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# Mastercycler® X50

Operating manual

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### **Notice**

The software of the Mastercycler X50 contains open source software. License information is available in the settings of the Mastercycler X50 software under *About this Mastercycler*.

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# 1 Operating instructions









## 1.1 Using this manual

- ▶ Read this operating manual completely before using the device for the first time.
- ▶ Consider this manual as part of the product and keep it somewhere easily accessible.
- ▶ If this operating manual is lost, please request another one. The current version of the operating manual can be found on our webpage [www.eppendorf.com](http://www.eppendorf.com).

## 1.2 Danger symbols and danger levels

### 1.2.1 Danger symbols


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

	<b>Biohazard</b>		<b>Explosive substances</b>
	<b>Electric shock</b>		<b>Hot surface</b>
	<b>Risk of crushing</b>		<b>Toxic substances</b>
	<b>Hazard point</b>		<b>Material damage</b>

### 1.2.2 Danger levels

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

## 1.3 Symbols used

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

## 1.4 Abbreviations used

**DHCP**

Dynamic Host Configuration Protocol (network)

**DNS**

Domain Name System (network)

**IP**

Internet Protocol (network)

**MAC**

Media Access Control (network)

**PCR**

Polymerase Chain Reaction – PCR

**PDF**

Portable Document Format

**PIN**

Personal Identification Number

**USB**

Universal Serial Bus



## **2 Safety**

### **2.1 Intended use**

The Eppendorf Mastercycler X50 is a laboratory device intended to amplify via the polymerase chain reaction specific segments of double stranded nucleic acids in training, routine and research laboratories in the fields of life sciences, industry or chemistry. The product is intended for research purpose only, but not intended for use in diagnostic and therapeutic procedures.

It integrates various blocks types to accommodate different plate and tube formats.

The Mastercycler X50 is to be used only by operators trained in laboratory techniques and procedures.

### **2.2 User profile**

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

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

### **2.3 Information on product liability**

In the following cases, the designated protection of the device may be compromised. Liability for any resulting property damage or personal injury is then transferred to the operator:

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

## 2.4 Warnings for intended use

Read the operating manual and observe the following general safety instructions before using the Mastercycler X50.



### **DANGER! Risk of explosion.**

- ▶ Do not operate the device in areas where work is completed with explosive substances.
- ▶ Do not use this device to process any explosive or highly reactive substances.
- ▶ Do not use this device to process any substances which could create an explosive atmosphere.



### **WARNING! Risk of fire.**

- ▶ Do not use this device to process any highly flammable liquids.



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

- ▶ When handling infectious liquids and pathogenic germs, observe the national regulations, the biological safety level of your laboratory, the material safety data sheets, and the manufacturer's application notes.
- ▶ Wear your personal protective equipment.
- ▶ Consult the "Laboratory Biosafety Manual" (source: World Health Organization, Laboratory Biosafety Manual, in its respectively current valid version).



### **WARNING! Lethal voltages inside the device.**

Touching parts which are under high voltage may cause an electric shock. An electric shock injures the heart and causes respiratory paralysis.

- ▶ Ensure that the housing is closed and undamaged.
- ▶ Do not remove the housing.
- ▶ Ensure that no liquid can penetrate into the device.

Only authorized service staff may open the device.



### **WARNING! Biohazard when tempering with the heated lid open.**

When tempering with an open heated lid, the lids of the reaction vessels can spring open. This will release sample material.

- ▶ Only temper with a closed heated lid.



### **WARNING! Biohazard due to unsuitable reaction vessels, plates and lids.**

Unsuitable reaction vessels, plates and lids will get damaged in the Cycler. This will release sample material.

- ▶ Only use reaction vessels, plates and lids that meet the requirements specified in the operating manual.



**CAUTION! Risk of burns on the thermoblock, heated lid and reaction vessels.**

The thermoblock, heated lid and reaction vessels reach temperatures of over 50 °C very quickly.

- ▶ Wait until the temperature of the thermoblock, heated lid and reaction vessels is below 30 °C.
- ▶ Then open the heated lid.



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

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

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



**WARNING! Risk of injury when lifting the device.**

If the device is moved using the lid, the lid may break, causing the device to fall.

- ▶ Lift the device by holding it at the bottom of the housing.
- ▶ Use both hands to carry the device.
- ▶ Do not lift the device using the lid.



**CAUTION! Risk of injury from lifting and carrying heavy loads.**

The device is heavy. Lifting and carrying the device can lead to back injuries.

- ▶ Only lift and transport the device with a sufficient number of helpers.
- ▶ Use a transport aid for transporting the device.



**NOTICE! Damage to electronic components due to condensation.**

Condensate can form in the device after it has been moved from a cool environment to a warmer environment.

- ▶ After installing the device, wait for at least 12 h. Only then connect the device to the mains/ power line.
-

## 2.5 Danger symbols on the device

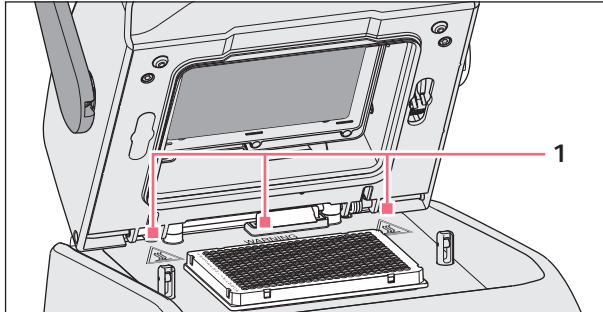


Fig. 2-1: Warning symbols on the Mastercycler

1



### **Burns due to hot surfaces.**

If the heated lid is open, you may suffer burns when touching the thermoblock and the hot plate.

- ▶ Do not touch any hot surfaces.

**3 Product description**  
**3.1 Product overview**  
**3.1.1 Master variant**

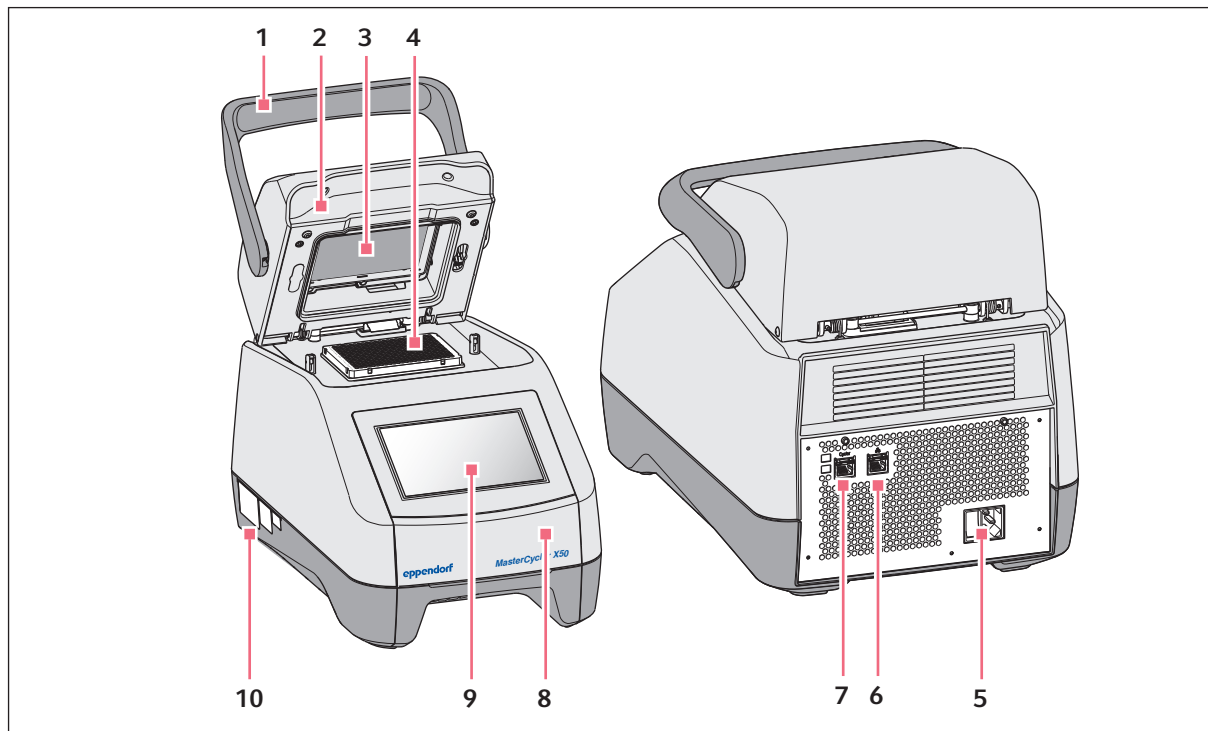


Fig. 3-1: Front view and rear view

- |  |                                 |
|--|---------------------------------|
| <b>1 Lid handle</b><br>For opening and closing the heated lid.                                 | <b>6 Ethernet port</b>          |
| <b>2 Heated lid</b>  | <b>7 Cyclor port</b>            |
| <b>3 Heating plate</b>   | <b>8 Lid</b><br>USB port cover. |
| <b>4 Thermoblock</b>   | <b>9 Touch screen</b>           |
| <b>5 Mains/power cord socket with mains/power switch</b><br>0 = switched off, I = switched on. | <b>10 Name plate</b>            |

### 3.1.2 Eco variant

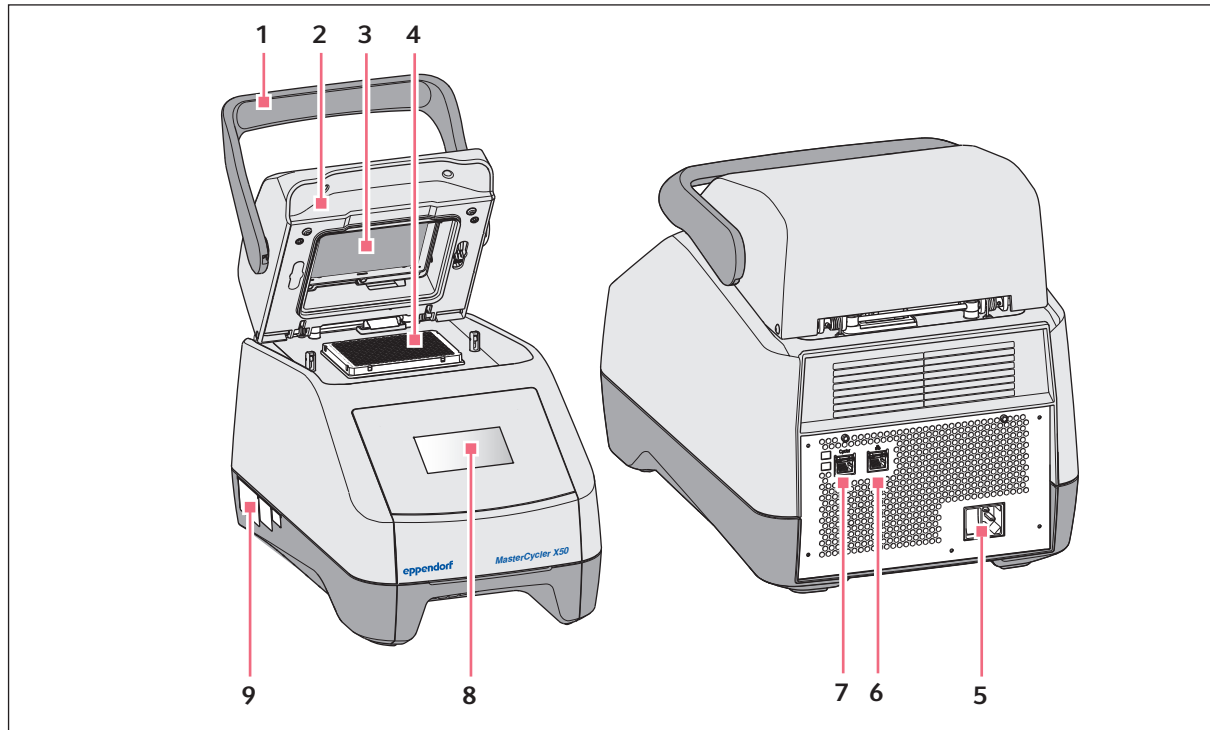


Fig. 3-2: Front view and rear view

- |  |  |
|--|--|
| <p><b>1 Lid handle</b><br/>For opening and closing the heated lid.</p> <p><b>2 Heated lid</b></p> <p><b>3 Heating plate</b></p> <p><b>4 Thermoblock</b></p> <p><b>5 Mains/power cord socket with mains/power switch</b><br/>0 = switched off, I = switched on.</p> | <p><b>6 Deactivated port</b></p> <p><b>7 Cyclor port</b></p> <p><b>8 Display</b><br/>Information is displayed. Operation is not possible.</p> <p><b>9 Name plate</b></p> |
|--|--|

### 3.1.3 Ports

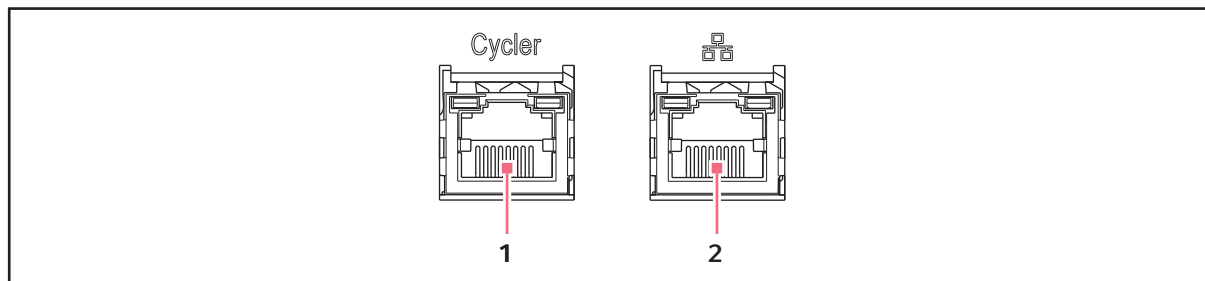


Fig. 3-3: Ports

#### 1 Cyclor port

Connection to an eco variant of the Mastercycler X50 or an Ethernet switch.

#### 2 Ethernet port

Connection to the Internet for master variants. In eco devices this port is deactivated.

Only Mastercycler X50 eco devices can be connected to a Mastercycler X50 master device.

### 3.1.4 Status lamp

The status lamp is located on the right above the touch screen.

Status lamp	Operating status
Lights up yellow	The device is starting up.
Briefly flashes yellow, then lights up white	The device is in idle mode.
Flashes blue	A program run is active.
Flashes green	A program run is completed.
Flashes yellow	The program run is waiting for a user action in the Pause or Hold step.
	During a program run the lid is open.
Lights up blue	The heating block is active. No program is selected.
	The heated lid is active. No program is selected.
	Verification of the thermoblock.
Lights up violet	After a mains/power outage the device will be automatically restarted.
Flashes red	Device error. See the display for additional information on the type of error.
Flashes violet	Software update

### 3.2 Delivery package

Quantity	Description
1	Mastercycler X50 in the ordered version
1	Operating manual for all master variants. Eco devices are delivered without an operating manual.
1	Certificate of uniformity
1	Mains/power cord with EU plug
1	Mains/power cord with US plug
1	1.5 m Ethernet cable (eco devices only)

### 3.3 Features

**Circuit technologie:** Circuit technologie ensures a homogeneous temperature distribution and enables the generation of specific temperature gradients for PCR optimizations on the Mastercycler X50.

**SteadySlope:** The SteadySlope technology ensures that the heating and cooling rates of the thermoblock in gradient operation are identical to those in normal operation. A reliable transfer of the optimization results to the routine application is ensured.

**flexlid:** Except for the High Pressure Lid versions, all Mastercycler X50 are equipped with a heated flexlid. It enables ergonomic operation with one hand and automatically adjusts the contact pressure for all tubes and PCR plates.

**Thermal Sample Protection:** The Thermal Sample Protection technology maintains a constant thermoblock temperature of 20 °C during the warm-up phase of the heated lid. Thermal Sample Protection reduces the thermal load on your samples and minimizes the probability of non-specific product formation during the PCR.

**Self test function:** The master variants of the Mastercycler X50 have an integrated self test function. The self test function provides a simple way of testing the correct function of the thermoblock of the master device and the connected eco devices without any further tools.

**Control:** The eco variants of the Mastercycler X50 do not have a control panel. They are controlled via a connected master variant of the Mastercycler X50.



### 3.3.1 Features of the Mastercycler X50

	Master device	Thermoblock version	Thermoblock material	High Pressure Lid
Mastercycler X50a	X	96-well format	Aluminum	—
Mastercycler X50p	X	96-well format	Aluminum	X
Mastercycler X50h	X	384-well format	Aluminum	X
Mastercycler X50l	—	96-well format	Aluminum	—
Mastercycler X50r	—	96-well format	Aluminum	X
Mastercycler X50t	—	384-well format	Aluminum	X
Mastercycler X50s	X	96-well format	Silver	—
Mastercycler X50i	—	96-well format	Silver	—

### 3.3.2 Consumable

	PCR strip (0.1 mL) or PCR tubes (0.2 mL)	PCR plates
Mastercycler X50a	96	1x 96-well
Mastercycler X50p	—	1x 96-well
Mastercycler X50h	—	1x 384-well
Mastercycler X50l	96	1x 96-well
Mastercycler X50r	—	1x 96-well
Mastercycler X50t	—	1x 384-well
Mastercycler X50s	96	1x 96-well
Mastercycler X50i	96	1x 96-well

### 3.3.3 Networking

Another Mastercycler X50 eco device can be connected directly to and controlled from the Mastercycler X50.

Up to 9 Mastercycler X50 eco devices can be connected and controlled via an Ethernet switch.

### 3.3.4 Service

Eppendorf offers customized service options for preventive maintenance and verification of your thermal cycler. For more information, service requests and local offers go to [www.eppendorf.com/epservices](http://www.eppendorf.com/epservices) and see local websites.

**Product description**

Mastercycler® X50  
English (EN)

### **3.4 Intuitive operating concept**

Eppendorf offers a cross-product operating concept which supports swift familiarization with different Eppendorf products. For different Eppendorf products, the basic operating controls are compatible with each other by using an intuitive touch user interface.

## 4 Installation

### 4.1 Selecting the location

---



**WARNING! Risk of injury due to unsuitable work surface.**

The device may fall over if placed on an unsuitable work surface.

- ▶ Observe the criteria in the operating manual on selecting a location.
- 



**NOTICE! Damage from overheating.**

- ▶ Do not install the device near heat sources (e.g., heating, drying cabinet).
  - ▶ Do not expose the device to direct sunlight.
  - ▶ Ensure unobstructed air circulation. Maintain a clearance of at least 30 cm around all ventilation gaps.
- 



When the device is in operation, ensure that the device mains/power switch and the cutting unit of the power system circuit (e.g., residual current circuit breaker) are accessible.

