

Proline[®] Plus Mechanical Pipette



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1. Intended use

The Sartorius Proline® Plus pipette is intended, designed and manufactured for dispensing liquids in a variety of applications, and to be used in combination with Sartorius Optifit Tips or Safetyspace® Filter Tips.

The Sartorius Proline® Plus product range covers a volume range of 0.1 µl to 10,000 µl. It is recommended that Sartorius Optifit Tips or Safetyspace® Filter Tips are used with Sartorius pipettes to ensure optimum compatibility and performance.

The Sartorius Proline® Plus pipette is a general purpose laboratory device that is developed and manufactured according to ISO 9001 and ISO 13485 standards.

Read this user manual carefully before using the pipette for the first time. Additional copies can be downloaded from www.sartorius.com or hardcopies ordered by email from lhinfo.finland@sartorius.com.

Note: Prolonged pipetting can cause Work Related Upper Limb Disorder (WRULD). The manufacturer is not responsible for WRULD or any related injuries caused by using a pipette.

2. Product description

Your new Proline® Plus is an autoclavable air displacement pipette. The attractive and ergonomical design of the Proline® Plus pipette together with its low pipetting forces reduce the risk of repetitive strain injuries (RSI). The pipette is designed for both right- and left-handed use.

Note: It is known that prolonged pipetting can cause RSI. The manufacturer is not responsible for RSI or any related diseases caused by prolonged pipetting.

The special tip cone design of the pipette offers the possibility to use replaceable Safe-Cone Filters to help prevent the contamination and damage of the pipette. The pipette uses disposable tips.

See order information at the end of the manual.

3. Sartorius pipette tips

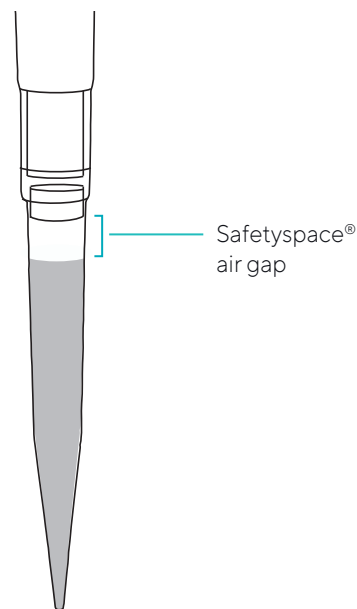
We recommend only using Sartorius pipette tips with the Proline® Plus pipette. Using fully compatible tips guarantees the pipette's performance specifications and ensures pipetting accuracy and precision.

Sartorius tips are made of pure virgin polypropylene and manufactured in protected cleanroom conditions.

Sartorius non-filter tips are available in trays, bulk packages, and space-saving refill systems. Both non-filter tips and trays are autoclavable at 121°C (252°F), 20 min, 1 bar (15 psi). All Single Tray racks and clean Refill Packs are certified RNase, DNase, and endotoxin-free.

To avoid aerosol contamination, use Safetyspace® Filter Tips and discard them after each pipetting. These can also be used to avoid sample loss caused by the sample coming into contact with the filter. The extra space between the sample and the filter (see picture) ensures that even foaming or viscous liquids do not come into contact with the filter in reverse pipetting or repetitive/multiple dispensing modes.

For more information, please visit www.sartorius.com or contact your local Sartorius representative.

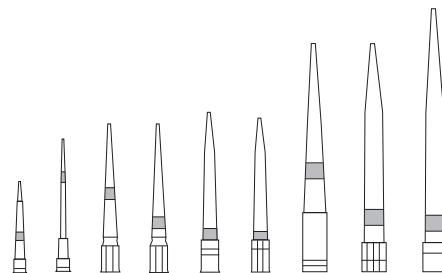


4. Unpacking

The Proline® Plus pipette package contains the following items:

1. Pipette
2. Calibration tool (also tube opener)
3. Safe-Cone filters (pipettes >10 µl) and forceps
4. Grease
5. Instruction manual
6. Performance certification in accordance with ISO 8655-6

