning the dial counterclockwise (to the left).
9. While the cell moves towards the capillary, it may be necessary to slightly equilibrate the vacuum generated by turning the dial clockwise (to the right) in order that the cell is not fixed too firmly to the capillary tip. After the cell has reached the capillary tip, an optimal constant pressure should be set.
   Important: Excessive constant pressure can damage the cell.

Important note on pressure behavior:
An overpressure or vacuum can be built up in the capillary using the volume of the piston area (cylinder) and pressure tube. Therefore, the pressure behavior varies depending on the position of the piston. If the piston is located, e.g., in position 10 to 15, the differences in pressure are greater than, e.g., in position 0 to 5. By carefully selecting the position of the piston, the sensitivity of the CellTram Air piston pump can be adapted to your requirements.

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7.2 Transfer mode

The same mode of operation applies to the transfer of cells as to the holding of cells. As the cell should be aspirated into the capillary during this process, ensure that pressure is equilibrated sensitively and evenly during aspiration.

7.3 How to aspirate certain liquids

1. Move the capillary into the liquid that is to be aspirated.
2. Aspirate the liquid by creating a low pressure (rotate counterclockwise approx. twice).
3. Wait for a short period and then loosen the ventilation screw. Retighten the screw after pressure compensation.

8 Maintenance

Maintenance is not required for CellTram Air and the pressure tube. If the O-rings on the universal capillary holder or on the grip head are damaged (e.g. sharp-edged glass capillaries), they can be replaced with the aid of the extraction tool (see Sec. 10, "Ordering information").

CellTram Air, the pressure tube and the capillary holder can be cleaned with water or a mild lab detergent.

Important: No liquid residue must remain in the pressure tube and in the capillary holder after cleaning as this prevents constant pressure behavior. Blow through pressure tube and capillary holder with compressed air after cleaning and dry well.

After longer use or if the tilting joint moves too smoothly, it may be necessary to tighten the fastening screw of the tilting joint again with an offset screwdriver (4-mm Allen key).

9 Disinfection

The surfaces of CellTram Air can be disinfected with an alcoholic disinfectant (isopropanol). In addition, the pressure tube and the capillary holder can be rinsed with an alcoholic disinfectant.

Autoclaving is not possible.

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10 Ordering information

Order no.	
5176 000.017	CellTram Air
5176 114.004	Pressure tube, 1 m
5176 190.002	Universal capillary holder, incl. grip head 0
	Offset screwdriver for Allen screws
	Accessories (not standard)
5176 207.002	Grip head 3 for universal capillary holder; for microcapillaries with an outer diameter of 0.7 to 0.8 mm
5176 210.003	Grip head 0 for universal capillary holder; for microcapillaries with an outer diameter of 1.0 to 1.1 mm
5176 212.006	Grip head 1 for universal capillary holder; for microcapillaries with an outer diameter of 1.2 to 1.3 mm
5176 214.009	Grip head 2 for universal capillary holder; for microcapillaries with an outer diameter of 1.4 to 1.5 mm
5176 116.007	Pressure tube for CellTram, 1 m, with Luer Lock connection, male
5176 196.000	O-ring set for grip heads 0–3 with extraction tool
5176 195.004	Service kit for grip head and capillary holder, consisting of O-ring set, adapter for Femtotip® and clamping piece

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1 General information

CellTram Oil / vario is a manual piston pump for precise control of the transfer of cells, such as spermatocytes or ES cells, and for manual liquid injection.

As CellTram Oil / vario uses oil for pressure transmission which, unlike air, can hardly be compressed, its operating cycles are very controlled and constant.

This new filling technique reduces the filling time and simplifies oil filling.

2 Design principle

Using a movable piston, CellTram Oil / vario generates differences in pressure which are transferred directly to a capillary via a pressure tube. To ensure controlled, constant pressure transmission, the cylinder, pressure tube and part of the capillary are filled with oil. Depending on piston movement, cells can be aspirated or dispensed. The capillary is inserted into a capillary holder which, in turn, provides the connection to the pressure tube. The capillary holder enables permanent mounting of the capillary in the laboratory.

CellTram vario has an additional dial that drives the piston at a transmission ratio of 10:1, enabling ultra-fine cell movements.

CellTram Oil / vario has an ergonomic design which enables easy handling, particularly in conjunction with all control units of Eppendorf Micromanipulators.

