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# Mastercycler® nexus

**Operating Manual**

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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.

The sequences of actions in this operating manual are described for operation using the control panel. You can also operate the Mastercycler nexus using the mouse (see p. 29).

## 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:

| | | | |
|---|---|---|---|
| | **Biohazard** | | **Explosive substances** |
| | **Electric shock** | | **Hot surfaces** |
| | **Risk of crushing** | | **Toxic substances** |
| | **Hazard point** | | **Material damage** |

### 1.2.2 Danger levels

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

## 1.3 Symbols used

| Depiction | Meaning |
|---|---|
| 1.<br>2. | Actions in the specified order |
| ▸ | Actions without a specified order |
| • | List |
| *Text* | 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)

**PCL**
Printer Command Language – standard for printer control

**PCR**
Polymerase Chain Reaction

**PDF**
Portable Document Format

**PIN**
Personal Identification Number

**PS**
PostScript – standard for printer control

**SMTP**
Simple Mail Transfer Protocol (network)

**TSP**
Thermal Sample Protection

**USB**
Universal Serial Bus

## 1.5 Glossary

**F**

**flexlid**
The heated lid of the thermal cycler automatically adapts to the used tubes or plates. This always ensures that a reliable pressure is applied to the thermoblock and that the tubes are sealed securely. Unlike conventional heated lids, they do not need to be manually adjusted.

**T**

**Thermal Sample Protection**
When the heated lid is being heated, the thermoblock is actively maintained at a constant temperature. This minimizes non-specific annealing and evaporation of the samples.

**Triple circuit technology**
The thermoblock is controlled by three independent control loops. This is necessary to produce temperature gradients and leads to improved temperature homogeneity.

# 2 Safety

## 2.1 Intended use

The Mastercycler nexus is used for temperature control of aqueous solutions, suspensions or emulsions in closed micro test tubes for enzymatic reactions, typically the polymerase chain reaction (PCR).

The Mastercycler nexus is exclusively intended for indoor use.

All country-specific safety requirements for operating electrical equipment in laboratories must be observed.

The product can be used for training, routine and research laboratories in the areas of life sciences, industry or chemistry. This product is intended to be used for research purposes only. Eppendorf does not provide a warranty for other applications. The product is not suitable for use in diagnostic or therapeutic applications.

## 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 and the instructions for use of the accessories carefully and familiarize yourself with the device's mode of operation.

## 2.3 Warnings for intended use

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

**DANGER! Risk of explosion.**

- Do not use the device in an explosive atmosphere.
- Do not operate the device in areas where work with explosive substances is carried out.
- 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! Fire hazard.**

- 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 biosafety level of your laboratory, and the manufacturers' Safety Data Sheets and application notes.
- Wear your personal protective equipment.
- Consult the "Laboratory Biosafety Manual" (source: World Health Organization, Laboratory Biosafety Manual, as amended) for comprehensive regulations on the handling of germs or biological material of risk group II or higher.

**WARNING! Lethal voltages inside the device.**
Touching parts under high voltage can cause an electric shock. Electric shocks cause injuries to the heart and respiratory paralysis.

- Ensure that the housing is closed and undamaged.
- Do not remove the housing.
- Make sure that no liquids can enter 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 accessories and spare parts other than those recommended or from improper use.

- 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 and cause the device to fall.

- Lift the device by the bottom of the housing.
- Use both hands to carry the device.
- Do not lift the device by its lid.

**CAUTION! Risk of injury due to lifting and carrying heavy loads**
The device is heavy. Lifting and carrying the device can lead to back injuries.

- Transport and lift the device with an adequate number of helpers.
- Use a transport aid for transporting the device.