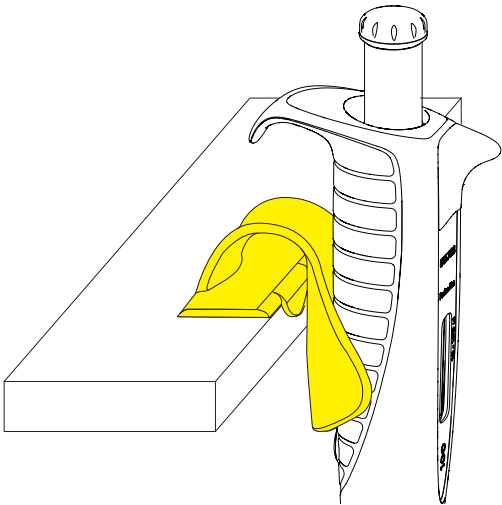
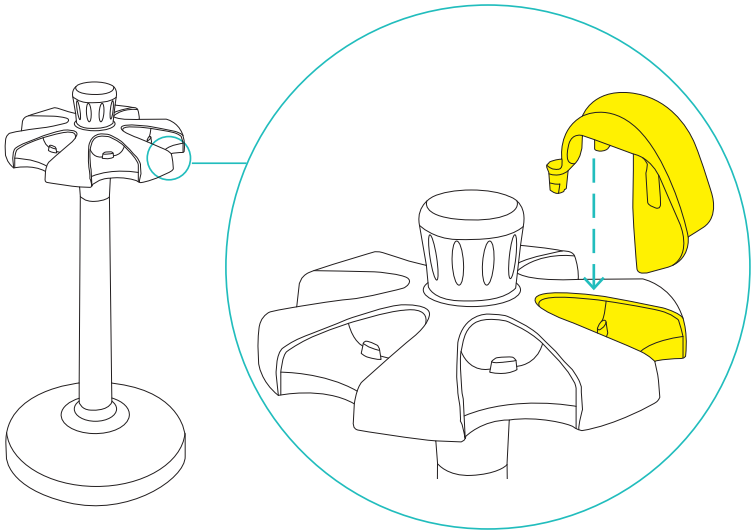
Please check that all items are included and that no damage has occurred during shipment.



5. Pipette holder and carousel stand

For convenience and safety, always keep the pipette vertically on its own holder, carousel or linear stand when not in use.

Cat.No.	Product
LH-725630	Carousel Stand for 6 pipettes
LH-727640	Pipette Holder for 1 pipette
725620	Linear Stand

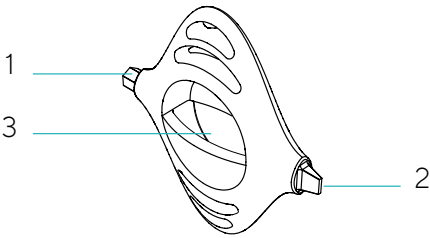


6. Calibration Tool

(also tube opener)

The calibration tool is designed for the following purposes:

- 1. Tool for recalibration.
- 2. Opening tool for the lid of the calibration nut.
- 3. Opening tool for the tubes.



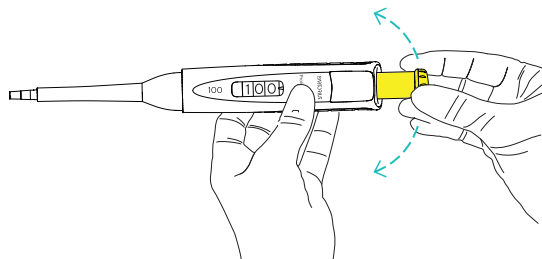
7. Operating the pipette

7.1. Setting the volume

The volume of the pipette is clearly shown through the display. The volume setting is carried out with the following steps:

1. Set the volume by rotating the operating button (clockwise to decrease the volume and counterclockwise to increase).

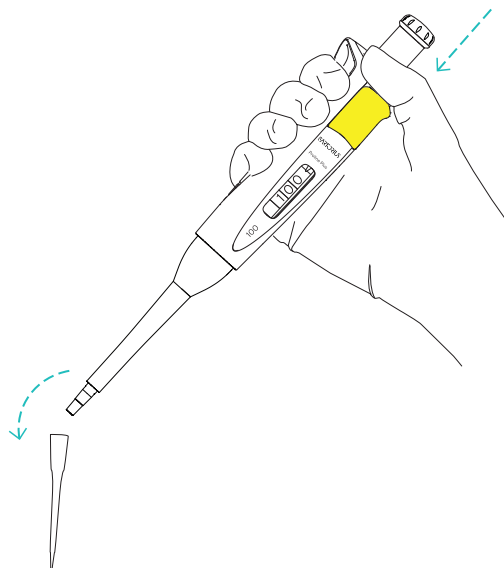
Note: Do not rotate the operating button outside the volume range of the pipette.



7.2. Sealing and ejecting tips

To ensure the maximum accuracy and precision, Sartorius tips are recommended to be used with Proline® Plus pipettes. Before fitting a tip ensure that the pipette tip cone is clean. Press the tip on the tip cone of the pipette.