Take the following criteria into account when selecting the location for the device:

- The surface must have sufficient bearing capacity and ensure the required stability.
- The surface must be free of vibration.
- The device feet must not slip.
- The height of the location should allow for convenient and safe operation of the device.

## 4.2 Installing the device

### 4.2.1 Connecting the device to the power supply

---



**WARNING! Risk from incorrect voltage supply.**

- ▶ Only connect the device to voltage supplies which correspond with the electrical requirements on the name plate.
  - ▶ Only use sockets with a protective earth (PE) conductor and a suitable mains/power cord.
- 



**NOTICE! Sample loss through interruption in the mains/power supply.**

If you use multiple sockets, the current consumption of several devices may exceed the power current strength. The mains/power fuse interrupts the mains/power supply. The devices do not receive any power. The current programs are aborted.

- ▶ Connect the mains/power cord of each device directly to an earth/grounded socket.
  - ▶ Do not use multiple sockets.
- 



**NOTICE! Impairment to the display caused by the protective foil**

The display functionality can be impaired if the protective foil is peeled off when the device is switched on.

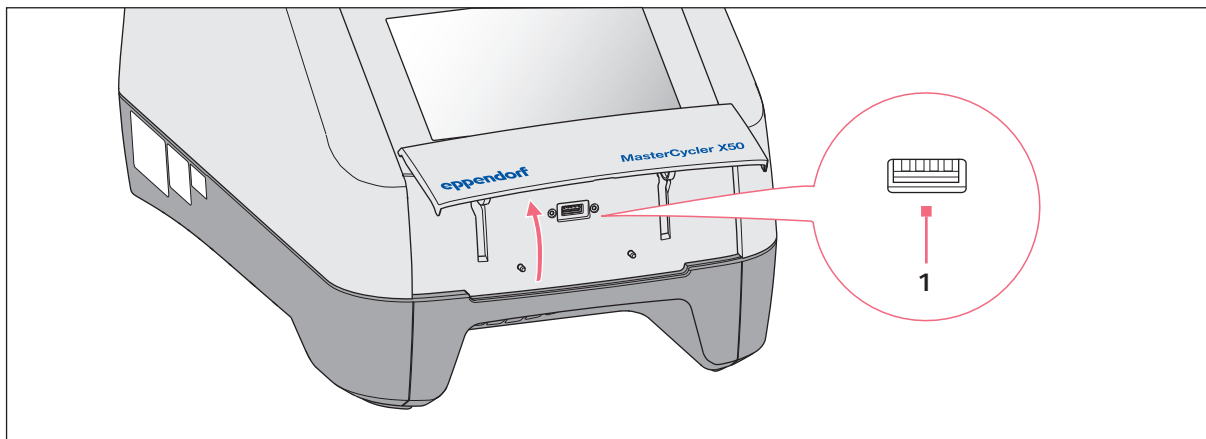
- ▶ Remove the protective foil before switching on the device for the first time.
- 

- ▶ Connect the mains connection socket to the power socket using a power cable.

## 4.2.2 Using the USB port

The master variants of the Mastercycler X50 have a USB port to which a storage medium can be connected.

There is no USB port on the eco devices.



1. Open the lid.
2. Insert the storage medium into the USB port (1).
3. After data has been imported or exported: Remove the storage medium and close the lid.

## 4.2.3 Connecting the Mastercycler X50 to a network

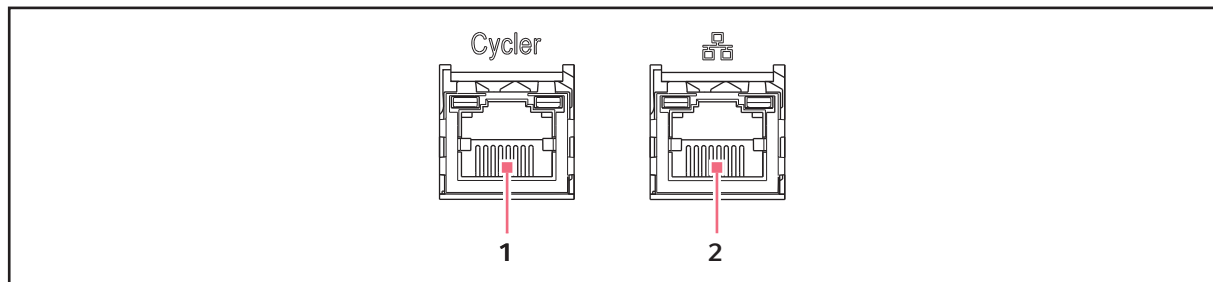


The master device can be connected directly to the Internet and to an internal network. An Internet connection is not necessary to operate the device. If the master device is connected to the Internet the operator is responsible for data security.

- ▶ A connection to the internal network or the Internet can only be made by a network administrator.
- ▶ Check the settings for the internal network or the Internet before making a connection.



The device has a network connection (RJ45). It is possible to work with a DHCP or a fixed IP address. The connection is possible with any common, ethernet-based infrastructure. We recommend 100 Mbit or 1 Gbit connections (autonegotiation).



**1 Cycler port**

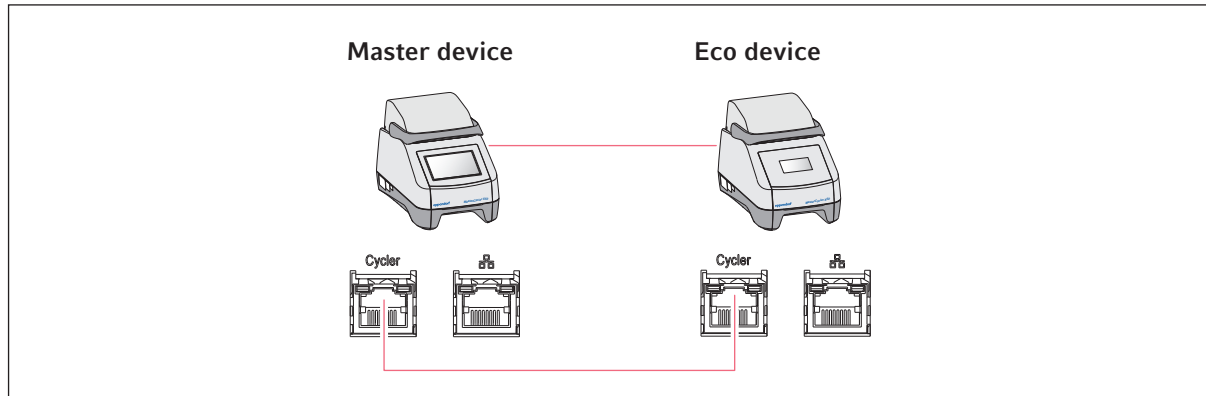
**2 Ethernet port. In eco devices this port is deactivated.**

1. Connect the master device to the internal network via the **Cycler** port.
2. Connect the eco devices to the internal network via the **Cycler** port.

The eco devices are recognized by the master device and can be assigned to the master device (see *Assignment on p. 72*).

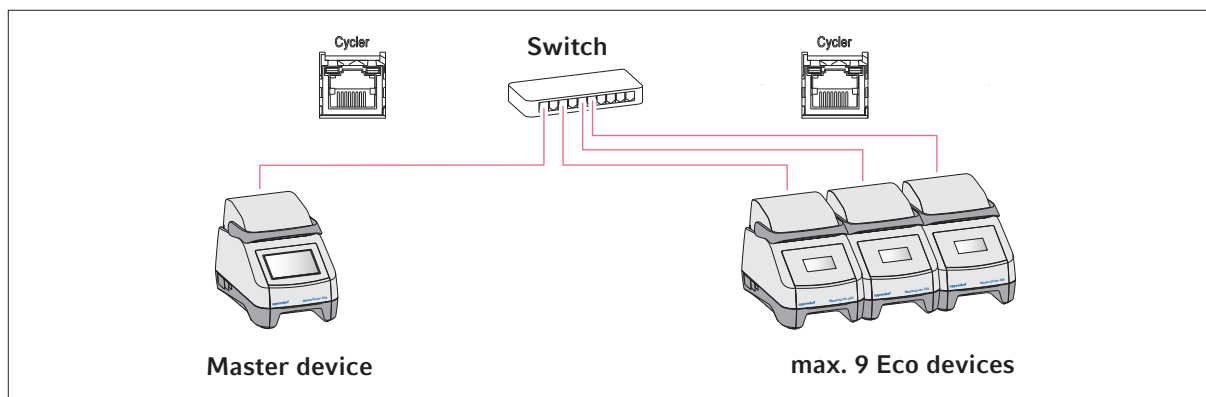
3. Connect the master device to the Internet via port **2**.

#### 4.2.4 Connecting the eco device directly to the master device



- ▶ Connect the master device and the eco device via the **Cyclor** ports.  
The eco device is recognized by the master device and can be assigned to the master device (see *Assignment on p. 72*).

#### 4.2.5 Connecting multiple eco devices



1. Connect the master device to the Ethernet switch via the **Cyclor** port.
2. Connect the eco devices to the Ethernet switch via the **Cyclor** ports.  
The eco devices are recognized by the master device and can be assigned to the master device (see *Assignment on p. 72*).

### 4.3 Shut down



Programs on connected eco devices continue to run when the master device is switched off.

If the Mastercycler X50 is not in use for more than one week, the following steps must be carried out:

1. Load the block with an empty PCR plate or tube.
2. Close the heated lid and flip the handle forwards.  
The closed lid prevents contamination of the thermoblock.
3. Disconnect the Mastercycler X50 from the power supply.



## 5 Operation

### 5.1 Initial steps

Before the Mastercycler X50 is used for the first time, the following points must be met:

- The device is correctly connected.
- The device is free of damage.
- Free circulation of air around the ventilation gaps at the rear of the device and at the fan between the front stabilizing feet has been guaranteed.

#### 5.1.1 Switching the device on

1. Switch on the device using the power switch at the back.

The status lamp lights up and the fan starts.

The software starts.

#### 5.1.2 Open heated lid

The Mastercycler X50 is equipped with a heated lid. The heated lid automatically adjusts to the height of the used PCR tubes or PCR plates. It can be operated with one hand. Manual adjustment to the tube height, or adjusting the contact pressure to the tube lids, is not required.

The heated lid ensures uniform contact between the tubes and the thermoblock, and secures the tube lids against leaks. The heating process prevents condensation from forming in the upper area of the tube during the tempering of the reaction liquid.



**WARNING! Biohazard when tempering with the heated lid open.**

When tempering with an open heated lid, the lids of the reaction vessels can spring open. This will release sample material.

- ▶ Only temper with a closed heated lid.



**CAUTION! Risk of burns on the thermoblock, heated lid and reaction vessels.**

The thermoblock, heated lid and reaction vessels reach temperatures of over 50 °C very quickly.

- ▶ Wait until the temperature of the thermoblock, heated lid and reaction vessels is below 30 °C.
- ▶ Then open the heated lid.

- 
- ▶ Flip the lid handle up as far as it will go.

### 5.1.3 Closing heated lid



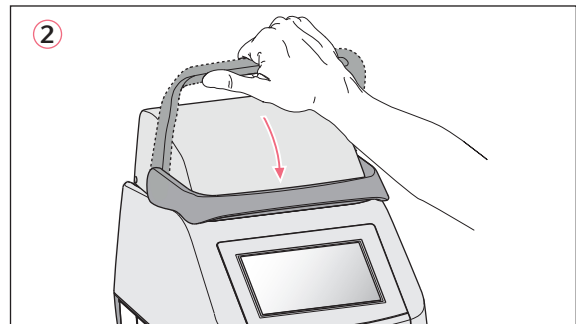
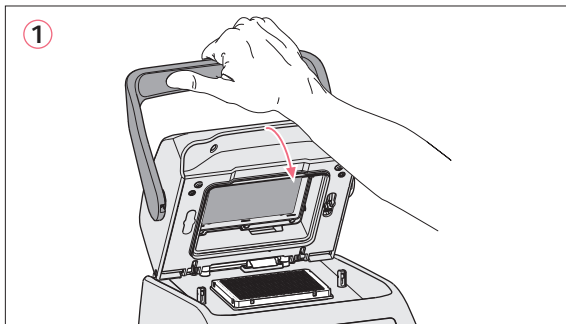
**CAUTION! Risk of crushing when closing the heated lid.**

- ▶ Hold the middle of the handle on the heated lid.
- ▶ When you close the heated lid, do not place your fingers between the heated lid and the housing.



Always make sure that the thermoblock is loaded with PCR tubes of the same type only to ensure a uniform height of the tubes. This is necessary in order to make sure that the tubes are evenly pressed into the thermoblock.

1. Load the thermoblock with PCR tubes or a PCR plate.



2. Close the heated lid **(1)**.
3. Move the lid handle further down and lock it **(2)**.



The required force to lock the heated lid depends on the type of used PCR tubes or the PCR plate.

The device is ready for operation.

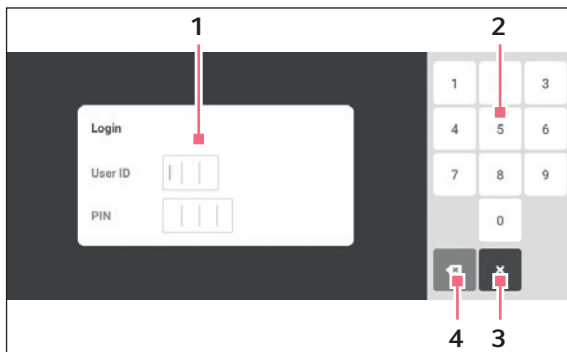
## 5.2 Operating the user interface

- i** The touch screen is designed to be operated with your fingers only without the need for tools. Laboratory gloves made of nitrile or latex can be worn. Alternatively, a stylus can be used, for example, when thick gloves need to be worn in the laboratory.
- i** If liquid comes into contact with the touch screen, the functions displayed on the touch screen may be triggered.
  - ▶ Do not drop any liquids onto the touch screen.
  - ▶ Do not spill any liquids onto the touch screen.

### 5.2.1 Logging in and out as a user

Prerequisites

The user administration is set up



1 Edit box

2 Number pad

3 Abort login

4 Delete the entry step by step

#### Logging in as a user

1. Tap the *Login* button.
2. Enter your user ID or user name.
3. Enter your PIN or password.

If the correct PIN or password was entered, the user is automatically logged in.

#### Logging out as a user

1. Tap the *Logout* button.

- i** As an alternative to the *Logout* button in the toolbar users can log out using the *Menu*.

## 5.2.2 Home screen

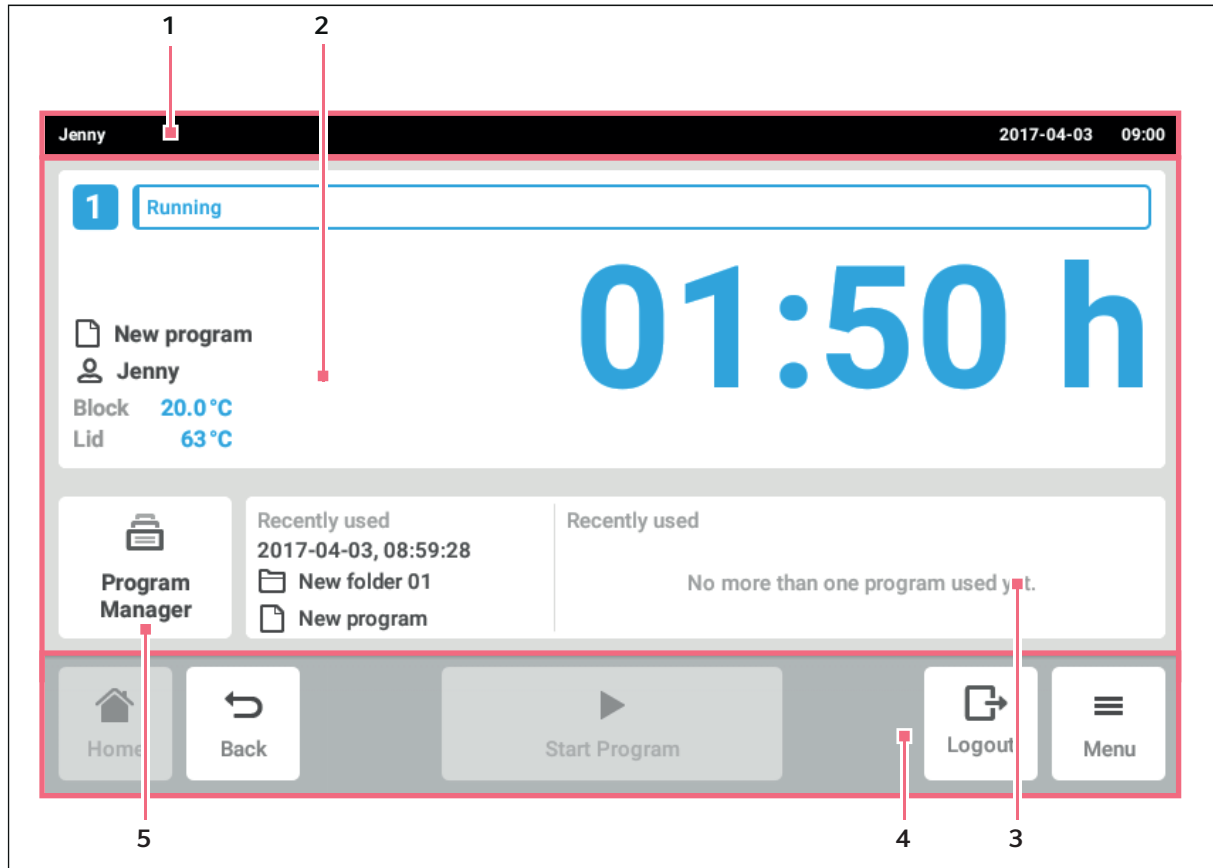


Fig. 5-1: Home screen

### 1 Status bar

User name if the user is logged in via the user administration.  
 Date and time

### 2 Current information about the device status and the selected program.

### 3 Display of the most recently used programs or users.

### 4 Toolbar

Buttons for navigation and operation of the device

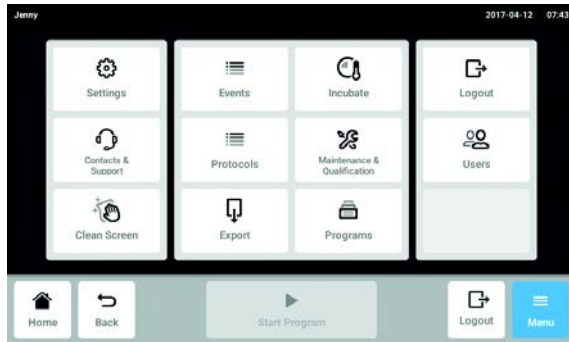
### 5 Program Manager

The buttons for navigating within software are located in the toolbar **(4)**. The toolbar is always visible.

- *Home*: The home screen is displayed.
- *Back*: The previous window is displayed.
- *Menu*: The menu items available for the device are displayed (see *Menu on p. 29*).