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

## 2.4 Danger symbols on the device

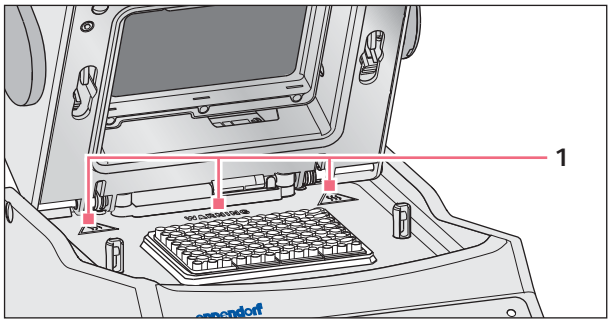



Fig. 2-1: Warning symbols on the Mastercycler

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 variants

- Mastercycler nexus
- Mastercycler nexus gradient

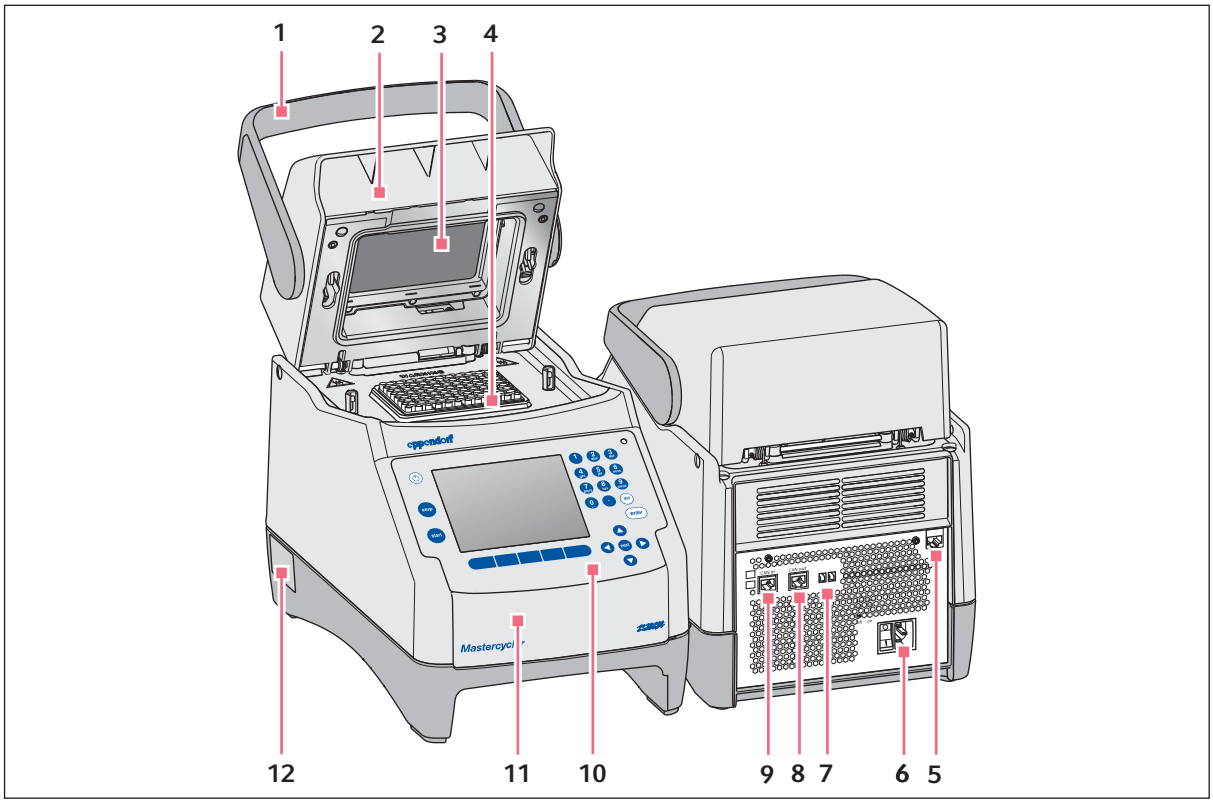



Fig. 3-1: Front and rear view

**1 Lid handle**
For opening and closing, and locking and unlocking the heated lid.

**2 Heated lid**

**3 Heating plate**

**4 Thermoblock**

**5 Ethernet port**

**6 Mains connection socket with power switch**
0 = off, I = on.

**7 Eco switch and Term switch**

**8 CAN out port**

**9 CAN in port**

**10 Control panel**
See detailed image (see p. 19)

**11 Lid**
Cover for the USB ports.

**12 Name plate**

### 3.1.2 Master variants with 64+32-well thermoblocks

- Mastercycler nexus X2
- Mastercycler nexus GX2

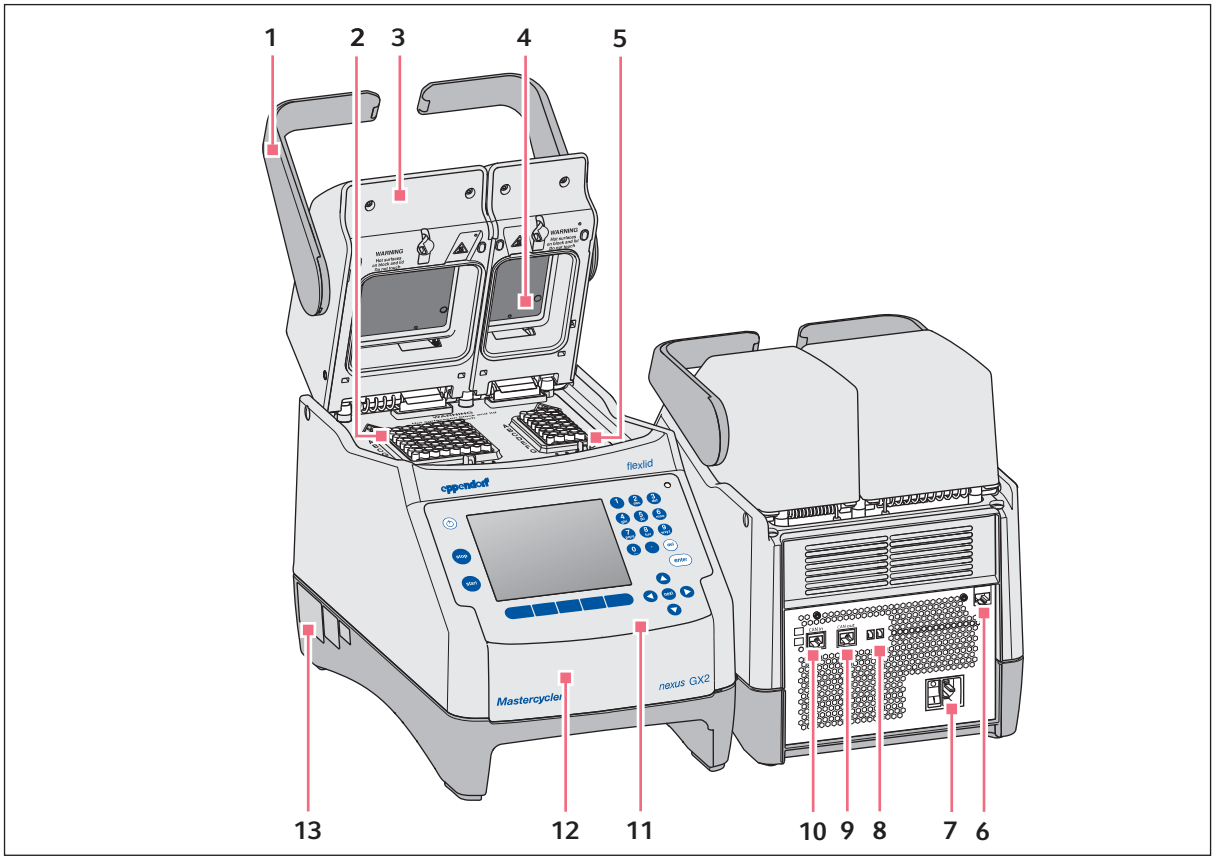



Fig. 3-2: Front and rear view

**1 Lid handle**
For opening and closing, and locking and unlocking the heated lid.

**2 Thermoblock with 64 wells**

**3 Heated lid**

**4 Heating plate**

**5 Thermoblock with 32 wells**

**6 Ethernet port**

**7 Mains connection socket with power switch**
0 = off, I = on.

**8 Eco switch and Term switch**

**9 CAN out port**

**10 CAN in port**

**11 Control panel**
See detailed image (see p. 19)

**12 Lid**
Cover for the USB ports.

**13 Name plate**

### 3.1.3 ECO variants

- Mastercycler nexus eco
- Mastercycler nexus gradient eco
- Mastercycler nexus X2e (with 64+32-well thermoblocks; not shown in the image)
- Mastercycler nexus GX2e (with 64+32-well thermoblocks; not shown in the image)

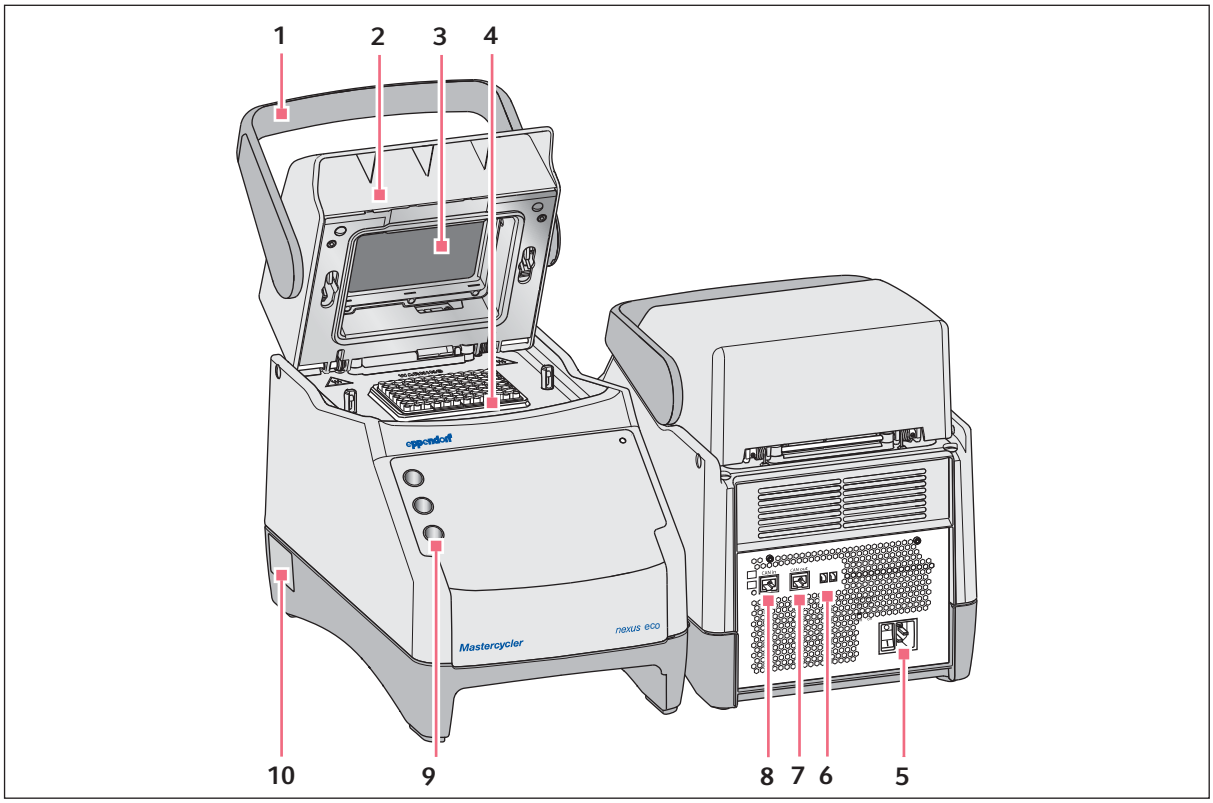



Fig. 3-3: Front and rear view

**1 Lid handle**
For opening and closing, and locking and unlocking the heated lid.

**2 Heated lid**

**3 Heating plate**

**4 Thermoblock**

**5 Mains connection socket with power switch**
0 = off, I = on.

**6 Eco switch and Term switch**

**7 CAN out port**

**8 CAN in port**

**9 Pen holder**
Holder for up to three pens.

**10 Name plate**

### 3.1.4 Terminal block

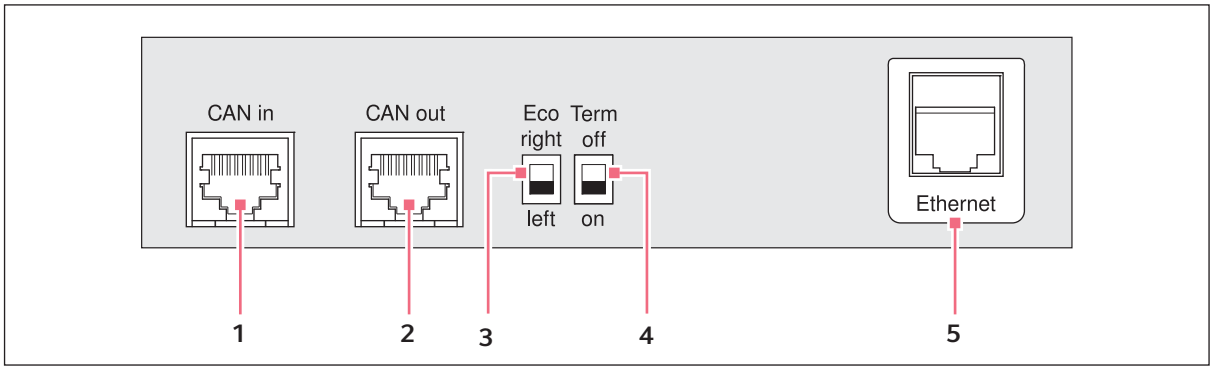



Fig. 3-4: Terminal block

1 **CAN in port**
For connection with an eco device.

2 **CAN out port**
For connection with a further eco device.

3 **Eco switch**
For setting the position of an eco device (to the left or right next to a master variant with control panel).

4 **Term switch**
Termination of the CAN data connection when networked with the eco device.

5 **Ethernet port (not on an eco device)**
For connecting a master variant of the Mastercycler nexus with an Ethernet network.

Only connect devices to the interfaces of the Mastercycler nexus that comply with the IEC 950/EN 60950 (UL 1950) standards.

