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Operating instructions

CyBio SELMA
Semi-automatic pipetting station

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To ensure correct and safe use, follow these instructions. Keep these instructions for later reference.

General information

http://www.analytik-jena.com

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Technical documentation

Analytik Jena GmbH+Co. KG

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1 Basic information

1.1 About this user manual

Content

The operating manual describes the semi-automatic pipetting station CyBio SELMA.

The device is intended to be operated by qualified specialist personnel observing this user manual.

The manual provides information about the design and operation of the device and provides operating personnel with the necessary know-how for safe handling of the device and its components. Furthermore, the manual includes information on the maintenance and care of the device as well as indications for potential causes for malfunctions and their correction.

The original manual is written in German. Editions in other languages are translated from the original manual.

Conventions

Instructions for actions occurring in chronological order are numbered and combined into action units.

Warnings are indicated by a warning triangle and a signal word. The type, source and consequences of the hazard are stated together with notes on preventing the hazard.

Elements of the control and analysis program are indicated as follows:

- Program terms are in bold (e.g., the **System** menu).
- Menu items are separated by vertical lines (e.g., **System** | **Device**).

Symbols and signal words used in this manual

The user manual uses the following symbols and signal words to indicate hazards or instructions. These warnings are always placed before an action.

WARNING

Indicates a potentially hazardous situation which can cause death or very serious (possibly permanent) injury.

CAUTION

Indicates a potentially hazardous situation which can cause slight or minor injuries.

NOTE

Provides information on potential material or environmental damage.

1.2 Intended use

The pipetting station CyBio SELMA has been developed for manual and semi-automatic processing of microplates in chemical and biological laboratories. In the fields of medicine and diagnostics, its use is limited to research.

The basic functions include the absorption and dispensing of liquid from and into reservoirs, microplates, and their individual columns. The device is suitable to be operated by one person.

You can equip the device exclusively with the following tip holders:

- Tip magazines (metal tip holders for long-term use)
- CyBio TipTray (disposable tip holder made of plastic specially designed for CyBio SELMA)

For proper use, please observe the following:

For proper use, please observe the following:

- The device must only be operated by qualified and trained personnel.
- The device must only be used in accordance with this manual. This applies in particular to the adherence to the connection values, conditions of use and notes on the maintenance, transport, and disposal.
- The safety instructions in this manual must be observed.

It is not permissible

- to operate this equipment in a medical laboratory,
- to work with explosive substances in this device,
- to operate this device in an explosive environment.
- to smoke or use a naked flame at the installation location.

As regards the safe handling of dangerous substances (radioactive, infectious, toxic, corrosive, combustible, and other hazardous substances), the owner/operator will be responsible in accordance with applicable laws and guidelines.

The same applies in terms of compliance with environmental protection rules (e. g. for disposal of reagents and consumables).

2 Safety

For your own safety and to ensure error-free and safe operation of the device, please read this chapter carefully before commissioning.

Observe all safety instructions listed in this manual, as well as all messages and instructions displayed by the control- and analysis software on the monitor.

2.1 Safety labeling on the device

Warning and mandatory action labels have been attached to the device and must always be observed.

Damaged or missing warning and mandatory action labels can cause incorrect actions leading to personal injury or material damage. The labels must not be removed. Damaged warning and mandatory action labels must be replaced immediately!

The following warning and mandatory action labels have been attached to the device:

Fig. 1 Safety labeling on the device

Warning symbol	Meaning	Comment
	Warning of biohazard	Warning of hazardous biological and chemical substances

Warning symbol	Meaning	Comment
	Warning of a danger point	Warning of mechanical hazard from moving equipment parts.
	Warning of crushing	Warning of crushing in the area of the tip mounting

2.2 Danger zone

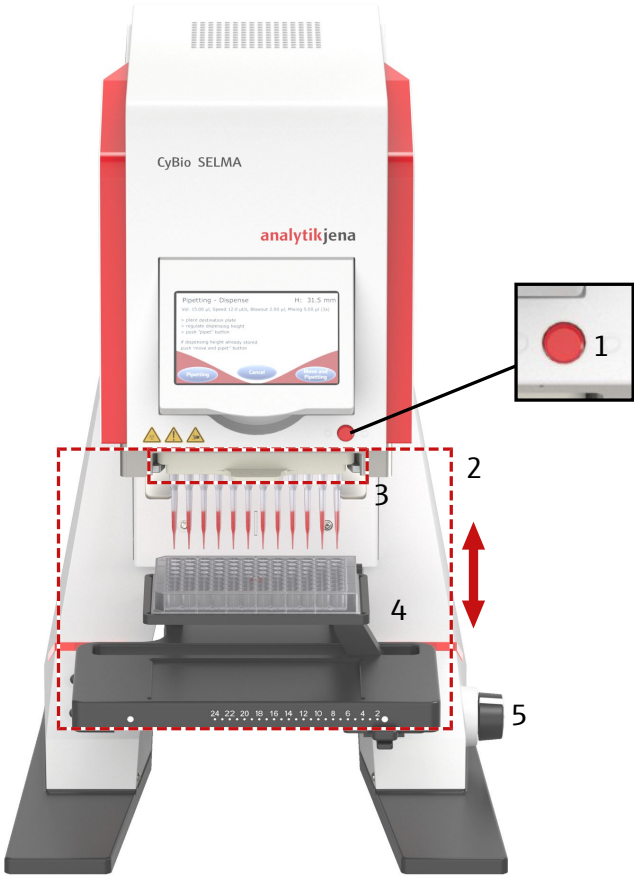


Fig. 2 Hazard area

1 STOP button (emergency stop)
2 Movement area of the pipetting head
3 Tip mounting
4 Tray with two working positions
5 Rotary knob

The movement of the pipetting head can endanger the operating personnel. Failure to observe warning information can result in crushing injuries to hands.

Any intervention into the movement area of the device during operation may cause material damage to the device or the samples.

- Never reach into the movement range of the pipetting head physically or with an object during operation.

- Immediately release the rotary knob in the case of maloperation (manual operation). The rotary knob will return to its mid-range position. Turn the knob in clockwise direction in order to restore the pipetting head to zero position.
- To abort a program, press the STOP button (semi-automatic operation).
- Always correct any faulty movements on the touchscreen of the device. Faulty actions or maloperations may cause material damage or physical injury otherwise.
- Do not move the pipetting head against the tray.

2.3 Requirements for the operating personnel

The device may only be operated by trained specialist personnel instructed in technical safety. The operating personnel must have read and understood the operating instructions.

The personal protective equipment must be worn to operate or service the device.

The operating personnel must be familiar with the dangers arising from the substances used.

2.4 Safety instructions for operation

Handling hazardous substances

The operator is responsible for the selection of substances used in the process as well as for their safe handling. This is particularly important for radioactive, infectious, poisonous, corrosive, combustible, explosive and otherwise dangerous substances.

When handling hazardous substances, the locally applicable safety instructions and instructions in the safety data sheets from the manufacturers of the auxiliary and operating materials must be complied with.

Observe the following:

- The operator is responsible for carrying out suitable decontamination should the device become contaminated externally or internally with dangerous substances.
- Splashes, drops or larger liquid spillages should be removed using an absorbent material such as cotton wool, laboratory wipes or cellulose.
- For biological contamination, wipe the affected area with a suitable disinfectant, such as an Incidin Plus solution. Then wipe the cleaned areas so that they are dry.
- The only suitable cleaning method for the housing is wipe disinfection. If the disinfectant has a spray nozzle, apply disinfectant to a suitable cloth before using it on the device.
  Work particularly carefully and cleanly with infectious material because the device cannot be decontaminated as a whole.
- Before using a cleaning or decontamination procedure other than that prescribed by the manufacturer, the user is required to check with the manufacturer that the intended procedure will not damage the device. Safety labels attached to the device must not have methanol applied.

Start-up and safe operation

The operator must make sure that the device and its safety equipment is in sound condition each time before starting up the device. This applies in particular after each modification or extension of the device or its repair.

Observe the following:

- The device may only be operated if all items of protective equipment (e.g. covers in front of electronic components) are in place, properly installed and fully operational.
- The sound condition of the protection and safety equipment must be checked regularly. Any defects must be corrected as soon as they occur.

- Protective and safety equipment must never be removed, modified or switched off during operation.
- Always ensure free access to the main switch and to the emergency shutdown switches and locks during operation.
- The external power supply unit must be connected to a proper power outlet to ensure that the device (ground connector) meets the protection class I. Do not replace the removable power supply unit with a different power supply unit (without protective ground conductor). Extensions of the supply cable are not permitted!
- Keep all combustible materials away from the device.
- The ventilation equipment on the device must be in good working condition. Covered ventilation grilles or slots etc. may cause the device to break down or may cause damage to it.
- Ensure that no liquid enters the interior of the device, for example at cable connections. There is a danger of electric shock.
- Modifications, conversions and extensions to the device are only permitted after consultation with Analytik Jena. Unauthorized modifications can jeopardize the device's operational safety and may lead to limitations regarding the warranty and access to customer service.

2.5 Safety instructions for maintenance and repair

The device is generally maintained by the customer service department of Analytik Jena or specialist personnel trained and authorized by them.

Unauthorized maintenance can damage the device. For this reason, only the activities described in the user manual in the "Maintenance and care" chapter may be performed by the operator.

- Work on the electronics may only be carried out by the customer service of Analytik Jena and specially authorized technicians.
- All maintenance and repair work on the device must only be carried out when the device is switched off (unless specified otherwise).
- Touching live parts can result in death, injury, or damage to property. Always unplug the power cord from the power outlet first. Only then disconnect the power cord from the power supply unit. Never open the power supply unit and do not carry out any repairs on the power supply unit. If any error occurs, contact customer service.
- Only clean the exterior of the device with a slightly moistened, non-dripping cloth. Use only water and, if required, customary surfactants.
- Do not use organic solvents or abrasives to clean the device. Exercise caution when decontaminating the device with disinfectants containing alcohol. The alcohol can damage the safety labeling on the device.
- Use only original spare parts, wear parts and consumables. They have been tested and ensure safe operation. Glass part are wear parts and are not subject to the warranty.
- All protective equipment must be reinstalled and checked for proper function when the maintenance or repair work is complete.
- Risk of damage to health due to improper decontamination! Perform a professional and documented decontamination of the device before returning it to Analytik Jena. The decontamination report is available from Service when registering the return. Without a completed decontamination report, the acceptance of the device will be refused. The sender may be liable for damage caused by inadequate decontamination of the device.

2.5.1 Chemical resistance

Aggressive substances may damage the device. Although the materials used are resistant to most of the commonly used substances, material damage from aggressive substances cannot be completely excluded.

- Before using any aggressive substances, e.g., bases, acids, or organic solutions: Check whether the materials are resistant to this.
- Only use substances compatible with the materials listed.
- When in doubt, consult the manufacturer.

Component	Material
Pipette tips	PP
■ Plunger (contact via aerosols is possible) ■ Plunger seals	■ Stainless steel ■ PE-HD
Reagent cups	PMMA; PTFE

Examples of aggressive substances and mixtures of substances against which there is insufficient resistance:

- Hydrofluoric acid (HF/hydrofluoric acid)
- Highly concentrated acids
- naphtha
- Gasoline
- Acetone
- Ozone
- Oxidizing solutions
- Cleaning spray
- Cleaning powder
- Paint thinner

2.6 Behavior during emergencies

If there is no immediate risk of injury, stop the device movement in a dangerous situation with the STOP button.

Alternatively, turn the device off using the on/off switch and/or pull the power plug out of the power outlet.

3 Technical description

3.1 Device configuration

The semi-automatic pipetting station CyBio SELMA is used for the quick and precise processing of microplates with 96 or 384 wells in the ANSI/SLAS standard. The device has a pipetting head with 96 or 384 plungers that work simultaneously, with which it aspirates and dispenses liquids via the proven tip sealing system. With the pipetting station you can replicate or reformat microplates and make serial dilutions. Here, you will achieve error-free and reproducible results.

You can equip the device with reusable metal tip magazines or ready-made plastic tip holders (CyBio TipTray). The plastic tip holders are made for single use and can be changed particularly quickly and easily.

The memory function enables fast processing of semi-automatic routines.

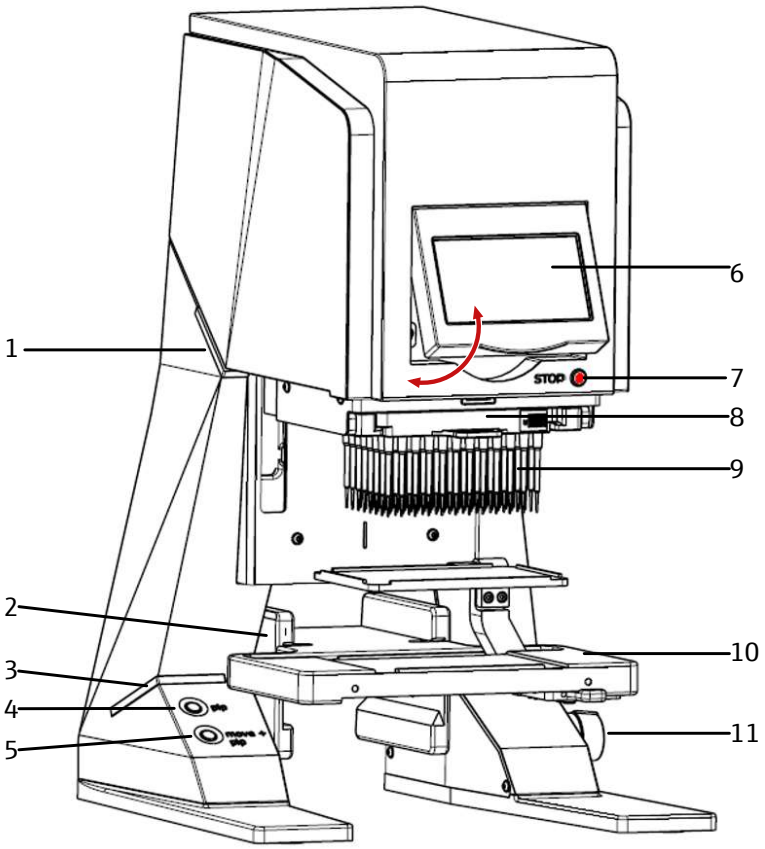


Fig. 3 Device configuration

1 Light element
2 Guide groove I + II
3 Light element
4 Pipetting push button “pip”
5 Moving and pipetting push button “move + pip”
6 Foldable touchscreen
7 STOP button
8 Pipetting head
9 TipTray
10 Tray with working positions I + II
11 Rotary knob

The device is mainly operated via the touchscreen, which can be folded upwards. Therefore, you can work sitting or standing. Two buttons on the support foot of the device allow you to choose between "pipetting" ("pip" button) and "pipetting with saved values" ("move + pip" button). Semi-automatic work processes can be interrupted with the stop button. You can use the rotary knob to move the pipetting head to pipette over the microplates.

Glowing light elements indicate the switched-on state (when activated).

You can process microplates with 96 wells or 384 wells in a single step. For models with 96 channels, you can also use an adapter to position microplates with 384 wells in the XY direction on a tray and process them in four steps.

3.2 Control elements

On/off switch and standby

The device has an on/off switch on the back of the device.