## 5.3 Menu

### 5.3.1 Opening the menu



1. Tap the *Menu* button.  
The menu items available for the device are displayed.
2. Select menu item.

### 5.3.2 Events

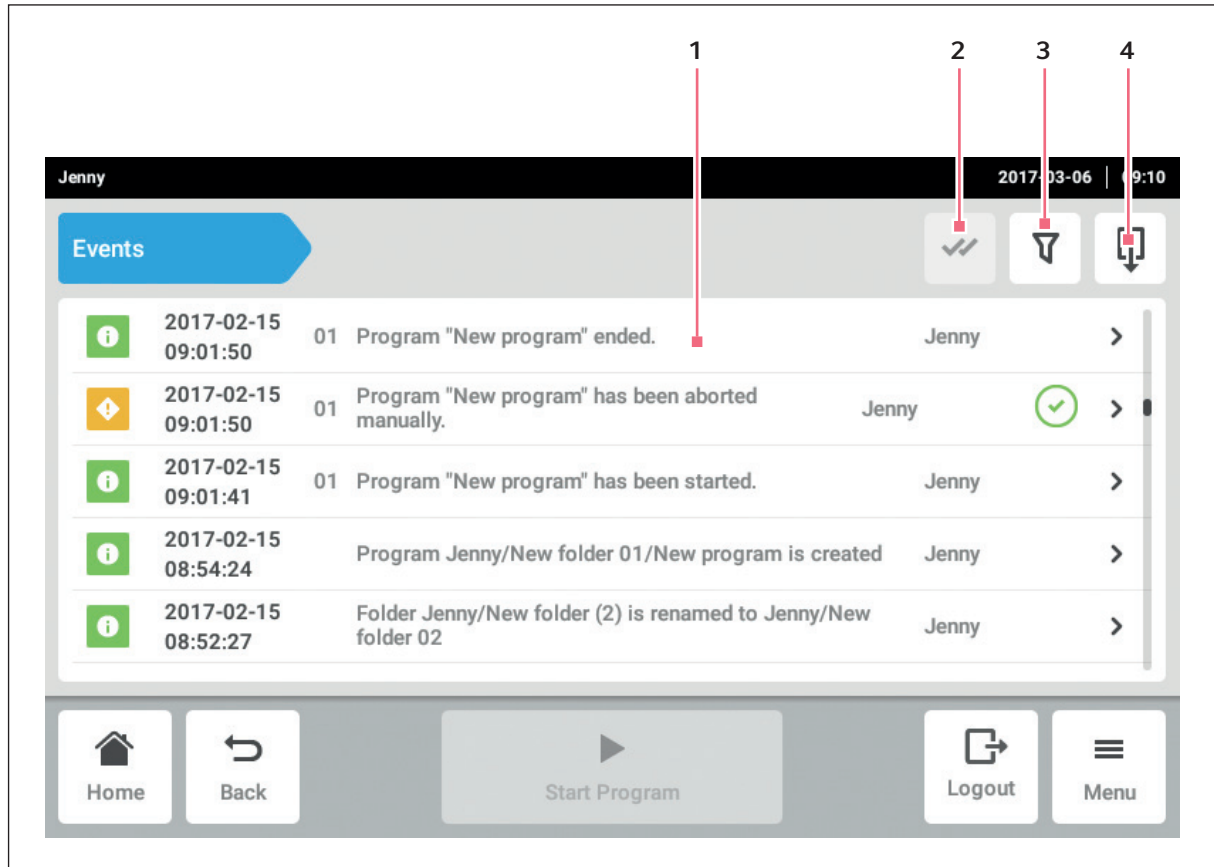


Fig. 5-2: Events window

- 1 List with all notifications and messages
- 2 Confirm all pending notifications.
- 3 Filter options  
The button is highlighted in blue if messages are filtered.
- 4 Export list with messages to a USB storage medium

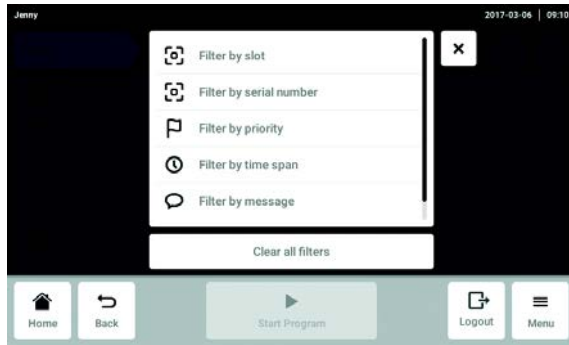


500000 notifications and messages are saved. If there are more than 500000 entries, the oldest entries are overwritten.

### Accessing *Events*

1. Tap the *Menu* button.
2. Tap the *Events* button.

### Filtering the event list



3. Tap the button for the filter options.  
 The window with the settings for the filters opens.

- *Filter by slot*
- *Filter by serial number*
- *Filter by priority*
- *Filter by time span*
- *Filter by function*
- *Filter by message*
- *Filter by acknowledgement status*

If a filter is enabled, a checkmark appears next to the filter.

To deactivate all filters, tap the *Clear all filters* button.

4. Close the selection window.  
 The filtered notifications and messages are displayed.

### Opening more information

1. Select a notification or message from the event list.  
 The window with detailed information appears.

2. Navigate between the notifications and messages using the arrow keys.

### Exporting the event list

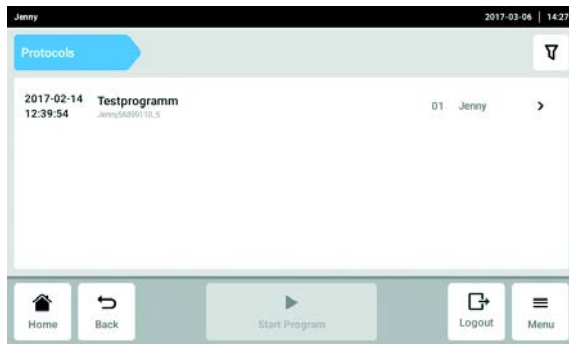
1. Connect a USB stick and tap the *Export* button.  
 the event list is saved as an Excel table. If the export was successful, the *Export successful* window appears.
2. To complete the process, confirm the message.

### 5.3.3 Protocols



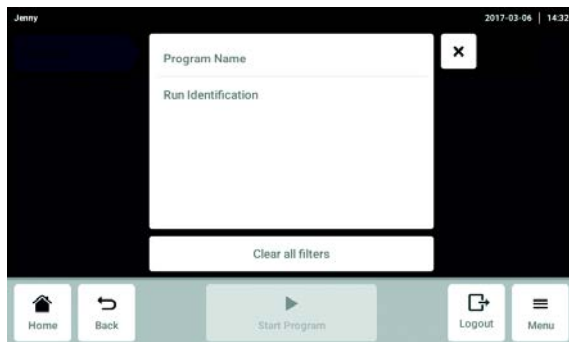
1 000 program runs can be saved. If there are more than 1 000 programs, the oldest programs are overwritten.

#### Opening logs



1. Tap the *Menu* button.
2. Tap the *Protocols* button.  
The list of logged programs appears.

#### Filtering logs



3. Tap the button for the filter options.  
The window with the settings for the filters opens.
  - *Program Name*
  - *Run Identificaion*

If a filter is enabled, a checkmark appears next to the filter.  
To deactivate all filters, tap the *Clear all filters* button.
4. Close the selection window.  
The filtered logs are displayed.



## Information window

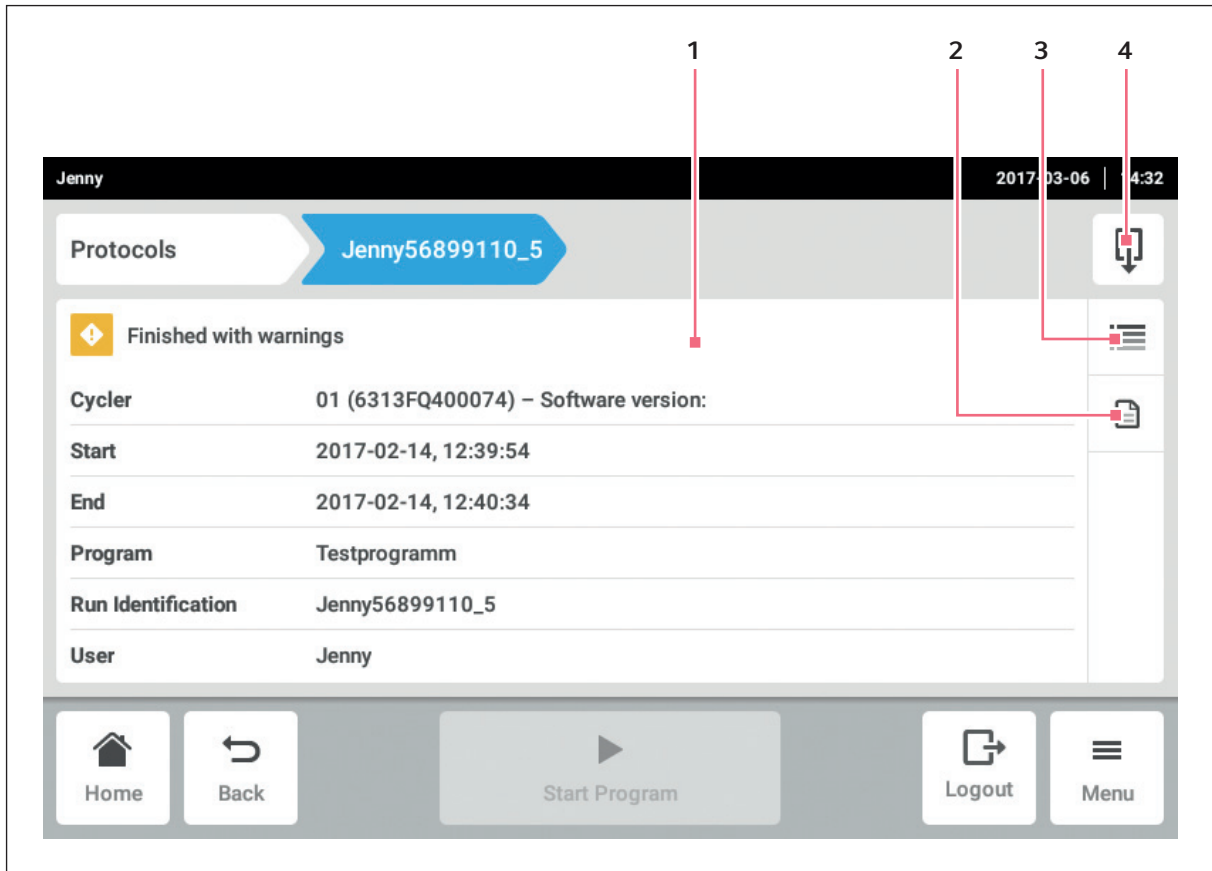


Fig. 5-3: Information window of a log

- 1 General information on the program
- 2 Information on the program settings

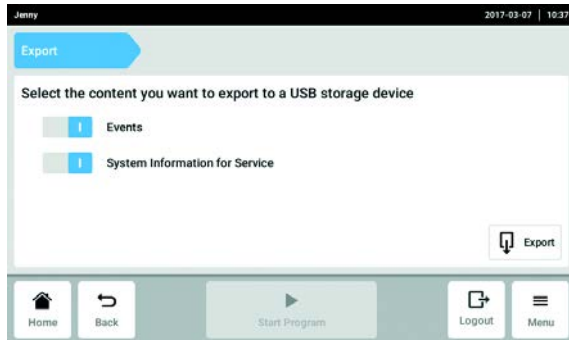
### 3 Details

### 4 The *Export* button

A log with information on the program can be saved as a PDF file.

1. Select the log.  
The information window of the log is displayed.

### 5.3.4 Export



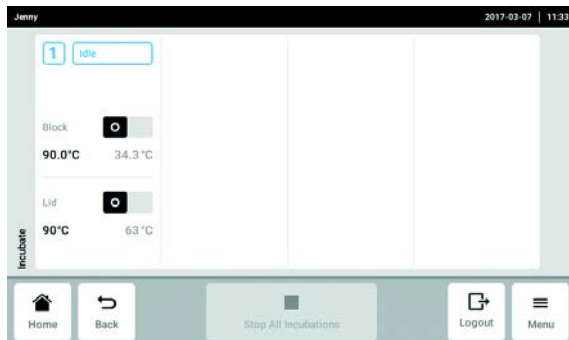
1. Tap the *Menu* button.
2. Tap the *Export* button.  
A selection list for the export appears.
3. Connect the USB stick.
4. Select data for the export.
5. Tap the *Export* button to export the selected data.  
The data is saved. If the export was successful, the *Export successful* window appears.
6. To complete the process, confirm the message.

### 5.3.5 Incubate

The thermoblock and the lid can be tempered independently from a PCR run.

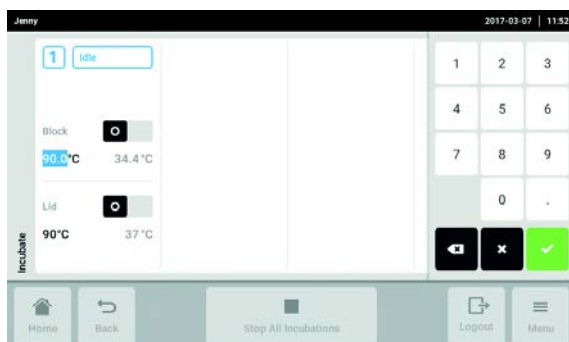
The *Incubate* function can be set separately for all connected devices.

#### Opening the *Incubate* function



1. Tap the *Menu* button.
2. Tap the *Incubate* button.

#### Setting the *Incubate* function.



3. Set the temperature for the thermoblock.
4. Use the switch to activate the *Incubate* function for the thermoblock.
5. Set the temperature for the lid.
6. Use the switch to activate the *Incubate* function for the lid.

### Terminating the *Incubate* function

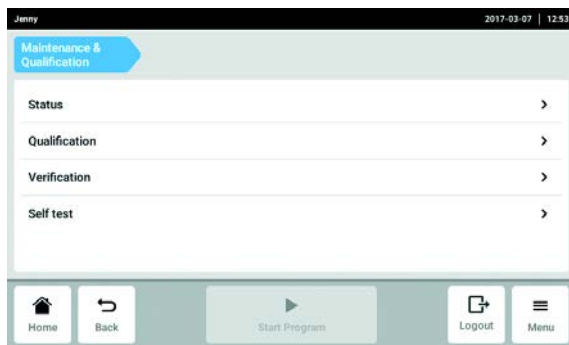


7. To terminate the *Incubate* function for all devices, tap the *Stop All Incubations* button.
8. To terminate the *Incubate* function for individual devices, switch off the corresponding *Block* or *Lid* switch.

### 5.3.6 Maintenance & Qualification

The functions under the *Maintenance & Qualification* menu item can be opened separately for all connected eco devices.

#### Opening the *Maintenance & Qualification* function



1. Tap the *Menu* button.
2. Tap the *Maintenance & Qualification* button.
  - *Status*
  - *Qualification*
  - *Verification*
  - *Self test*

#### *Status*

- ▶ Tap the *Status* button and select the device.
 

The following information is displayed:

  - *Verification state*
  - *Last verification*
  - *Next verification*
  - *Remaining operations without verification*
  - *Self test state*
  - *Last self test*
  - *Next self test*
  - *Remaining operations without self test*

### *Qualification*

Only an administrator may perform the qualification.



The administrator may only qualify the device after all inspections required by the lab have been performed.

### *Verification*

#### Prerequisites

Verification requires a Temperature Verification System.



Verification with the multi-channel system is described in the operating manual of the "Temperature Verification System – T6".

Verification with the one-channel measuring device can only be performed by an administrator or a user with standard access rights.

1. Tap the *Verification* button.
2. Follow the instructions displayed by the software.
3. Export the certificate to a USB stick after taking the measurement.



The certificate can only be exported to a USB stick directly after the measurement is taken.

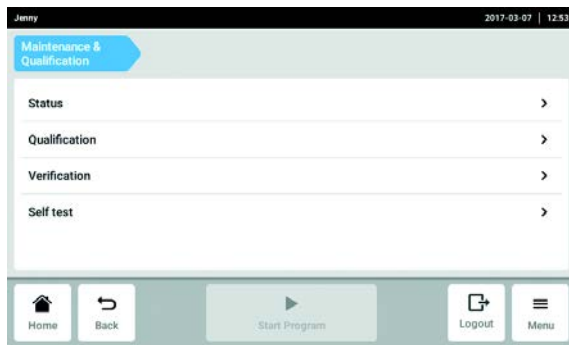
## Self test

Any user can perform a self test.

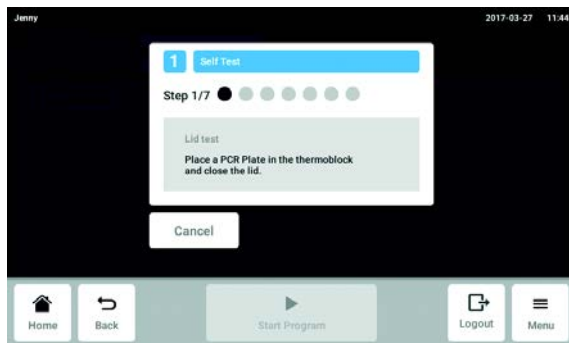
The master variants of the Mastercycler X50 have an integrated self test function. The self test function provides a simple way of testing the correct function of the master device and the connected eco devices without any further tools.



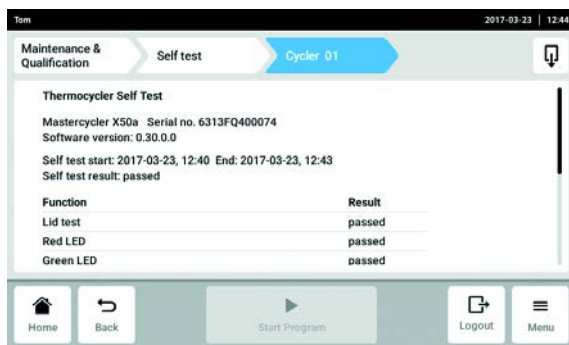
The certificate can only be exported to a USB stick directly after the measurement is taken.



1. Tap the *Self test* button and select the device.



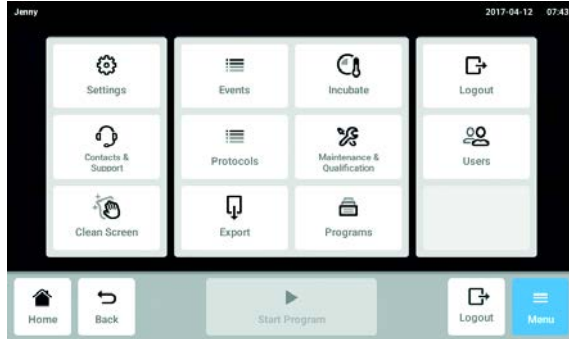
2. Follow the instructions displayed by the software. The results are displayed after the self test.