### 3.1.5 Control panel

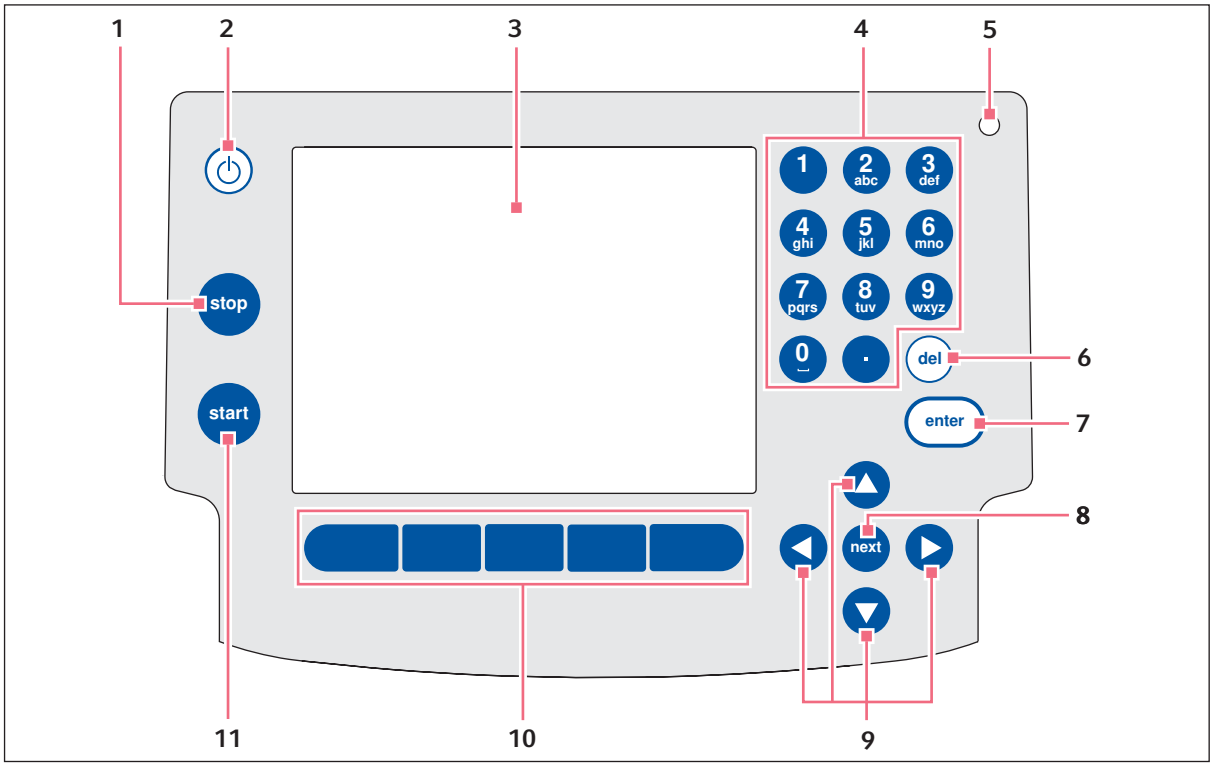



Fig. 3-5: Control panel

**1 stop key**
For stopping a running program.

**2 Standby key**
For putting the device into power saving mode.

**3 Display**

**4 Number pad**

**5 Status lamp**
On devices with 64+32-well thermoblocks, the status lamp is deactivated on the control panel. The active status lamps is located on the heated lid on devices with 64+32-well thermoblocks.

**6 del key**
For deleting characters to the right of the cursor and marked objects.

**7 enter key**
For confirming entries and opening selection lists.

**8 next key**
For moving the cursor to the next edit box.

**9 Arrow keys**
For moving the cursor.

**10 Softkeys**
Functions change with the software dialog, these each appear on the display above the softkey.

**11 start key**
For starting the selected program.

### 3.1.6 Number pad

For entering numbers and text in edit boxes. For numerical edit boxes (e.g., temperature, time) the keys are only assigned to numbers. For decimal numbers with decimal places, use the period as the decimal sign. For alphanumerical edit boxes, the keys are assigned multiple characters.

- To enter text, press the key with the corresponding letter until the desired letter is shown.

**Example:** To enter *pcr 3* in a text field, press each of the following keys in quick succession:

1. For *p*: Press **7** once.
2. For *c*: Press **2** three times.
3. For *r*: Press **7** three times.
4. For the space: Press **0** (zero) two times.
5. For *3*: Press **3** four times.

### 3.1.7 Status lamp

| Status lamp | Operating status |
|---|---|
| flashes briefly in green | The device is in standby mode. The display is off for this. |
| Is lit in green | The device is idling. |
| Flashes in green | A program run is active. |
| Flashes in orange | The program run is waiting for user action in the Pause or Hold step. |
| Flashes in red | A error has occurred. Additional information on the error type is shown in the display. |

## 3.2 Delivery package

| Quantity | Description |
|---|---|
| 1 | Mastercycler nexus as ordered |
| 1 | Operating manual for all Master versions. Eco devices are delivered without an operating manual. |
| 1 | Certificate of Conformity |
| 1 | Mains/power cord |
| 1 | CAN bus cable (only with eco devices) |

## 3.3 Features

**Triple circuit technology**
The triple circuit technology leads to a homogeneous temperature distribution and enables a selective generation of temperature gradients for PCR optimizations with the Mastercycler nexus gradient and Mastercycler nexus GX2.

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

**flexlid**
All variants of the Mastercycler nexus have a flexlid heated lid. It enables ergonomic one-hand operation 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**
With the *Self Test* function, the following properties of the thermoblock can be tested:

- Heating and cooling rates
- Proper functioning of the temperature control loops
- Temperature homogeneity in each of the three block zones (left, middle and right zone)
- Temperature homogeneity throughout the entire block

After a successful self test, a certificate can be generated in PDF format.

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

**Standby function**
All variants of the Mastercycler nexus can be switched to standby mode automatically or by pressing a key. This reduces energy consumption and ensures that the device is ready for use at any time.

### 3.3.1 Features of the Mastercycler nexus

| | Thermoblock version | Thermoblock material | Freely programmable temperature gradient (gradient spread) |
|---|---|---|---|
| Mastercycler nexus gradient | 96-well format | Aluminum | X (max. 20°C) |
| Mastercycler nexus gradient eco | 96-well format | Aluminum | X (max. 20°C) |
| Mastercycler nexus | 96-well format | Aluminum | |
| Mastercycler nexus eco | 96-well format | Aluminum | |
| Mastercycler nexus GX2 | 64-well format and 32-well format | Aluminum | X (max. 12°C) |
| Mastercycler nexus GX2e | 64-well format and 32-well format | Aluminum | X (max. 12°C) |
| Mastercycler nexus X2 | 64-well format and 32-well format | Aluminum | |
| Mastercycler nexus X2e | 64-well format and 32-well format | Aluminum | |

### 3.3.2 Control panel and ports

| | Control panel | Ethernet port | USB port |
|---|---|---|---|
| Mastercycler nexus gradient | X | X | 2 |
| Mastercycler nexus gradient eco | — | — | — |
| Mastercycler nexus | X | X | 2 |
| Mastercycler nexus eco | — | — | — |
| Mastercycler nexus GX2 | X | X | 2 |
| Mastercycler nexus GX2e | — | — | — |
| Mastercycler nexus X2 | X | X | 2 |
| Mastercycler nexus X2e | — | — | — |

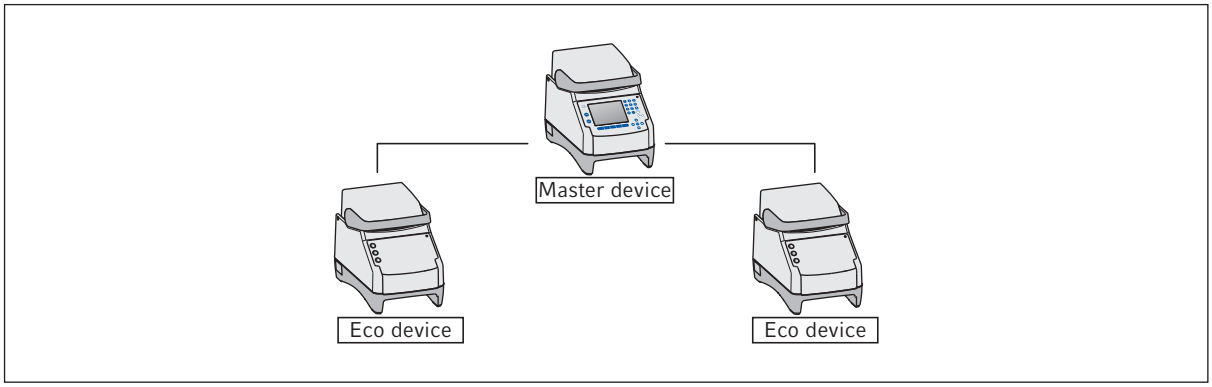
### 3.3.3 Consumables

| | PCR tubes (0.1 mL or 0.2 mL) | PCR tubes *)(0.5 mL) | PCR plates |
|---|---|---|---|
| Mastercycler nexus gradient | 96 | 71 | 1x 96-well |
| Mastercycler nexus gradient eco | 96 | 71 | 1x 96-well |
| Mastercycler nexus | 96 | 71 | 1x 96-well |
| Mastercycler nexus eco | 96 | 71 | 1x 96-well |
| Mastercycler nexus GX2 | 64 + 32 | 45 + 19 | 2x 32-well<br>1x 32-well<br>or<br>segments of separable 96-well PCR plates |
| Mastercycler nexus GX2e | 64 + 32 | 45 + 19 | 2x 32-well<br>1x 32-well<br>or<br>segments of separable 96-well PCR plates |
| Mastercycler nexus X2 | 64 + 32 | 45 + 19 | 2x 32-well<br>1x 32-well<br>or<br>segments of separable 96-well PCR plates |
| Mastercycler nexus X2e | 64 + 32 | 45 + 19 | 2x 32-well<br>1x 32-well<br>or<br>segments of separable 96-well PCR plates |

*) In the case of 0.5 mL tubes with a bigger lid, the number of usable sample places can be lower.