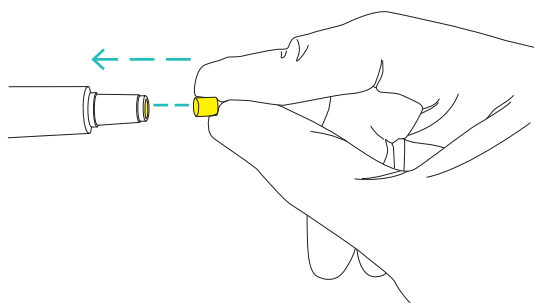
Eject the tip by pressing the tip ejector with your thumb. Make sure that the tip is disposed into a suitable waste container.



7.3. Protective tip cone filters

The tip cone design of the Sartorius pipettes (>10 µl) allows the use of Safe-Cone Filters in the tip cones. These removable filters prevent liquids and aerosols from entering the pipette and thus, protects the pipette from contamination and damage.

The Safe-Cone Filters are available as Standard or Plus versions. It is recommended to use the Standard filter for general applications and the Plus filter for more demanding applications such as cell culture, bacterial and virological work and molecular biology. Filters need to be exchanged regularly. The interval for filter exchanging is application dependant but the recommendation is to change the filter daily (after 50 - 250 pipetting cycles) and always in case of over-aspiration. (See www.sartorius.com for ordering information.) The Filter Foreceps should be used to avoid touching the soiled filters by hand. Make sure that the filter is disposed into a suitable waste container. Clean the tip cone if needed and put the new filter in place.

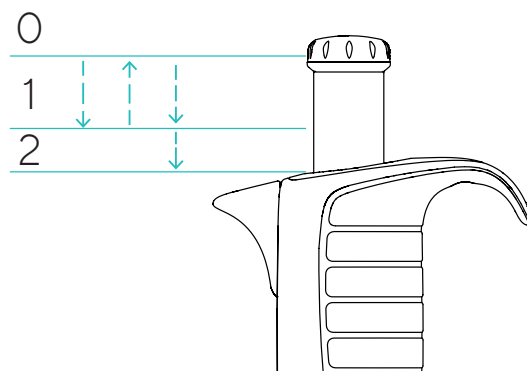


8. Pipetting Techniques

Two basic pipetting techniques, forward and reverse pipetting, are associated with Proline® Plus pipettes. Forward pipetting is the most common used pipetting technique. The technique employs the blow-out function ensuring complete delivery of the liquid. Reverse pipetting is recommended for highly viscous, biological or foaming liquids, or very small volumes of liquid. A selected volume plus an excess is aspirated into the tip. The delivery is done without blow-out, and, thus, the excess volume remains in the tip. The reverse technique also facilitates the repeated delivery of the same volume. If reverse pipetting technique is used the pipette might need recalibration.

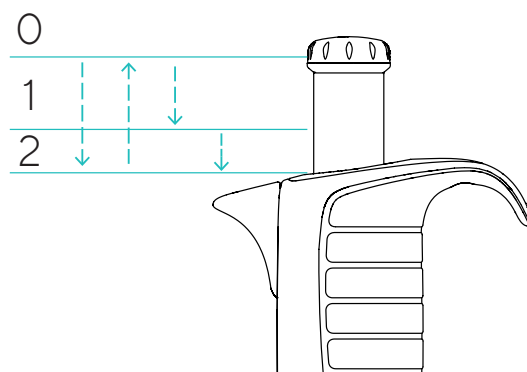
8.1. Forward pipetting

1. Fit the tip onto the pipette tip cone.
2. Press the operating button to the first stop.
3. Place the tip just under the surface of the liquid (2-3 mm) and smoothly release the operating button up to the starting position. Wait one second. Carefully withdraw the tip from the liquid, touching against the edge of the container to remove excess from the outside of the tip.
4. Dispense the liquid by pressing the operating button to the first stop. After a short delay press the operating button to the second stop. This action will empty the tip.



8.2. Reverse pipetting

1. Fit the tip onto the pipette tip cone.
2. Press the operating button all the way to the second stop.
3. Place the tip just under the surface of the liquid (2-3 mm) and smoothly release the operating button up to the starting position.
4. Withdraw the tip from the liquid touching against the edge of the container to remove excess.
5. Press the operating button smoothly to the first stop to deliver the desired volume. Hold the operating button at the first stop. The liquid that remains in the tip should not be included in the delivery.
6. Discard the remaining liquid by pressing the operating button to the second stop.