3. Connect a USB stick and tap the *Export* button. The certificate is saved as a PDF file. If the export was successful, the *Export successful* window appears.

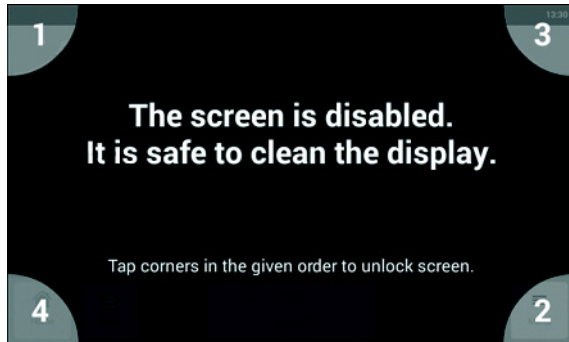
4. To complete the process, confirm the message.

### 5.3.7 Locking and cleaning the touch screen



1. Tap the *Menu > Clean Screen* button.  
The touch screen is locked for normal usage and can be cleaned.

#### Unlocking the locked touch screen



2. Touch the corners in the numbered sequence.  
The touch screen is unlocked for operation and the previous screen is displayed.

## **6 User administration**

### **6.1 The user administration concept**

The user administration can be used to organize access to the Mastercycler X50. There are three user roles:

- Administrator
- User with standard rights
- User with restricted rights

#### **6.1.1 Administrator**

The administrator has additional rights:

- Configuring Mastercycler X50
- Access to user administration

#### **6.1.2 User with standard rights**

A normal user can operate the Mastercycler X50 without restrictions and create new programs and folders.

#### **6.1.3 User with restricted rights**

A user with restricted rights can operate the Mastercycler X50 with certain restrictions, i.e. select, start and stop existing programs.

#### **6.1.4 User rights without user administration**

Without user administration all users have the same rights an administrator has.

### 6.1.5 User rights

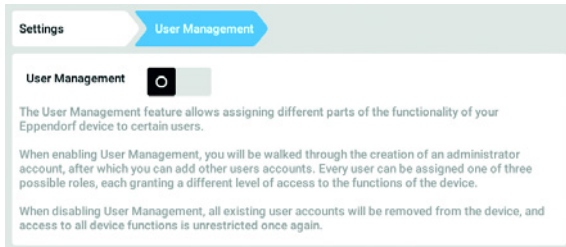
Tasks	User with restricted rights	User with standard rights	Administrator/ operator (rights without user administration)
Export logs	x	x	x
Login/Logout	x	x	x
Changing your own password	x	x	x
View administrator settings (does not apply for user administration)	x	x	x
View device information	x	x	x
View logs	x	x	x
Start self test	x	x	x
View programs	x	x	x
View program folder	x (shared)	x	x
Select program for PCR run	x	x	x
Enter run ID	x	x	x
Start PCR run	x (released programs only)	x	x
Interrupt PCR run	x	x	x
Stop PCR run	x	x	x
Select incubation temperature	x	x	x
Start incubation	x	x	x
Stop incubation	x	x	x
View user settings	x	x	x
View <i>Program information</i>	x	x	x
Identify last error	x	x	x
Set service intervals	x	x	x
Use <i>Sketch mode</i>		x	x
Import and export programs	x (export only)	x	x
Edit programs		x	x
Assign programs to a folder		x	x
Create, edit and delete a folder		x	x
Cut, copy and paste the contents of a folder		x	x
Delete the contents of a folder		x	x
Maintain programs (protected program access)		x	x



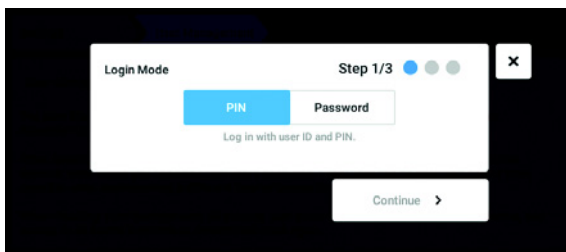
Tasks	User with restricted rights	User with standard rights	Administrator/ operator (rights without user administration)
Select program templates		×	×
Release a program		×	×
Define access rights for folders			×
Share folders		×	×
Verify a device		×	×
Set the <i>Auto Restart</i> function			×
Set the acoustic alarm			×
Assign eco devices to the system			×
Configure network settings			×
Create a user account			× (administrator)
Updating the software	×	×	×
<i>Qualification status</i> accounts			×
Change a user name			×
Change user rights			×
Reset a user password			×
Deleting a user account			×

## 6.2 Defining settings in the user administration

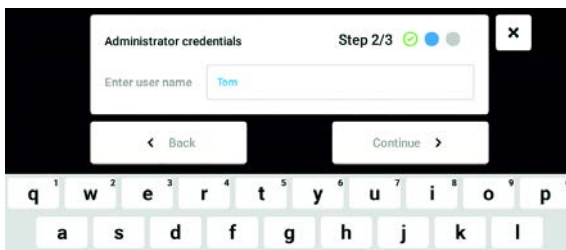
### 6.2.1 Creating an administrator



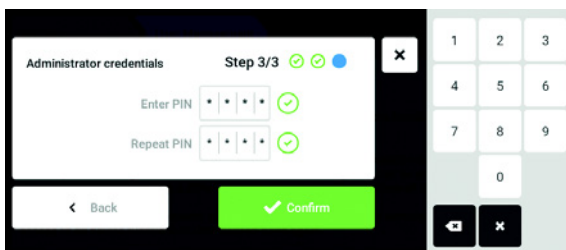
1. Tap the *Menu* button and navigate to the *Settings* > *User Management* menu item.
2. To activate the user administration, slide the *User Management* switch to the *I* position. The *Login mode* window appears.



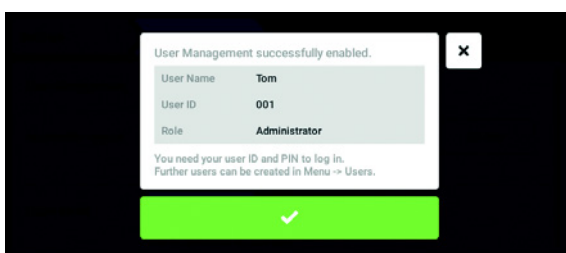
3. Define the login mode for all users.
4. Continue the process with *Continue*. The *Administrator credentials* window appears.



5. Enter the user name for the first administrator in the *Enter User Name* field.
6. Continue the process with *Continue*. The *Administrator credentials* window appears.



7. Enter PIN or password in the *Enter PIN/Password* field. Confirm the entry in the *Repeat PIN/Password* field.
8. Continue the process with *Continue*. The *User Management successfully enabled* window appears. The user administration is activated. The user account for the first administrator is created.

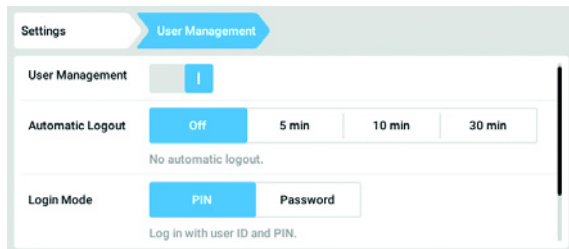


9. Confirm the message. The *User Management* window appears. It is now possible to edit the user administration.

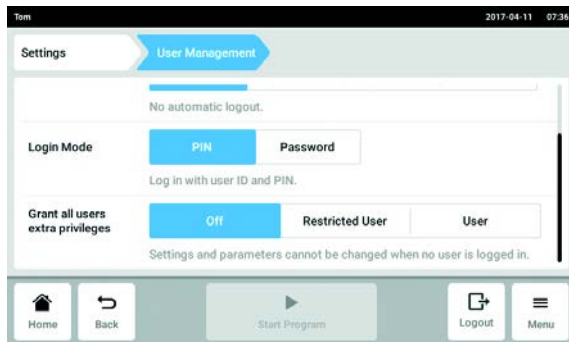
## 6.2.2 Editing the user administration

### Prerequisites

- The administrator is logged in.



1. Tap the *Menu* button and navigate to the *Settings* > *User Management* menu item.



2. Define the settings for the user administration.

- *User Management*: Switch the user administration on and off.
- *Automatic Logout*: Define the time after which a user is automatically logged out if the touch screen is not used.
- *Login Mode*: Define the login mode for all users.
- *Grant all users extra privileges*: Restricted rights (*Restricted User*) or standard rights (*User*) are active for all users.



When the *Grant all users extra privileges* option is activated a login is not necessary. Also users who are not recorded in the user administration can operate the device with these rights (*Restricted User / User*).

### 6.2.3 Deactivating the user administration



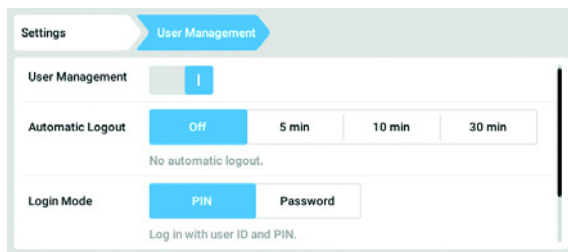
#### NOTICE! Data loss in case of deactivation of the user administration

Deactivating the user administration deletes all user accounts.

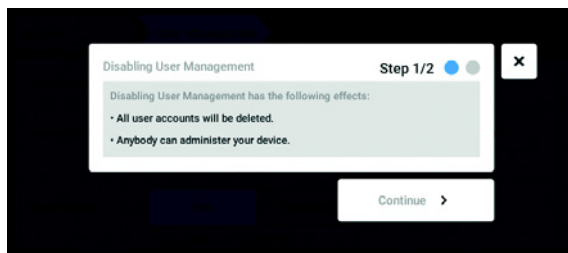
- ▶ Check whether deactivation of the user administration is required.
- ▶ Inform all users that the user accounts have been deleted.

#### Prerequisites

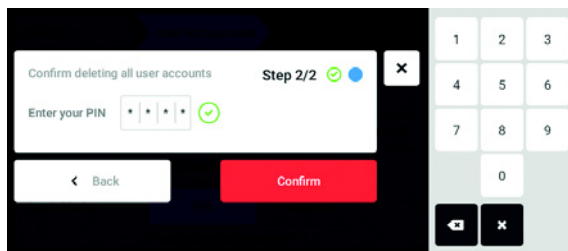
- The administrator is logged in.



1. Tap the *Menu* button and navigate to the *Settings* > *User Management* menu item.
2. To deactivate the user administration, slide the *User Management* switch to the *Off* position. The *Disabling User Management* window appears.



3. Continue the process with *Continue*. The *Confirm deleting all user accounts* window appears.



4. Enter the PIN/password.
5. Complete the process with *Continue*. The user administration is deactivated. All user accounts are deleted.

## 6.3 Editing user accounts as administrator



**NOTICE! Data loss due to loss of the administrator password.**

The administrator can only change his password or PIN with his access data. If the administrator's access data is lost, no changes will be possible in the user management and system settings.

In this case, the device will have to be reset to the factory settings by an authorized service technician. All the user accounts and the data and settings stored on the device will be deleted.

- ▶ Create a second user account with administrator rights.
- ▶ Keep the administrator password secure.

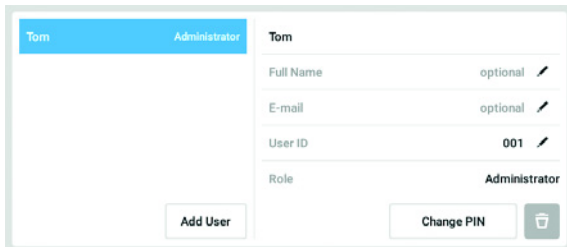
### 6.3.1 Creating a user account



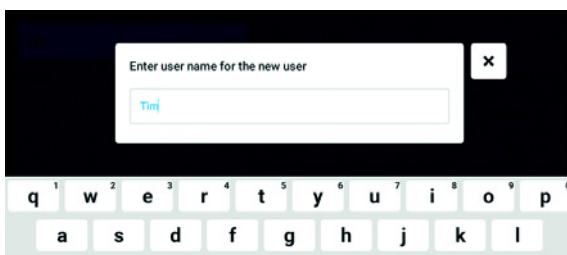
You can create 999 user accounts.

**Prerequisites**

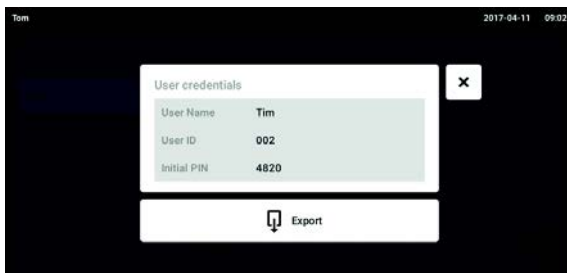
- The administrator is logged in.



1. Tap the *Menu* button and navigate to the *User* menu item.  
The list with the user accounts is displayed.
2. Tap the *Add User* button.  
The *Enter User Name for the new user* field appears.



3. Enter the user name.
4. Confirm your entry.  
The *User credentials* window appears.  
The user account is created. The user data appears in the window.  
The user is assigned to the user group *Restricted User*.



5. **Optional export of user data:** Connect the USB stick and tap the *Export* button.
6. Confirm the export.  
The user data is exported to the USB stick in a TXT file.
7. If the export was successful, the *Export successful* window appears.  
To complete the process, confirm the message.

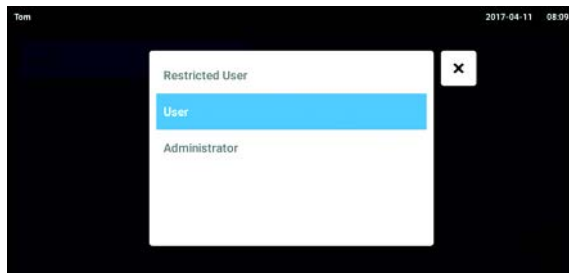
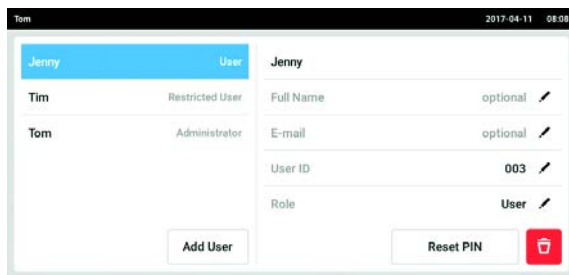
### 6.3.2 Editing user accounts



Users with restricted user rights or standard rights can only edit their own entries *Full Name* and *E-mail*. Users can always change their own PIN or password. Administrators can assign a new user ID to a user account and change the rights.

#### Prerequisites

- The administrator is logged in.



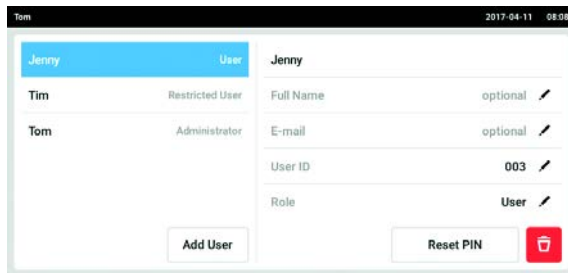
1. Tap the *Menu* button and navigate to the *User* menu item.  
The list with the user accounts is displayed. Entries that can be edited are indicated by a black pen.
2. Select the user account.
3. Optional: Enter the full name.
4. Optional: Enter the e-mail address.
5. To change the user ID, tap *User-ID*.
6. Select the new user ID.
7. To change the user group and the corresponding rights, tap *Role*.  
The list with the available user groups is displayed.
8. Assign a user group to the user.
  - Restricted User
  - User
  - Administrator

The selected parameters are stored and appear in the user account.

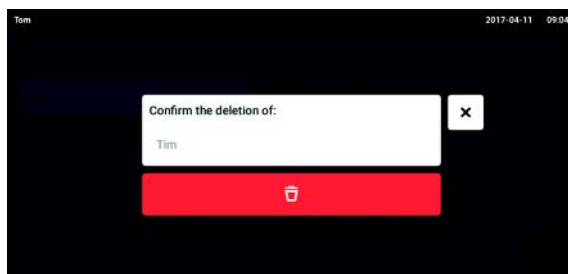
### 6.3.3 Deleting a user account

#### Prerequisites

- The administrator is logged in.



1. Tap the *Menu* button and navigate to the *User* menu item.  
The list with the user accounts is displayed.
2. Select the user account to be deleted.
3. Tap the *Recycle bin* symbol.  
The *Confirm the deletion of:* window appears.



4. Confirm that you want to delete the user account.  
The user account is deleted.

### 6.3.4 Resetting the password/PIN for a user account

If a user has forgotten his password/PIN, the administrator can generate a new password.

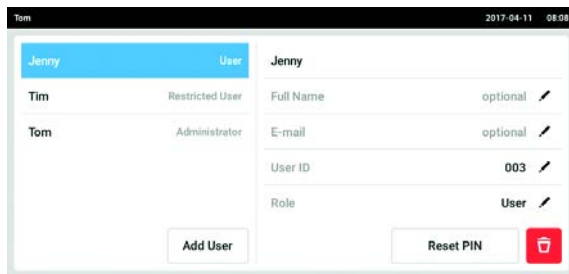


The administrator can only change his password or PIN with his current access data. If the administrator's access data is lost, changes are no longer possible in the user administration. In this case, the device must be reset to the factory settings by an authorized service technician. All user accounts and the programs, log files and logs stored on the device will be deleted.

- ▶ Create a second user account with administrator rights.

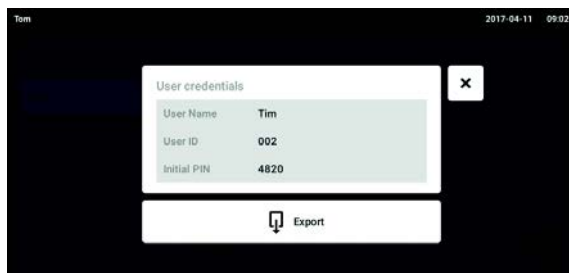
#### Prerequisites

- The administrator is logged in.



1. Tap the *Menu* button and navigate to the *User* menu item.  
The list with the user accounts is displayed.
2. Select the user account.
3. Tap the *Reset Password/PIN* button.  
The *Do you want to reset the Password/PIN for:* window appears.

4. Confirm the process with *Reset*.  
The *New Credentials* window appears.  
The new password/PIN is created automatically.



5. To export the user data, connect the USB stick and tap the *Export* button.
6. Confirm the export.  
The user data is exported to the USB stick in a TXT file.
7. If the export was successful, the *Export successful* window appears.  
To complete the process, confirm the message.

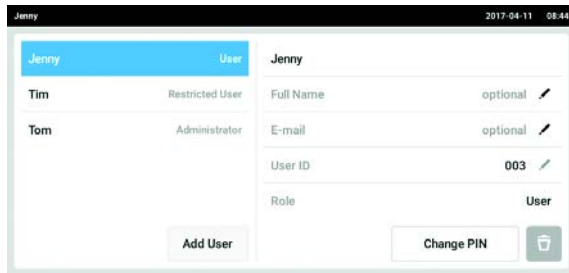


## 6.4 Administrating your own user account

Users can only edit their own *Full Name* and *E-mail* entries. Users can always change their own PIN or password.