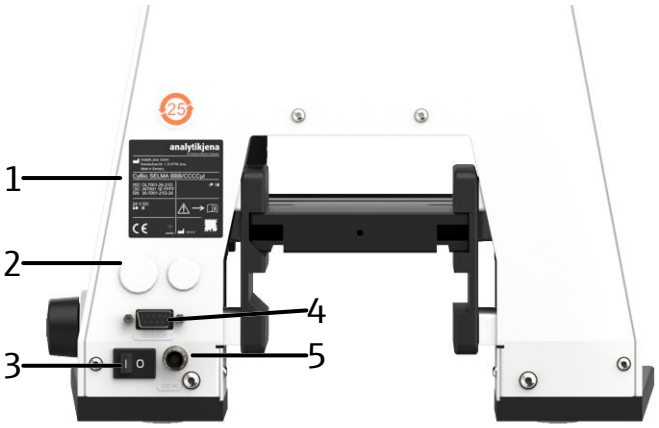


Fig. 4 Device rear

1 Type plate
2 Cover flaps or connectors
3 On/off switch (O/I)
4 Service interface
5 DC input

You can activate the standby mode in the device settings. The device then goes into idle state after the specified time. The standard value is at 30 min.

In standby mode, the power consumption is reduced and the touchscreen lighting is switched off. If you touch the touchscreen or operate an operating element on the support foot of the device, the device is activated again.

STOP button

Use the STOP button to interrupt a running pipetting process. The device immediately stops all movements of the plunger and pipetting head. The pipetting head stands still.

You can continue or abort the pipetting process via the touchscreen. You can move the pipetting head upwards with the rotary knob.

Push button "pip"

Trigger the movement of the plungers in the pipetting head with the "pip" button on the support foot of the device. The device then automatically carries out the plunger movements and works through the following steps:

- Aspirating a fluid
- Dispensing the fluid
- Residual ejection of the liquid (Blowout)
- Move the plunger to the zero position

The pipetting head is not moved here, only the plungers.

Push button "move + pip"

You can run pipetting routines repeatedly using the "move + pip" button.

In contrast to the "move + pip" button, the "pip" button also triggers the vertical movement of the pipetting head. After pipetting, the pipetting head returns to its initial position again.

The process is as follows:
- Approaching the saved pipetting height
- Pipetting
- Approaching the height before pipetting

Rotary knob

You can move the pipetting head in a vertical direction with the rotary knob on the right support foot of the device. You can adjust the height of the pipetting head so that you can change microplates. You can also use the rotary knob to position the pipette tips in the well of a microplate.

The direction of travel of the pipetting head is determined by the direction of rotation.

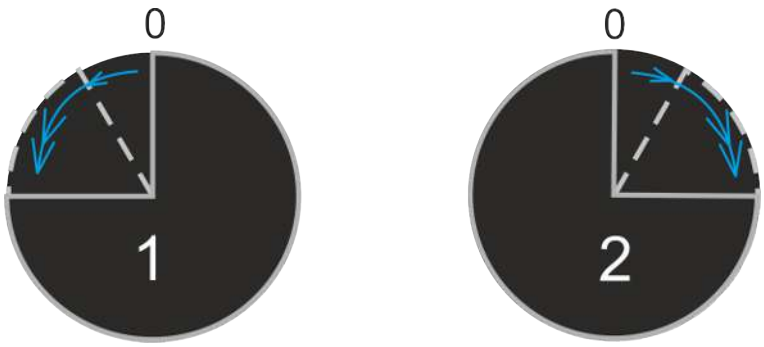


Fig. 5 Direction of rotation and travel

1 Turn to the left - pipetting head moves downwards

2 Turn to the right - pipetting head moves upwards

Deflecting the rotary knob changes the speed of the pipetting head. If the rotary knob is in the idle position, the pipetting head will hold its current position. The greater the deflection, the faster the pipetting head moves.

When processing the pipetting routines, sometimes the pipette tips must be positioned in the wells with an accuracy of up to 0.1 mm. Therefore, the speed of the pipetting head does not increase linearly with the deflection of the rotary knob.

The following values can be assumed as benchmarks:
- Mean response time (awareness to motor-driven implementation): approx. 0.5 to 1 s
- Minimum resolution of the movement: approx. 0.1 mm

Touchscreen

You operate the device mainly via the touchscreen. The touchscreen can be swiveled upwards and can therefore be operated easily while sitting and standing.

First, set all values for the pipetting process via the touchscreen. You can then trigger the pipetting process using one of the following buttons or the buttons on the touchscreen:
- "pip" button on the support foot of the device
- "move + pip" button on the support foot of the device
- Button on the touchscreen

You can continue the pipetting process after a step of manual operation with one of the two buttons or the corresponding button on the touchscreen. Operation via the touchscreen is easier, especially when standing.

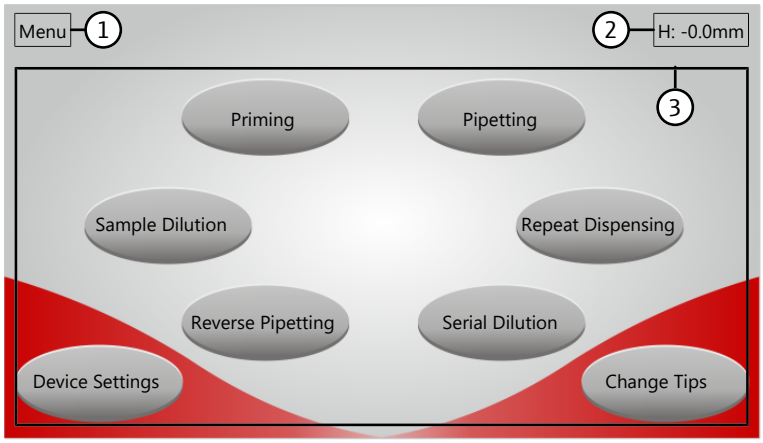


Fig. 6 Button layout

1 Information about the current pipetting step in the menu
2 Current height of the pipetting head
3 Working area with various control elements and information

3.3 Tray

The tray has two working positions. Working position 1 is fixed. Working position 2 can be shifted to the left entirely as well as column by column in grids. Thus the device can process individual columns of a microplate without any problems.

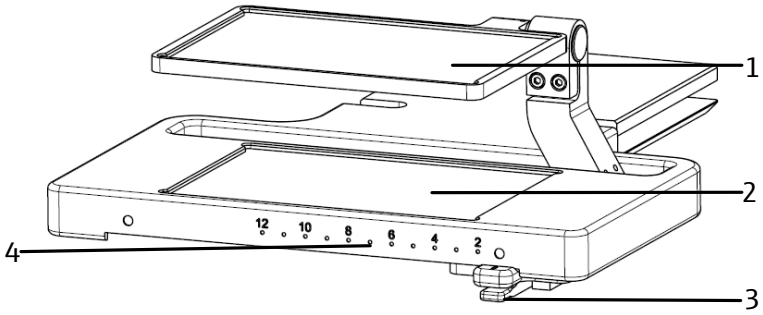


Fig. 7 Tray with working position 1 and 2

1 Working position 2 (can be shifted entirely and column by column)
2 Working position 1 (fixed)
3 Spring lever for selecting the individual columns
4 Column scale

The tray can also be inserted into the device in two guide grooves (I or II). This means that the device can also transfer liquid from reservoirs with deep well pipette tips into deep well microplates easily.

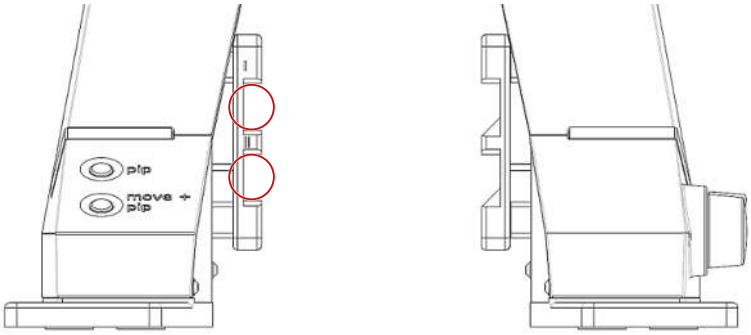


Fig. 8 Guide groove I and II

3.4 External power supply unit

The power supply unit is a wide range power supply unit. The power is supplied on the primary side at a power outlet with 100 to 240 V ±10 % (1.7 A max); 50/60 Hz. On the secondary side, the power supply unit provides a voltage of 24 V (2.5 A max.).

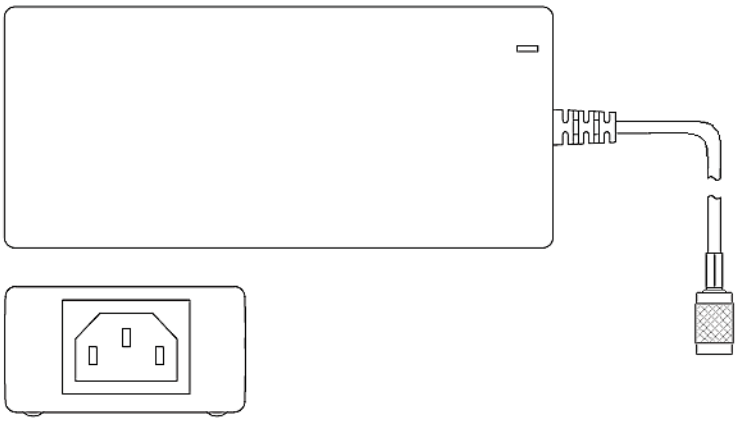


Fig. 9 External power supply unit

3.5 Connection

The connections, the on/off switch, and the type plate are located on the back of the device.

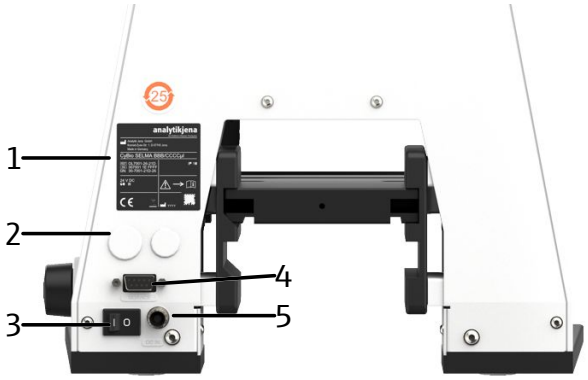


Fig. 10 Rear of the device

1 Type plate
2 Cover flaps or connectors
3 On/off switch (O/I)
4 Service interface
5 DC input

Depending on the device version, two cover caps or a cover flap and a connector are attached to the rear side. Never remove these parts.

The type plate contains the following information:
- manufacturer address, trademark
- Machine designation
- Serial number
- Conformity and test sign
- Year of manufacture
- Disposal instructions (Caution! Do not dispose of as household waste!)
- Note: Read the operating manual!
- Electrical connection data

3.6 Device versions

The device type is noted on the front of the pipetting head.

Device type	Number of pipette tips	Maximum volume for each plunger	Can be dosed in steps of
CyBio SELMA 96/25 µl	96	25 µl	0.01 µl
CyBio SELMA 96/60 µl	96	60 µl	0.01 µl
CyBio SELMA 96/250 µl	96	250 µl	0.1 µl
CyBio SELMA 96/1000 µl	96	1000 µl	0.1 µl
CyBio SELMA 384/25 µl	384	25 µl	0.01 µl
CyBio SELMA 384/60 µl	384	60 µl	0.01 µl

3.7 Scope of delivery

The scope of delivery includes:

- Pipetting station with moving tray
- Power supply unit
- Country-specific power cord
- Box with CyBio TipTray (in standard quality)
- Operating instructions
- Optional accessories

3.8 Function

With the pipetting station CyBio SELMA, you can process microplates semi-automatically in the ANSI/SLAS standard. The device can work in the following pipetting modes. As an added functionality, the device can automatically loosen and tighten the tip holders airtight again.

Pipetting modes / basic functions	Explanation
Priming	■ Absorption of a defined volume ■ Flushing the pipette tips by repeatedly dispensing and aspirating the volume (source plate = target plate) ■ Delivery of the defined volume, including ejection of the remaining volume from the tip (Blowout)
Pipetting	■ Absorption of a defined volume ■ Delivery of the defined volume, including ejection of the remaining volume (Blowout) ■ Running the mixing cycles is possible
Repeat Dispensing	■ Absorbs a total volume as the sum of the defined sub-volumes ■ Dispensing the partial volumes in several preset steps. The remaining volume remains in the pipette tip. ■ Ejection of the residual volume (Blowout)
Sample Dilution	■ Absorbing a specified volume (sample) ■ Suction of an air bubble ■ Absorbing a second specified volume according to the desired dilution ratio (diluent) ■ Dispensing the entire content of the tips
Reverse Pipetting	■ Absorbing a defined volume plus an additional volume ■ Dispensing the defined volume. The remaining volume remains in the pipette tip. ■ Ejection of the residual volume (Blowout)
Serial Dilution	■ Absorption of a defined volume ■ Dispensing the defined volume in a specific volume of liquid provided ■ Mixing the liquids
Change Tips	■ Motorized release of the tip holder ■ Removing the tip holder ■ Insertion of a new tip holder, equipped with tips ■ Motorized tightening and sealing of the tip holder

3.9 The Pipetting Cycle

A pipetting cycle always consists of:

- Aspiration (absorption of liquid)
- Dispensing (dispensing of liquid)
- Blowout (ejection of residual volume)
- Returning the plungers to the zero position

When the plungers have returned to the zero position, the next pipetting cycle can begin.

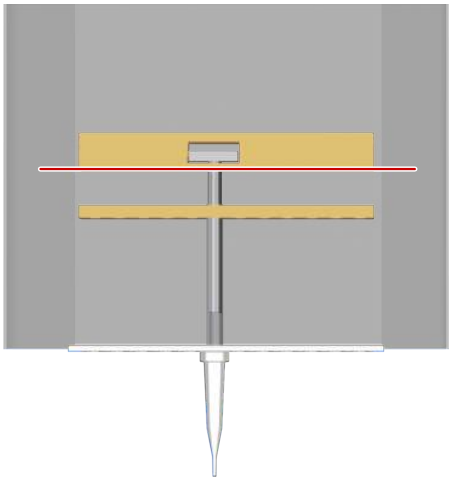
Aspiration and dispensing of liquid is accomplished by plunger motion. The plunger drive moves plates upwards and downwards in which the plungers are loosely mounted.

There is always an air cushion between the plunger and the liquid. The pipette tips are airtight on the cones of the pipetting head. The movement of the plunger affects the air cushion through this airtight seal. The raising and lowering of the plungers causes a negative or positive pressure in the channel. The pressure differential causes the liquid to be aspirated or dispensed.

The processes involved in pipetting and reverse pipetting are different. The following graphics shows the different processes using the example of a single pipetting channel.

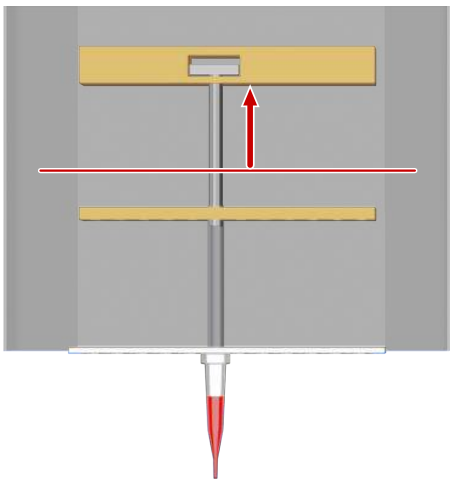
Pipetting

When pipetting, the device aspirates an exact volume of liquid without an additional overstroke. The device delivers the volume with a blowout into the target cavity.