8.3. Repetitive reverse technique

1. Follow the reverse technique steps 1 to 5.
2. Continue pipetting by repeating steps 3 to 5 as long as needed.
3. Finally discard the remaining liquid by pressing the operating button to the second stop.

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9. Recommendations for Good Pipetting

- Make sure that the tip is firmly attached to the tip cone.
- Hold the pipette vertically when aspirating the liquid and place the tip only a few millimeters into the liquid.
- Always control the operating button slowly and smoothly.
- Pre-rinse the tip before aspirating the liquid by filling and emptying the tip for three to five times. This is important especially when pipetting liquids with a viscosity and density greater than water or liquids with high vapor pressure (e.g. ethanol).
- Check that the pipette, tip and liquid are at the same temperature.
- When pipetting liquids with temperatures different to the ambient temperature change the tip after each pipetting. Do not pre-rinse the tip.
- To avoid contamination, do not rest the pipette on its side especially with the tip attached.
- Change the tip cone filter regularly (recommendation after 50 - 250 pipetting cycles).
- Never strike the tip cone against the tip tray when mounting the tip as this can damage the pipette.
- Avoid rough handling and do not drop the pipette.
- Avoid exposing the unit to extreme temperature changes, humidity and dust (operating temperature from 15°C to 40°C).

10. Maintenance

Proline® Plus pipettes have been designed for easy in-house service. If the pipette is used daily it is recommended to clean|decontaminate and check the performance of the pipette every three months. Sartorius also provides complete repair and recalibration service for your pipette including a service report and performance certificate.

Note: Please make sure that the pipette has been decontaminated before you send it to us or your local representative. Please advise if any hazardous material has been used with your pipette.

Note: The use of the tip cone filters may prolong the service interval. Change the filters regularly.

Note: It is recommended to always use gloves when cleaning the pipette.

10.1. Daily Cleaning of The Outer Surface of The Pipette

Your Proline® Plus pipette should be checked every day for cleanliness. To clean and decontaminate the outer surface of your pipette use ethanol (70%), isopropanol (60%) or a mild detergent and a soft lint-free cloth.

Gently clean the surface of the pipette with moistened cloth and wipe dry. Pay special attention to the tip cone. Change the tip cone filter if needed (Chapter 7.3.)

10.2. Cleaning The Lower Part of The Pipette

If your pipette is in daily use it is recommended to clean/decontaminate and grease the pipette every three months. It is recommended to send the multichannel pipettes to your local Sartorius service representative for cleaning and greasing. To clean and decontaminate the lower parts of the single channel pipette, follow these steps:

Disassembling and cleaning

(diagrams at the end of the manual)

1. Eject the tip cone filter (if fitted, Chapter 7.3.)
2. Unscrew the tip ejector collar (1) counterclockwise and remove it.
3. Pipettes < 2,000 µl:
Unscrew the tip cone holder (2) counterclockwise and carefully remove it with the tip cone (3).
Pipettes 2,000 µl, 5,000 µl:
Unscrew the tip cone cylinder (3) counterclockwise and remove it.
Pipette 10,000 µl:
Hold the tip cone cylinder firmly and turn the tip cone holder clockwise with your fingers.
4. Clean the tip ejector collar, the tip cone holder, the tip cone (cylinder) and the piston (4) with ethanol (70%), isopropanol (60%) or mild detergent and soft lint-free cloth.
5. Clean the interior of the tip ejector collar and the tip cone (cylinder) with a cotton swab. Be careful with the pipettes so that the seal inside the tip cone will not damage.
6. Rinse the parts with distilled water if needed and let the parts dry.
7. Pipettes ≤ 100 µl:
Put a thin layer of grease on the piston (4).
Pipettes 250, 500 and 1,000 µl:
Put a thin layer of grease around the piston seal (4).
Pipettes 2,000, 5,000 and 10,000 µl:
Put a thin layer of grease on the piston seal (4) and the interior of the tip cone cylinder (3).

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

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

Reassembling:

1. Pipettes:
Carefully place the tip cone (3) on the piston and attach it by screwing the tip cone holder (2) clockwise.
Pipettes 2,000, 5,000 and 10,000 µl:
Carefully place the tip cone cylinder (3) on the piston and screw clockwise. Make sure that the tip cone (cylinder) is properly tightened. Avoid over-tightening.
2. Attach the tip ejector collar (1) by screwing it clockwise.
3. Place the new tip cone filter on its place.
4. Press the operating button several times to ensure that the grease has spread evenly.
5. Check the performance of the pipette.