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3 Technical data

	CellTram Oil	CellTram vario Coarse / fine
Dial diameter:	40 mm	42 / 34 mm
Change in volume per revolution:	9.8 µl	9.6 / 0,96 µl
Adjustable total volume:	980 µl	960 µl
Entire stroke of the piston:	50 mm corresponds to 100 revolutions	
Minimum adjustment volume:	< 0.02 µl	< 0.02 / 0.002 µl
Total filling volume (incl. 1 m tube and universal capillary holder):	< 2 ml	< 2 ml
Generation of pressure:	using piston and cylinder	
Pressure tube:	length: inner diameter: polyethylene	1 m 1 mm
Pressure attainable:	approx. 20,000 hPa	approx. 20,000 hPa
Ambient temperature:	max. 40 °C	max. 40 °C
Ambient relative humidity:	max. 80 %	max. 80 %
Space required (w/o pressure tube):	27.5 x 6 cm	29.5 x 6 cm
Weight:	approx. 1.7 kg	approx. 1.7 kg

Technical specifications subject to change!

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4 Safety precautions and applications



Never point capillaries at persons!
Very high pressures may build up in CellTram Oil / vario, e.g. due to a blocked capillary. This may cause capillaries to fly out of the capillary holder due to the "blow-pipe" effect.
For this reason, never point capillaries at persons!



Caution when mounting tools!
Mounting must not be performed with pressure. Glass capillaries can be damaged during mounting if they are not handled carefully. Wear eye protection to prevent the risk of injury from glass splinters.

The device is intended for use for in vitro applications or in the research laboratory only!

The device is to be used solely for microinjection and holding and transferring of cells in accordance with the appropriate legislative requirements!

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5 Device description

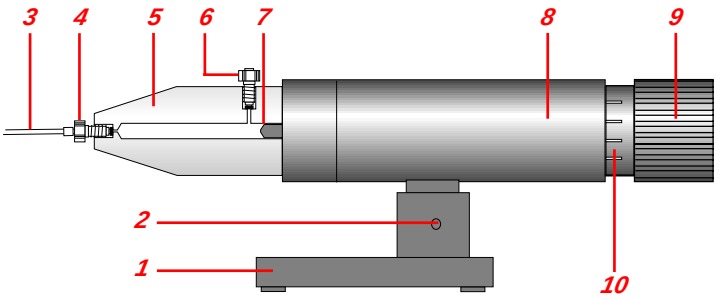


Fig. 1: CellTram Oil, side view

1 Foot
2 Tilting joint
3 Pressure tube
4 Tube connection screw
5 Cylinder body (transparent)
6 Filling bore with plug screw
7 Piston (in initial position)
8 Housing
9 Dial
10 Scale

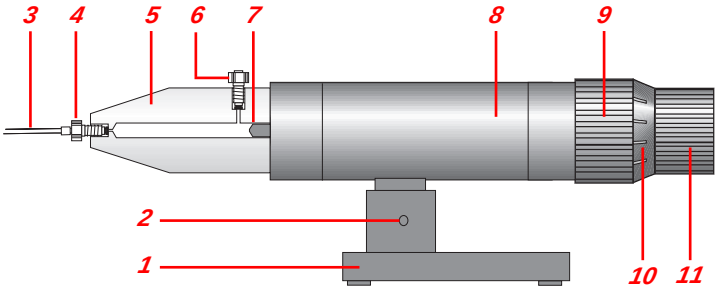


Fig. 2: CellTram vario, side view

1 Foot
2 Tilting joint
3 Pressure tube
4 Tube connection screw
5 Cylinder body (transparent)
6 Filling bore with plug screw
7 Piston (in initial position)
8 Housing
9 Dial, coarse drive
10 Scale
11 Dial, fine drive

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The piston is moved into the pump using a dial/coarse drive (Fig. 1/2.9). A complete revolution of the dial corresponds to a change in volume of approx. 9.8 µl. CellTram vario has an additional fine drive (Fig. 2.11). The transmission ratio between fine drive and coarse drive is 10:1. A complete revolution of the fine drive corresponds to a change in volume of 0.96 µl.

A clockwise rotation, i.e. to the right, results in an increase in pressure, the capillary contents are pressed out. A counterclockwise rotation, i.e. to the left, results in a decrease in pressure, aspiration into the capillary takes place. The direction of rotation and fine pressure adjustment are assisted by scaling (Fig. 1/2.10).

The position of the piston (Fig. 1/2.7) can be observed in the transparent cylinder (Fig.1/2.5). The filling bore with the plug screw is at the top of the cylinder (Fig. 1/2.6). The pressure tube (Fig. 1/2.3) is connected to CellTram Oil/ vario with the aid of the tube connection screw (Fig. 1/2.4). The tube has a joint at both ends and thus connects CellTram Oil / vario and the capillary holder.

To adapt the device to its surroundings, the tilting joint (Fig. 1/2.2) enables CellTram Oil / vario to be tipped upwards and downwards.