### 3.3.4 Networking

You can connect and control up to any two eco devices to a master variant of the Mastercycler nexus.




### 3.3.5 Service

Eppendorf offers customized service options for preventive maintenance and verification of your thermal cycler. For more information, service requests and local offers visit www.eppendorf.com/epServices and the local websites.

# 4 Installation

## 4.1 Selecting the location

**WARNING! Risk of injury due to unsuitable work surface.**
The device may fall down if placed on an unsuitable work surface.

- Observe the criteria for selecting a location. The criteria can be found in the operating manual.

**NOTICE! Damage due to overheating.**

- Do not install the device near heat sources (e.g., heating, drying cabinets).
- 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.

Information regarding the dimensions and weight of device components can be found in a separate section (see *Weight/dimensions on p. 101)*.

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

This section describes how to put the device into operation and how to connect one or two eco devices to a master variant of the Mastercycler nexus.

### 4.2.1 Connecting the device to the mains/power line

**WARNING! Danger due to incorrect voltage supply.**

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

**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.

Information on the power consumption of the Mastercycler nexus is provided separately (see *Power supply on p. 101)*.

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

### 4.2.2 Attaching devices to each other

You can attach adjacent devices to each other to prevent individual devices from slipping and avoid mechanical stress on the cables.

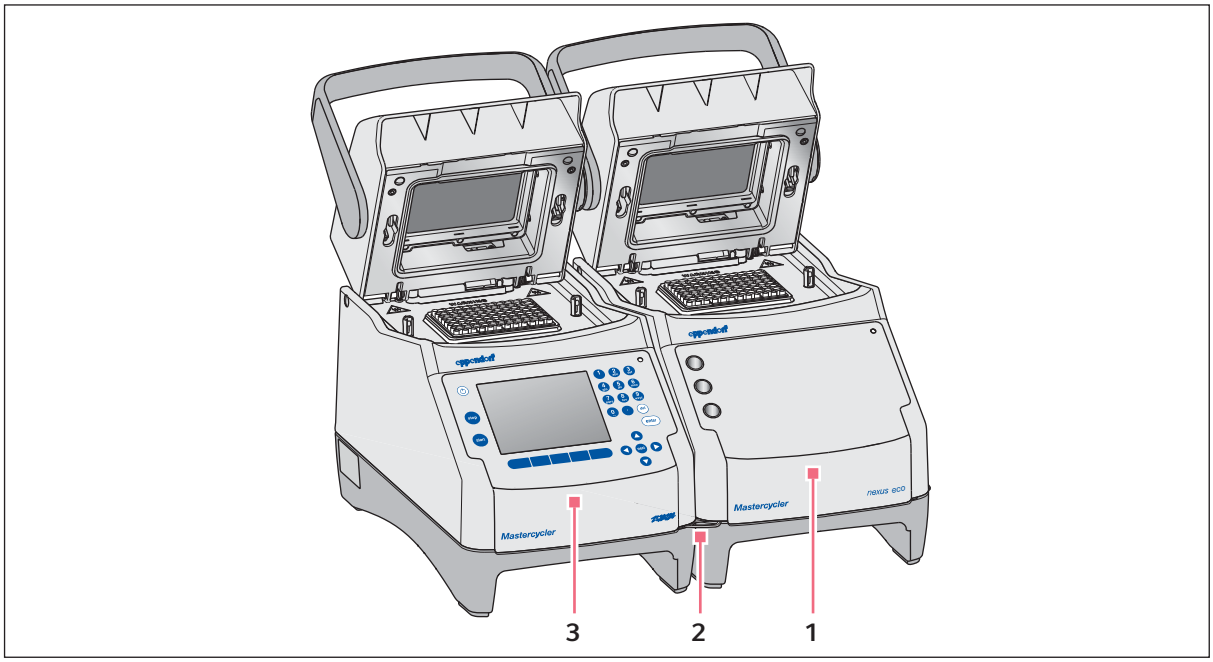



Fig. 4-1: Example: two Mastercycler nexus attached to each other

**1 Eco variant Mastercycler nexus**

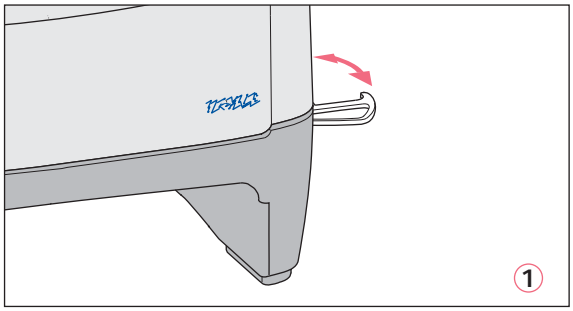
**2 Bracket**

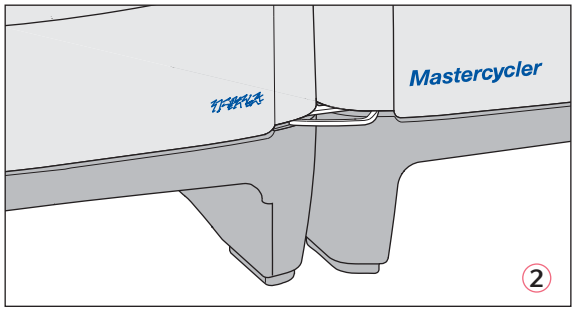
**3 Master variant Mastercycler nexus**

**CAUTION! Danger from devices falling down.**
The bracket can break or be released from the recess in the housing if you move or lift devices that are attached to each other. Devices could fall down and cause injury.

- Do not lift devices that are attached to each other with the bracket.
- Do not move devices that are attached to each other with the bracket.
- Separate the devices before lifting or moving them.

1. Position the devices next to each other.




2. Fold out the bracket of the device on the left ①. Insert the bracket into the recess in the housing of the device on the right ②.
3. Align the devices attached to each other in parallel.

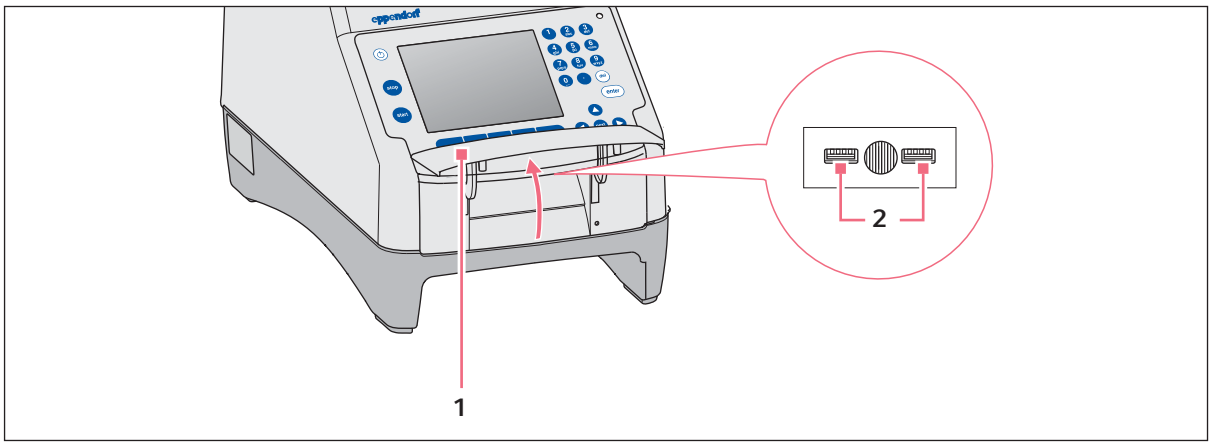
### 4.2.3 Separating devices

1. Switch off the devices at the power switch. Disconnect the cable connections at the rear of the devices.
2. Hold the bracket and push the device on the right back until the bracket comes out of the recess in the housing.
3. Fold the bracket away.

### 4.2.4 Using the USB ports

The master variants of the Mastercycler nexus have two USB ports for the connection of a mouse, a printer and a storage medium.

- Use a USB hub if you would like to connect more than two USB devices at the same time.
- The USB printer must be compatible with the **PostScript®** or **PCL** printer standards. Further information can be found in the operating manual for your printer.
- The eco devices do not have any USB ports.




1. Open the flap (**1**) to access the USB ports (**2**).
2. Insert the USB device into one of the two ports.
   Newly connected USB devices are automatically detected during operation.
3. Close the flap.

### 4.2.5 Connecting the eco device

This section explains how to operate one or two eco devices together with a master variant of the Mastercycler nexus. The eco device is controlled via a master variant Mastercycler nexus. This requires a cable connection between the devices. Use Eppendorf CAN-bus cables for this.