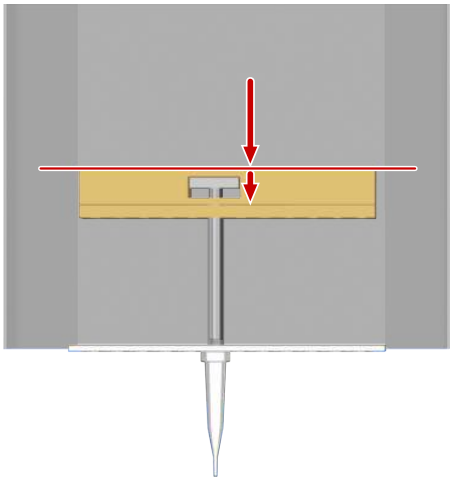
Zero-position

The plunger starts in the zero position above the source cavity. The pipette tip is immersed in the liquid.



Aspiration

The plunger drive pulls the plunger upwards. The air cushion in the channel creates a negative pressure during this movement. Liquid is aspirated into the pipette tip by the negative pressure. The volume of the aspirated liquid corresponds exactly to the nominal volume.

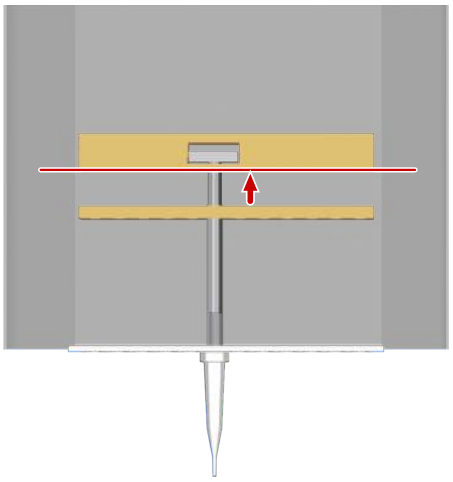


Dispense nominal volume and blowout

The dispensing takes place in the target cavity.

The plate moves the plunger down, compressing the air cushion in the channel. The resulting excess pressure pushes the liquid out. The device dispenses the nominal volume.

To empty the pipette tip completely, the mechanical guide moves the plunger beyond the zero position (blowout). Residues of the liquid are ejected by the blowout.

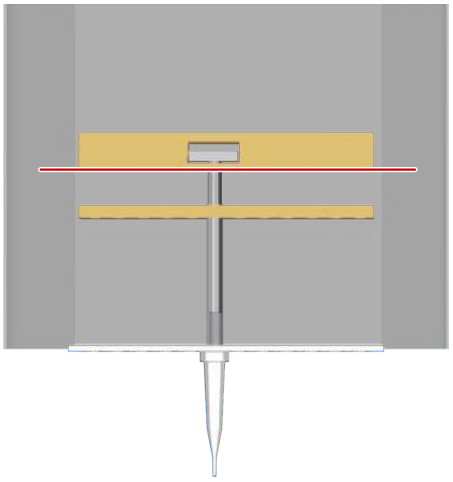


Return to the initial position / zero position

After the blowout, the plate returns the plunger to the zero position. The pipetting cycle is finished.

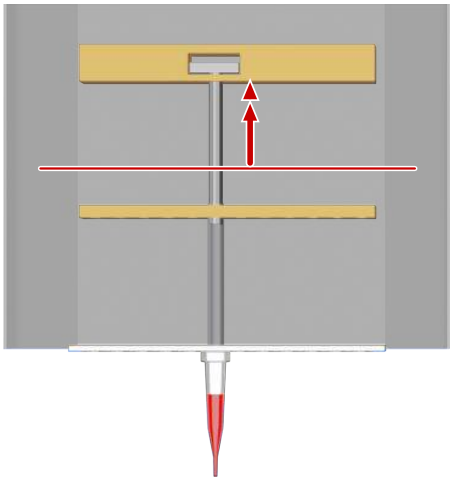
Reverse pipetting

With reverse pipetting, the device aspirates the liquid with an additional overstroke volume. Reverse pipetting reduces the risk of splashing, frothing, and bubble formation and is therefore particularly suitable for pipetting highly viscous liquids or liquids with a tendency to frothing.



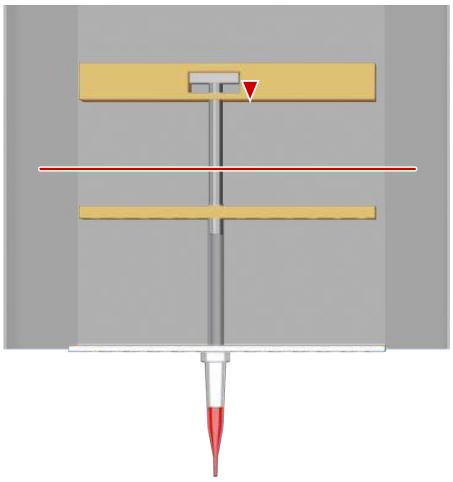
Zero-position

The plunger starts in the zero position above the source cavity. The pipette tip is immersed in the liquid.



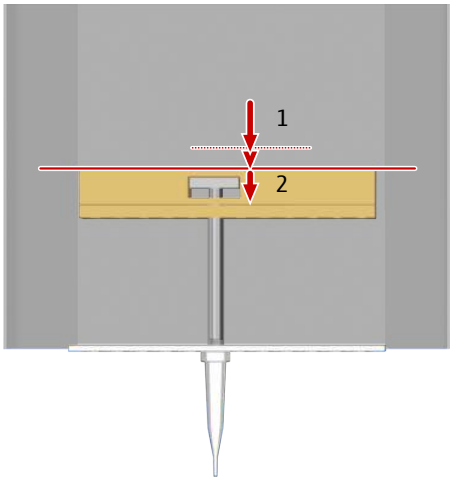
Aspirate nominal and overstroke volume

The plunger drive pulls the plunger upwards. The air cushion in the channel creates a negative pressure during this movement. Liquid is aspirated into the pipette tip by the negative pressure. The aspirated volume is made up of the nominal volume and an additional overstroke volume.



Dispense additional volume

After aspiration, a small additional volume is dispensed initially. This step ensures that the freeplay has been overcome and the subsequent step dispenses the nominal volume correctly.



Dispense nominal volume (1)

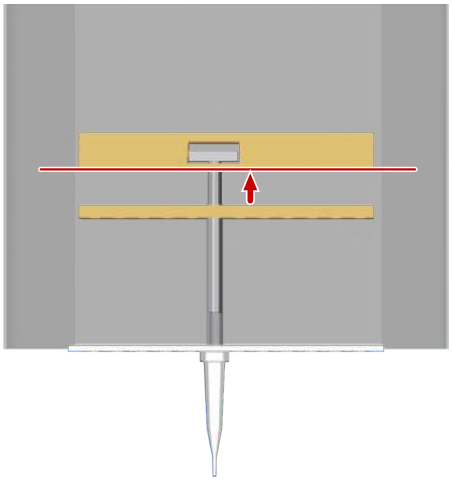
The nominal volume is dispensed into the target cavity.

The plate moves the plunger down, compressing the air cushion in the channel. The resulting excess pressure pushes the liquid out. The device dispenses the nominal volume.

Residual volume and blowout (2)

The remaining volume is either ejected or returned to the source cavity.

To completely empty the pipette tip, the pipetting head dispenses the remaining volume including the blowout. For the blowout, the mechanical guide moves the plunger downwards beyond the zero position.



Return to the initial position / zero position

After the blowout, the plate returns the plunger to the zero position. The pipetting cycle is finished.

Slack

The mechanical guide for raising and lowering the plungers has mechanical play (slack). This means: after each reversal of the direction of movement, the mechanical guide covers an additional distance without transferring the movement to the plungers. This motion length corresponds to the freeplay.

In order to prevent dosing errors, a pipetting cycle is implemented mechanically in such a way that the plunger reversal point lies outside of the actual pipetting range (moving to zero-position, aspiration with additional stroke) or is corrected by suitable compensatory motion (dispensing with additional stroke).

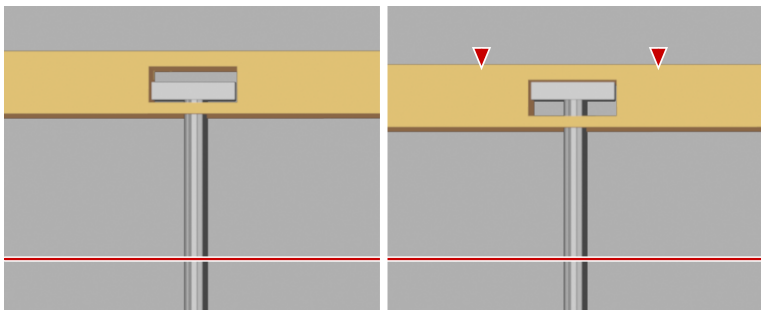


Fig. 11 Overcoming the freeplay after aspirating

3.10 System precision

The device works on the principle of air displacement. This means that the plungers, mechanically connected to a common drive, move respectively in an air space created by the pipette tips and the internal device seals.

The volume resolution of the plunger movement corresponds to one tenth or one hundredth of a microliter.

The achievable degree of precision is limited and influenced by:

- the wettability of tips,
- the dimensional stability of their outlet opening,
- the way the system and involved liquids are handled.
- physical and chemical properties of liquid
- the quality of the microplates

Observe the following:

- Liquids are aspirated or dispensed as a result of negative pressure or overpressure created by plunger motion. In either case, the process will not be completed before pressure balance state has been reached. The time required to reach this state depends on, among other factors, the properties of the liquid being handled. For this reason, adequate pause times should be included with all operating sequences as necessary.
- When working with dry tips, pressure equalization of a different kind will occur after filling. It takes a longer to finish, because an air vapor pressure will build up in the air cushion inside the tip above liquid level. resulting in liquid emerging from the tips. This can be avoided by performing a few cycles before pipetting and saturating the air in the tip with vapor. Even after a longer downtime with tips in filled condition, no liquid will emerge on completion of preventive rinsing.
- By wetting the tips with liquid, you may influence the level of precision and accuracy. As a matter of importance, tips should therefore be submerged into the liquid volume just as much as necessary for a particular process. In addition, the immersion depth should always be the same for several cycles. Always ensure that the reservoir is sufficiently full.

4 Installation and commissioning

4.1 Installation conditions

4.1.1 Ambient conditions

Climatic conditions

The requirements for the ambient conditions at the installation location are set out in the specifications. If required, ensure that the room is temperature-controlled.

Observe the following instructions when selecting the installation site:

- This laboratory device is designed for inside use.
- The installation site must be free of drafts, dust and caustic fumes. Dust and corrosive vapors can cause damage to the device, e.g., due to corrosion.
- Place the device on a stable surface.
- The laboratory bench must be designed for the weight of the device.
- Avoid mechanical shocks and vibrations.
- Do not locate the device near sources of electromagnetic interference.
- Avoid direct sunlight and radiation from heaters onto the device. If necessary, provide air conditioning.

See also

Specifications [▶ 61]

4.1.2 Power supply

WARNING

Danger due to electrical voltage

- Only connect the device to a properly grounded socket which complies with the voltage indicated on the device's rating plate.
- Do not use an adapter in the feeder.

The device operates on single-phase alternating current.

Before connecting the device to a power outlet, check its voltage rating to ensure that the required voltage and frequency match the available power source.

4.2 Commissioning

Set up and connect the device

NOTE

Damage to the electronics due to condensation

Significant temperature differences can lead to the formation of condensation which can damage the device's electronics.

- After long-term storage or transport in a colder environment, allow the device to acclimatize at room temperature for at least one hour before switching it on.

NOTE

Keep the original packaging

Transport damage can only be avoided if the device is transported in its original packaging.

- Keep the original packaging for transport, e.g., in case the device must be returned to the manufacturer for repair.

- Remove the power supply unit and accessories from the transport packaging.
  - Remove the upper transport packaging.
  - Pull the device upwards and out of the packaging, grasping firmly behind the pipetting head.
    ⚠ CAUTION! Risk of injury when lifting the device. Do not reach into the area under the tip holder. Do not reach under the tray.

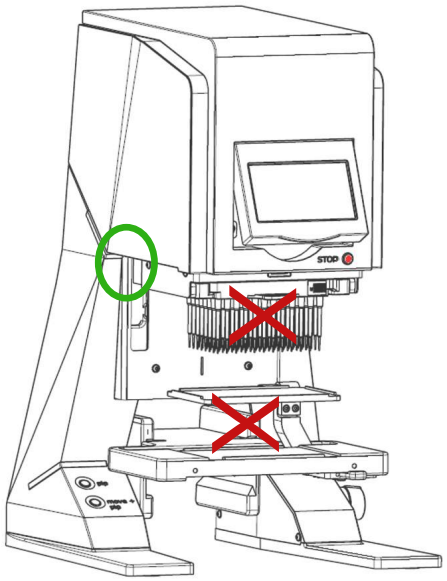


Fig. 12 Lift the device correctly

- Check the delivery for completeness and integrity based on the packing list.
- Set up the device. Remove protective foil and transport locks.
- Allow the device to acclimatize for at least 1 hour when it is switched off.
- Connect the power supply unit:
  - Plug the power supply unit into the socket on the rear side of the device and screw the power plug tight.
  - Plug the power supply unit into a power outlet with a protective earth conductor.
- Switch on the device at the rear side of the device.

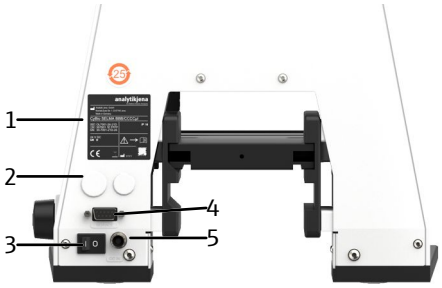


Fig. 13 Device rear

1 Type plate
2 Cover flaps or connectors
3 On/off switch (O/I)
4 Service interface
5 DC input

Initialize the device

Each time the device is switched on, the start screen appears briefly on the touchscreen. Then the device starts the initialization automatically. The **Initialization** screen is displayed.

- Follow the instructions on the touchscreen and press the **Start** button to begin initialization.
  - ✓ After successful initialization of the vertical drive, the device switches to the main menu.

For example, if a pipetting cycle is interrupted due to a power failure, the instrument will dispense the remaining volume from the tips during the next initialization.

- Start the initialization with the **Start** button and follow the instructions on the touchscreen.
- Insert a reservoir and adjust the dispensing height with the rotary knob.
- Start the initialization for the ejection of the remaining volume (Blowout) with **Continue**.
- Move the pipette tips out of the plate again. Continue and complete the initialization by clicking on **Continue**.
  - ✓ The system is ready again for operation.

4.3 Re-commissioning

If the device has been stored and not used for > 6 months, perform a restart routine before using it again. Then carry out a leak test and a precision test.

Restart routine

Perform the restart routine as follows:

- Clean the sealing mat. Before cleaning, refer to the information provided in the chapter “Sealing mat cleanliness”.
- Put the device into operation.
- Program and perform a routine with the following parameters:
  - 500 cycles of wet rinsing
  - Flushing liquid: distilled water
  - Piston speed reduced to one third of the default value
  - Maximum nominal volume

– Perform a residue discharge

Leak test and precision test

Then carry out a leak test and a precision test, as described in the chapter "Function Tests".

NOTE! Return the piston speed to the default setting before carrying out the leak test and precision test.

If the device is within the specifications, you can put the device into operation.

If the device is **not** within the specifications, check the following points with regard to their influence on the measurement result:

- Application or execution errors
- Faulty or contaminated consumables
- Errors in the p-nitrophenol solution used
- Reader errors
- Contaminated or defective microplates
- Climatic influences
- Storage errors

Afterwards repeat the restart routine twice. Then carry out the leak and precision tests again. If the results remain outside the specified range, contact the Service team at Analytik Jena.

4.4 Function Tests

You can check the pipetting head for leaks, precision, and accuracy using the following function tests.

Run the function tests when putting the device into operation, when restarting it after a long period of inactivity, and after moving the device to another location.

First, check the tightness before you run a test for precision or accuracy.