### Prerequisites

- The user is logged in.



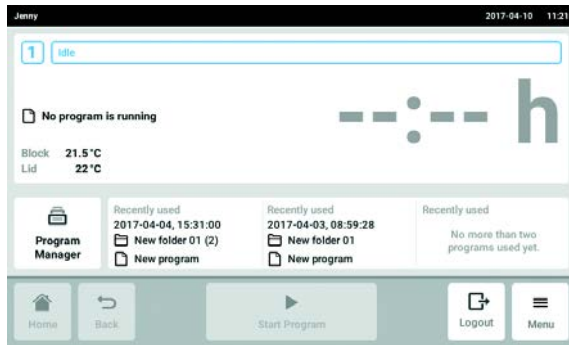
1. Tap the *Menu* button and navigate to the *User* menu item.  
The list with the user accounts is displayed. Entries indicated by a black pen can be edited.
2. Select the user account.
3. Optional: Enter the full name.
4. Optional: Enter the e-mail address.
5. To change the password/PIN, tap the *Change Password/PIN* button.
6. Enter the current password/PIN in the *Enter current Password/PIN* field.
7. Enter the new password/PIN in the *Enter new Password/PIN* and *Repeat new Password/PIN* fields.
8. Confirm your entry.  
The message *Password/PIN successfully changed* appears.  
The new password or the new PIN is active.



## 7 Programming

### 7.1 Overview *Program Manager*

#### 7.1.1 Accessing *Program Manager*



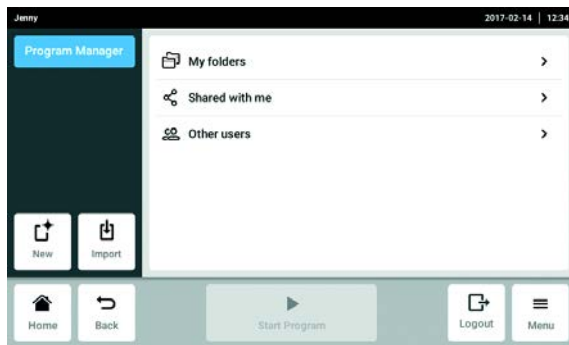
► Tap the *Program Manager* on the home screen. The window with the *Program Manager* is displayed.



The *Program Manager* can also be called up in the *Menu*.



The available folders and programs are displayed depending on the user rights.

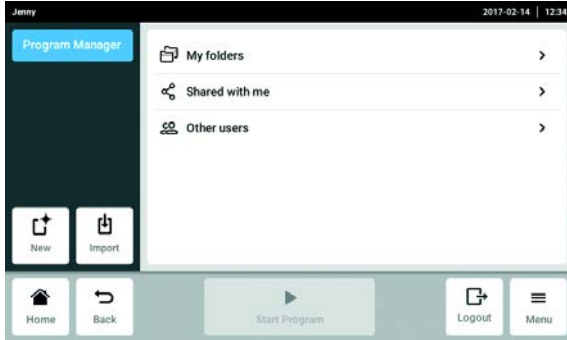


- *New* button: Create new folders or new programs.
- *Import* button: Import folders and programs from a USB stick.
- *My folder*: Folder for your own subfolders and programs.
- *Shared with me* folder: This folder contains all subfolders and programs other users have granted you access to.
- *Other users* folder: Depending on the user rights, subfolders and programs can be accessed by other users.
- *Lost and Found* folder (not shown here): This folder is only visible for the administrator. It contains deleted programs and folders of all users.

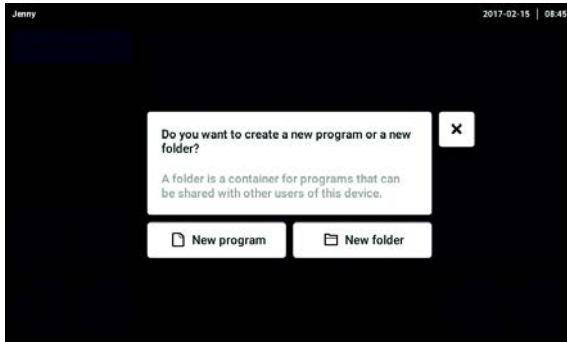
## 7.2 Creating a new folder



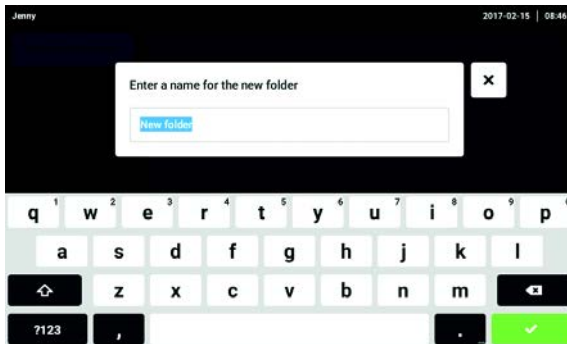
You can create up to 500 folders.



1. Tap the *New* button.



2. Select *New folder*.



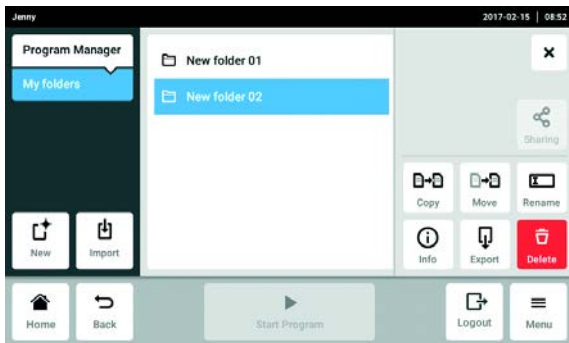
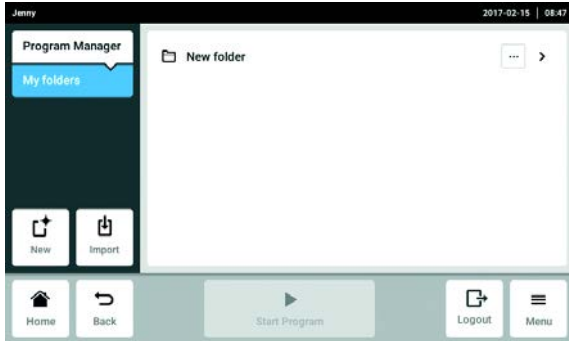
3. Enter a name for the folder.

4. Confirm your entry.

The new folder is displayed under *My folders*.

### 7.3 Administration of folders

1. Tap the ... button to the right of the folder name. The folder editing options are displayed.



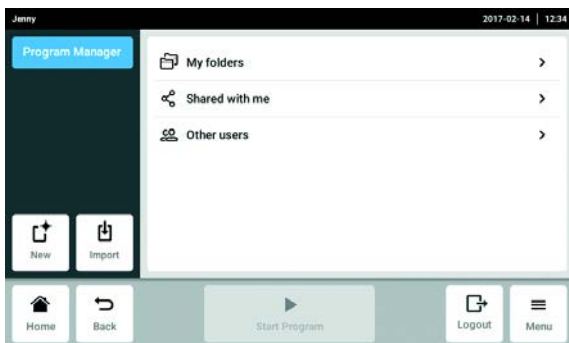
- *Sharing* button (administrator and users with standard rights): Share a folder with other users.
- *Copy* button: Copy folder
- *Move* button (administrator only): Move folder from *Lost and Found* to *My folders*.
- *Rename* button: Rename folder
- *Info* button: Information about folder
- *Export* button: Copy folder to a USB stick
- *Delete* button: Delete a folder

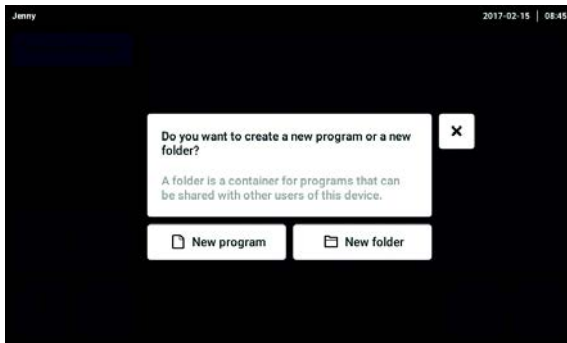
### 7.4 Creating a new program



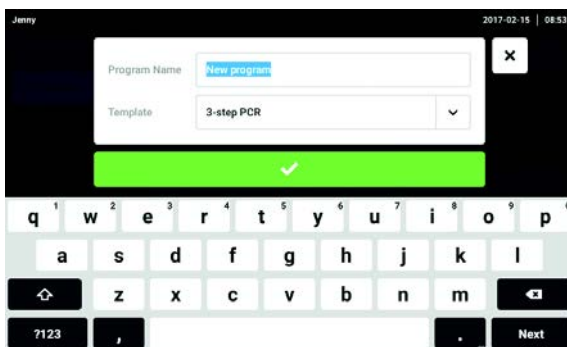
You can create and save up to 5000 programs.

1. Tap the *New* button.

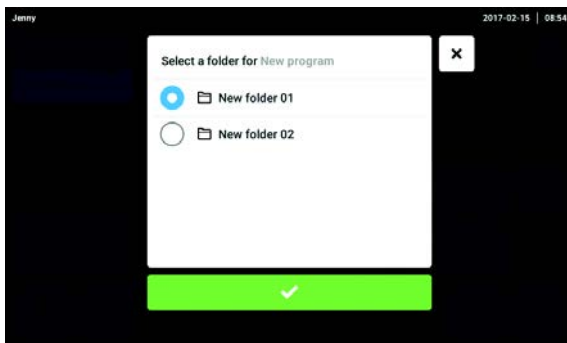




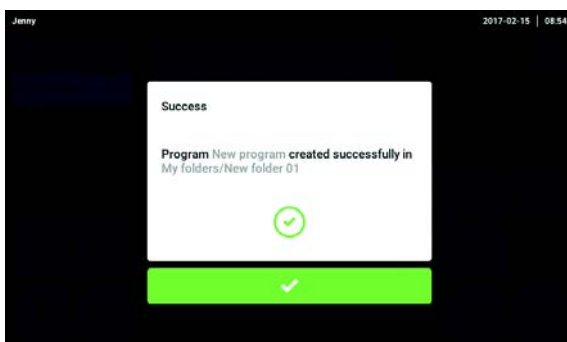
2. Select *New program*.



3. Enter a name for the program.
4. Select the template.
5. Confirm your entry.

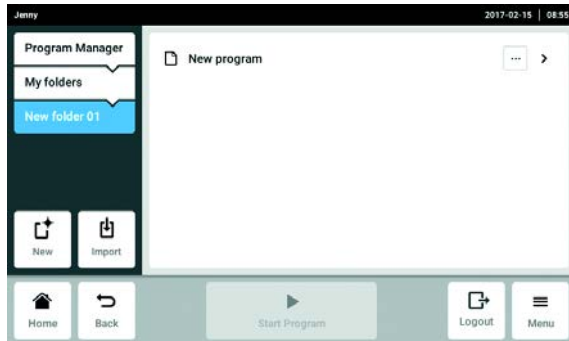


6. Select and confirm the folder for the new program.

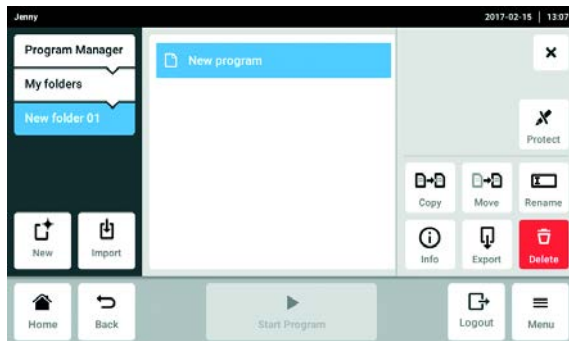


7. Confirm the displayed message.  
The new program is displayed in the selected folder.

## 7.5 Administration of programs



1. Tap the ... button to the right of the program name.  
The program administration options are displayed.



- *Protect* button: Protect program (*Read only* or *Write and read*)
- *Copy* button: Duplicate a program
- *Move* button: Move program to another folder
- *Rename* button: Rename program
- *Info* button: Information about program
- *Export* button: Copy program to a USB stick
- *Delete* button: Delete program

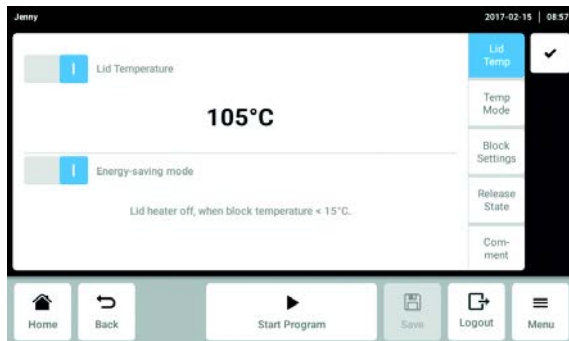
## 7.6 Adjusting program settings



1. Select a program.



2. Tap the *Edit Settings* button.  
 The window with the header settings is displayed.



- *Lid Temp*: Lid temperature settings.
- *Temp Mode*: Block temperature control mode
  - Fast ( $\leq 10 \mu\text{L}$ )
  - Intermediate ( $10 \mu\text{L} - 20 \mu\text{L}$ )
  - Standard ( $20 \mu\text{L} - 50 \mu\text{L}$ )
  - Safe ( $> 50 \mu\text{L}$ )
- *Block Settings*: Set the block type and limit the heating and cooling rate.
- *Release State*: Select program status.
- *Comment*: Add comment to program. The text is displayed in the log of the PCR run.



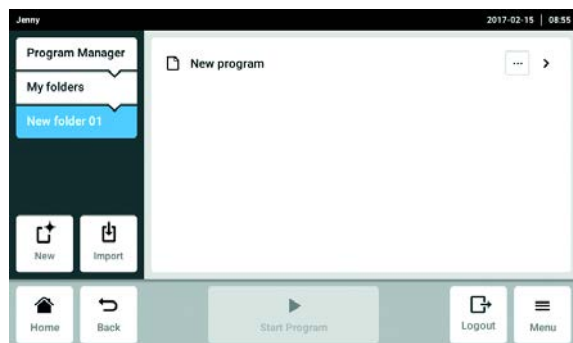
Programs with the status “released” can not be changed and can also be used by users with restricted user rights.

- ▶ Release programs after detailed examination only.



## 7.7 Editing a program

### 7.7.1 Selecting a program step



1. Select a program.

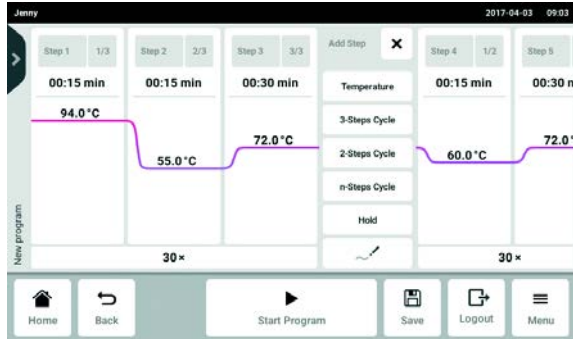


2. Select the column with the program step to be edited.

The available editing options are displayed next to the program steps.

- *Gradient*: Set gradients
- *Inc./Dec.*: Stepwise temperature and/or holding time adjustment from cycle to cycle
- *Ramp*: Set temperature control speed of the thermoblock
- *Add step left*: Add another programming step to the left of the selected programming step
- *Add step right*: Add another programming step to the right of the selected programming step
- *Delete*: Delete program step

## 7.7.2 Inserting a program step



1. Tap the *Add step left* or *Add step right* button.

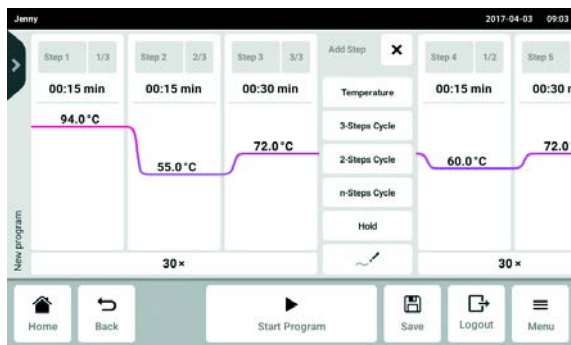
Depending on the previous or following program step, the following program steps can be selected:

- *Temperature*: Individual temperature step with adjustable block temperature and holding time.
  - *3-Steps Cycle*: Cycle program step with 3 temperature steps and an adjustable number of repetitions (1 to 99).
  - *2-Steps Cycle*: Cycle program step with 2 temperature steps and an adjustable number of repetitions (1 to 99).
  - *n-Steps Cycle*: Cycle program step with up to 40 temperature steps and an adjustable number of repetitions (1 to 99).
  - *Hold*: Temperature step with adjustable block temperature and indefinite holding time. The set temperature is maintained until the user continues the program manually.
  - *Sketch mode*: Free programming on the touch screen
2. Select a new program step.  
The new program step is inserted on the left or right of the previously marked program step.
  3. Set the block temperature, holding time and number of repetitions.
  4. Tap the *Save* button.  
The modified program is saved.

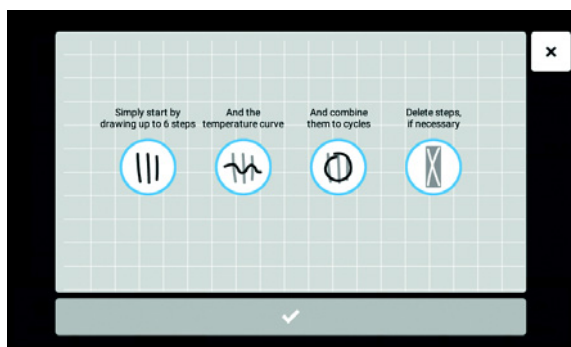
### 7.7.3 Sketch mode



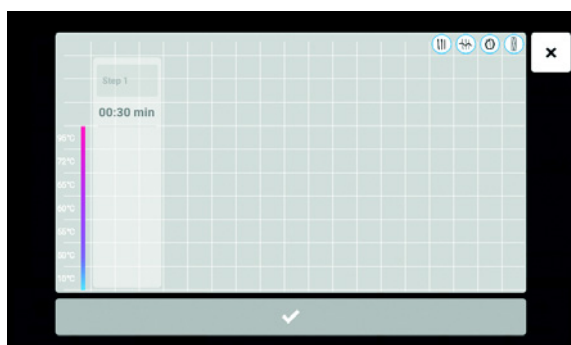
1. Select the column with the program step to be edited.
2. Tap the *Add step left* or *Add step right* button.