**Connecting a single eco device**

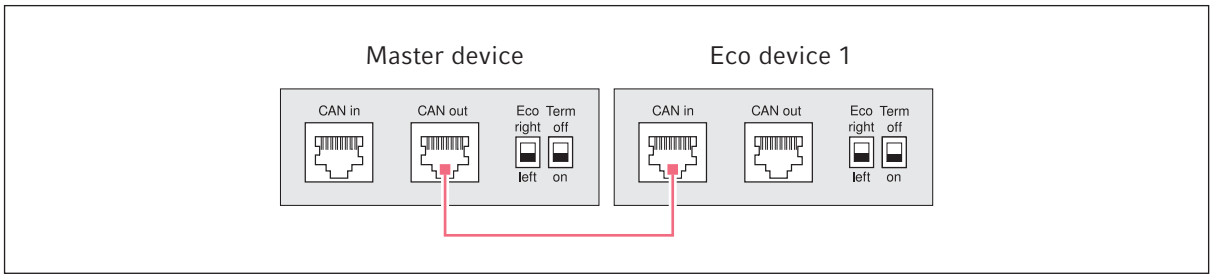



Fig. 4-2: Wiring diagram showing rear view of the devices

**Connecting two eco devices**

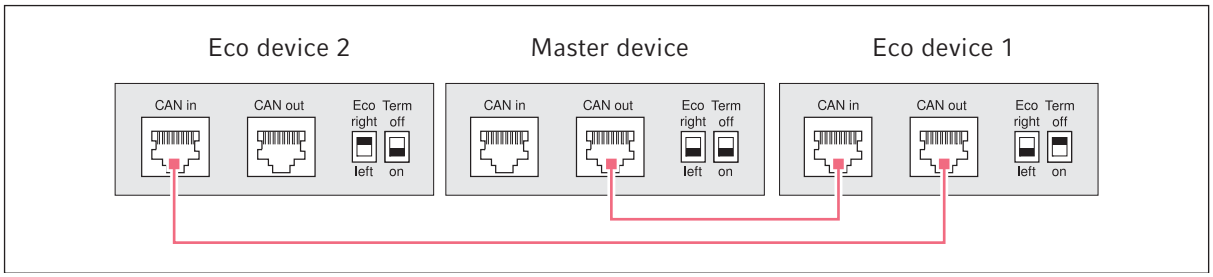



Fig. 4-3: Wiring diagram showing rear view of the devices

The connections and switches are located on the rear of the devices.

### 4.2.5.1 Establishing the data connection

1. Switch off all devices at the power switch.

**Connecting the first eco device**

2. Connect the CAN bus cable to the **CAN out** port of the Mastercycler nexus (with control panel) and to the **CAN in** port of the eco device.

**Connecting the second eco device**

3. Connect the second CAN bus cable to the **CAN out** port of the first eco device and to the **CAN in** port of the second eco device.

### 4.2.5.2 Setting the Eco and Term switches

You must set the **Eco** and **Term** switches on all devices depending on whether you have connected one or two eco devices to a master variant of the Mastercycler nexus.

▸ Set the **Eco** and **Term** switches on the rear of all connected devices as follows:

| Connected devices | Master device | | Eco device 1 | | Eco device 2 | |
|---|---|---|---|---|---|---|
| One eco device | Eco right: left | Term off: on | Eco right: left | Term off: on | — | — |
| Two eco devices | Eco right: left | Term off: on | Eco right: left | Term off: on | Eco right: left | Term off: on |

- The position of the **Eco** switch of the eco device should reflect its installation position on the left or right next to a master variant of the Mastercycler nexus with control panel.
- If you operate the Mastercycler nexus on its own, the position of the **Eco** and **Term** switches is not important.

## 4.3 Decommissioning

Proceed as follows if you do not want to use the Mastercycler nexus for longer than a week.

1. Load the block with an empty PCR plate or tube.
2. Close the heated lid and flip the handle forwards .
3. Disconnect the Mastercycler nexus from the power supply.

Never leave the lid of the Mastercycler nexus open to prevent contamination of the block.

# 5 Operation

## 5.1 Initial steps

**Checking the correct installation**

Before the Mastercycler nexus is commissioned for the first time, ensure that the following requirements are met:

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

### 5.1.1 Using the flexlid heated lid

The Mastercycler nexus is equipped with a flexlid heated lid. The flexlid 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.

#### 5.1.1.1 Open heated lid

**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.

Open the heated lid in one go as follows:

- ▸ Flip the lid handle up over the heated lid and flip the heated lid up at the lid handle as far as it will go.

### 5.1.1.2 Closing the heated lid

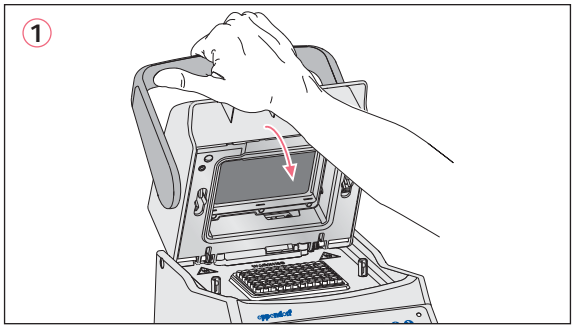
Prerequisites

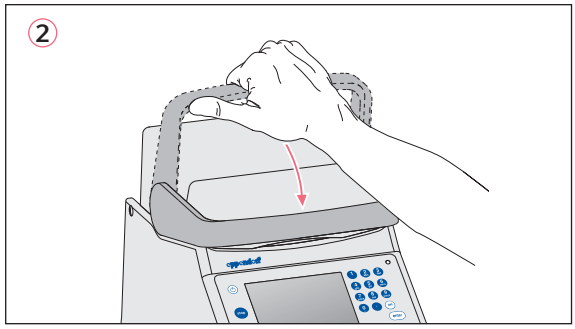
Thermoblock loaded with sample tubes or a PCR plate.

**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.

Comply with the guidelines for loading the thermoblock with PCR tubes (see *Loading the thermoblock on p. 59)*.




1. Grip the heated lid at the center of the lid handle and close it **(1)**.
2. Continue to move the lid handle further down until it is in a horizontal position **(2)**.

The force required to move the lid handle into the horizontal position depends on the type of PCR tubes or PCR plate used.

The heated lid is now locked. You can now start a program run or manually temper the heated lid and samples.

## 5.2 Starting the Mastercycler nexus

Prerequisites

The Mastercycler nexus is properly set up and connected to the power supply.

- Switch on the device using the power switch at the back (see p. 15).

  The status lamp lights up and the fan starts.
  The display illumination is switched on (not for Mastercycler nexus eco).

### 5.2.1 Defining the administrator PIN

The first time the device is started, you can define an administrator PIN to protect it against unauthorized access. The administrator PIN is saved and will be maintained even when the Mastercycler nexus is switched off.

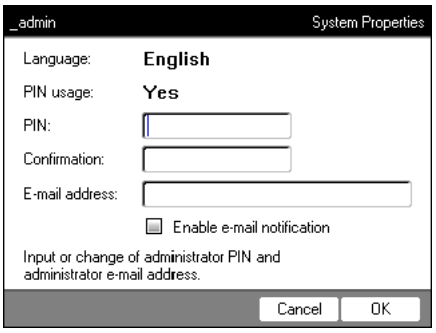
If an administrator PIN has not been defined, you will be prompted to define one.

**NOTICE! Data loss due to unauthorized use of the administrator password.**
The administrator password protects the device software from unwanted access.

- Make a note of the administrator password.
- Store the administrator password in a secure location.
- Only provide the administrator password to individuals who work with the system configuration.
- Please contact Eppendorf SE if you have any problems with the administrator password.

- If you do not want to use user management, you do not need to define an administrator PIN. In this case, leave the input fields in the *Input Admin PIN* window blank and deactivate the *PIN* function. Further information on user management can be found separately (see *System settings on p. 70)*.
- If the *PIN* function is activated (see *System settings on p. 70)*, you must define an administrator PIN. If you do not do this, the input prompt will appear each time the device is switched on.
- You can also change the administrator PIN at a later time (see *Changing the administrator PIN on p. 69)*.

To define the administrator PIN, perform the following steps in the sequence described.




1. Switch on the Mastercycler nexus at the power switch.
   The *Input Admin PIN* window appears.
2. Enter the desired administrator PIN using the numeric keys.

next

3. Re-enter the PIN in the *Confirmation:* field.

del

4. An error message appears if the two PIN entries do not match. If this happens, delete the incorrectly entered PIN and reenter the PIN twice.

5. Optional: enter the administrator's e-mail address for receiving messages from the Mastercycler nexus in the *E-mail address:* field (see p. 85).
6. Optional: select *Enable e-mail notification* to activate e-mail notifications for the administrator.
7. Press the *OK* softkey.

After the successful confirmation of the administrator PIN, the navigation tree appears on the display. You are now logged in as the administrator.

### 5.2.2 Other steps

#### 5.2.2.1 Changing the language

You can change the language of the user interface of the Mastercycler nexus (see *System settings on p. 70)*.

#### 5.2.2.2 Set date and time

The date and time are shown in the upper right corner of the display. As the administrator, you can change this internal clock at any time (see *System settings on p. 70)*.

#### 5.2.2.3 Setting up user accounts

To be able to use the Mastercycler nexus, you must set up at least one user account. Detailed information on user management and how to set up user accounts can be found separately (see *Managing user accounts on p. 67)*.

## 5.3 Logging in and out as a user

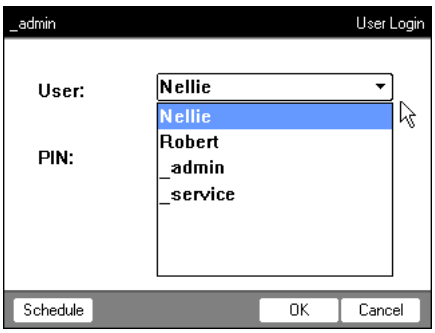
The functions described here are only available if the PIN function is activated (see *System settings on p. 70)*.