Universal capillary holder

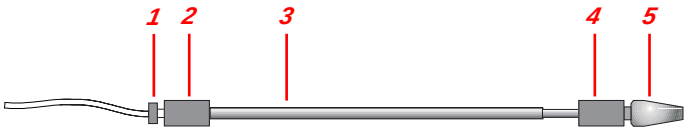


Fig. 3: Universal capillary holder

1 Tube connection
2 Rear knurled screw
3 Tension piece
4 Front knurled screw, rotatable
5 Grip head 0 for capillaries with an outer diameter of 1.0 to 1.1 mm; transparent plastic

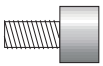
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Accessories for universal capillary holder



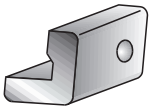
Grip head 0,
plus two sets of O-rings
and sealing washer





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Adapter for Femtotips®
(microcapillaries for microinjection),
incl. two spare O-rings



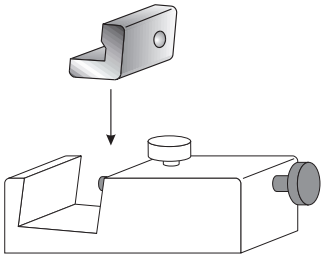
Clamping piece
for fastening the universal capillary holder

Capillaries with an outer diameter of 1.0 to 1.1 mm can be used in the universal capillary holder. The transparent grip head allows the user to visually monitor the position of the capillary.

The capillary is fixed in the universal capillary holder via the grip head (Fig. 3.5). The mounted capillary can be rotated about its own axis by turning the front knurled screw (Fig. 3.4).

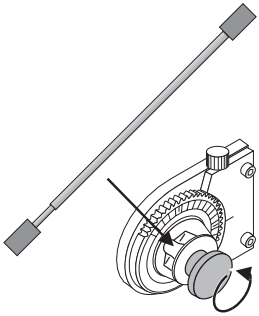
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Micromanipulator with an old tool holder
The universal capillary holder is mounted by placing the clamping piece into the tool holder of the Eppendorf Micromanipulator and then tightening it with the fastening screw.



The universal capillary holder is positioned with the correct length into the tool holder and then fixed into position. The position of the capillary can be changed by loosening the fastening screw.

Micromanipulator with a new cannula holder, adjustable
The universal capillary holder is clamped directly.



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6 Startup

– Move the piston to the rear initial position by rotating counterclockwise (Fig. 4.A).

– Connect CellTram Oil / vario to the pressure tube and the universal capillary holder (Fig. 4.1/2).

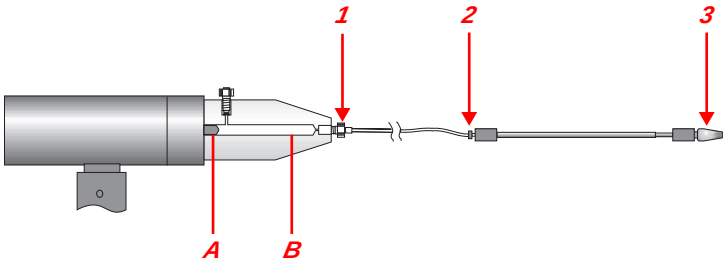
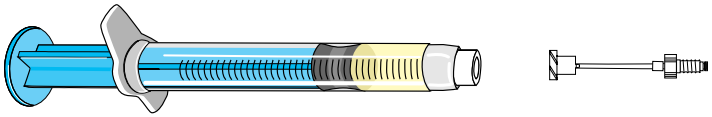


Fig. 4: Startup

A = Initial position of piston
B = Final position of piston

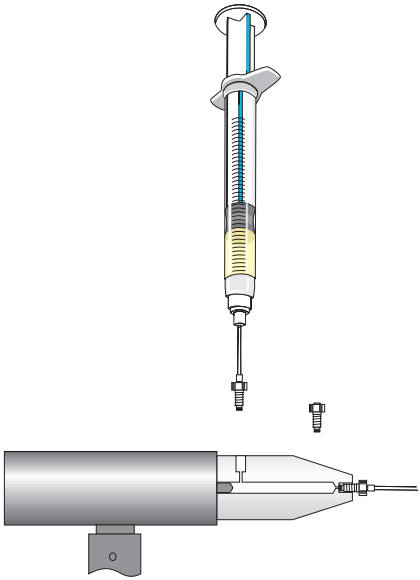
– Screw the filling tube to the syringe using the Luer connection.