Materials for function tests:

- Vertical photometer for microplates, with option for 405 nm
- Analytical balance, calibrated
- Manual pipette, calibrated, to prepare the test solution
- Microplate with transparent flat bottom, high quality, polystyrene

NOTE! Vacuum-packed microplates should be unpacked at least 1 day before measurements are taken.

- Cover foil for microplates
- Shakers for microplates
- Centrifuge for microplates

Use a microplate with 96 wells that fits the pipetting head.

Reagents for function tests:

- p-nitrophenol
- Sodium hydroxide pellets (NaOH, M 40.00 g/mol, p.a.), to prepare a 0.1 N NaOH solution (density 1.004 g/cm^3)
- Demineralized water (purity grade II, conductivity < 1 µS/cm, density 0.998 g/cm^3 at 20 °C)

The prepared solutions are stable for 3 months. Filter the solutions before using them for the function tests.

4.4.1 Leak test

Perform the impermeability test to ensure that the pipetting head has no liquid leaks. You check the plungers, the pipette tips, and the sealing mat with the test.

Aspirate a certain volume of liquid.

You can use distilled water as the liquid for this test. You can further improve visibility by using a dye solution instead of water.

Observe if the liquid level in the pipette tips remains constant over a period of 30 minutes.

Course of events

- Use a spirit level to check that the device is level. If necessary, realign the device.
- Remove the tip holder with the old pipette tips using the menu command **Change Tips**.
- Check and clean the sealing mat:
- Thoroughly inspect the sealing mat for cracks or deposits using a light source such as a flashlight.
- Carefully apply a microplate masking tape (e.g., nunc 236366; Thermo Scientific 236366) to the sealing mat and smooth out to cover all channels.
  - Only use adhesive foils specifically designed for microplates.
  - Proceed very carefully so that the sealing mat is not dislodged. Otherwise, there is danger of plate openings getting clogged with fluff balls.
  - Peel off the adhesive foil diagonally starting from one corner immediately and carefully.
    If the foil remains stuck too long, there is a risk of damaging the sealing mat when removing it.
- Place the tip holder with new tips in the device. Tighten the tips via the menu command **Change Tips**.
- Place the reagent reservoir containing the dye solution on the tray under the pipette tips.
- Move the pipette tips to the reservoir with the rotary knob. Immerse the pipette tips at least 2 mm deep into the dye solution.
- Pre-wet the pipette tips using the menu command **Priming**. Settings: **Volume** = Maximum volume, **Cycles** ≥ 3
- Absorb 50% of the maximum tip volume of dye solution. Leave the tips in the solution.
- Mark the water level at the foremost and rearmost tips, if required. The marking makes it easier to read later.
- After 30 minutes, move the tips out of the solution.
- Check the liquid levels of all pipette tips. A ruler for visual connection of the level point on the foremost and rearmost pipette makes reading easier.
- Document all tips whose level has changed.

  ✓ The impermeability test has been carried out.

Result of leak testing

The fill level of all pipette tips must not change by more than 2 mm. A drop in level in a pipette tip indicates a possible leak. Repeat this test with new pipette tips. If the leak is found to occur in the same place, you should contact the customer service department of Analytik Jena or your service partner.

4.4.2 Precision test

You can determine the precision of the pipette head by determining the coefficient of variation CV (percentage standard deviation).

To determine the coefficient of variation, use the pipetting head to dilute a dye solution in a transparent flat-bottomed microplate.

Use a vertical photometer as a measuring instrument and determine the absorbance of the diluted dye solution. Determine the precision of the device from the scatter of the measurement results. Before the test, determine and document the precision of the photometer according to the manufacturer's instructions.

Please observe:

- Carry out at least 2 measurements per tested volume. You can prepare the two microplates for the two measurements at the same time.
- Use a separate 96-well, microplate with a transparent flat bottom (e.g., Greiner F96 PS, ID: 655101). Always use new and **unwashed** microplates, otherwise the scatter of the measured values will be too large.
- Always use new pipette tips.
- Between steps, cover the microplate with special adhesive film for microplates. Keep the time during which the microplate is without adhesive film as short as possible. The measurement result is negatively influenced by inhomogeneous evaporation across the microplate.
- In the range of very small volumes, the pipetting head achieves a somewhat lower level of precision than in the upper volume range; please refer to the specifications Specifications. Therefore, determine separate values for the precision in the lower and upper specified volume range. The volumes to be tested can be found in the table in the following section.

Test sequence

- ▶ Insert a 96-well microplate or a 384-well microplate with transparent flat bottom into the instrument.
- ▶ Depending on the device model and volume range, pipette the sample volume of 0.1 N NaOH specified in the table into the wells.
- ▶ Before the actual measurement: Pre-wet the pipette tips in the pipetting mode **Priming**. Settings: **Volume** = Maximum volume, **Cycles** ≥ 3
- ▶ Run the precision test in the pipetting mode **Reverse Pipetting**.
- ▶ Configure the settings for pipetting the test volume as follows:
  - Set the aspiration volume according to the table. Aspiration is performed with additional stroke.
  - Set the test volume to be dispensed according to the table. The test volume is dispensed without blowout.
  - Pipette the test volume into the first column of the microplate containing the provided NaOH solution. When dispensing the test volume, the pipette tips should be immersed approx. 1 mm into the NaOH solution.
  - Dispense the remaining volume in the pipette tip into the reservoir with a blowout.
  - Repeat the pipetting process for the remaining columns of the microplate.
- ▶ Peel the adhesive film off the microplate.
- ▶ Start the pipetting process.
- ▶ After completing the pipetting process, cover the microplate again with the adhesive film.

- Mix the solutions, centrifuge them, and allow them to settle before measuring them in the vertical photometer. The following table lists the individual steps and specifies the settings for the orbital shaker and centrifuge:

Step	Device and settings	Time
Mix	700 rpm orbital shaker	15 min
Centrifuge	Centrifuge with 2000 rpm	2 min
Allow plates to settle	-	30 min

- Peel the adhesive film off the microplate.
- Insert the microplate into the vertical photometer and determine the absorbance of the dye solutions at 405 nm.
- Evaluate the measurement results and determine the coefficient of variation (CV value).
- Compare the CV values with the specifications of the pipetting head. The specifications can be found below in the table or in the Specifications chapter Specifications.

  ✓ The precision test has been carried out.

The following table shows the optimal settings, volumes, and dye concentrations for all device models, divided for precision measurements in the lower volume range (line 1) and upper volume range (line 2).

Model	Plunger speed	Aspirated volume	Sample volume (NaOH)	Test volume (p-nitrophenol)	Dye solution (p-nitrophenol)
CyBio SELMA 96/25 µl	4 µl/s	20 µl	198 µl	2 µl	12 mM
			195 µl	5 µl	4.8 mM
CyBio SELMA 96/60 µl	8 µl/s	20 µl	197 µl	3 µl	12 mM
			195 µl	5 µl	4.8 mM
CyBio SELMA 96/250 µl	40 µl/s	50 µl	190 µl	10 µl	2.4 mM
			175 µl	25 µl	0.96 mM
CyBio SELMA 96/1000 µl	150 µl/s	150 µl	175 µl	25 µl	0.96 mM
			100 µl	100 µl	0.24 mM
CyBio SELMA 384/25 µl	4 µl/s	20 µl	47 µl	3 µl	3 mM
			45 µl	5 µl	1.2 mM
CyBio SELMA 384/60 µl	8 µl/s	20 µl	47 µl	3 µl	3 mM
			45 µl	5 µl	1.2 mM

See also

Specifications [▸ 61]

4.4.3 Accuracy Test

ISO 23784 lists test methods for determining the volumetric performance of automated liquid dosing systems. The following section describes a test method for determining accuracy, based on ISO 23784.

Determine the accuracy of the pipetting head by pipetting different volumes into a microplate in a series of measurements and then weighing the plate. Compare the actual value with the target value. Find the mean of all measurements. Run the test with demineralized water. At 1 bar, the density of deionized water is 998 mg/cm^3.

Materials & preparatory action

- Laboratory scale (minimum resolution of 1 mg, calibrated)
- 96-well 12-column reservoir, with high profile for accuracy testing of the CyBio FeliX SELECT Head 8/1000 µL (e.g., Axygen 12-col v-bottom RES PP high profile, ID236 in Composer)
- Lid suitable for the column reservoir
- Reservoir with deionized water

Observe the following notes regarding conducting the test:

- New reservoirs are usually vacuum packed. The weight of new reservoirs can change due to evaporation or absorption. Therefore, unpack the column reservoir at least one day before the test.
- Keep the time during which the column reservoir is without a lid as short as possible. Otherwise evaporation may lead to distorted results. Pay particular attention to placing the lid on quickly between weighing processes.
- Perform the test at least three times for each volume.

▶ Place a reservoir of demineralized water at working position 1 of the tray.

▶ Pre-wet the pipette tips with the pipetting mode **Priming**. Settings: **Volume** = Maximum volume, **Cycles** ≥ 3

▶ Run the accuracy test in the pipetting mode **Reverse Pipetting**.

▶ Weigh an empty, capped microplate.

▶ Open the microplate and place it at working position 2 of the tray.

▶ Immediately afterwards, pipette the desired volume into the column reservoir.

▶ Replace the lid on the column reservoir.

▶ Weigh the filled and covered column reservoir and record the result.

▶ Determine the deviations of the actual volume from the target volume based on the measurement results.

▶ Carry out at least three measurements for each volume and determine the accuracy for the series of measurements.

✓ The accuracy test has been carried out.

5 Operation

WARNING

Warning of biohazard

The device handles biological and biochemical substances that are potentially pathogenic.

- Wear personal protective equipment when handling these substances.
- Observe all instructions and specifications in the safety data sheets. Observe national regulations when handling these substances.
- Decontaminate and clean the device after use.

CAUTION

Risk of crushing

There is a risk of crushing hands in the movement area of the pipetting head.

- Do not reach into the movement area of the device during semi-automated processes.

NOTE

Risk of plunger damage

Direct contact of the tip holder with the plungers can damage the plungers.

- Never insert a tip holder without pipette tips into the device.
  A tip holder inserted with no pipette tips installed will void any warranty claims.
- Even if the device is not used for several hours or days, leave the tip holder in the device.

There are two options for carrying out the liquid handling steps:

- In the **manual operation**, you set the heights for aspirating and dispensing liquids using the rotary knob on the support foot of the device.
- In the **semi-automatic operation**, the device automatically moves to the previously saved pipetting heights.

Observe the following instructions during operation:

- If the height of the pipette tips and reservoirs allow it, slide the tray into guide groove I to keep the travel distances of the pipette head as small as possible.
- If possible, use the maximum blowout volume (default setting).

Important tips

Make sure that no liquid ever enters the pipetting head. This could damage the pipetting head so severely that it will no longer be functional.

- Make sure that the tips do not come into contact with the liquid at all while the plunger is moving to the zero-position.
- The liquid in the tips must not reach too high a level due to air bubbles. There is a risk of air bubbles forming in the tips, especially when withdrawing liquid from vessels with an insufficient fill level or with insufficient immersion depth.
- Never exceed the maximum possible pipetting volume when using smaller tips, such as 10 µl tips on a 25 µl pipetting head.

5.1 Operate the device via touchscreen

Operate the software (general)

If parameters are to be entered, the touchscreen shows you the general input window. The input window shows a keypad. You can use the displayed keys to enter digits, letters, and special characters. The input line shows the minimum possible parameters on the left and the maximum possible parameters on the right.

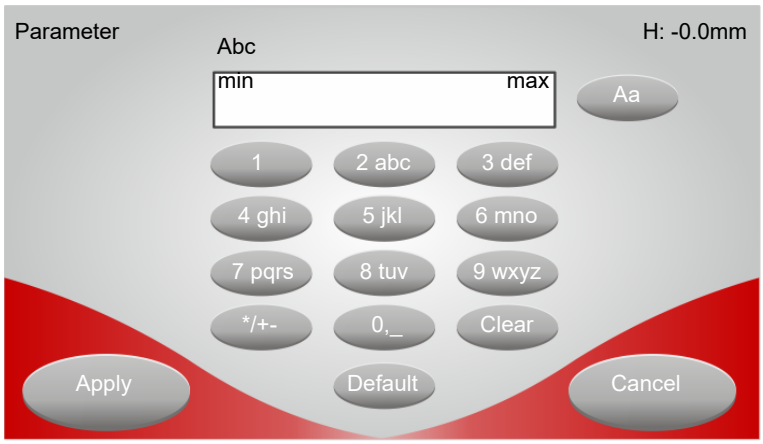


Fig. 14 Keypad on the touchscreen

The individual keys have multiple assignments. Pressing it several times produces the different characters. The first key pressed after the input window appears will overwrite the current input. You cannot move the input cursor. The characters are always appended at the end.

Key	Description
Clear	A click on the key deletes the last character.
Default	Clicking the key replaces the current input with the preset default value for that parameter.
Aa	The key allows you to switch between upper and lower case. This key is only visible if alphanumeric input is allowed. The current mode is displayed above the input field. The following modes are supported: Automatic "Aa" (Abc): Each character after a space is capitalized, all other characters are lowercase. Lowercase "a" (abc) or uppercase "A" (ABC): Each character is written in lower or upper case.
Apply	After clicking the button, the software checks the input value. If the input value is within the allowed values but outside of the specified volume range, the input box will display the following error messages: Value too large Value too small
Cancel	After clicking the button, the software restores the original input.

The main menu

The **Menu** display contains all the buttons for the basic pipetting modes. You can also use this menu to access the extended functionalities.

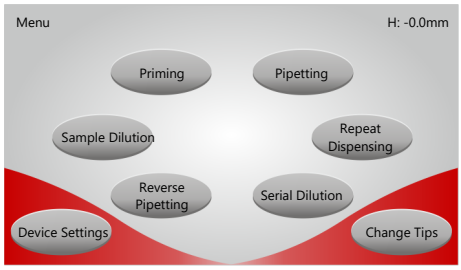


Fig. 15 Main menu

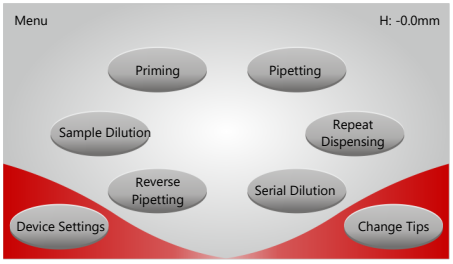
The buttons with the basic pipetting modes are:
- Priming
- Pipetting
- Sample Dilution
- Repeat Dispensing
- Reverse Pipetting
- Serial Dilution

The buttons with extended functionalities are:
- Device Settings (Device settings)
- Change Tips

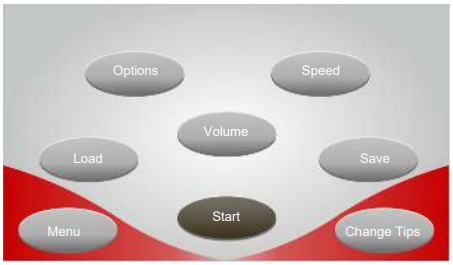
The screenshots in the following handling instructions are simplified. The touchscreen shows the currently set values under the keys. This information was omitted.

5.2 Priming

During priming, the pipette tips take up a defined volume exactly. The pipetting tips are flushed by aspirating and dispensing the liquid. Next, the device dispenses the volume with ejection (Blowout). When priming, the source late is also the target plate.



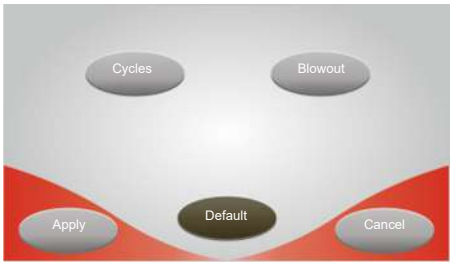
▸ From the main menu, select pipetting mode using the corresponding key.