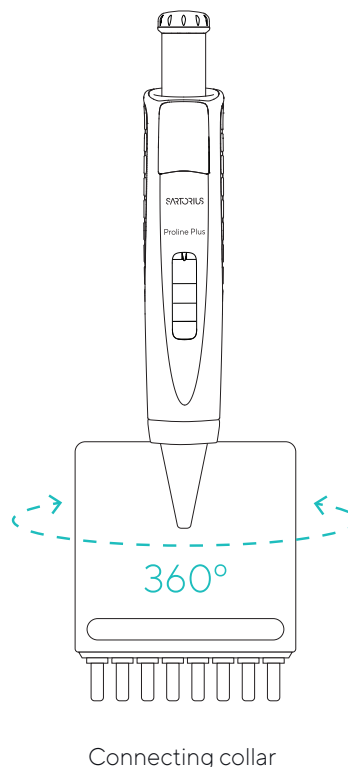
Note: It is always necessary to check the performance of the pipette after in-house service or maintenance.

10.3. Sterilization of The Pipette

The entire Proline® Plus pipette can be sterilized by steam autoclaving at 121°C, (252°F), 1 bar overpressure for 20 minutes. Remove the tip cone filter (if fitted, Chapter 7.3). The single channel pipettes can be autoclaved without special preparations. Unscrew the lower part of the multichannel pipettes by holding the connecting collar and turning the lower part 360° counterclockwise. Put the pipette into the sterilization bag and place it into the autoclave. After autoclaving, the pipette must be cooled down and left to dry overnight before use. Screw the lower part of the multichannel pipettes by holding the connecting collar and turning the lower part 360° clockwise. Make sure that the lower part is properly tightened. It is recommended to check the performance of the pipette after every autoclaving. It is also recommended to grease the piston|seal of the pipette after every 10 autoclaving.

11. Testing the Performance and Recalibration

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



11.1. Testing the Performance

Performance testing should take place in a draught-free room at 15 - 30°C, constant to +/- 0.5°C and humidity above 50%. The pipette, tips and the test water should have stood in the test room a sufficient time (at least 2 hours) to reach equilibrium with the room conditions. Use distilled or deionised water (grade 3, ISO 3696). Use an analytical balance with a readability of 0.01 mgs. (ISO 8655-6.)

Weighing

1. Adjust the desired test volume V_s .
2. Carefully fit the tip onto the tip cone.
3. Fill the tip with test water and expel to waste five times to reach a humidity equilibrium in the dead air volume.
4. Replace the tip. Pre-wet the tip by filling it once with test water and expel to waste.
5. Aspirate the test water, immersing the tip only 2-3 mm below the surface of the water. Keep the pipette vertical.
6. Withdraw the pipette vertically and touch the tip against the inside wall of the test water container.
7. Pipette the water into the weighing vessel, touching the tip against the inside wall of the vessel just above the liquid surface at an angle of 30° to 45°. Withdraw the pipette by drawing the tip 8-10 mm along the inner wall of the weighing vessel.
8. Read the weight in mgs (m_i).
9. Repeat the test cycle until 10 measurements have been recorded.
10. Convert the recorded masses (m_i) to volumes (V_i)
 $V_i = m_i Z$ Z = correction factor (Table 1)
11. Calculate the mean volume (V) delivered: $V = (V_i)/10$
12. For conformity evaluation, calculate the systematic error (e_s) of the measurement:
in μl : $e_s = V - V_s$ V_s = selected test volume

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or in %: $e_s = 100 (V - V_s) / V_s$

13. For conformity evaluation, calculate the random error of the measurement: as standard deviation

$$s = \sqrt{\frac{\sum (V_i - \bar{V})^2}{n - 1}} \quad n = \text{number of measurement (10)}$$

or as coefficient of variation $CV = 100s/V$

14. Compare the systematic error (inaccuracy) and random error (imprecision) with the values in the performance specifications - (p. 97) or the specifications of your own laboratory. If the results fall within the specifications, the pipette is ready for use. Otherwise check both systematic and random errors and, when necessary, proceed to the recalibration procedure (Chapter 11.2).

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

Note: Sartorius specifications are achieved in strictly controlled conditions (ISO 8655-6). The user should establish own specifications based on the field of use and the accuracy requirements placed on the pipette (ISO 8655-1).

Z-values (µl/mg)

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

Note: This method is based on ISO 8655.