### 5.3.1 Logging in as a user

To be able to log in with your user name, your administrator must have set up a user account for you.

Proceed as follows:

1. Open the list by pressing the **enter** key, and select your user name.



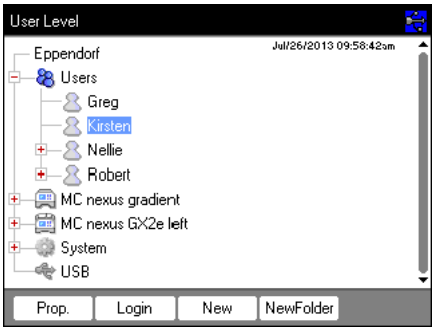
2. Press the **next** key.
   The cursor jumps to the *PIN:* field.

3. Enter your PIN via the numerical keys.
   If the PIN is wrong, *Wrong PIN* appears. Press the *Login* softkey to return to the *User Login* window, delete the wrong PIN entry with the *Delete* key, and enter the correct PIN.
4. Press the *OK* softkey to confirm.
   The navigation tree is displayed.

You are now logged in with your user name and can work with the Mastercycler nexus.

### 5.3.2 Changing users

Only one user can be logged in at a time. Proceed as follows to switch between users:




1. Select either your user node or the *Other Users* user node.
2. Press the *Login* softkey.
3. Log in as a user.
   The previously logged-in user is automatically logged out.

### 5.3.3 Logging out as a user

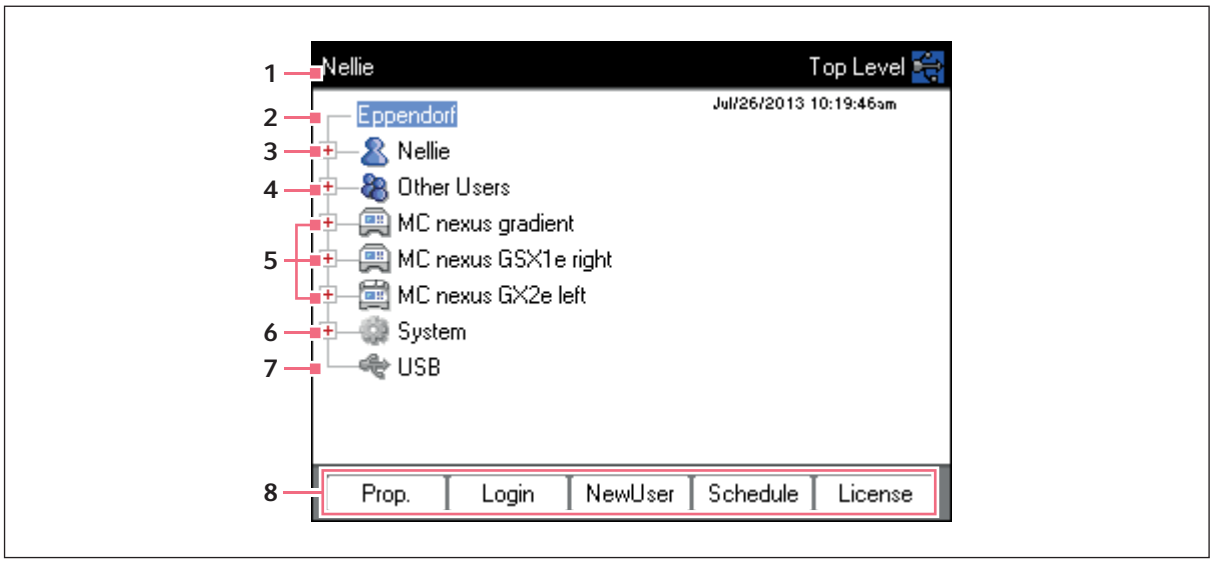
You can log out to protect your programs against unauthorized changes.

1. Select your user node.
2. Press the *Logout* softkey.

   You are now logged out.
   The guest user is automatically logged in. The guest user cannot start programs and only has read access to all programs and folders.

## 5.4 Overview of software operation

### 5.4.1 Navigation tree overview




**1 Window title**
Current level in the navigation tree or title of a dialog box.

**2** ***Eppendorf*** **node**
The main node which contains all other nodes.

**3** ***User*** **node**
Contains the programs and folders as well as the list of the 5 most recently started programs of the logged-in user.

**4** ***Other Users*** **node**
Contains the nodes of the users that are not currently logged in if PINs are used (see p. 70).

**5 Cycler node**
Each cycler that is connected and switched on is shown as a separate node. The cycler node can be used to display the cycler status and execute functions.

**6** ***System*** **node**
This node contains the most important system settings. Some settings can only be edited by the administrator.

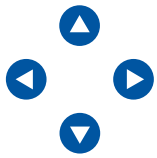
**7** ***USB*** **node**
This node is only visible if a USB storage medium has been inserted. Use this node to transfer programs and perform data backups.

**8 Softkeys**
The 5 softkeys have context-specific functions, depending on the selected node or active window.

### 5.4.2 Navigating in the navigation tree

#### 5.4.2.1 Opening the node

You have three options:



- Mark the node with the arrow keys and press the **enter** key or the ▶ arrow key.
  The node opens and the ⊞ symbol changes to ⊟.

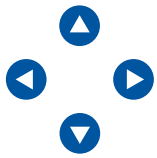
- Alternatively, click on the ⊞ symbol next to the node.

- Alternatively, use the mouse to double-click on the desired node.

#### 5.4.2.2 Closing the node

Carry out the above-mentioned steps in the reverse order:

- Click on the ⊟ symbol next to the node.
- Alternatively, double-click on the node with the mouse.



- Alternatively, mark the node with the arrow keys and press the **enter** key or the ◀ arrow key.
  The node is closed and the ⊟ symbol next to the node changes to ⊞.

### 5.4.3 Using external storage media

You can back up programs, log files and protocols to a storage medium and, for example, archive them on a PC or print them. External storage media are also needed for data backups and software updates (see p. 70).

#### 5.4.3.1 Connecting a USB storage medium

- Connect a USB storage medium to a USB port.

  After a few seconds, the *USB* node appears in the navigation tree. The programs and user nodes saved on the USB storage medium can be accessed via this node.

The Mastercycler creates a folder called \eppendorf on the USB storage medium where all files will be saved.

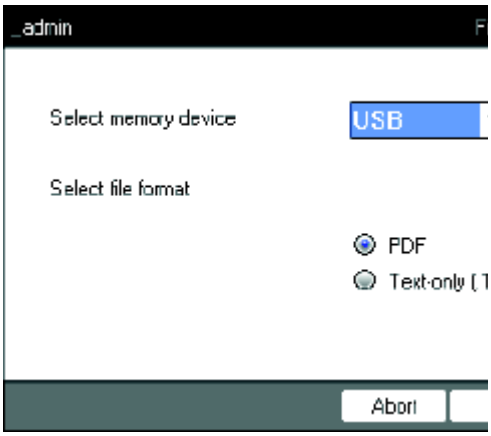
### 5.4.3.2 Removing the USB storage medium

**Caution!** The symbol is displayed in the upper right corner while the storage medium is being accessed. Wait until it has disappeared before removing the USB storage medium.

- Remove the USB storage medium.
  The *USB* node disappears from the navigation tree.

## 5.4.4 Selecting export file formats

When exporting programs, protocols and log files to external storage media, you can choose between text-only format (.TXT) and PDF.




- *Select memory device*
  Storage medium for the exported file.
- *Select file format*
  - *PDF*: Saves the file as a PDF.
    Use this setting if you only want to print or view the documents on your PC. You need to have a PDF reader software installed (e.g. Adobe® Reader®).
  - *Text-only (.TXT)*: Saves the file in text-only format (.TXT).
    Use this setting if you want to process the document content electronically (e.g. embed it in a report).
- Confirm your selection with *OK*.

The file is copied to the external storage medium, and the file name is displayed.

# 5.5 Managing folders and programs

If you are logged in as a normal user (not as an administrator), you can only create, edit and delete programs below your own user node. Further information on user rights can be found in a separate section (see *Administrator functions on p. 67)*.

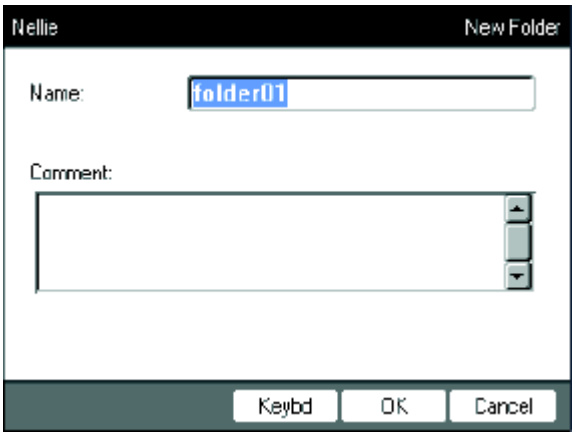
## 5.5.1 Creating folders and programs

### 5.5.1.1 Creating a folder

Proceed as follows:

1. Mark the user node.
2. Press the *NewFolder* softkey.
3. Enter a name for the new folder using the numeric keys.

Instead of the numeric keys, you can also use the software keyboard to make entries in text fields. This can be accessed via the *Keybd* key.