▸ Set the following parameters in the menu for the pipetting mode: **Options**, **Volume**, **Speed**.
After pressing the **Volume** button, the input window appears immediately.

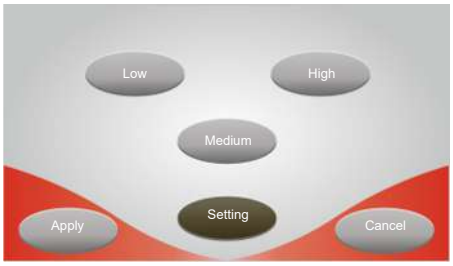
✓ The currently set values appear below the keys.

If you do not make any changes in the menu, the device will pipette with the preset standard values.



- In the **Priming Options** menu, set the following parameters: **Cycles** and **Blowout**.
  - ✓ The input window appears after pressing the respective key.
- Enter the desired values and apply with **Apply**.

If you press the **Default** button after making a change, the device automatically reverts to the default values for all parameters.



- Set the absorption and dispensing speed of the liquid in the **Speed** menu. Confirm the value with **Apply**.

The following values apply for the CyBio SELMA 96/250 µl model:

- Slow: 40 µl/s
- Medium: 120 µl/s
- Fast: 180 µl/s
- Precision adjustment: 2.0 to 200.0 µl/s

For all other models, please refer to the table at the end of the chapter.

- Start the pipetting process with the **Start** button in the main menu.
- Follow the instructions on the touchscreen:
  - Place the source/target plate on the tray.
  - Set the required absorbing height of the pipetting head with the rotary knob.
  - Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.

NOTE

Pipetting head can hit the upper table

In order to be able to aspirate or dispense liquids at the lower working position of the tray, the travel area of the pipetting head must be free.

- For pipetting at the lower working position: slide the upper table all the way to the left.

- **Semi-automatic process (optional):** Repeat the previously manually performed pipetting steps with the **Motion & Pipetting** button or the "move + pip" button on the left support foot of the device.
  - ✓ The device works through the pipetting steps as often as you like. However, the settings are only available until the next time the device is switched off or until the next time the pipetting routine is changed.
- If you want to save pipetting parameters and pipetting heights permanently, follow the instructions for working with semi-automatic routines.
- Finish the pipetting process. When prompted, remove the pipette tips from the pipetting liquid using the rotary knob. Move the plungers to the zero position up to the upper stop.
- Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
  - ✓ The pipetting process is finished.

The following table shows the possible settings in the pipetting mode **Priming** for all device models, with a value range and default settings respectively.

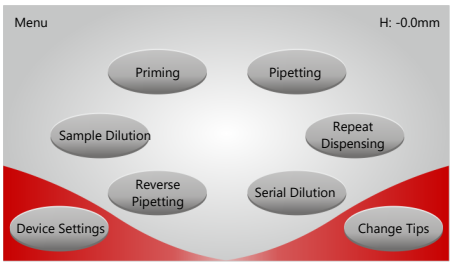
Model	CyBio SELMA 96/25 µl CyBio SELMA 384/25 µl		CyBio SELMA 96/60 µl CyBio SELMA 384/60 µl		CyBio SELMA 96/250 µl		CyBio SELMA 96/1000 µl	
Values	Area	Stan-dard	Area	Stan-dard	Area	Stan-dard	Area	Stan-dard
Volume (µl)	0.01 ... 25.0	25.0	0.10 ... 60.0	60.0	0.1 ... 250.0	250.0	10.0 ... 1000.0	1000.0
Velocity (µl/s)	0.2 ... 20.0	12.0	1.0 ... 40.0	25.0	2.0 ... 200.0	120.0	6.0 ... 600.0	400.0
Cycles	1 ... 500	5	1 ... 500	5	1 ... 500	5	1 ... 500	5
Blowout (µl)	0.7 ... 2.0	2.0	1.0 ... 4.0	4.0	7.0 ... 70.0	70.0	16.0 ... 100.0	100.0

See also

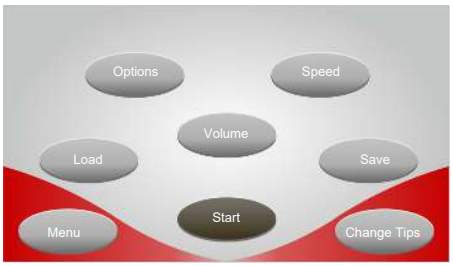
Work with semi-automatic routines [▶ 50]

5.3 Pipetting

When pipetting, the device absorbs a precisely defined volume and dispenses it again by ejecting the remaining volume (Blowout). The device can run mixing cycles.

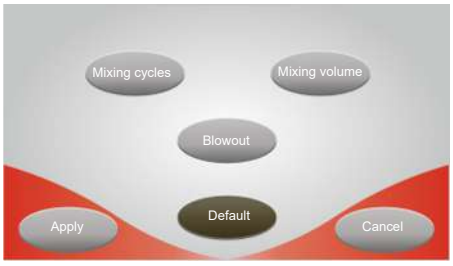


- From the main menu, select pipetting mode using the corresponding key.



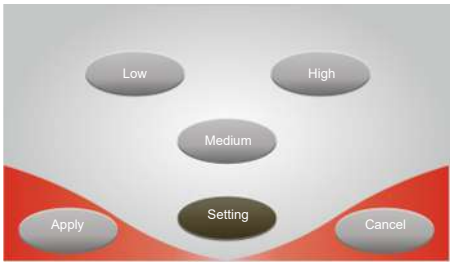
- Set the following parameters in the menu for the pipetting mode: **Options**, **Volume**, **Speed**.
  After pressing the **Volume** button, the input window appears immediately.
  - ✓ The currently set values appear below the keys.

If you do not make any changes in the menu, the device will pipette with the preset standard values.



- Set the following parameters in the menu with the options for the pipetting mode: **Mixing cycles**, **Blowout** and **Mixing volume**.
  - ✓ The input window appears after pressing the respective key.
- Enter the desired values and apply with **Apply**.

If you press the **Default** button after making a change, the device automatically reverts to the default values for all parameters.



- Set the absorption and dispensing speed of the liquid in the **Speed** menu. Confirm the value with **Apply**.

The following values apply for the CyBio SELMA 96/250 µl model:

- Slow: 40 µl/s
- Medium: 120 µl/s
- Fast: 180 µl/s
- Precision adjustment: 2.0 to 200.0 µl/s

For all other models, please refer to the table at the end of the chapter.

- Start the pipetting process with the **Start** button in the main menu.
- Follow the instructions on the touchscreen:
  - Place the source plate on the tray.
  - Set the required absorbing height of the pipetting head with the rotary knob.
  - Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
  - Move the pipetting head upwards.
  - Place the target plate on the tray.
  - Set the required dispensing height of the pipetting head.
  - Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.

NOTE

Pipetting head can hit the upper table

In order to be able to aspirate or dispense liquids at the lower working position of the tray, the travel area of the pipetting head must be free.

- For pipetting at the lower working position: slide the upper table all the way to the left.

- **Semi-automatic process (optional):** Repeat the previously manually performed pipetting steps with the **Motion & Pipetting** button or the "move + pip" button on the left support foot of the device.
  - ✓ The device works through the pipetting steps as often as you like. However, the settings are only available until the next time the device is switched off or until the next time the pipetting routine is changed.
- If you want to save pipetting parameters and pipetting heights permanently, follow the instructions for working with semi-automatic routines.
- Finish the pipetting process. When prompted, remove the pipette tips from the pipetting liquid using the rotary knob. Move the plungers to the zero position up to the upper stop.
- Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
  - ✓ The pipetting process is finished.

The following table shows the possible settings in the pipetting mode **Pipetting** for all device models, with a value range and default settings respectively.

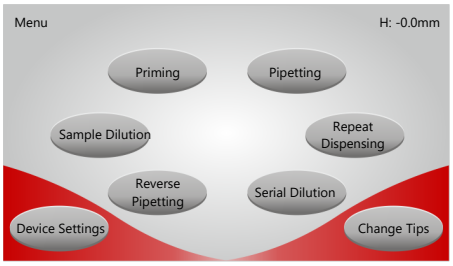
Model	CyBio SELMA 96/25 µl CyBio SELMA 384/25 µl		CyBio SELMA 96/60 µl CyBio SELMA 384/60 µl		CyBio SELMA 96/250 µl		CyBio SELMA 96/1000 µl	
Values	Area	Standard	Area	Standard	Area	Standard	Area	Standard
Volume (µl)	0.01 ... 25.0	25.0	0.10 ... 60.0	60.0	0.1 ... 250.0	250.0	10.0 ... 1000.0	1000.0
Velocity (µl/s)	0.2 ... 20.0	12.0	1.0 ... 40.0	25.0	2.0 ... 200.0	120.0	6.0 ... 600.0	400.0
Mixing cycles	0 ... 100	3	0 ... 100	3	0 ... 100	3	0 ... 100	3
Blowout (µl)	0.7 ... 2.0	2.0	1.0 ... 4.0	4.0	7.0 ... 70.0	70.0	16.0 ... 100.0	100.0
Mix volume (µl)	0.01 ... 25.0	5.0	0.1 ... 60	10.0	0.1 ... 250.0	50.0	10.0 ... 1000.0	200.0

See also

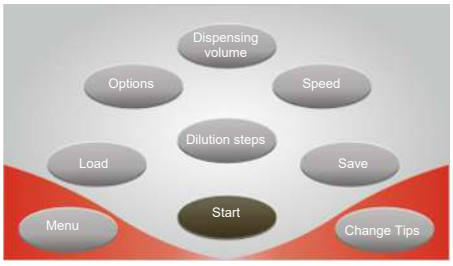
Work with semi-automatic routines [▶ 50]

5.4 Diluting

When diluting, the device takes a predetermined volume of sample, then an air bubble, and then a volume of diluent. The device dispenses the entire contents of the tip by ejecting the remaining volume (Blowout).

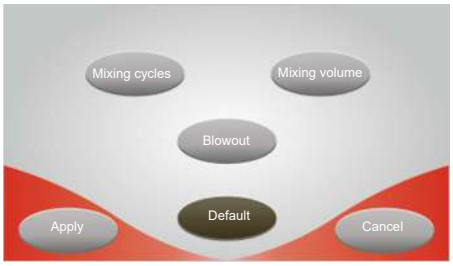


- From the main menu, select pipetting mode using the corresponding key.



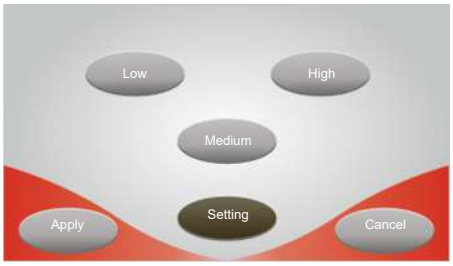
- In the **Sample Dilution** menu, set the following parameters: **Options**, **Sample volume**, **Diluent volume**, **Speed**.
  After pressing the **Sample volume** and **Diluent volume** buttons, the input window appears immediately.
  - ✓ The currently set values appear below the keys.

If you do not make any changes in the menu, the device will pipette with the preset standard values.



- Set the following parameters in the menu with the options for the pipetting mode: **Mixing cycles**, **Blowout** and **Mixing volume**.
  - ✓ The input window appears after pressing the respective key.
- Enter the desired values and apply with **Apply**.

If you press the **Default** button after making a change, the device automatically reverts to the default values for all parameters.



- Set the absorption and dispensing speed of the liquid in the **Speed** menu. Confirm the value with **Apply**.

The following values apply for the CyBio SELMA 96/250 µl model:

- Slow: 40 µl/s
- Medium: 120 µl/s
- Fast: 180 µl/s
- Precision adjustment: 2.0 to 200.0 µl/s

For all other models, please refer to the table at the end of the chapter.

- Start the pipetting process with the **Start** button in the main menu.
- Follow the instructions on the touchscreen:
  - Place the source plate on the tray.
  - Set the required absorbing height of the pipetting head with the rotary knob.
  - Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
  - Move the pipetting head upwards and out of the liquid.
  - Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device in order to absorb an air bubble.
  - Place the diluent plate on the tray.
  - Set the required absorbing height of the pipetting head with the rotary knob.
  - Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
  - Move the pipetting head upwards.
  - Place the target plate on the tray.
  - Set the required dispensing height of the pipetting head.
  - Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.

NOTE

Pipetting head can hit the upper table

In order to be able to aspirate or dispense liquids at the lower working position of the tray, the travel area of the pipetting head must be free.

- For pipetting at the lower working position: slide the upper table all the way to the left.

- **Semi-automatic process (optional):** Repeat the previously manually performed pipetting steps with the **Motion & Pipetting** button or the "move + pip" button on the left support foot of the device.
  - ✓ The device works through the pipetting steps as often as you like. However, the settings are only available until the next time the device is switched off or until the next time the pipetting routine is changed.
- If you want to save pipetting parameters and pipetting heights permanently, follow the instructions for working with semi-automatic routines.
- Finish the pipetting process. When prompted, remove the pipette tips from the pipetting liquid using the rotary knob. Move the plungers to the zero position up to the upper stop.

- Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.

  ✓ The pipetting process is finished.

The following table shows the possible settings in the pipetting mode **Sample Dilution** for all device models, with a value range and default settings respectively.

Model	**CyBio SELMA 96/25 µl** **CyBio SELMA 384/25 µl**		**CyBio SELMA 96/60 µl** **CyBio SELMA 384/60 µl**		**CyBio SELMA 96/250 µl**		**CyBio SELMA 96/1000 µl**	
Values	Area	Standard	Area	Standard	Area	Standard	Area	Standard
Sample volume (µl)	0.01 ... 25.0	2.0	0.1 ... 60	4.0	0.1 ... 250.0	20.0	10.0 ... 1000.0	40.0
Velocity (µl/s)	0.2 ... 20.0	12.0	1.0 ... 40.0	25.0	2.0 ... 200.0	120.0	6.0 ... 600.0	400.0
Diluent volume (µl)	0.01 ... 25.0	18.0	0.1 ... 60.0	35.0	0.1 ... 250.0	180.0	10.0 ... 1000.0	700.0
Mixing cycles	0 ... 100	3	0 ... 100	3	0 ... 100	3	0 ... 100	3
Blowout (µl)	0.7 ... 2.0	2.0	1.0 ... 4.0	4.0	7.0 ... 70.0	70.0	16.0 ... 100.0	100.0
Mix volume (µl)	0.01 ... 25.0	5.0	0.1 ... 60	10.0	0.1 ... 250.0	50.0	10.0 ... 1000.0	200.0

The following table shows the relationships between the parameters:

	CyBio SELMA 96/25 µl **CyBio SELMA 384/25 µl**	**CyBio SELMA 96/60 µl** **CyBio SELMA 384/60 µl**	**CyBio SELMA 96/250 µl**	**CyBio SELMA 96/1000 µl**
Volume of the air bubble	2 µl	4 µl	20 µl	80 µl

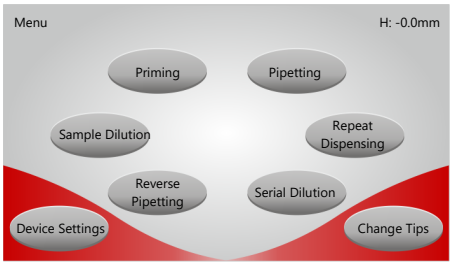
Table 1 Relationship between the parameters

See also

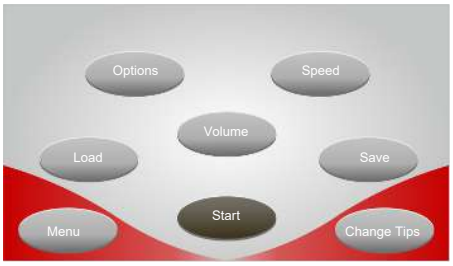
Work with semi-automatic routines [▶ 50]

5.5 Dispensing

When dispensing, a total volume is absorbed as a sum of partial volumes and an additional volume with overstroke. The volumes absorbed are dispensed again in partial steps. The residual volume remains in the tip and is finally dispensed back into the source plate or a reservoir.