3. Tap the *Sketch mode* button.
  - The start page with an explanation for the four functions appears for a short time.
  - Vertical line: Adds a program step. A maximum of 6 program steps are possible.
  - Horizontal line: Sets the temperature for a program step. A curve that spans over several program steps creates a temperature sequence.
  - Circle around several program steps: Creates a cycle for these program steps (30x).
  - Cross: Deletes the program step.



4. Wait until the start window closes.



5. Create program steps, temperatures and cycles.
6. Confirm program steps.
  - The *Sketch mode* window is closed.
7. Tap the *Save* button.
  - The modified program is saved.

## 7.7.4 Set gradients

You can use a gradient step to optimize the specificity and yield in PCR reactions. A vertical or horizontal temperature gradient is generated during the holding time. The ramp rates before and after the gradient step are constant over the entire thermoblock.

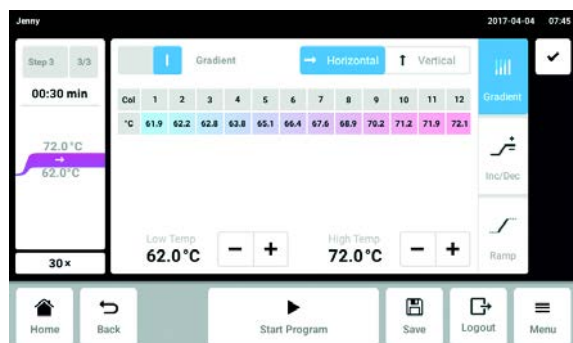


The gradient function is only available if the *Block Settings* in the header settings for the devices were selected correctly (see p. 56). If *Any* is selected no gradient temperatures are displayed.

The gradient temperature can be set to between 30 °C and 99 °C. If a gradient temperature under 30 °C was defined an alarm message is displayed when the program starts. The gradient spread is max. 30 °C



1. Select the column with the program step to be edited.

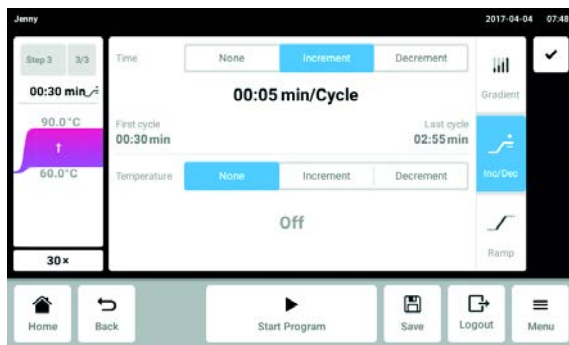


2. Tap the *Gradient* button and activate the function.
3. Select a horizontal or vertical gradient function.
4. Define the lower (*Low Temp*) and upper (*High Temp*) temperature.
5. Tap the *Save* button.  
The modified program is saved.
6. Close the window.

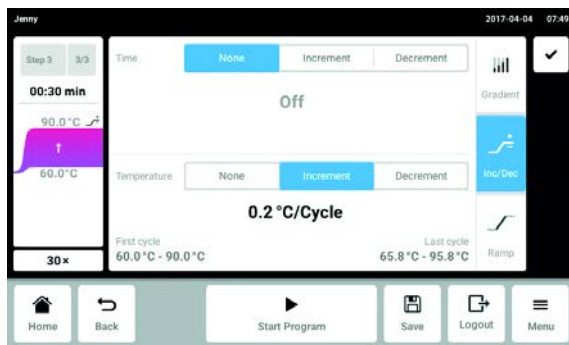
## 7.7.5 Defining increments and decrements



1. Select the column with the program step to be edited.



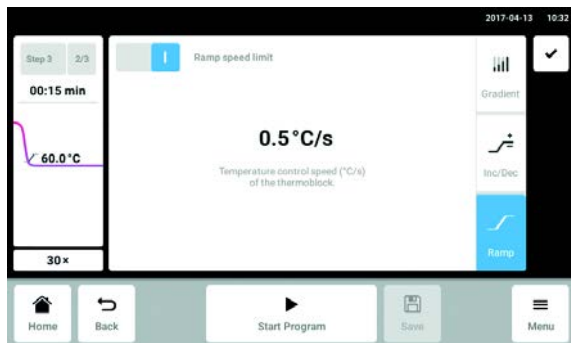
2. Enter an increment or decrement for the cycle time.  
*Time:* The duration of the next cycle will be increased or reduced by the selected value.  
 Adjustable from 00:01 to 01:00 in 1 s increments.



3. Enter an increment or decrement for the block temperature.  
*Temperature:* The block temperature for the next cycle will be increased or reduced by the selected value.  
 Adjustable within the block limits between 4 °C and 99.0 °C in increments of 0.1 °C.
4. Close the window.
5. Tap the *Save* button.  
 The modified program is saved.

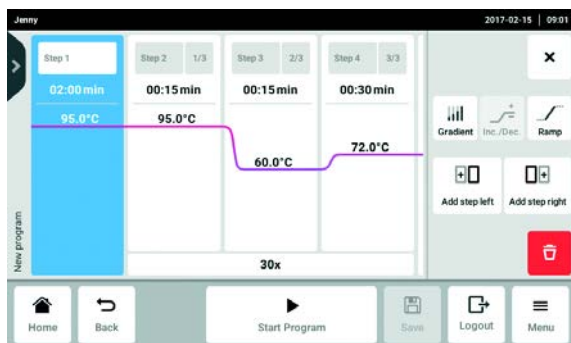
## 7.7.6 Defining the ramp

The ramp can be used to set the temperature control speed of the thermoblock.



1. Select the column with the program step to be edited.
2. Tap the *Ramp* button and activate the function.
3. Enter the value for the ramp rate (cooling).  
The maximum ramp rate depends on the cooling rate (see *Application parameters on p. 88*).
4. Close the window.
5. Tap the *Save* button.  
The modified program is saved.

## 7.7.7 Delete program step



1. Select the column with the program step to be deleted.
2. Tap the *Delete* button.  
The program step is deleted.

**8 PCR run**  
**8.1 Loading the thermoblock**  
**8.1.1 Selecting the sample tubes**



**WARNING! Biohazard due to unsuitable reaction vessels, plates and lids.**  
 Unsuitable reaction vessels, plates and lids will get damaged in the Cycler. This will release sample material.

- ▶ Only use reaction vessels, plates and lids that meet the requirements specified in the operating manual.

**Approved sample tubes for devices with a 96-well thermoblock**

The thermoblock can be loaded with the following sample tubes:

- 0.1 mL PCR strips
- 0.2 mL PCR tubes and PCR strips
- 96-well PCR plates

**Approved sample tubes for devices with a 384-well thermoblock**

The thermoblock can be loaded with the following sample tubes:

- 384-well PCR plates

**Approved sample tubes for devices with High Pressure Lid**

Devices with a High Pressure Lid can be loaded with the following sample tubes:

- 96-well PCR plates

**Compatible PCR plate types**

The following PCR plate types are compatible.

Semi-skirted PCR plate	Skirted PCR plate	Non-skirted/unskirted PCR plate
PCR plate with surrounding half-edge.	PCR plate with a surrounding edge.	PCR plate without any surrounding edge.

### Requirements for sample tubes

The sample tubes must meet the following requirements:

- Temperature resistance at least 120°C
- Exact fit in the thermoblock

### Maximum volumes

The possible sample volumes can vary depending on the tubes used.

#### For devices with a 96-well thermoblock

- PCR plates: max. 100 µL
- 0.1 mL PCR strips: max. 100 µL
- 0.2 mL PCR tubes and PCR strips: max. 100 µL

#### For devices with a 384-well thermoblock

- PCR plates: max. 25 µL

## 8.1.2 Inserting the sample tubes



### **WARNING! Biohazard due to sample material directly in the thermoblock.**

- ▶ Do not fill sample material directly into the thermoblock.
- ▶ Only use reaction vessels, plates and lids that meet the requirements specified in the operating manual.



### **WARNING! Biohazard when tempering with the heated lid open.**

When tempering with an open heated lid, the lids of the reaction vessels can spring open. This will release sample material.

- ▶ Only temper with a closed heated lid.

Observe the following notes:

- ▶ Never run a program with an empty thermoblock. Always equip the thermoblock with PCR plates or PCR tubes when running a program.
- ▶ Place the tubes or strips into the center of the thermoblock and ensure that they are symmetrically positioned.
- ▶ Load the thermoblock with at least 5 tubes. If you have fewer reaction batches, also add empty tubes so the thermoblock is loaded with at least 5 tubes.



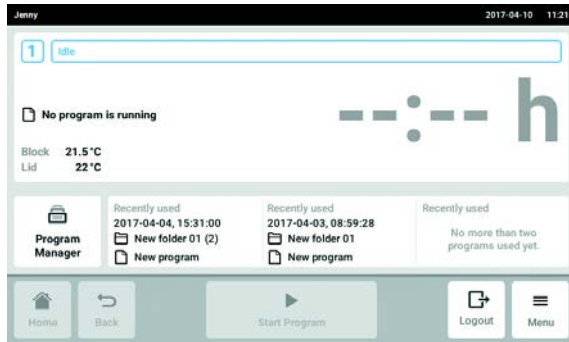
Very soft PCR tubes may become deformed at high temperatures. To prevent deformations:

- Increase the number of empty sample tubes in the thermoblock.
- Reduce the temperature of the heated lid .
- Use original Eppendorf PCR consumables. Eppendorf PCR consumables are optimally suited for the device.



## 8.2 Selecting a program

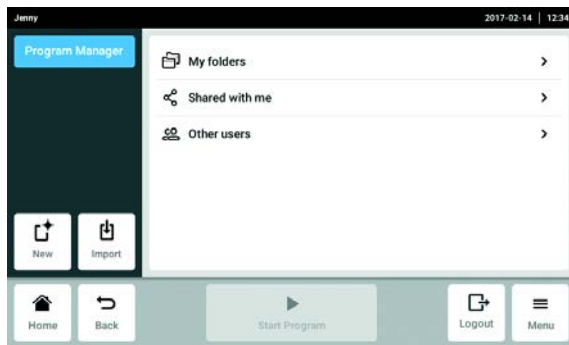
### 8.2.1 Selecting a program in the *Program Manager*



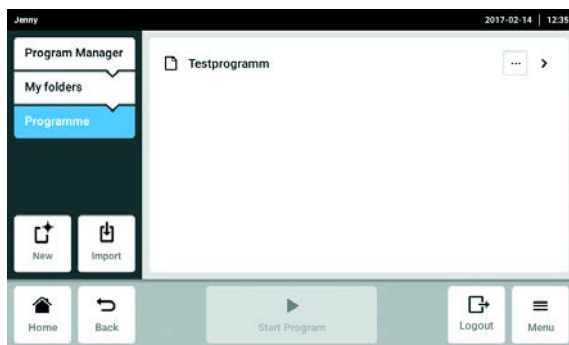
- ▶ Tap the *Program Manager* on the home screen. The window with the *Program Manager* is displayed.



The available folders with programs are displayed depending on the user rights.

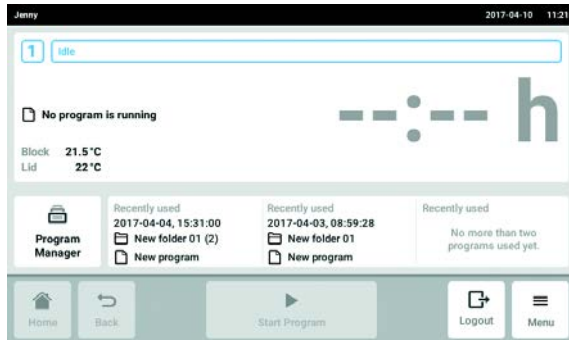


- ▶ Open the *My folders* folder. Your own folders are displayed.



- ▶ Open one of your own folders. Your own available programs are displayed.
- ▶ Select a program. The program window is displayed.

## 8.2.2 Selecting the most recently used program



- ▶ Select a program under *Recently used* on the home screen. The program window is displayed.

## 8.3 Starting a program

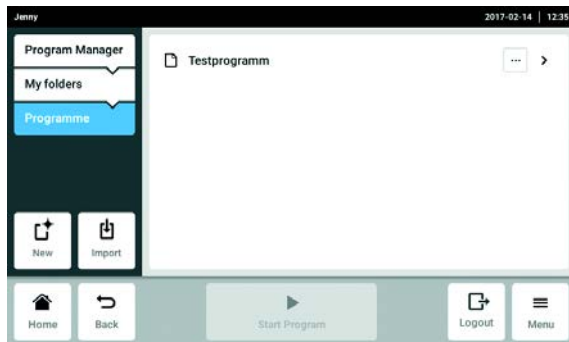


The *Start Program* button is inactive on the home screen. The button is only active in the program window if a program has been selected. A wrong program can result in sample loss. Before a program is started:

- ▶ Check the program selection.

### Prerequisites

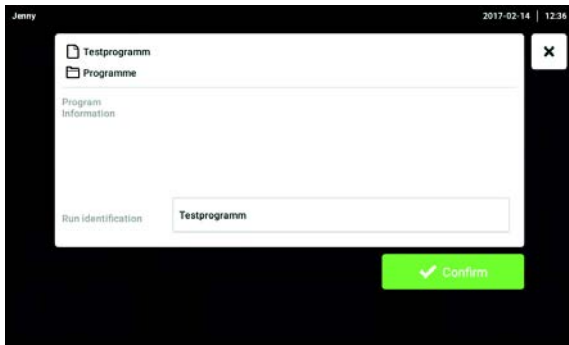
- The thermoblock is loaded
- Heated lid is closed



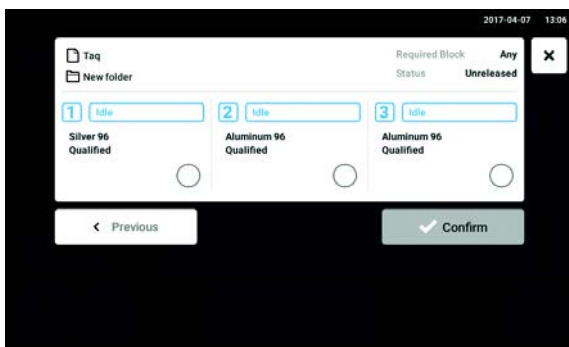
1. Select the program using the *Program Manager* or from the most recently used programs on the home screen. The program window is displayed and the *Start Program* button is now active.



2. Tap the *Start Program* button.



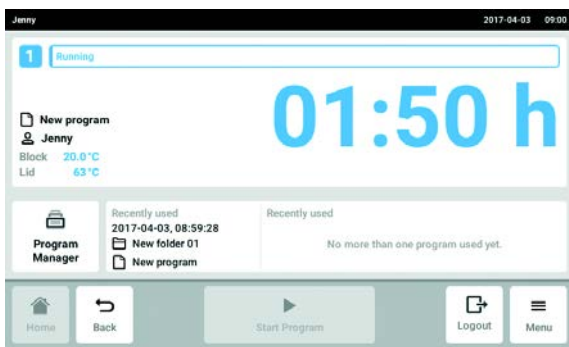
3. Accept or change the *Run identification* edit box.



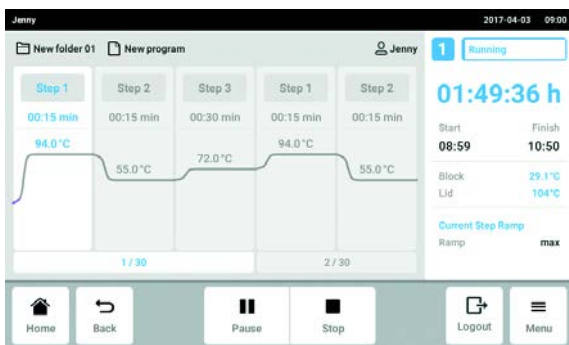
4. Select the *Cycler* (only if eco devices are connected).

5. Confirm the program selection.  
 The program starts.

### 8.4 Pausing and resuming a program

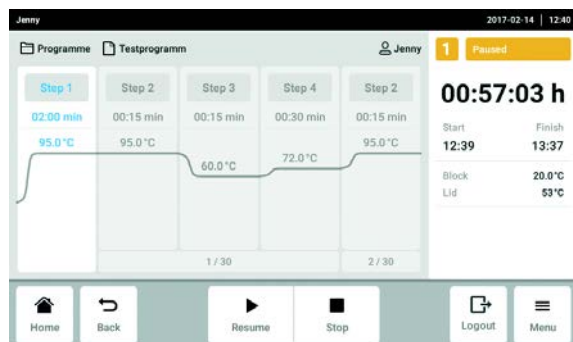


1. On the home screen, tap the window with the information about the current program.  
 The program window is displayed.



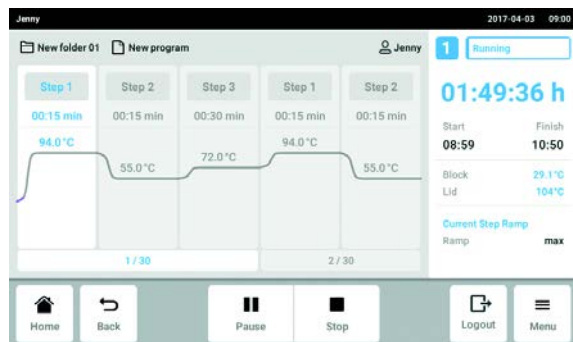
2. Tap the *Pause* button.  
 The program is paused.

## PCR run Mastercycler® X50 English (EN)

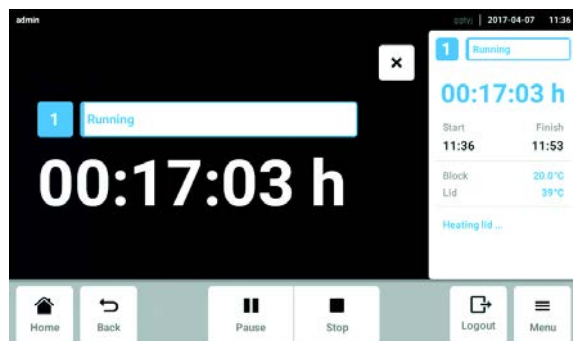


- Tap the *Resume* button.  
The program is resumed.

## 8.5 Display the remaining run time for the program

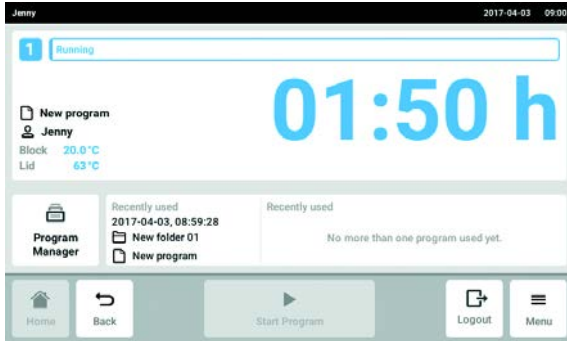


- ▶ Tap the display with the remaining run time.  
A window with the remaining run time opens.