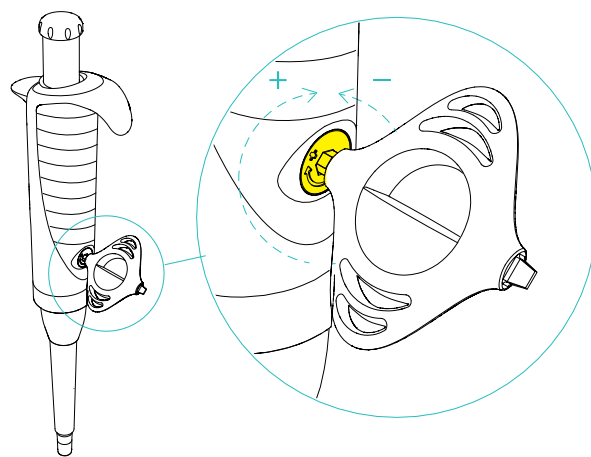
11.2. Recalibration

The calibration of your Proline® Plus pipette has been factory-checked by using forward pipetting technique and certified at 22°C using grade 3 distilled water according to ISO 3696. The calibration is based on ISO 8655-6: Gravimetric test method for volumetric instruments. The pipette's specifications are guaranteed only with genuine Sartorius tips. If you find the pipette to be inaccurate after performance testing, please follow the instructions below:

1. Remove the lid of the calibration nut, located on the back of the handle, with the aid of the calibration tool.
2. Place the hexagonal head of the calibration tool into the hole of the calibration nut.
3. Turn the adjustment lock counterclockwise to decrease and clockwise to increase the volume.
4. Repeat testing the performance procedure (Chapter 11.1.). Continue until the results are correct.

Note: Recalibration is recommended if reverse pipetting technique is used.

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



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12. Troubleshooting

Symptom	Possible Cause	Solution
Droplets left inside the tip	<ul style="list-style-type: none">▪ Unsuitable tip	<ul style="list-style-type: none">▪ Use original Sartorius tips
Leakage or pipetted volume too small	<ul style="list-style-type: none">▪ Non uniform wetting of the plastic▪ Tip incorrectly attached▪ Unsuitable tip▪ Foreign particles between tip and cone▪ Tip cone holder incorrectly tightened▪ Pipette damaged	<ul style="list-style-type: none">▪ Attach new tip▪ Attach firmly▪ Use original Sartorius tips▪ Clean the tip cone, attach new tip▪ Tighten the tip cone holder▪ Return to your Sartorius service representative for servicing
Pipette outside the established specifications	<ul style="list-style-type: none">▪ Incorrect operation▪ Unsuitable tip▪ Calibration altered	<ul style="list-style-type: none">▪ Follow instructions▪ Use original Sartorius tips▪ Recalibrate
Operating button jammed or moves erratically	<ul style="list-style-type: none">▪ Liquid has penetrated tip cone and dried▪ Safe-Cone Filter has been contaminated▪ Insufficient amount of grease on a piston and seal	<ul style="list-style-type: none">▪ Clean and grease the piston seal▪ Clean the tip cone▪ Change filter▪ Grease accordingly
Tip ejector jammed or moves erratically	<ul style="list-style-type: none">▪ Tip ejector collar has been contaminated	<ul style="list-style-type: none">▪ Remove and clean ejector collar and tip cone