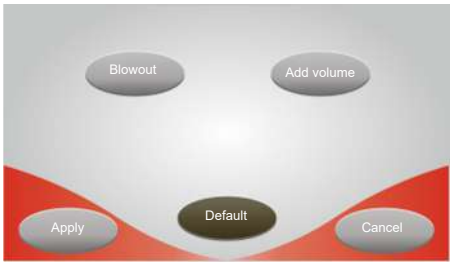


- From the main menu, select pipetting mode using the corresponding key.



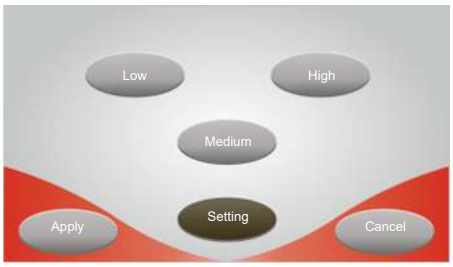
- In the **Repeat Dispensing** menu, set the following parameters: **Options**, **Dispensing volume**, **Dispensing steps** and **Speed**. After pressing the **Volume** button, the input window appears immediately.
  - ✓ The currently set values appear below the keys.

If you do not make any changes in the menu, the device will pipette with the preset standard values.



- In the **Repeat Dispensing Options** menu, set the following parameters: **Blowout** and **Add volume**.
  - ✓ The input window appears after pressing the respective key.
- Enter the desired values and apply with **Apply**.

If you press the **Default** button after making a change, the device automatically reverts to the default values for all parameters.



- Set the absorption and dispensing speed of the liquid in the **Speed** menu. Confirm the value with **Apply**.

The following values apply for the CyBio SELMA 96/250 µl model:
- Slow: 40 µl/s
- Medium: 120 µl/s
- Fast: 180 µl/s
- Precision adjustment: 2.0 to 200.0 µl/s

For all other models, please refer to the table at the end of the chapter.

- Start the pipetting process with the **Start** button in the main menu.
- Follow the instructions on the touchscreen:
  - Place the source plate on the tray.
  - Set the required absorbing height of the pipetting head with the rotary knob.
  - Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
  - Move the pipetting head upwards.
  - Place the first target plate on the tray.
  - Set the required dispensing height of the pipetting head.
  - Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
- Repeat the work steps for each additional target plate.

NOTE

Pipetting head can hit the upper table

In order to be able to aspirate or dispense liquids at the lower working position of the tray, the travel area of the pipetting head must be free.

- For pipetting at the lower working position: slide the upper table all the way to the left.

- **Semi-automatic process (optional):** Repeat the previously manually performed pipetting steps with the **Motion & Pipetting** button or the "move + pip" button on the left support foot of the device.
  - ✓ The device works through the pipetting steps as often as you like. However, the settings are only available until the next time the device is switched off or until the next time the pipetting routine is changed.
- If you want to save pipetting parameters and pipetting heights permanently, follow the instructions for working with semi-automatic routines.
- Place the reservoir on the tray for dispensing the remaining volume.
  - – Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
- Finish the pipetting process. When prompted, remove the pipette tips from the pipetting liquid using the rotary knob. Move the plungers to the zero position up to the upper stop.
- Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
  - ✓ The pipetting process is finished.

The following table shows the possible settings in the pipetting mode **Repeat Dispensing** for all device models, with a value range and default settings respectively.

Model	**CyBio SELMA 96/25 µl** **CyBio SELMA 384/25 µl**		**CyBio SELMA 96/60 µl** **CyBio SELMA 384/60 µl**		**CyBio SELMA 96/250 µl**		**CyBio SELMA 96/1000 µl**	
Values	Area	Standard	Area	Standard	Area	Standard	Area	Standard
Dispensed volume (µl)	0.00 ... 25.0	5.00	0.1 ... 60.0	5.0	0.1 ... 250.0	25.0	10.0 ... 1000.0	100.0
Velocity (µl/s)	0.2 ... 20.0	12.0	1.0 ... 40.0	25.0	2.0 ... 200.0	120.0	6.0 ... 600.0	400.0
Dispensing steps	1 ... 50	5	1 ... 500	5	1 ... 500	5	1 ... 500	5
Blowout (µl)	0.7 ... 2.0	2.0	1.0 ... 4.0	4.0	7.0 ... 70.0	70.0	16.0 ... 100.0	100.0
Additional volume (µl)	0.01 ... 25.0	1.0	0.1 ... 60.0	2.0	0.1 ... 250.0	10.0	10.0 ... 1000.0	40.0

Relationships between the parameters:

CyBio SELMA 96/25 µl	
Constraint	Number of dispensing steps x dispensing volume ≤ 24 µl
Automatic calculation of the aspirated volume	Aspirated volume = number of dispensing steps x dispensing volume + 1 µl
CyBio SELMA 96/60 µl	
Constraint	Number of dispensing steps x dispensing volume ≤ 58 µl
Automatic calculation of the aspirated volume	Aspirated volume = number of dispensing steps x dispensing volume + 2 µl
CyBio SELMA 96/250 µl	
Constraint	Number of dispensing steps x dispensing volume ≤ 240 µl
Automatic calculation of the aspirated volume	Aspirated volume = number of dispensing steps x dispensing volume + 10 µl
CyBio SELMA 96/1000 µl	
Constraint	Number of dispensing steps x dispensing volume ≤ 960 µl
Automatic calculation of the aspirated volume	Aspirated volume = number of dispensing steps x dispensing volume + 40 µl
CyBio SELMA 384/25 µl	
Constraint	Number of dispensing steps x dispensing volume ≤ 24 µl
Automatic calculation of the aspirated volume	Aspirated volume = number of dispensing steps x dispensing volume + 1 µl
CyBio SELMA 384/60 µl	
Constraint	Number of dispensing steps x dispensing volume ≤ 58 µl
Automatic calculation of the aspirated volume	Aspirated volume = number of dispensing steps x dispensing volume + 2 µl

Table 2 Relationship between the parameters

See also

Work with semi-automatic routines [▶ 50]

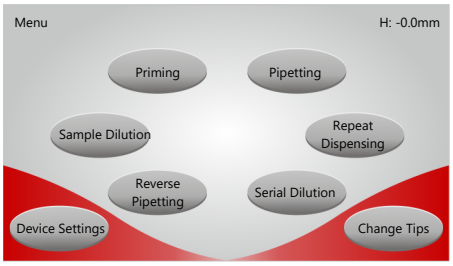
5.6 Reverse pipetting

With reverse pipetting, the device absorbs a defined volume plus an additional volume with overstroke. The device then dispenses the defined volume exactly.

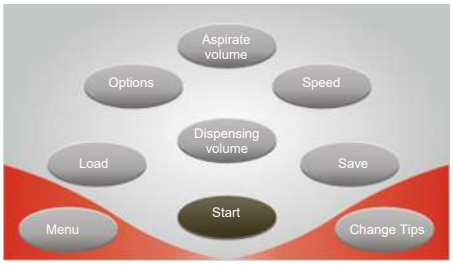
This sequence can be executed as a repetition. The residual volume remains in the tip and is finally released back into the source or into a reservoir.

Reverse pipetting is particularly suitable for:

- Small volume
- foaming liquids
- highly viscous liquids

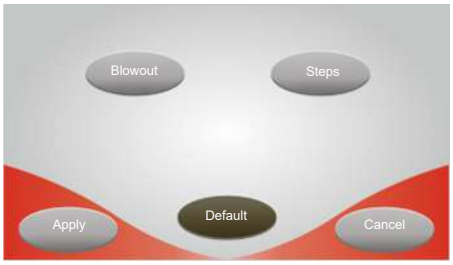


- From the main menu, select pipetting mode using the corresponding key.



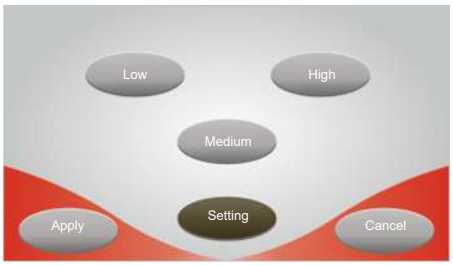
- In the **Reverse Pipetting** menu, set the following parameters: **Options**, **Aspirate volume**, **Dispensing volume** and **Speed**.
  After pressing the **Aspirate volume** and **Dispensing volume** buttons, the input window appears immediately.
  - ✓ The currently set values appear below the keys.

If you do not make any changes in the menu, the device will pipette with the preset standard values.



- In the **Reverse Pipetting Options** menu, set the following parameters: **Blowout** and **Steps**.
  - ✓ The input window appears after pressing the respective key.
- Enter the desired values and apply with **Apply**.

If you press the **Default** button after making a change, the device automatically reverts to the default values for all parameters.



- Set the absorption and dispensing speed of the liquid in the **Speed** menu. Confirm the value with **Apply**.

The following values apply for the CyBio SELMA 96/250 µl model:
- Slow: 40 µl/s
- Medium: 120 µl/s
- Fast: 180 µl/s
- Precision adjustment: 2.0 to 200.0 µl/s

For all other models, please refer to the table at the end of the chapter.

- Start the pipetting process with the **Start** button in the main menu.
- Follow the instructions on the touchscreen:
  - Place the source plate on the tray.
  - Set the required absorbing height of the pipetting head with the rotary knob.
  - Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
  - Move the pipetting head upwards.
  - Place the target plate on the tray.
  - Set the required dispensing height of the pipetting head.
  - Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
  - Move the pipetting head upwards.
  - Repeat the work steps for the number of entered pipetting steps. Alternatively: Press the **Motion & Pipetting** button or the "move + pip" button on the left support foot of the device to carry out the work steps automatically.
  - Place the reservoir for the remaining volume on the tray.

– Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.

NOTE

Pipetting head can hit the upper table

In order to be able to aspirate or dispense liquids at the lower working position of the tray, the travel area of the pipetting head must be free.

- For pipetting at the lower working position: slide the upper table all the way to the left.

- **Semi-automatic process (optional):** Repeat the previously manually performed pipetting steps with the **Motion & Pipetting** button or the "move + pip" button on the left support foot of the device.
  - ✓ The device works through the pipetting steps as often as you like. However, the settings are only available until the next time the device is switched off or until the next time the pipetting routine is changed.
- If you want to save pipetting parameters and pipetting heights permanently, follow the instructions for working with semi-automatic routines.
- Finish the pipetting process. When prompted, remove the pipette tips from the pipetting liquid using the rotary knob. Move the plungers to the zero position up to the upper stop.
- Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
  - ✓ The pipetting process is finished.

The following table shows the possible settings in the pipetting mode **Reverse Pipetting** for all device models, with a value range and default settings respectively.

Model	**CyBio SELMA 96/25 µl** **CyBio SELMA 384/25 µl**		**CyBio SELMA 96/60 µl** **CyBio SELMA 384/60 µl**		**CyBio SELMA 96/250 µl**		**CyBio SELMA 96/1000 µl**	
Values	Area	Standard	Area	Standard	Area	Standard	Area	Standard
Aspirated volume	0.01 ... 25.0	25.0	0.1 ... 60.0	60.0	0.1 ... 250.0	250.0	10.0 ... 1000.0	1000.0
Velocity (µl/s)	0.2 ... 20.0	12.0	1.0 ... 40.0	25.0	2.0 ... 200.0	120.0	6.0 ... 600.0	400.0
Dispensing volume	0.01 ... 25.0	24.0	0.1 ... 60.0	58.0	0.1 ... 250.0	240.0	10.0 ... 1000.0	960.0
Blowout (µl)	0.7 ... 2.0	2.0	1.0 ... 4.0	4.0	7.0 ... 70.0	70.0	16.0 ... 100.0	100.0
Steps	1 ... 20	1	1 ... 20	1	1 ... 20	1	1 ... 20	1

See also

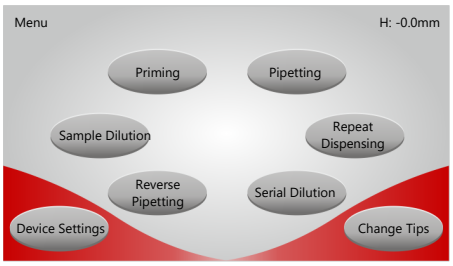
Work with semi-automatic routines [▸ 50]

5.7 Serial dilution

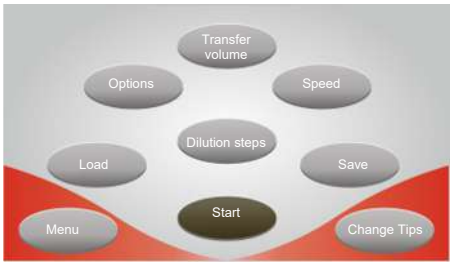
With serial dilution, the device absorbs a defined volume column by column. Next, the device dispenses the volume absorbed again column by column into a specific volume provided. The liquids are then mixed.

Preparation

With serial dilution, the device uses a tip holder that is equipped with only eight tips (96 channels) or 16 tips (384 channels) in a column. Insert this tip holder into the device as preparatory action.

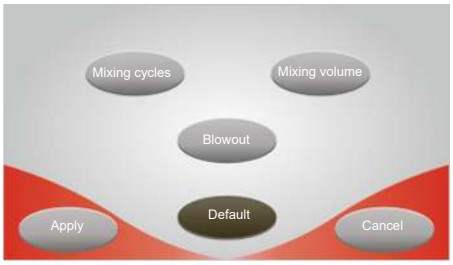


- From the main menu, select pipetting mode using the corresponding key.



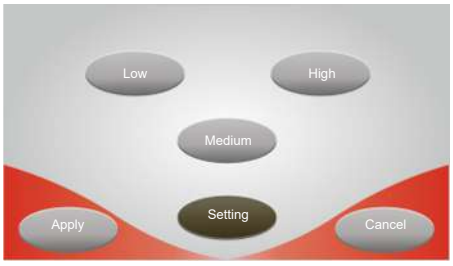
- In the **Serial Dilution** menu, set the following parameters:
  Options, **Transfer volume**, **Dilution steps**, **Speed**.
  After pressing the **Transfer volume** and **Dilution steps** buttons, the input window appears immediately.
  - ✓ The currently set values appear below the keys.

If you do not make any changes in the menu, the device will pipette with the preset standard values.



- Set the following parameters in the menu with the options for the pipetting mode: **Mixing cycles**, **Blowout** and **Mixing volume**.
  - ✓ The input window appears after pressing the respective key.
- Enter the desired values and apply with **Apply**.

If you press the **Default** button after making a change, the device automatically reverts to the default values for all parameters.



- Set the absorption and dispensing speed of the liquid in the **Speed** menu. Confirm the value with **Apply**.

The following values apply for the CyBio SELMA 96/250 µl model:

- Slow: 40 µl/s
- Medium: 120 µl/s
- Fast: 180 µl/s
- Precision adjustment: 2.0 to 200.0 µl/s

For all other models, please refer to the table at the end of the chapter.

- Start the pipetting process with the **Start** button in the main menu.
- Follow the instructions on the touchscreen:
  - Place the source plate on the tray.
  - If needed: Position the column under the pipette tips from which liquid is to be absorbed. To do this, move the tray using the spring lever.
  - Set the required absorbing height of the pipetting head with the rotary knob.
  - Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
  - Move the pipetting head upwards.