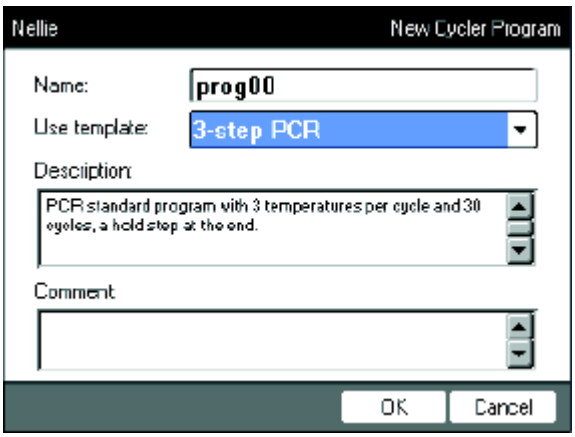

4. To enter a comment for the new folder, use the **next** key to go to the *Comment:* field.
5. Enter your comment via the numerical keys and confirm with *OK*.
   The folder is created and appears under your user node in the navigation tree.

You can change the name and comment for the folder at any time using the *Prop.* softkey.

### 5.5.1.2 Creating a new program

You can create programs in the navigation tree on the user node level or on the folder level.

1. In the navigation tree, mark the user node or folder where you want to create the new program.
2. Press the *New* softkey.




3. Enter the program name in the *Name:* field. The maximum number of characters is 21.
4. Select a program template in the *Use template:* field.
   An overview of the available program templates can be found separately (see p. 58). If you do not want to use a template, select *none*.
5. Optional: enter a comment for the new program in the *Comment* field.
6. Press the *OK* softkey.
   The new program opens in the program editor. You can now configure and save the program (see p. 49).

You can change the program properties at a later time. To do so, mark the program in the navigation tree and press the *Prop.* softkey. The following properties can be changed:

- Program name
- Comment for the program
- Read/write access rights for the program

### 5.5.2 Copying folders and programs

To copy folders or programs into your own user node, proceed as follows. When copying a folder, the programs it contains are also automatically copied.

1. In the user node of any user, mark the folder or program you want to copy.
2. Press the *Copy* softkey.

   A message appears informing you that the folder or the program was copied to the clipboard.
3. Press *OK* to confirm the message.
4. Mark your own user node. If you want to copy an individual program, you can also select a folder under your user node to which you want to copy the program.
5. Press the *Paste* softkey.

   If a program or folder already exists with the same name, you will be prompted to enter a new name. The folder or program is pasted below your user node. You can now start or edit this program.

### 5.5.3 Deleting folders and programs

1. In the navigation tree, mark the folder or the program.
2. Press the **del** key.

   A confirmation prompt appears.
3. Press the *Yes* softkey.

   The folder or program is deleted.

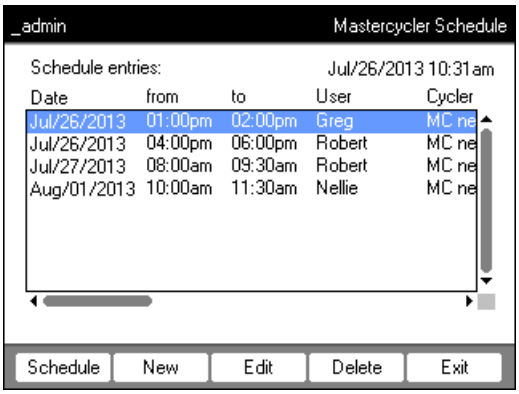
## 5.6 Using the schedule

The schedule enables users to reserve devices for a specific time. You can view the schedule at any time or use it as an automatic screensaver. Use the *System* > *Schedule Settings* node to set the devices and weekdays for the schedule. Past schedule entries are automatically deleted.

You can use the schedule as an automatic screensaver (see p. 70)

- Mark the *Eppendorf* node. Press the *Schedule* softkey.

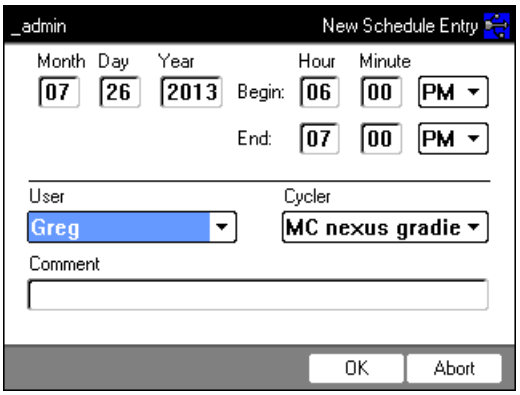
  The *Mastercycler Schedule* window appears.




| | |
|---|---|
| *Schedule* | Display the schedule. |
| *New* | Create a new schedule entry. |
| *Edit* | Change the schedule entry for the logged-in user. |
| *Delete* | Delete the schedule entry for the logged-in user. |
| *Exit* | Close the window. |

### 5.6.1 Editing a schedule entry

The following window appears if you choose to display, create or change a schedule entry:




1. Compete the fields as follows.

| | |
|---|---|
| *Day*, *Month*, *Year* | Date of the reservation. |
| *Begin:* | Start of the reservation. |
| *End:* | End of the reservation. |
| *User:* | Name of the respective user. Only users that have been set up can be selected. |
| *Cycler* | Reserved device. |
| *Comment* | Optional: comment for the reservation. |

2. Press the *OK* softkey.

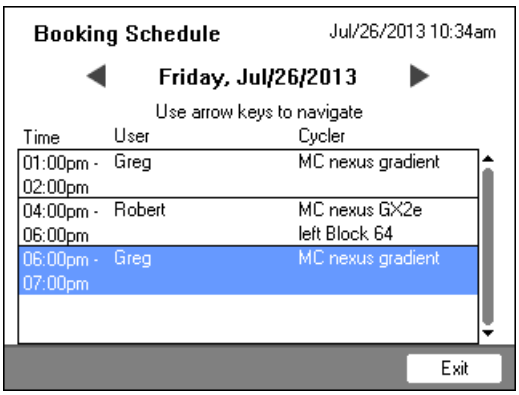
   The schedule entry appears in the list in the *Mastercycler Schedule* window.

### 5.6.2 Displaying the schedule

You can access the schedule from the *Mastercycler Schedule* and *User Login* windows.

You can use the schedule as an automatic screensaver (see p. 70)

1. In the *Mastercycler Schedule* or *User Login* windows, press the *Schedule* softkey.
   The schedule is displayed on a day-to-day basis.




Only days that have been activated by the administrator are displayed in the schedule(see p. 70).

2. Scroll to the left or right with the arrow keys to view the entries for other days.
3. Press the *Exit* softkey to exit the schedule.

## 5.7 Using the power save mode

You can use the power save mode to reduce power consumption when the device is in idle mode.

The Mastercycler nexus eco automatically switches to power saving mode if the thermoblock and heated lid have not been tempered.

The administrator can define that the Mastercycler nexus will automatically switch to the power saving mode (see p. 70).

Prerequisites

- No program and no temperature control is active.
- The program editor is not open.
- No error message is displayed.

**Switching on the power save mode**

- ▸ Press the standby key.
  The device switches to power save mode.
  - The display is switched off.
  - The USB ports are switched off.
  - The fan is switched off.
  - The status lamp flashes green at long intervals.

**Exiting the power save mode**

- ▸ Press the standby key.
  The device leaves the power save mode.
  - The display is switched on.
  - The USB ports are switched on.

# 6 Programming

## 6.1 Overview of the program editor

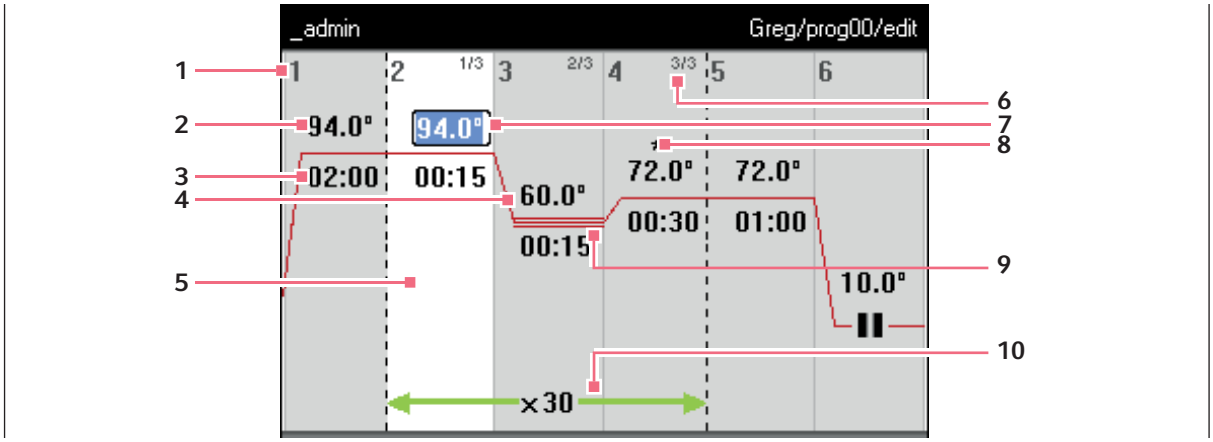
The graphic program editor can be used to view and change existing programs.