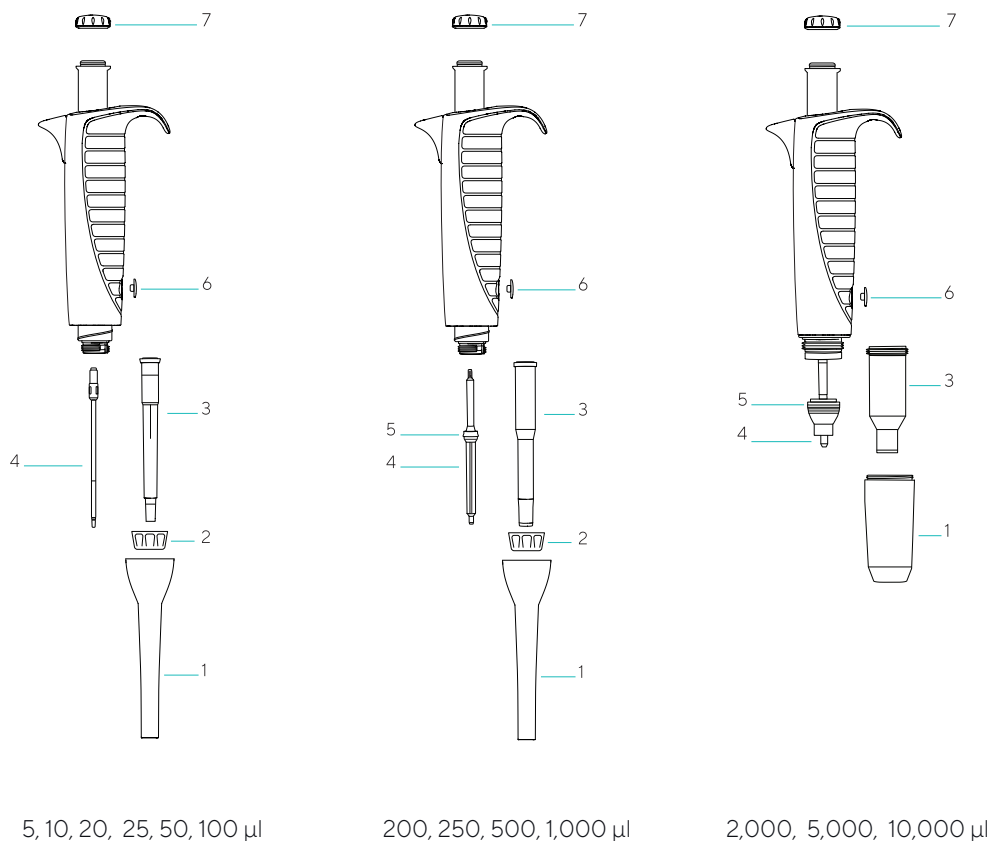
13. Warranty information

The Proline® Plus pipettes are covered by warranty for 2 years against defects in materials and workmanship. Should your pipette fail to function at any time, please contact your local Sartorius representative.

ANY WARRANTY WILL, HOWEVER, BE DEEMED AS VOID IF FAULT IS FOUND TO HAVE BEEN CAUSED BY MALTREATMENT, MISUSE, UNAUTHORIZED MAINTENANCE OF SERVICE OR NEGLIGENCE OF REGULAR MAINTENANCE AND SERVICE, ACCIDENTAL DAMAGE, INCORRECT STORAGE OR USE OF THE PRODUCTS FOR OPERATIONS OUTSIDE THEIR SPECIFIED LIMITATIONS, OUTSIDE THEIR SPECIFICATIONS, CONTRARY TO THE INSTRUCTIONS GIVEN IN THIS MANUAL OR WITH OTHER THAN THE MANUFACTURER'S ORIGINAL TIPS.

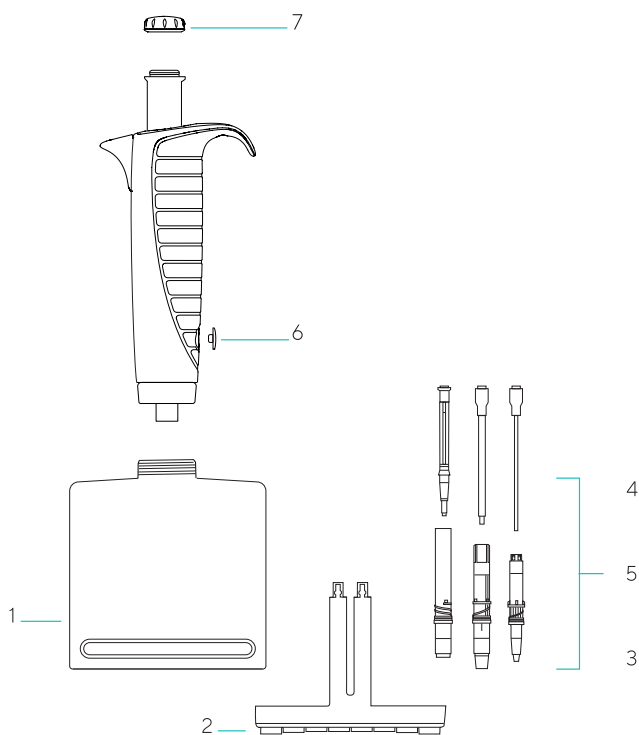
Each Proline® Plus pipette is tested before shipping by the manufacturer. The Sartorius Quality Assurance Procedure guarantees that the Proline® Plus pipette you have purchased is ready for use.