- Place the target plate on the tray. Position the gap to be filled under the pipette tips.
- Set the required dispensing height of the pipetting head.
- Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
- Move the pipetting head upwards.
- Repeat the work steps for the number of dilution steps.
- Place the reservoir on the tray to eject the remaining volume (Blowout).
- Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.

NOTE

Pipetting head can hit the upper table

In order to be able to aspirate or dispense liquids at the lower working position of the tray, the travel area of the pipetting head must be free.

- For pipetting at the lower working position: slide the upper table all the way to the left.

- **Semi-automatic process (optional):** Repeat the previously manually performed pipetting steps with the **Motion & Pipetting** button or the "move + pip" button on the left support foot of the device.
  - ✓ The device works through the pipetting steps as often as you like. However, the settings are only available until the next time the device is switched off or until the next time the pipetting routine is changed.
- If you want to save pipetting parameters and pipetting heights permanently, follow the instructions for working with semi-automatic routines.
- Finish the pipetting process. When prompted, remove the pipette tips from the pipetting liquid using the rotary knob. Move the plungers to the zero position up to the upper stop.
- Press the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
  - ✓ The pipetting process is finished.

The following table shows the possible settings in the pipetting mode **Serial Dilution** for all device models, with a value range and default settings respectively.

Model	**CyBio SELMA 96/25 µl** **CyBio SELMA 384/25 µl**		**CyBio SELMA 96/60 µl** **CyBio SELMA 384/60 µl**		**CyBio SELMA 96/250 µl**		**CyBio SELMA 96/1000 µl**	
Values	Area	Standard	Area	Standard	Area	Standard	Area	Standard
Transfer volume	0.01 ... 25.0	25.00	0.1 ... 60.0	60.0	0.1 ... 250.0	250.0	10.0 ... 1000.0	1000.0
Velocity (µl/s)	0.2 ... 20.0	12.0	1.0 ... 40.0	25.0	2.0 ... 200.0	120.0	6.0 ... 600.0	400.0
Dilution steps	1 ... 250	5	1 ... 250	5	1 ... 250	5	1 ... 250	5

Model	CyBio SELMA 96/25 µl CyBio SELMA 384/25 µl		CyBio SELMA 96/60 µl CyBio SELMA 384/60 µl		CyBio SELMA 96/250 µl		CyBio SELMA 96/1000 µl	
Mixing cycles	0 … 250	3	0 … 250	3	0 … 250	3	0 … 250	3
Blowout (µl)	0.7 … 2.0	2.0	1.0 … 4.0	4.0	7.0 … 70.0	70.0	16.0 … 100.0	100.0
Mix volume (µl)	0.01 … 25.0	5.0	0.1 … 60	10.0	0.1 … 250.0	50.0	10.0 … 1000.0	200.0

See also

- Tip replacement [▶ 48]
- Work with semi-automatic routines [▶ 50]

5.8 Advanced functions

5.8.1 Tip replacement

CAUTION

Risk of crushing on the pipetting head

There is a risk of crushing when tightening the tip holders.

- Do not touch the pipetting head when tightening the tip.

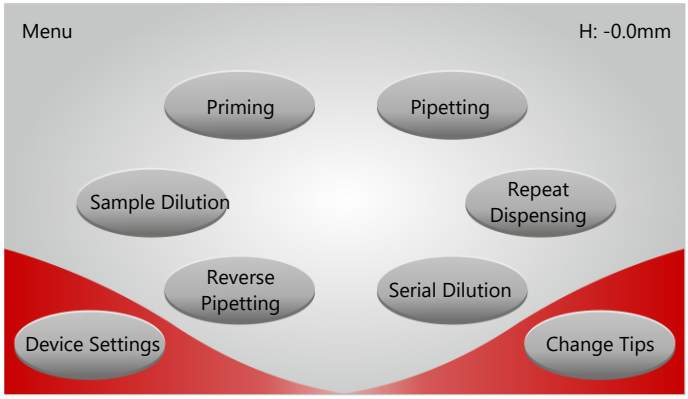


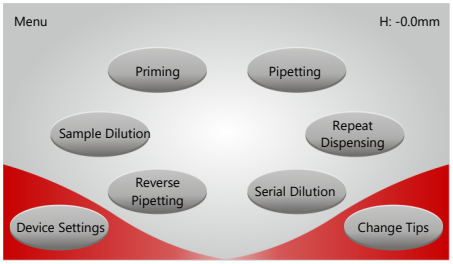
Fig. 16 Main menu with pipetting modes and extended functions

- ▶ Move the pipetting head to the zero position using the rotary knob.
- ▶ Press the **Change Tips** button in the main menu.
  - ✓ The tip holder is automatically released from the pipetting head.
- ▶ Take hold of the tip holder by the handle. Gently shake the tip holder to loosen the pipette tips from the sealing mat. Next, pull the tip holder out of the device.
- ▶ Slide in the new tip holder.
- ▶ Press the **Continue** button.
  - ✓ The tip holder is automatically tightened by the pipetting head. The pipette tips are this changed.

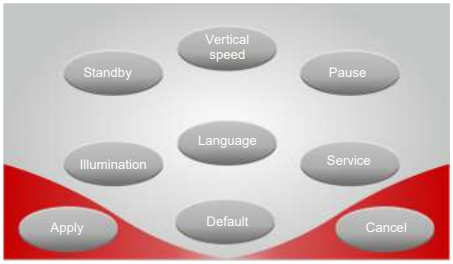
5.8.2 Device settings

You can adjust the basic settings of the device. The basic settings include:

Function	Meaning
Standby	Time until the activation of idle state of the device. During the idle state, the design elements flash.
Vertical speed	Vertical speed of the pipetting head during the function **Motion & Pipetting**
Pause	Pause after aspirating/dispensing
Illumination	Option to change the brightness of the lighting on the device: Touchscreen lighting, work area lighting and general lighting (design elements)
Language	Option to change the national language Selection: German, English, Russian, Chinese, and Japanese.
Service	Get the current firmware version Get the statistics: Plunger cycles, total volume, Z-axis cycles, total Z-axis travel



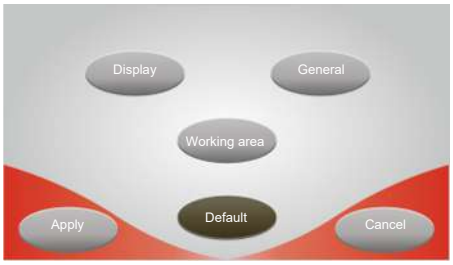
- Press the **Device Settings** button in the main menu.



- To change the parameters in the **Device Settings** sub-menu, press the respective key: **Standby**, **Vertical speed**, **Pause**.
  - ✓ The input window is displayed.
- Enter the desired values and apply with **Apply**.

If you press the **Default** button after making a change, the device automatically reverts to the default values for all parameters. The default national language is English.

- To change the national language: Press the **Language** button. Select the language you want.
- Apply the settings with **Apply**.



- To change the brightness of the lighting, press the **Illumination** button in the **Device Settings** sub-menu.
- In the following window, press the button for the respective lighting: **Display**, **Working area**, **General**.
  - ✓ The input window is displayed.
- Set the desired settings and apply with **Apply**.

- To check the firmware status and to get statistical values, press the **Service** button in the **Device Settings** sub-menu.
  - ✓ The current firmware version is displayed in the following window.
- Switch to the **Statistics** sub-menu with **Continue**.

- If necessary, get the following values here: Plunger cycles, total volume, Z-axis cycles, and total Z-axis travel.
- The display switches back to the **Device Settings** sub-menu with **Continue**.

Name	Unit	Value area	Standard
Idle state	min	0...180	30
Pause	s	1...180	1
Vertical speed	mm/s	10...80	66
Lighting	%	10...100	100
Touchscreen		0...100	50
Working area		0 = Off; >0 = On	50
General information			
Language	/	English	English
		German	
		Russian	
		Chinese	
		Japanese	

Table 3 Parameters of the basic settings

5.8.3 Idle state

The device has a standby function. A time between 1 and 180 minutes can be set (default value is 30 min) in the sub-menu **Device Settings** using the **Standby** button.

If the device is in the main menu and is not operated for the set period of time, it switches to the standby function. Shortly before the idle state is activated, the pipetting head moves to the zero position (= upper stop) automatically. The lighting and the drives are switched off. The design elements flash.

- To use the device again: Touch anywhere on the touchscreen.

Please observe:
- If a standby time of 0 minutes is stored, the standby function is not active.
- If the device is in a pipetting routine and there is still liquid in the pipette tips, the device will not switch to idle state.

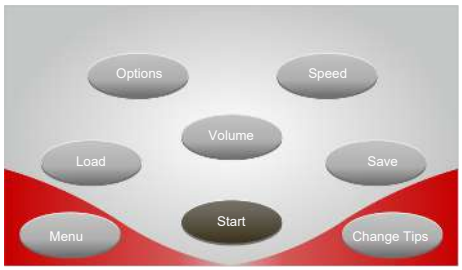
5.8.4 Work with semi-automatic routines

You can save parameter sets with pipetting parameters and manually optimized pipetting heights as semi-automatic routines. The semi-automatic routines enable you to work comfortably and, above all, reproducibly.

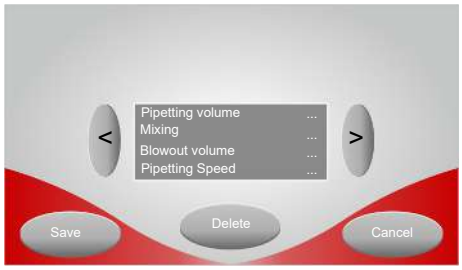
Sequence of a semi-automatic routine

- Select pipetting mode in the main menu.
- Begin the pipetting process with **Start** and place the plate on the tray.
- Load a preset routine.
- Start the processing of the routine with the **Motion & Pipetting** button or the "move + pip" button on the left support foot of the device.
- Follow the further instructions on the touchscreen. Change plates when indicated.
  - ✓ The device automatically carries out the liquid handling steps previously carried out manually with the saved parameter sets and set pipetting heights.

Create and save a routine



- Select a pipetting mode.
- Process the pipetting mode manually:
  - Move to the pipetting height with the rotary knob.
  - Carry out the desired pipetting step with the **Pipetting** button on the touchscreen or the "pip" button on the left support foot of the device.
- After finishing the routine, save the set parameters. In the menu in the pipetting mode, press the **Save** button.
  - ✓ The touchscreen shows an overview of the set parameters.



- Check the set parameters and confirm with **Save**.
- Name the created routine using the keypad. Save the name with **Apply**.
  - ✓ In addition to the parameter set, the device saves the pipetting heights in the routine.

If the entered name is already taken, a warning appears on the touchscreen. Assigning the same name in different pipetting modes is permitted.

You can now load the created routine and start it with the **Motion & Pipetting** button or the "move + pip" button on the left support foot of the device. During the routine, you do not need to adjust the height using the rotary knob any longer.

NOTE

Pipetting head can hit the upper table

In order to be able to aspirate or dispense liquids at the lower working position of the tray, the travel area of the pipetting head must be free.

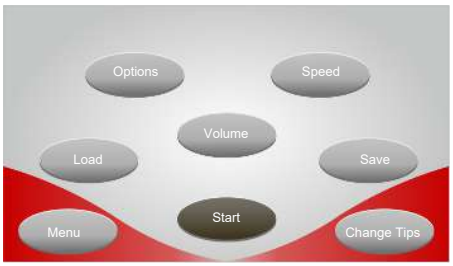
- For pipetting at the lower working position: slide the upper table all the way to the left.

Please observe:

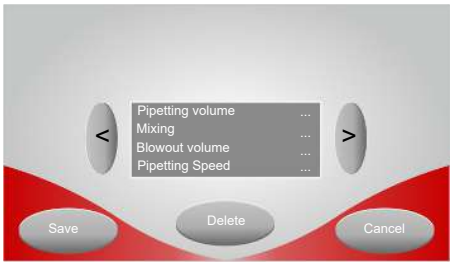
- The saved heights are fixed. However, the liquid level in the reservoirs normally decreases as the method progresses. If you are pipetting large volumes or repeating a routine frequently, the liquid level will decrease quickly. There is a risk that the device will draw air bubbles into the pipette tip during aspiration. You should therefore monitor the liquid level and adjust it manually.

- When dispensing, it is sufficient if you specify the dispensing amount once. The machine runs all iterations at this first height.

Load a parameter set

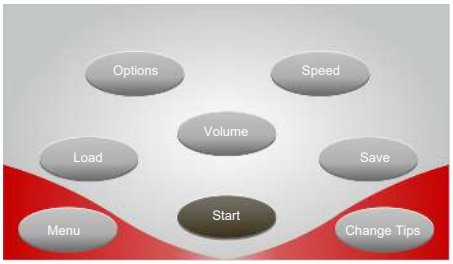


- From the menu in the pipetting mode, press the **Load** button.
  - ✓ The touchscreen shows an overview of the saved parameter sets.

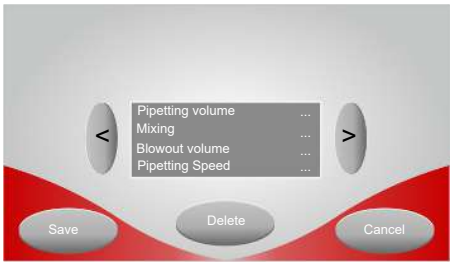


- Use the arrow keys to select the desired parameter set.
- Confirm the selection with **Apply**.
  - ✓ The parameter set is loaded.

Delete a parameter set



- From the menu in the pipetting mode, press the **Save** button.
  - ✓ The touchscreen shows an overview of the set parameters.



- Use the arrow keys to select the desired parameter set.
- Press the **Delete** button
  - ✓ The touchscreen shows a warning.
- Confirm the deletion of the parameter set with **Yes**.
  - ✓ The parameter set is deleted.

6 Troubleshooting

The device displays malfunctions. If the malfunctions are caused by the operator, operation can usually be continued after the fault has been eliminated.

In the event of malfunctions, check all possible sources of error. If the malfunction persists even after the error has been corrected, or if problems other than those described occur, contact the customer service department of Analytik Jena or the authorized service partner.

WARNING

Risk of damage to health due to improper decontamination

- Decontaminate the device professionally and document the cleaning measures before returning the device to Analytik Jena.
- The customer service department will send you the decontamination declaration when you register the return.

6.1 Entry of incorrect values

If you enter a value using the keypad that is outside of the device specifications, the input field will display an error message, e.g. **Value too large**. Then correct your entry.

6.2 Operation only with inserted tip holder

The device issues an error message if no tip holder is inserted or if the tip holder is not inserted correctly.

- Follow the instructions on the touchscreen and insert a tip holder.
- Slide the tip holder in as far as it will go.
- Press the **Continue** button
  - ✓ The device tightens the tip holder.

6.3 Interrupt the pipetting routine with the STOP button

If you notice an error during the pipetting process or if you discover a foreign object under the pipette tips, you can interrupt the movement of the drives with the STOP button.

After pressing the STOP button:

- Continue the pipetting routine by pressing the **Continue** button.
- Cancel the pipetting routine by pressing the **Cancel** button.

If the pipetting routine is aborted:

- Follow the instructions on the touchscreen:
  - – Insert a reservoir, set the dispensing height, and press **Continue**.
  - ✓ The device dispenses the liquid in the pipette tips into the inserted reservoir.
- Move the pipette tips out of the microplate.

- Press the **Continue** button.
  - ✓ The plungers return to the zero position and the device is ready for operation again.