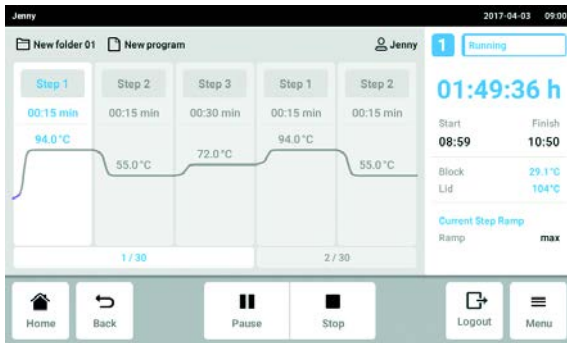


## 8.6 Aborting the program

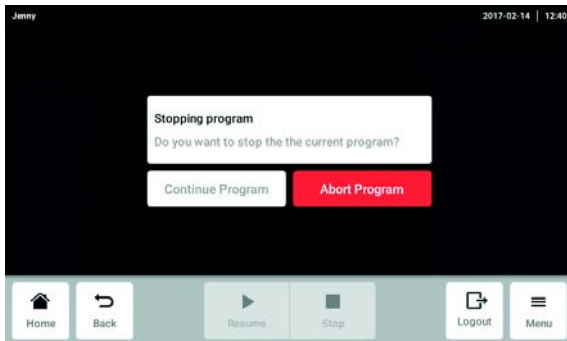
1. On the home screen, tap the window with the information about the current program. The program window is displayed.



2. Tap the *Stop* button.



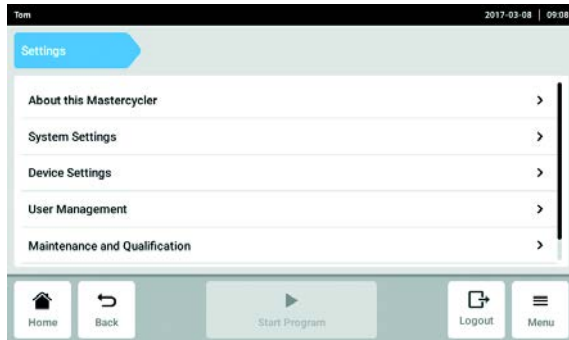
3. Tap the *Abort Program* button. The program is shut down.





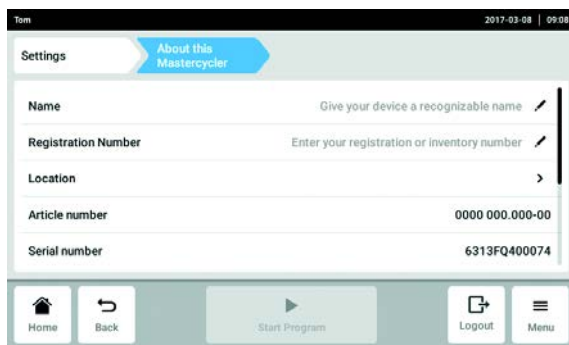
## 9 Settings

### 9.1 Calling up settings



1. Tap the *Menu* button.
2. Tap the *Settings* button.  
 The following menu items are displayed:
  - *About this Mastercycler* (see *About this Mastercycler* on p. 71)
  - *System Settings* (see *System Settings* on p. 71)
  - *Device Settings* (see *Device Settings* on p. 75)
  - *User Management* (see *Editing the user administration* on p. 43)
  - *Maintenance and Qualification* (see *Setting the service intervals* on p. 77)

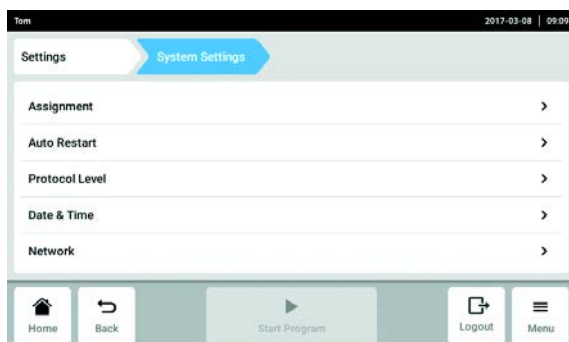
### 9.2 About this Mastercycler



- ▶ Tap the *About this Mastercycler* button.  
 The following information can be called up:
  - *Name*: The device name can be entered by the administrator.
  - *Registration Number*: The registration number can be entered by the administrator.
  - *Location*: Location information can be entered by the administrator.
  - *Article number*
  - *Serial number*
  - *Software Version*
  - *Hardware Configuration*
  - *Associated Devices*
  - *License Information*

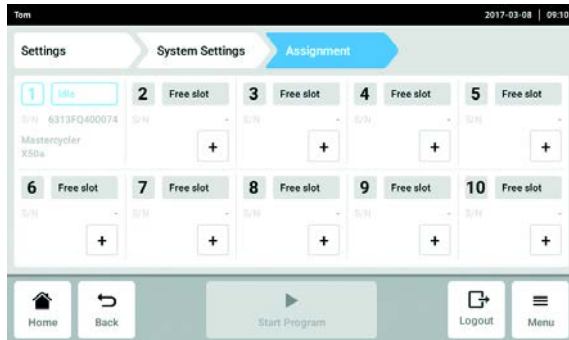
### 9.3 System Settings

#### 9.3.1 Accessing System Settings



- ▶ Tap the *System Settings* button.  
 The following settings can be made.
  - *Assignment*: Assign eco devices
  - *Auto Restart*
  - *Protocol Level*
  - *Date & Time*: Set the date, time and time zone.
  - *Network*: Set the parameter for network operation.

### 9.3.2 Assignment



1. Tap the *Assignment* button.
2. Select a free slot.  
All eco devices that are connected or available on the intranet are displayed in the selection list.
3. Assign the eco device to the slot.
4. Enter the *Registration ID* of the eco device and confirm.  
The eco device can be operated from the master device.

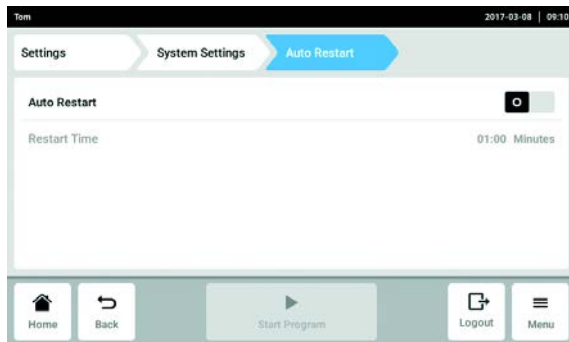


The *Registration ID* is shown on the display of the eco device.

### 9.3.3 Auto Restart

If the *Auto Restart* function is active, the current program is automatically resumed after a mains/power outage.

The *Restart Time* parameter defines how long a mains/power outage may last. If the device is not supplied with electricity again after this period is over, the current program is not continued.

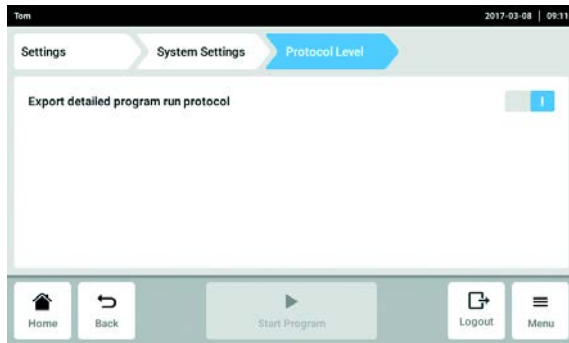


1. Tap the *Auto Restart* button.
2. Activate the function with the *Auto Restart* switch.
3. Tap the *Restart Time* button.
4. Enter the value for the *Restart Time* parameter.  
Permitted values: 1 s – 45 min



### 9.3.4 Protocol Level

The *Export detailed program run protocol* function defines how logs are exported. When this function is activated more detailed logs are exported.



1. Tap the *Protocol Level* button.
2. Activate or deactivate the *Export detailed program run protocol* function with the switch.

### 9.3.5 Date & Time

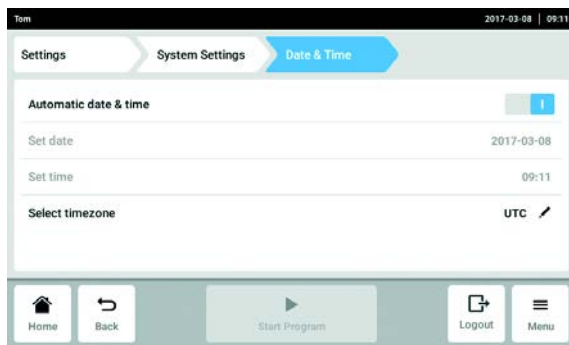
#### Setting the date and time automatically

##### Prerequisites

- The device is connected to the network. A time server is available.



If you change the date, time or time zone this may result in incorrect sorting of the logs.

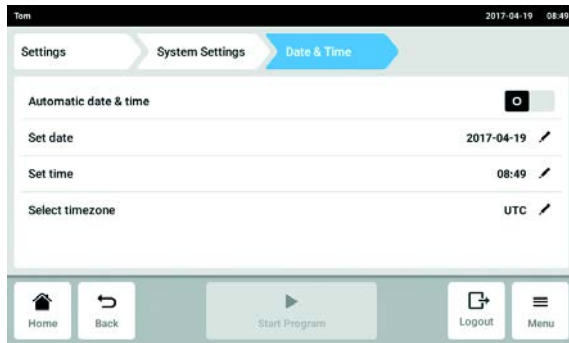


1. Tap the *Date & Time* button.
2. Activate the function with the *Automatic date & time* switch.
3. Tap the *Select timezone* button.
4. Select the continent and time zone.

### Setting the date and time manually



If you change the date, time or time zone this may result in incorrect sorting of the logs.



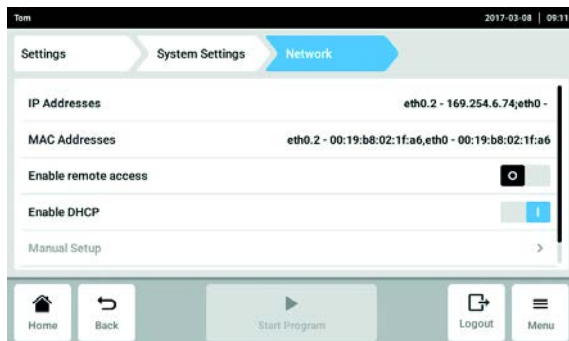
1. Tap the *Date & Time* button.
2. Deactivate the function with the *Automatic date & time* switch.  
*Set date* and *Set time* can be selected.
3. Tap the *Set date* button and enter the date.
4. Tap the *Set time* button and enter the time.
5. Tap the *Select timezone* button.
6. Select the continent and time zone.

### 9.3.6 Network



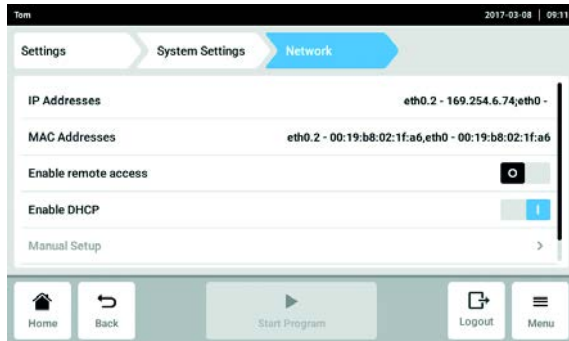
The master device can be connected directly to the Internet and to an internal network. An Internet connection is not necessary to operate the device. If the master device is connected to the Internet the operator is responsible for data security.

- ▶ A connection to the internal network or the Internet can only be made by a network administrator.
- ▶ Check the settings for the internal network or the Internet before making a connection.



1. Tap the *Network* button.  
The following settings can be made.
  - *IP Adresses*: Current IP address of the device.
  - *MAC Adresses*: Number by which the device can be uniquely identified.
  - *Enable remote access*: The device allows communication with external software.
  - *Enable DHCP*: The device uses an IP address assigned to it by an existing DHCP server.
  - *Manual Setup*: Activates a window. In this window network settings can be entered manually if no DHCP server is available. Manual Setup can be selected if automatic IP address assignment (Enable DHCP) is switched off.
  - *Self signed certificate*: Generates an own certificate.

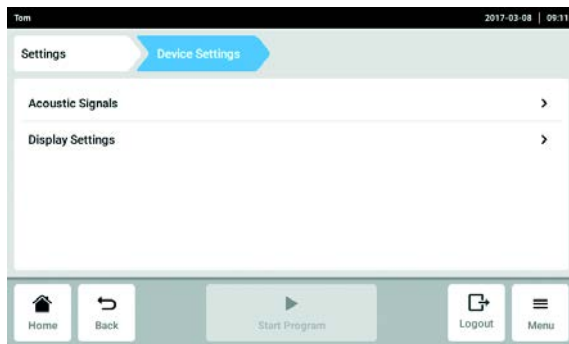
### Manual Setup



2. Deactivate the *Enable DHCP* function with the switch.
- Manual Setup* can be selected.
3. Tap the *Manual Setup* button.
4. Enter and confirm the entries in the entry window.

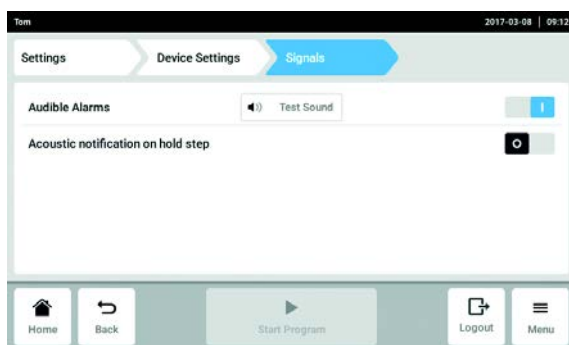
## 9.4 Device Settings

### 9.4.1 Accessing Device Settings



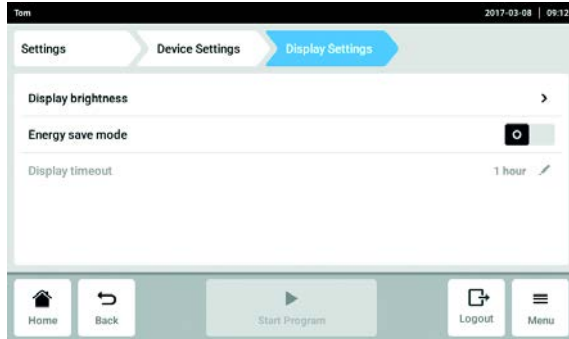
- ▶ Tap the *Device Settings* button.
- The following settings can be made.
- *Acoustic Signals*: Set the volume and the acoustic alarm.
  - *Display Settings*: Set the brightness and the power saving mode.

### 9.4.2 Acoustic Signals



1. Tap the *Acoustic Signals* button.
2. Activate or deactivate the acoustic alarm.
3. Activate or deactivate *Acoustic notification on hold step*.

### 9.4.3 Display Settings



1. Tap the *Display Settings* button.

#### Adjust brightness

2. Tap the *Display brightness* button.  
The slider for brightness adjustment is displayed.
3. Adjust brightness

#### Activating energy saving mode

4. Activate or deactivate the energy saving mode with the *Energy save mode* switch.

#### Set *Display timeout*

##### Prerequisites

The energy saving mode is activated

5. Tap the *Display timeout* button.  
A window with preset times is displayed.
6. Select the time, after which the brightness of the display will be dimmed.  
The display brightness is dimmed if no entry is made within the selected time period.

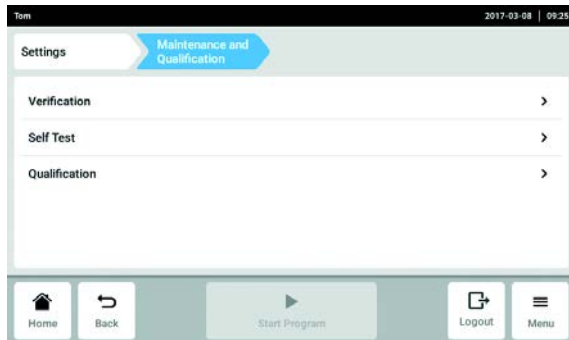
## 9.5 Setting the service intervals

### 9.5.1 Accessing *Maintenance and Qualification*



Information for carrying out the service:

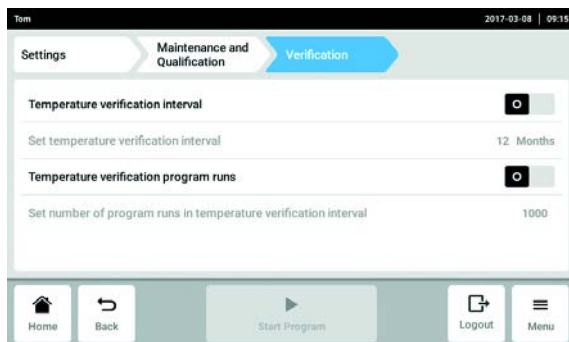
- *Verification* (see p. 36)
- *Self Test* (see p. 37)
- *Qualification* (see p. 36)



▶ Tap the *Maintenance and Qualification* button. The following settings can be made.

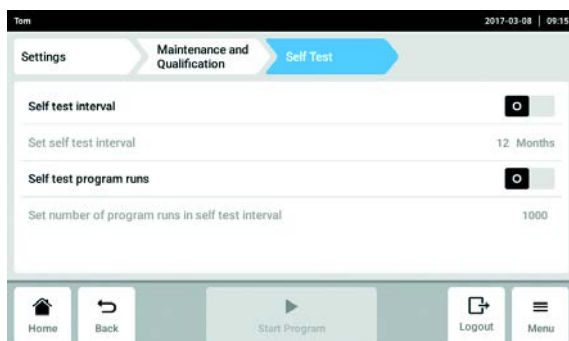
- *Verification*
- *Self Test*
- *Qualification*

### 9.5.2 *Verification*



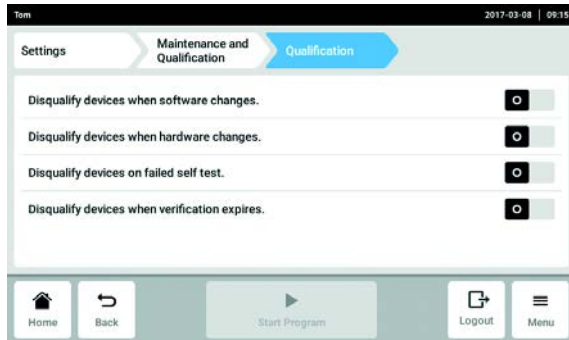
1. Tap the *Verification* button.
2. Activate or deactivate *Temperature verification interval*.
3. Tap the *Set temperature verification interval* button.
4. Enter and confirm interval.
5. Activate or deactivate *Temperature verification program runs*.
6. Tap the *Set number of program runs in temperature verification interval* button.
7. Enter and confirm the quantity.