***Note**:* Incorrect aspiration may lead to the formation of tiny air bubbles. This must be avoided as the air bubbles may be transferred to CellTram, which may impair or slow down the filling process. If the syringe contains small air bubbles, these should be collected by long-term storage. Large air bubbles can be pressed out during filling.

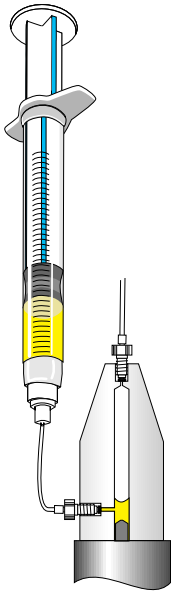
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– Aspirate at least 3 ml oil into the syringe.
– Remove the plug screw from the filling bore. Screw on the filling tube.

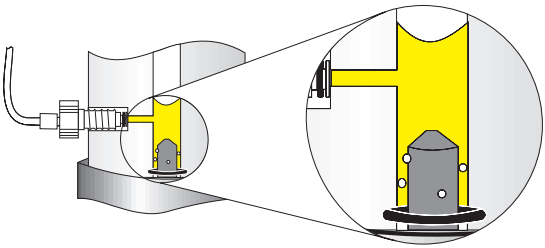


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– Hold CellTram Oil / vario vertically. Using the syringe, press some oil into the piston chamber.

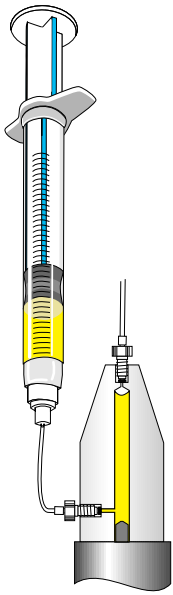


– During the first filling, several air bubbles will probably be present between the piston and the cylinder. Allow these bubbles to rise by moving the piston several times forwards and backwards (dial / coarse drive).



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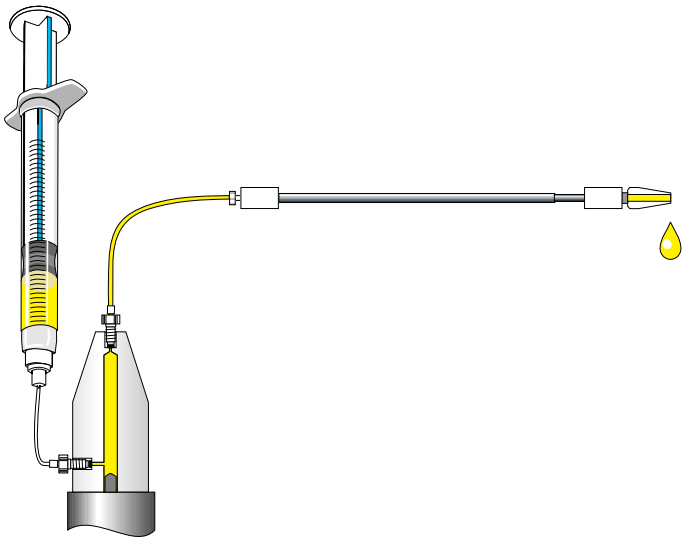
– After filling has been completed, make sure that there are no air bubbles in the tip of the piston chamber.



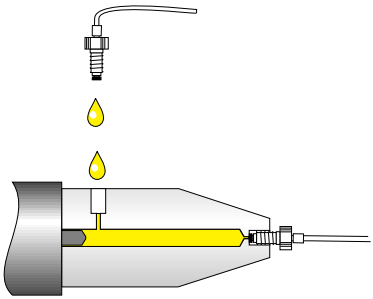
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– Fill the piston chamber, the tube and the capillary holder completely. It is very important that any air in the system is removed as air bubbles may result in delayed movements during aspiration and dispensing which are difficult to control.

  Visual check of the capillary adapter: Ensure that no air bubbles are present in the universal capillary holder.

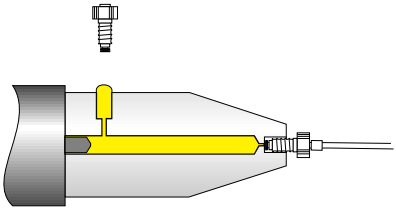


– Return CellTram to a horizontal position. Unscrew the filling tube and fill the bore with oil.



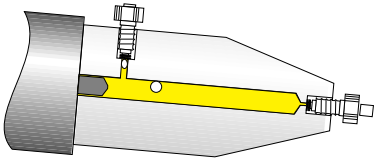
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– Screw the plug screw into the filled bore. When doing so, make sure that no new air bubbles enter the bore. Soak up any excess oil using a soft cellulose cloth.