6.4 Error handling

Device cannot be activated

If the device cannot be switched on, check the following points:

- Is the device switched on at the rear side?
- Is the power cord plugged into the power supply unit or power outlet properly?
- Is the correct operating voltage present at the power outlet? Testing must only be done by a qualified electrician!
- Is the cable from the power supply unit correctly plugged into the device and screwed tight?

If there is a defect in the power supply unit or if the device cannot be switched on despite checking the points described above, inform the Analytik Jena customer service department or the authorized service partner. Do not carry out any repairs on the power supply unit yourself. Only operate the device with an original power supply unit.

Malfunction of the pneumatic spring

In the course of its lifetime, the pneumatic spring can wear out and thus lose its spring force. When the power is off, the pipetting head of the device lowers itself. The device must then no longer be operated.

When the device is switched on, the following error message appears: "Z-drive: Service life exceeded. Servicing recommended".

To avoid a failure of the pneumatic spring, the customer service must change the pneumatic spring at the latest after 50000 stroke cycles of the Z-axis.

The number of stroke cycles of the Z-axis can be retrieved in the **Device Settings** | **Service** menu.

Error during initialization or program flow

If an error occurs when initializing the device, this is displayed on the touchscreen. The device repeats the initialization routine until the routine runs without error.

If an error occurs while the program is running, the program is aborted with an error message. Next, any remaining liquid must be removed from the pipette tips. Follow the instructions on the touchscreen:

- Confirm the error message with **Continue**.
- Follow the instructions on the touchscreen to load a reservoir, set the dispensing height, and press **Continue**.
  - ✓ The device dispenses the liquid in the pipette tips into the inserted reservoir.
- Move the pipette tips out of the microplate.
- Press the **Continue** button.
  - ✓ The plungers return to the zero position and the device is ready for operation again.

The following error messages can be displayed:

- Error on setting of pipetting speed.
- Error on reading of tip height.
- Error by vertical drive.

- Error on aspiration.
- Error on dispensing.
- Error on blowing out.
- Error on piston motion to zero-position.
- Error on piston reference motion.
- Unknown error.
- System error
- Error on tightening of tips.
- Error on releasing of tips.
- Tips not tightened.
- Sensor error.
- System operation stopped.
- Operator break.

6.5 Power failure

If the device is switched off unexpectedly, the device starts the initialization routine when it is switched on again. An unexpected shutdown can be caused by the user, by a power failure, or by a defective power supply unit.

If there was liquid in the pipette tips before the power failure, the device dispenses the liquid into a reservoir during initialization. You can continue working after successful initialization.

7 Maintenance and care

The operator may not undertake any service or maintenance work to this device and its components other than that specified in these instructions.

Observe the information in the "Safety instructions" section for all maintenance work. Compliance with the safety instructions is a prerequisite for the error-free operation of the device. Always observe all warnings and instructions that are displayed on the device itself or indicated by the control software.

To ensure faultless and safe functioning, Analytik Jena recommends an annual inspection and servicing by its Service department.

7.1 Maintenance overview

Basic device

Maintenance interval	Maintenance task
Weekly	■ Wipe the body and touchscreen clean. ■ Clean the tray and tray slots.
Monthly	Check the sealing mat for cleanliness.
Every six months	■ Carry out a leak test. ■ Run a precision test
After 50000 stroke cycles of the Z-axis	Have the pneumatic spring replaced by customer service. If the pneumatic spring needs to be changed, the software will show the following warning message every time it is switched on: “Z-drive: Service life exceeded. Servicing recommended”.
After ≥250000 cycles	Have the plunger sealing system changed by customer service. NOTE! Keep the sealing mat clean. Otherwise the plunger sealing system will wear out faster.

Tip holder

Maintenance interval	Maintenance task
Weekly	■ Replace used tips. ■ Clean the reusable tip holders. Autoclave these, if necessary.

External power supply unit

Maintenance interval	Maintenance task
Every six months	Have the external power supply unit (cable, protective earth conductor) checked by a qualified electrician.

7.2 Service the plunger sealing system

Tip holder

NOTE

Risk of plunger damage

Direct contact of the tip holder with the plungers can damage the plungers.

- Never insert a tip holder without pipette tips into the device.
  A tip holder inserted with no pipette tips installed will void any warranty claims.
- Even if the device is not used for several hours or days, leave the tip holder in the device.

Important tips

Make sure that no liquid ever enters the pipetting head. This could damage the pipetting head so severely that it will no longer be functional.

- Make sure that the tips do not come into contact with the liquid at all while the plunger is moving to the zero-position.
- The liquid in the tips must not reach too high a level due to air bubbles. There is a risk of air bubbles forming in the tips, especially when withdrawing liquid from vessels with an insufficient fill level or with insufficient immersion depth.
- Never exceed the maximum possible pipetting volume when using smaller tips, such as 10 µl tips on a 25 µl pipetting head.

Sealing mat

NOTE

Reduced sealing effect due to contamination

If the pipette tips are changed frequently, fluff or dust can settle on the sealing mat, which impairs the sealing effect.

- Only use clean pipette tips.
- Check the cleanliness of the sealing mat weekly.

- ▶ Initiate a tip change using the menu command **Change Tips**. Remove the tip holder.
  - ✓ The sealing mat is now accessible from below.
- ▶ Check and clean the sealing mat:
- ▶ Thoroughly inspect the sealing mat for cracks or deposits using a light source such as a flashlight.
- ▶ Carefully apply a microplate masking tape (e.g., nunc 236366; Thermo Scientific 236366) to the sealing mat and smooth out to cover all channels.
  - – Only use adhesive foils specifically designed for microplates.
  - – Proceed very carefully so that the sealing mat is not dislodged. Otherwise, there is danger of plate openings getting clogged with fluff balls.
  - – Peel off the adhesive foil diagonally starting from one corner immediately and carefully.
    If the foil remains stuck too long, there is a risk of damaging the sealing mat when removing it.
- ▶ Reinsert the tip holder and tighten it using the menu command **Change Tips**.
  - ✓ The sealing mat is cleaned.

8 Transport and storage

8.1 Transport

When transporting the device, observe the safety instructions in the "Safety instructions" section.

Avoid the following during transport:

- Impact and vibration
  Risk of damage due to shock, impact or vibration!
- Large temperature fluctuations
  Risk of condensation!

8.2 Preparing the device for transport

WARNING

Risk of damage to health due to improper decontamination

- Decontaminate the device professionally and document the cleaning measures before returning the device to Analytik Jena.
- The customer service department will send you the decontamination declaration when you register the return.

NOTE

Risk of device damage due to unsuitable packaging material

- Only transport the device and its components in the original packaging.
- Empty the device completely and attach all transport locks before transporting the device.
- Add a suitable desiccant to the packaging to prevent damage from moisture.

To prepare the system for transport, proceed as follows:

- ▶ Remove inserted tip holders from the device.
- ▶ Attach the transport lock to the pipetting head.
- ▶ Tighten the transport lock using the menu command **Change Tips**.
- ▶ Shut down the device.
- ▶ Insert the tray in the guide groove "II".

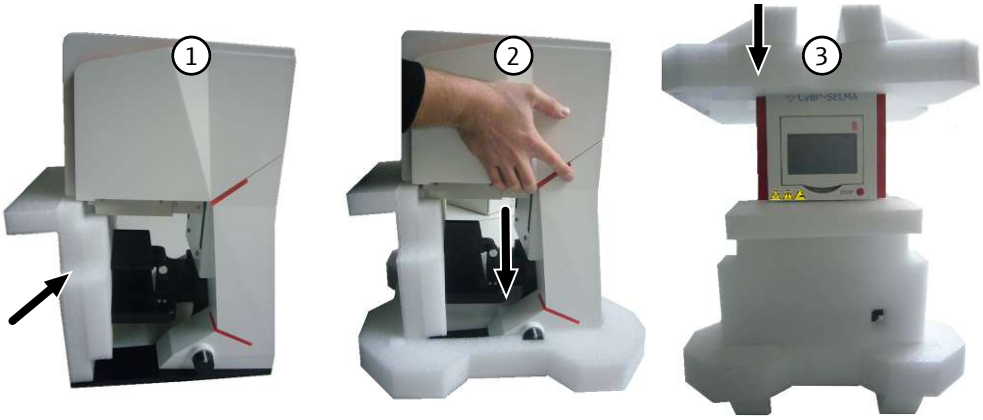


Fig. 17 Attach transport locks to the device

- Place the transport lock around the tip holder and the tray on the front of the device as shown in the image.
- Grab the device behind the pipetting head, lift it, and place it in the lower PE-mold.
  ⚠ CAUTION! Risk of injury when lifting the device. Do not reach into the area under the tip holder.
- Place the upper transport lock on the device.
- Pull the plastic sleeve over the device. Make sure the touchscreen is folded.
- Place the device in the original packaging.
- Put the power supply unit, operating manual, and any other accessories in the additional packaging and place them in the packaging.
- Close and seal the packaging.
  ✓ The device is packed for transport.

8.3 Moving the device in the laboratory

CAUTION

Risk of injury during transport

Dropping the device poses a risk of injury and damage to the device.

- Proceed carefully when moving and transporting the device.

Observe the following when moving the device within the laboratory:

- Insufficiently secured components pose a risk of injury!
  Before moving the device, remove all loose parts and disconnect all connections from the device.
- To lift, grab the device behind the pipetting head and place it in the lower PE-mold.
  ⚠ CAUTION! Risk of injury when lifting the device. Do not reach into the area under the tip holder. Hold the device behind the pipetting head when lifting it.
- Observe the guide values and adhere to the legally mandated limits for lifting and carrying loads without auxiliary means.
- Observe the installation conditions at the new location.

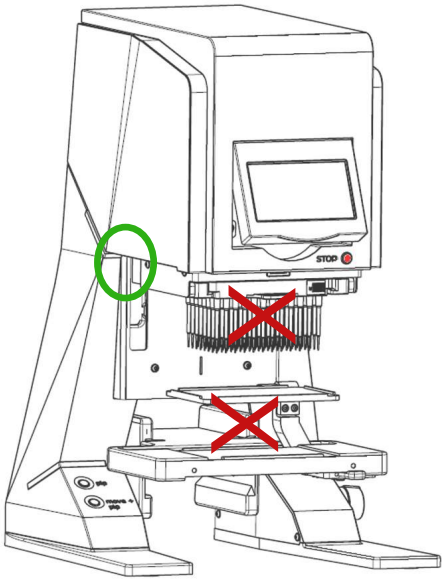


Fig. 18 Lift the device

8.4 Storage

NOTE

Risk of device damage due to environmental conditions

Environmental influences and condensation can destroy individual components of the device.

- Only store the device in air-conditioned rooms.
- Ensure that the atmosphere is free of dust and corrosive vapors.

If the device is not installed immediately after delivery or not required for longer periods, it should be stored in its original packaging. A suitable desiccant should be added to the equipment to prevent damage from moisture.

The requirements for the climatic conditions of the storage location can be found in the specifications.

Always store the device in an upright position. If the device is not stored in an upright position, i.e., tilted, this may lead to damage to the device.

Document the serial number and the date on which the device was stored. If storing the device for a period of more than 6 months, perform a restart routine before using the device again. Observe the information provided on performing the restart routine in the chapter “Re-commissioning”.

9 Specifications

General characteristics

Designation/type	CyBio SELMA
Dimensions (W x H x D)	■ 307 x 480 x 325 mm ■ 307 x 520 x 325 mm (for model CyBio SELMA 96/1000 µl)
Mass (depending on model)	18 to 20 kg
Mass with accessories and packaging	23 to 25 kg
Channels	96/384
Pipetting head	Motorized height adjustment (in Z-direction)
Plate positions	2
Storage capacity	>10 Parameter sets for each pipetting mode
Microplate formats	■ 96/384 ■ Shallow Well (SW), Deep Well (DW)
Noise emission	<70 dB (A)

Model CyBio SELMA 96/25 µl

Pipetting head	96 Channel head (25 µl)
Volume range*	0.5 µl to 25 µl Can be selected in 0.01 µl step
Precision (CV)*	>2 to 5 µl ≤2 %; >5 to 25 µl ≤1 %
Tip types	10 µl Shallow Well 25 µl Shallow Well 60 µl Deep Well

* applies for tips 10 µl, 25 µl

Model CyBio SELMA 96/60 µl

Pipetting head	96 channel head (60 µl)
Volume area	1 µl to 60 µl Can be selected in 0.01 µl step
Precision (CV)	>3 to 5 µl ≤2 %; >5 to 60 µl ≤1 %
Tip types	10 µl Shallow Well 25 µl Shallow Well 60 µl Deep Well

Model CyBio SELMA 96/250 µl

Pipetting head	96 Channel head (250 µl)
Volume area	5 µl to 250 µl Can be selected in 0.1 µl step
Precision (CV)	>10 to 25 µl ≤2 %; >25 to 250 µl ≤1 %
Tip types	250 µl Shallow Well 250 µl Deep Well

Model CyBio SELMA 96/1000 µl

Pipetting head	96 Channel head (1000 µl)
Volume area	10 µl to 1000 µl Can be selected in 0.1 µl step
Precision (CV)	>25 to 100 µl ≤2 %; >100 to 1000 µl ≤1 %
Tip types	1000 µl Deep Well

Model CyBio SELMA 384/25 µl		
	Pipetting head	384 Channel head (25 µl)
	Volume range*	0.5 µl to 25 µl Can be selected in 0.01 µl step
	Precision (CV)*	>2 to 5 µl ≤2 %; >5 to 25 µl ≤1 %
	Tip types	10 µl Shallow Well 25 µl Shallow Well 60 µl Deep Well

* applies for tips 10 µl, 25 µl

Model CyBio SELMA 384/60 µl		
	Pipetting head	384 Channel head (60 µl)
	Volume area	1 µl to 60 µl Can be selected in 0.01 µl step
	Precision (CV)	>3 to 5 µl ≤2 %; >5 to 60 µl ≤1 %
	Tip types	10 µl Shallow Well 25 µl Shallow Well 60 µl Deep Well

Electrical variables		
	Protection class	III
	Operating voltage	24 V (2.5 A max.)
	Power consumption (operation)	≤60 VA
	Power consumption (standby)	≤5 VA
	Interface (servicing)	RS 232 C, Sub-D 9 Poles
	External power supply unit	
	Input voltage	100 to 240 V ±10 % (1.7 A max); 50/60 Hz
	Output voltage	24 V (2.5 A max.)

Ambient conditions		
	Temperature during operation	+15 to +37 °C
	Humidity during operation/storage	≤85 % (+30 °C)
	Temperature during storage	-10 to +50 °C
	Maximum altitude	2000 m
	Maximum degree of contamination of the intended environment	2
	Application class, base area	Tabletop device for use in closed and well-maintained rooms Base area: stable, horizontal, dry, vibration-free

10 Standards and directives

Compliance with the following directives and regulations applicable to the product is declared:

- EMC Directive - 2014/30/EU
- RoHS Directive – 2011/65/EU incl. (EU)2015/863

In accordance with Annex I No. 1.5.1. of the Machinery Directive 2006/42/EG, the safety objectives of the Low Voltage Directive 2014/35/EU were also met.

The applied harmonized standards are:

- EN ISO 12100:2010
- EN 61326-1:2013
- EN 61010-1:2010+A1:2019
- EN IEC 63000:2018

11 Disposal

The operator is responsible for correct disposal of biological samples in accordance with statutory regulations.

Dispose of consumables that are contaminated with hazardous substances in accordance with the applicable national and international regulations on safety and environment.

Store or dispose of used pipette tips only in sealable containers that are provided and labeled for this purpose.

At the end of its service life, the device and its electronic components must be disposed of as electronic waste in accordance with the applicable regulations.

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