14. Pipette Parts and Materials



Parts

1. Tip ejector collar:
Polypropylene (PP)
2. Tip cone holder:
Polyamide (PA)
3. Tip cone complete
5, 10, 20, 25, 50, 100 µl:
Polyvinylidene fluoride (PVDF)
200, 250, 500, 1,000, 2,000,
5,000, 10,000 µl:
Polyphenylene sulfide (PPS)
4. Piston
5, 10, 20 µl:
Stainless steel (SS)
25, 50, 100, 200, 250, 500,
1,000, 2,000, 5,000, 10,000 µl:
Polyphenylene sulfide (PPS)
5. Piston seal
1,000, 2,000, 5,000 µl:
Ethylene propylene diene
monomer (EPDM)
10,000 µl:
Fluoroelastomer (FKM)
6. Calibration nut cover:
Polypropylene (PP)
7. Cap (5 pcs, blue):
Silicone (SI)



Parts













1. Tip cone housing:
Polyamide (PA)
2. Tip ejector bar:
Polyamide (PA)
3. Tip cone complete:
Polyvinylidene fluoride (PVDF)
4. Piston
10 µl:
Stainless steel (SS)
100, 300 µl:
Polyetherimide (PEI)
5. Piston assembly
6. Calibration nut cover:
Polypropylene (PP)
7. Cap (5 pcs, blue):
Silicone (SI)

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15. Performance Specifications and Order Information

Proline® Plus

Order Code	Channels		Volume Range	Increment	Test Volume	Systematic Error ^N Limit ±		Random Error ^N Limit	
			(μl)	(μl)	(μl)	(%)	(μl)	(%)	(μl)
728010	1		0.1 – 3	0.002	3	1.4	0.042	0.8	0.024
					1.5	2.6	0.039	1.6	0.024
					0.3	10.0	0.030	6.0	0.018
728020	1		0.5 – 10	0.01	10	1.0	0.100	0.6	0.060
					5	1.5	0.075	1.0	0.050
					1	3.0	0.030	2.0	0.020
728030	1		2 – 20	0.02	20	1.0	0.200	0.5	0.100
					10	1.4	0.140	0.9	0.090
					2	4.0	0.080	3.0	0.060
728040	1		5–50	0.10	50	1.0	0.500	0.3	0.150
					25	1.4	0.350	0.5	0.125
					5	3.0	0.150	1.5	0.075
728050	1		10–100	0.10	100	0.8	0.80	0.2	0.20
					50	1.0	0.50	0.4	0.20
					10	3.0	0.30	1.0	0.10
728060	1		20–200	2.00	200	0.6	1.20	0.2	0.40
					100	0.8	0.80	0.3	0.30
					20	2.3	0.46	0.9	0.18
728070	1		100–1,000	1.0	1,000	0.7	7.0	0.2	2.0
					500	0.8	4.0	0.2	1.0
					100	2.5	2.5	0.6	0.6
728080	1		500–5,000	10.0	5,000	0.6	30	0.2	10
					2,500	0.7	17.5	0.3	7.5
					500	2.4	12	0.6	3
728090	1		100–10,000	20.0	10,000	0.6	60	0.2	20
					5,000	1.2	60	0.3	15
					1,000	3.0	30	0.6	6
728120	8		0.5 – 10	0.01	10	1.5	0.150	1.0	0.100
728220	12				5	2.5	0.125	2.0	0.100
					1	5.5	0.055	4.0	0.040
728130	8		10–100	0.10	100	0.9	0.90	0.4	0.40
728230	12				50	1.2	0.60	0.7	0.35
					10	4.0	0.40	2.0	0.20
728140	8		30–300	0.20	300	0.6	1.80	0.25	0.75
728240	12				150	1.0	1.50	0.5	0.75
					30	2.5	0.75	1.0	0.30

Proline® Plus FIXED Volume, Single-Channel

Order Code	Channels		Volume Range	Test Volume	Systematic Error ^N Limit ±	Random Error ^N Limit		
			(μl)	(μl)	(%)	(μl)	(%)	(μl)
728515	1	■	5	5	1.3	0.065	1.2	0.060
728520	1	■	10	10	0.8	0.080	0.8	0.080
728530	1	■	20	20	0.6	0.120	0.5	0.100
728535	1	■	25	25	0.5	0.125	0.3	0.075
728545	1	■	50	50	0.5	0.250	0.3	0.150
728550	1	■	100	100	0.5	0.50	0.3	0.30
728560	1	■	200	200	0.4	0.80	0.2	0.40
728565	1	■	250	250	0.4	1.00	0.2	0.50
728567	1	■	500	500	0.3	1.50	0.2	1.00
728570	1	■	1,000	1,000	0.3	3.0	0.2	2.0
728575	1	■	2,000	2,000	0.3	6.0	0.15	3.0
728580	1	■	5,000	5,000	0.3	15	0.15	7.5
728590	1	■	10,000	10,000	0.6	60	0.2	20

^N Note: The listed systematic and random error values can be achieved only under strictly controlled conditions during type test per ISO 8655. Due to the continuous product development by Sartorius, the systematic and random error values are subject to change without prior notice.

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