### 9.5.3 *Self Test*



1. Tap the *Self Test* button.
2. Activate or deactivate *Self test interval*.
3. Tap the *Self test interval* button.
4. Enter and confirm interval.
5. Activate or deactivate *Self test program runs*.
6. Tap the *Set number of program runs in self test interval* button.
7. Enter and confirm the quantity.

### 9.5.4 Qualification



- ▶ Activate or deactivate *Disqualify devices when software changes.*
- ▶ Activate or deactivate *Disqualify devices when hardware changes.*
- ▶ Activate or deactivate *Disqualify devices on failed self test.*
- ▶ Activate or deactivate *Disqualify devices when verification expires.*

## 10 Maintenance

### 10.1 Performing a software update

The software update is performed on the master device. The software update is then performed on all eco devices.

#### Check the software version on the device

1. Check which software version is currently installed on your device. Tap on *Menu > Settings > About this Mastercycler*.

The software version is displayed under *Software Version*.

#### Requesting a software update

2. Request data for the software update from your local Eppendorf partner. You can look up the address on the Internet on [www.eppendorf.com](http://www.eppendorf.com).
3. Save the **update.zip** file with the software update on a USB stick.
4. Unpack the **update.zip** file.



The device only accesses data on the first level of the USB stick.

- Do not save data in a folder.

#### Performing a software update

##### Prerequisites

- The master device is switched off.
- All eco devices on which the software is to be updated are connected and switched on. All eco devices must be in idle mode. No program must be active.



If the menu item *Menu > Settings > Maintenance and Qualification > Qualification > Disqualify devices when software changes* is activated the device must be requalified after the software update.

5. Connect the USB stick with the software update to the device.
6. Switch on the master device.

The Mastercycler is started from the USB stick.

7. Follow the instructions on the device until the software update is complete.



Do not abort the software update. If the update is stopped, this will result in a loss of data and the device must be reset to the factory settings. Contact your Eppendorf service team in this case.



All connected eco devices are automatically updated when the software update for the master device is complete.

## 10.2 Cleaning



**CAUTION! Risk of burns on the thermoblock, heated lid and reaction vessels.**

The thermoblock, heated lid and reaction vessels reach temperatures of over 50 °C very quickly.

- ▶ Wait until the temperature of the thermoblock, heated lid and reaction vessels is below 30 °C.
- ▶ Then open the heated lid.



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

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



**DANGER! Electric shock due to the ingress of liquid.**

- ▶ Switch off the device and disconnect the power plug before starting cleaning or disinfection work.
- ▶ Do not allow any liquids to penetrate the inside of the housing.
- ▶ Do not spray clean/spray disinfect the housing.
- ▶ Only plug the device back in if it is completely dry, both inside and outside.



**DANGER! Electric shock.**

- ▶ Switch off the device and disconnect the power plug before starting maintenance or cleaning work.

### 10.2.1 Cleaning the housing

- ▶ Clean the surfaces of the Mastercycler X50 with a damp, lint-free cloth.
- ▶ If necessary, use a neutral lab cleaner.

Instructions on disinfecting and decontaminating the device can be found separately.



### 10.2.2 Cleaning the heated lid and the thermoblock

1. Open the heated lid.
2. Remove contamination on the thermoblock and the base of the heated lid. Use a damp, lint-free cloth. If necessary, use a neutral lab cleaner.
3. Check to see if there is lettering residue from the tube lids on the heated lid. Remove the residue using ethanol or isopropanol.



Keep the thermoblock bores free of dust and lint. Even small deposits affect the heat transfer between the thermoblock and vessels.

### 10.3 Disinfection/decontamination

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**NOTICE! Damage from UV and other high-energy radiation.**

- ▶ Do not use UV, beta, gamma, or any other high-energy radiation for disinfecting.
  - ▶ Avoid storage in areas with strong UV radiation
- 

#### Required equipment

- Alcohol (70%) (ethanol, isopropanol) or disinfectants containing alcohol

Proceed as follows:

1. Choose the disinfection method which corresponds to the legal regulations and guidelines in place for your range of application.
2. Switch off the device and disconnect it from the mains/power line.
3. Allow the device to cool down.
4. Wipe all parts of the device and accessories using the disinfectant.

### 10.4 Decontamination before shipment

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



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

1. Observe the information on the decontamination certificate. You can find it as a PDF document on our webpage ([www.eppendorf.com/decontamination](http://www.eppendorf.com/decontamination)).
  2. Decontaminate all the parts you would like to dispatch.
  3. Include the fully completed decontamination certificate in the package.
-



## **11 Troubleshooting**

### **11.1 General errors**

Technical faults may be triggered by faults such as a power failure or power fluctuations.

In most cases, the following procedure is therefore sufficient:

1. Switch the device briefly off and back on again after about 10 seconds.
2. Check cable connections.
3. If the fault occurs again: Notify your Eppendorf service team.



## 12 Transport, storage and disposal

### 12.1 Packing



**CAUTION! Risk of injury from lifting and carrying heavy loads.**

The device is heavy. Lifting and carrying the device can lead to back injuries.

- ▶ Only lift and transport the device with a sufficient number of helpers.
- ▶ Use a transport aid for transporting the device.



**NOTICE! Damage as a result of incorrect packing.**

Eppendorf AG is not liable for damage caused by improper packing.

- ▶ The device may only be stored and transported in its original packaging.



**WARNING! Risk to health due to contaminated device and accessories.**

- ▶ Decontaminate the device and the accessories before storage and shipping.

Use the supplied packing material when packing the device for transport or storage. If you do not have this anymore or if it is damaged, contact your Eppendorf office.

Prepare the device as follows prior to packing:

1. Pay attention to the decontamination notes (see *Decontamination before shipment on p. 81*).
2. Let the device stand for 30 minutes and make sure there is no condensate in the thermoblock.
3. Load the thermoblock with an empty PCR plate.
4. Close the heated lid.

### 12.2 Transport

- ▶ Use the original packaging for transport.

	Air temperature	Relative humidity	Atmospheric pressure
General transport	-25 °C – 60 °C	10 % – 95 %	30 kPa – 106 kPa
Air freight	-40 °C – 55 °C	10 % – 95 %	30 kPa – 106 kPa

## 12.3 Disposal

In case the product is to be disposed of, the relevant legal regulations are to be observed.

### **Information on the disposal of electrical and electronic devices in the European Community:**

Within the European Community, the disposal of electrical devices is regulated by national regulations based on EU Directive 2012/19/EU pertaining to waste electrical and electronic equipment (WEEE).

According to these regulations, any devices supplied after August 13, 2005, in the business-to-business sphere, to which this product is assigned, may no longer be disposed of in municipal or domestic waste. To document this, they have been marked with the following identification:



Because disposal regulations may differ from one country to another within the EU, please contact your supplier if necessary.

## 13 Technical data

### 13.1 Power supply

Voltage	100 V – 240 V, ±10 %
Frequency	50 Hz – 60 Hz
Power consumption (devices with aluminum thermoblock)	max. 850 W
Power consumption (devices with silver thermoblock)	max. 850 W
EMC: noise emission (radio interference)	IEC/DIN EN 55011 Class B - residential area
EMC: noise immunity	IEC/EN 61326-1
Overvoltage category	II (IEC 61010-1)
Degree of pollution	2
Protection class	I

### 13.2 Weight/dimensions

Dimensions	Width: 27.5 cm Depth: 43 cm Height: 33 cm Height with heated lid open: 43.9 cm
Weight (Master variant)	11,5 kg
Weight (eco variant)	10,7 kg

### 13.3 Ambient conditions

General operation	15 °C – 35 °C up to 75 % relative humidity up to 2 000 m NN (approx. 80 kPa)
Storage	–20 °C – 70°C up to 95 % relative humidity

### 13.4 Application parameters

<b>Mastercycler X50a, Mastercycler X50I</b>	
Thermoblock	Aluminum 96 wells
Sample capacity	<ul style="list-style-type: none"> <li>• 96 × 0.1 mL PCR tubes</li> <li>• 96 × 0.2 mL PCR tubes</li> <li>• one 96-well PCR plate (unskirted, semi-skirted, skirted and low-profile)</li> </ul>
Thermoblock temperature control range	4 °C – 99 °C
Ramp rate (heating) (measured on the thermoblock)	max. 5°C/s
Ramp rate (cooling) (measured on the thermoblock)	max. 2,3°C/s
Thermoblock temperature homogeneity (with the gradient function switched off) at 20 – 72 °C at 72 – 95 °C	±0.2 °C ±0.3 °C
Control accuracy (with the gradient function switched off)	±0,15°C
Gradient spread (horizontal and vertical)	max. 30°C
Gradient temperature control range (horizontal and vertical)	30 °C – 99 °C
Heated lid temperature control range	37 °C – 110 °C



**Mastercycler X50p, Mastercycler X50r (High Pressure Lid)**

Thermoblock	Aluminum 96 wells
Sample capacity	• one 96-well PCR plate (unskirted, semi-skirted, skirted and low-profile)
Thermoblock temperature control range	4 °C – 99 °C
Ramp rate (heating) (measured on the thermoblock)	max. 5°C/s
Ramp rate (cooling) (measured on the thermoblock)	max. 2,3°C/s
Thermoblock temperature homogeneity (with the gradient function switched off) at 20 – 72 °C at 72 – 95 °C	±0.2 °C ±0.3 °C
Control accuracy (with the gradient function switched off)	±0,15°C
Gradient spread (horizontal and vertical)	max. 30°C
Gradient temperature control range (horizontal and vertical)	30 °C – 99 °C
Heated lid temperature control range	37 °C – 110 °C

**Mastercycler X50h, Mastercycler X50t**

Thermoblock	Aluminum 384 wells
Sample capacity	• one 384-well PCR plate
Thermoblock temperature control range	4 °C – 99 °C
Ramp rate (heating) (measured on the thermoblock)	max. 5°C/s
Ramp rate (cooling) (measured on the thermoblock)	max. 2,3°C/s
Thermoblock temperature homogeneity (with the gradient function switched off) at 20 – 72 °C at 72 – 95 °C	±0.2 °C ±0.3 °C
Control accuracy (with the gradient function switched off)	±0,15°C
Gradient spread (horizontal and vertical)	max. 30°C
Gradient temperature control range (horizontal and vertical)	30 °C – 99 °C
Heated lid temperature control range	37 °C – 110 °C

<b>Mastercycler X50s, Mastercycler X50i</b>	
Thermoblock	Silver 96 wells
Sample capacity	<ul style="list-style-type: none"> <li>• 96 × 0.1 mL PCR tubes</li> <li>• 96 × 0.2 mL PCR tubes</li> <li>• one 96-well PCR plate (unskirted, semi-skirted, skirted and low-profile)</li> </ul>
Thermoblock temperature control range	4 °C - 99 °C
Ramp rate (heating) (measured on the thermoblock)	max. 10°C/s
Ramp rate (cooling) (measured on the thermoblock)	max. 5°C/s
Thermoblock temperature homogeneity (with the gradient function switched off)	
at 20 – 72 °C	±0.2 °C
at 72 – 95 °C	±0.3 °C
Control accuracy (with the gradient function switched off)	±0,15°C
Gradient spread (horizontal and vertical)	max. 30°C
Gradient temperature control range (horizontal and vertical)	30 °C – 99 °C
Heated lid temperature control range	37 °C - 110 °C

## 14 Ordering information

### 14.1 Mastercycler X50

#### 14.1.1 Master variants

Order no. (International)	Order no. (North America)	Description
6311 000.010	6311000010	<b>Mastercycler X50s</b> 110 – 230 V, EU and US plug Thermoblock with 96 wells, silver
6313 000.018	6313000018	<b>Mastercycler X50a</b> 110 – 230 V, EU and US plug Thermoblock with 96 wells, aluminum
6315 000.015	6315000015	<b>Mastercycler X50p</b> 110 – 230 V, EU and US plug Thermoblock with 96 wells, aluminum, high-pressure lid
6316 000.019	6316000019	<b>Mastercycler X50h</b> 110 – 230 V, EU and US plug Thermoblock with 384 wells, aluminum

#### 14.1.2 Eco variants

Order no. (International)	Order no. (North America)	Description
6301 000.012	6301000012	<b>Mastercycler X50i</b> 110 – 230 V, EU and US plug Thermoblock with 96 wells, silver
6303 000.010	6303000010	<b>Mastercycler X50l</b> 110 – 230 V, EU and US plug Thermoblock with 96 wells, aluminum
6305 000.017	6305000017	<b>Mastercycler X50r</b> 110 – 230 V, EU and US plug Thermoblock with 96 wells, aluminum, high-pressure lid
6306 000.010	6306000010	<b>Mastercycler X50t</b> 110 – 230 V, EU and US plug Thermoblock with 384 wells, aluminum

## 14.2 Accessories



Use only genuine Eppendorf accessories or accessories approved by Eppendorf.

Order no. (International)	Order no. (North America)	Description
6313 070.040	6313070040	<b>Ethernet connecting cable</b> 5 m
0056 000.003	0056000003	<b>Temperature Verification System – USB – Single Channel</b>
0056 001.000	0056001000	<b>Temperature sensor for 96 Well</b>
0056 002.006	0056002006	<b>Temperature sensor for 384 Well</b>

## 14.3 PCR clean consumables

Order no. (International)	Order no. (North America)	Description
0030 128.648	951020401	<b>Eppendorf twin.tec PCR Plate 96</b> skirted, 150 µL colorless, 25 pcs.
0030 128.508	951020702	<b>Eppendorf twin.tec PCR Plate 384</b> skirted, 40 µL PCR clean, colorless, 25 pcs.
0030 128.575	951020303	<b>Eppendorf twin.tec PCR Plate 96</b> semi-skirted, 250 µL colorless, 25 pcs.
0030 133.307	0030133307	<b>Eppendorf twin.tec-PCR-Platte 96, low profile</b> unskirted, 150 µL colorless, 20 pcs.
0030 133.358	0030133358	<b>Eppendorf twin.tec PCR Plate 96, divisible</b> unskirted, 150 µL colorless, 20 pcs.
0030 133.366	0030133366	<b>Eppendorf twin.tec PCR Plate 96</b> unskirted, 250 µL colorless, 20 pcs.
0030 133.374	0030133374	<b>Eppendorf twin.tec PCR Plate 96, divisible</b> unskirted, 250 µL colorless, 20 pcs.
0030 129.300	0030129300	<b>Eppendorf twin.tec microbiology PCR plate 96</b> skirted, 150 µL colorless, 10 pcs.
0030 129.326	0030129326	<b>Eppendorf twin.tec microbiology PCR plate 96</b> semi-skirted, 250 µL colorless, 10 pcs.
0030 129.342	0030129342	<b>Eppendorf twin.tec microbiology PCR plate 384</b> skirted, 40 µL PCR clean, colorless, 10 pcs.

Order no. (International)	Order no. (North America)	Description
0030 129.504	0030129504	<b>Eppendorf twin.tec PCR Plates 96 LoBind, semi-skirted</b> clear, 25 pcs.
0030 129.512	0030129512	<b>Eppendorf twin.tec PCR Plates 96 LoBind, skirted</b> clear, 25 pcs.
0030 124.332	951010006	<b>Eppendorf PCR Tubes</b> 0.2 mL colorless, 1,000 pcs. (1 000 pcs.)
0030 124.359	951010022	8-tube strips, 120 pcs. (960 tubes)
0030 124.812	0030124812	<b>Eppendorf PCR Tube Strips</b> 0.1 mL PCR clean, with Cap Strips, domed (10 × 12 strips)
0030 124.820	0030124820	PCR clean, with Cap Strips, flat (10 × 12 strips)
0030 124.839	0030124839	<b>Cap Strips</b> 8-strips domed, 120 pcs. (10 × 12 pcs.)
0030 124.847	0030124847	flat, 120 pcs. (10 × 12 pcs.)
0030 127.838	0030127838	<b>Eppendorf Heat Sealing Film</b> PCR clean, 100 pcs.
0030 127.854	0030127854	<b>Eppendorf Heat Sealing Foil</b> PCR clean, 100 pcs.
0030 127.781	0030127781	<b>Eppendorf PCR Film</b> self-adhesive PCR clean, 100 pcs.
0030 127.790	0030127790	<b>Eppendorf PCR Foil</b> self-adhesive PCR clean, 100 pcs.

The twin.tec PCR plates are also available in various frame colors (red, yellow, green, blue). The complete range of PCR consumables can be found in the Eppendorf catalog or at [www.eppendorf.com](http://www.eppendorf.com).

**Ordering information**

Mastercycler® X50  
English (EN)

**14.4 Forensic grade consumables**

Order no. (International)	Order no. (North America)	Description
0030 129.601	0030129601	<b>Eppendorf twin.tec PCR Plate 96</b> skirted, 150 µL colorless, 10 pcs.
0030 129.610	0030129610	<b>Eppendorf twin.tec PCR Plate 96</b> semi-skirted, 250 µL colorless, 10 pcs.
0030 129.628	0030129628	<b>Eppendorf twin.tec PCR Plate 384</b> skirted, 40 µL colorless, 10 pcs.
0030 124.707	0030124707	<b>Eppendorf PCR Tubes</b> 0.2 mL colorless, 500 pcs.

The twin.tec PCR plates are also available in various frame colors (red, yellow, green, blue). The complete range of PCR consumables can be found in the Eppendorf catalog or at [www.eppendorf.com](http://www.eppendorf.com).

**14.5 Recommended auxiliary materials**

Order no. (International)	Order no. (North America)	Description
0030 124.545	0030124545	<b>PCR Rack</b> 10 pcs.
0030 124.235	951010031	<b>Work tray</b> for semi-/unskirted PCR plates, PCR strips and 0.2 mL PCR tubes, for Rotor A-2-VC set of 10 pcs.
0030 124.243	951010049	<b>Frame for work tray</b> for Rotor A-2-VC set of 5 pcs.
3881 000.023 3881 000.031	022510541 022510525	<b>PCR-Cooler 0.2 mL</b> Pink Blue
5391 000.001	5391000001	<b>HeatSealer S100</b> 100 – 230 V/50 – 60 Hz
5392 000.005	5392000005	<b>HeatSealer S200</b> 100 – 230 V/50 – 60 Hz

# Declaration of Conformity

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

**Product name:**

Mastercycler® X50i (6301)	Mastercycler® X50l (6303)	Mastercycler® X50r (6305)
Mastercycler® X50t (6306)	Mastercycler® X50s (6311)	Mastercycler® X50a (6313)
Mastercycler® X50p (6315)	Mastercycler® X50h (6316)	

**Product type:**

Thermocycler

**Relevant directives / standards:**

2014/35/EU:	EN 61010-1, EN 61010-2-010 UL 61010-1, CAN/CSA C22.2 No. 61010-1
2014/30/EU:	EN 61326-1, EN 55011
2011/65/EU:	EN 50581 EN ISO 14971 47 CFR FCC part 15

Hamburg, June 27, 2017



Dr. Wilhelm Plüster  
Management Board



Dr. Philip Müller  
Portfolio Management

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