***Note**:* For filling and refilling with oil, the piston should be moved behind the filling bore.

– Hold the filling bore at an angle to move any air bubbles and then to remove them.



Mounting the capillary (Fig. 4.3)

– Loosen grip head slightly.

– Mount capillary and slide through the two inner O-rings into the universal capillary holder.

– Tighten grip head.
Important: Only use capillaries with an outer diameter of 1.0 to 1.1 mm. Other capillaries may only be used with the corresponding grip head (see Sec. 10, "Ordering information").

– Wipe off excess oil from capillary holder and capillary using a lint-free tissue.

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***Note**:* We recommend that you work with an air cushion in the visible area of the capillary in order to maintain a slight contact between the oil and the medium. Work may also take place without an air cushion.

The angle of CellTram Oil / vario can be set individually via the tilting joint. This requires the fastening screw in the tilting joint to be loosened and then retightened using an offset screwdriver (4-mm Allen key).

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7 Operation

1. Fix capillary holder into the tool holder of the Micromanipulator.
2. Determine the correct length and rotation of the capillary.
3. Move the micromanipulator upwards
   (see operating manual of the micromanipulator).
4. Position Petri dish.
5. Move capillary into the medium and observe it with the naked eye and then under a microscope.
6. Establish pressure equilibrium in the capillary.
   – Wait until equilibrium has been established
   or
   – establish counter pressure which compensates the active capillary force by moving the piston.
7. Move capillary near to the desired cell (e.g. spermatocytes, ES cells).
8. Generate vacuum by turning the dial counterclockwise (i.e. to the left).
9. While the cell moves towards the capillary, it may be necessary to slightly equilibrate the vacuum generated by turning the dial clockwise (i.e. to the right) in order that the cell is not aspirated too quickly and too far into the capillary tip.

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8 Maintenance

Maintenance is not required for CellTram Oil / vario and the pressure tube. If the O-rings on the universal capillary holder or on the grip head are damaged (e.g. sharp-edged glass capillaries), they can be replaced with the aid of an extraction tool (see Sec. 10 "Ordering information").

CellTram Oil / vario, the pressure tube and the capillary holder can be cleaned with water or mild lab detergent.

***Important**:* No liquid residue must remain in the pressure tube and in the capillary holder after cleaning as this prevents constant pressure behavior. Blow through pressure tube and capillary holder with compressed air after cleaning and dry well.

After longer use or if the tilting joint moves too smoothly, it may be necessary to tighten the fastening screw of the tilting joint again with an offset screwdriver (4-mm Allen key).

9 Disinfection

The surfaces of CellTram Oil / vario can be disinfected with an alcoholic disinfectant (isopropanol). In addition, the pressure tube and the capillary holder can be rinsed with an alcoholic disinfectant.

Autoclaving is not possible.

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10 Ordering information

Order no.	
5176 000.025	CellTram Oil Delivery package: 1 CellTram Oil
5176 114.004	1 Pressure tube, 1m
5176 190.002	1 Universal capillary holder, incl. grip head 0 1 Filling tube with Luer Lock connection, female 1 Disposable syringe with Luer Lock connection, male 20 ml Oil
5176 000 033	CellTram vario Delivery package: 1 CellTram vario
5176 114.004	1 Pressure tube, 1 m
5176 190.002	1 Universal capillary holder, incl. grip head 0 1 Filling tube with Luer Lock connection, female 1 Disposable syringe with Luer Lock connection, male 20 ml Oil
	Liquid paraffin e.g. 100 ml Fluka Viscosity (20 °C): 110 to alter125 mPa*s Order no. 76 235
	Mineral oil e.g. 1 l Sigma Order no. M-8410
	Accessories (not standard)
5176 210.003	Grip head 0 for universal capillary holder; for microcapillaries with an outer diameter of 1.0 to 1.1 mm
5176 212.006	Grip head 1 for universal capillary holder; for microcapillaries with an outer diameter of 1.2 to 1.3 mm
5176 214.009	Grip head 2 for universal capillary holder; for microcapillaries with an outer diameter of 1.4 to 1.5 mm
5176 207.002	Grip head 3 for universal capillary holder; for microcapillaries with an outer diameter of 0.7 to 0.8 mm

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5176 116.007	Pressure tube for CellTram, 1 m, with Luer Lock connection, male
5176 196.000	O-ring set for grip heads 0–3 with extraction tool
5176 195.004	Service kit for grip head and capillary holder, consisting of O-ring set, adapter for Femtotip® and clamping piece

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Support and Services Directory

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Website: **Email:**	www.eppendorf.com info@eppendorf.com	www.brinkmann.com canada@brinkmann.com
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