### 6.1.1 Opening the program editor

1. Mark the desired program in the navigation tree or create a new program.
2. Press the *Edit* softkey.
   The program editor is displayed.

### 6.1.2 Structure of the program editor

A program consists of a program header and up to 99 program steps that are executed by the cycler one after the other. Use the program editor to create and adjust programs.




**1 Number of the program step**

**2 Block temperature [°C]**
The thermoblock is heated or cooled in the relevant step at this temperature.

**3 Holding time [mm:ss]**
The set block temperature is maintained for this time.

**4 Average temperature for gradient steps**
When using gradient steps, increasing temperatures are generated across the columns of the thermoblock from left to right. The average temperature is displayed here.

**5 Program step highlighted marking**
The selected program step is highlighted in blue. New program steps are inserted before the marked step.

**6 Step number within the cycle**
The step number within a cycle and the total number of steps in the cycle are displayed on the top right. Example: *2/3*: second step of a 3-step cycle (*3 StepCyc*).

**7 Active input field**
Numerical keys are used to make entries.

**8 Extended program step**
Program steps are marked with a star * if they have a temperature or holding time increment or a reduced heating or cooling rate.

**9 Marking of gradient steps**
Gradient steps are indicated by three horizontal lines.

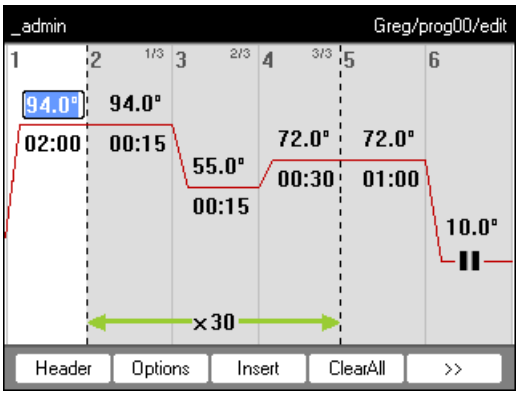
**10 Number of cycles**
The number of cycles indicates how often the program steps indicated by the green horizontal arrow are to be carried out.

## 6.2 Making general settings

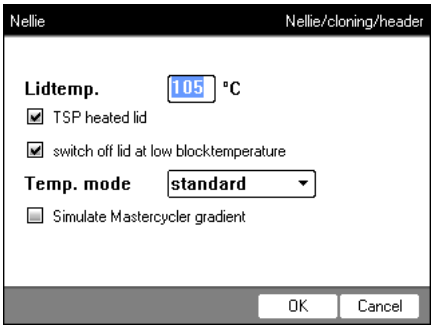
Each Mastercycler nexus program has a program header where you define the block temperature control mode and the behavior of the heated lid. These settings are valid for the entire program.

### 6.2.1 Opening the header

1. Open the program editor (see *Opening the program editor on p. 49)*.




2. Press the *Header* softkey.
   The header settings are displayed.




### 6.2.2 Editing header settings

| | |
|---|---|
| *Lidtemp.* | Heated lid temperature (37°C to 110°C). The set lid temperature is maintained constant during the program run.<br>If values below 37°C are entered, the heated lid remains switched off. |
| *TSP heated lid* | Preheat heated lid<br>• Switch TSP on and off.<br>If the *TSP heated lid* function is activated, the heated lid is heated up to the set temperature upon program start while the block temperature is maintained constant at 20°C. The program run starts once the heated lid temperature has been reached. |

| | |
|---|---|
| *switch off lid at low blocktemperature* | Lid heater with automatic switch-off<br>• Activated (default setting): the lid heater switches off if program steps have block temperatures of < 15 °C.<br>• Deactivated: the lid heater switches off after the end of the program. If the last command of the program is a hold step, the heated lid remains switched on until you press the **Enter** key.<br>**Note:** This option is useful if you have inserted a hold step as the last program step in order to automatically cool the samples after the PCR. |
| *Temp. mode* | Block temperature control mode<br>• *fast*:<br>Use this setting for Fast PCR, for low reaction volumes (< 20 µL) and for templates with a low G/C content. With this setting you achieve the shortest program run times.<br>• *standard*: block temperature control mode for standard applications.<br>Use this setting for sample volumes between 20 µL and 50 µL or if the *fast* setting only results in a weak amplification. The program run times are slightly longer than with the *fast* setting.<br>• *safe*: block temperature control mode for complex template and large reaction volumes.<br>Use this setting for sample volumes of 50 µL or more or to amplify templates with a high G+C content. The program run times are slightly longer than with the *standard* setting. |
| *Simulate Mastercycler gradient* | Simulate the temperature control behavior of the Mastercycler or Mastercycler gradient. This enables you to transfer programs from these cycler models to the Mastercycler nexus without making any adjustments (see *Transferring programs from an older Mastercycler model on p. 82)*.<br>If this option is deactivated, programs created for the Mastercycler will need to adapted for the Mastercycler nexus because of different temperature behavior. This may influence the PCR results. |

## 6.3 Editing programs

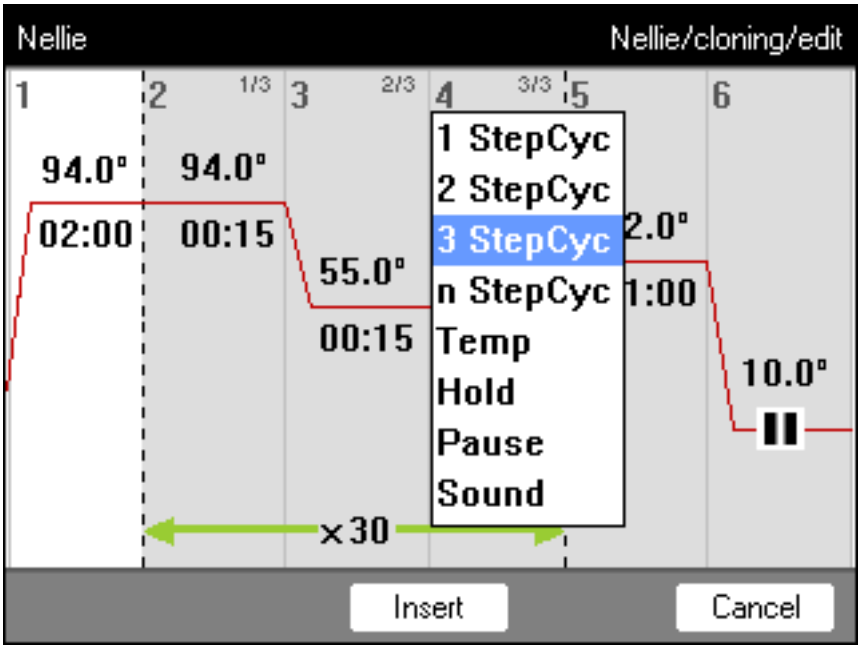
You can add, edit or delete steps in new (see p. 42) or copied (see p. 43) programs.

### 6.3.1 Inserting a program step

1. Open the program editor (see *Opening the program editor on p. 49)*.
2. Mark the program step with the arrow keys **in front of which** you would like to insert a new program step.

   The marked program step is highlighted in blue.

3. Press the *Insert* softkey.
   A list appears containing the available program steps.




4. Select the desired program step with the arrow keys.
   The following program steps are available:

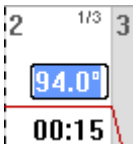
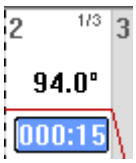
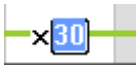
| | |
|---|---|
| *1 StepCyc* to *3 StepCyc* | Cycle program step with 1 to 3 temperature steps with an adjustable number of repetitions (1 to 99).<br>With cycle program steps you can increase or reduce the block temperatures and holding times by a preset value after each cycle . |
| *n StepCyc* | Cycle program step with an adjustable number of temperature steps. After this program step has been selected and confirmed with **enter**, a dialog window for the following entries is displayed.<br>• *Steps per Cycle*: Number of temperature steps per cycle (1 to 40)<br>• *Number of Cycles*: Number of cycles (1 to 99). If you have inserted a cycle with more than 6 steps, use the ◀ and ▶ arrow keys to view the steps that are not displayed. |
| *Temp* | Individual temperature step with adjustable block temperature and holding time. |
| *Hold* | Temperature step with adjustable block temperature and indefinite holding time.<br>The set temperature is maintained until the user presses the **enter** key. A corresponding prompt is displayed in the status view and signaled by orange flashing of the status lamp. |
| *Sound* | This program step emits an acoustic signal. |
| *Pause* | As *Hold*. The block temperature remains set to the value of the previous temperature step. |

5. Press the *Insert* softkey.
   The program step is inserted with standard parameters.

You can now insert additional program steps or edit the parameters of the program steps.

### 6.3.2 Editing parameters

1. Mark the desired program step with the arrow keys.
   The marked program step is highlighted in blue.
   You can change the temperature, holding time and number of cycles directly in this view.

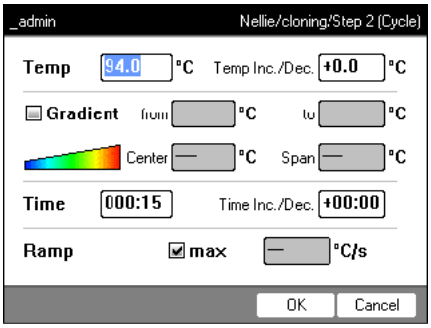
| | | |
|---|---|---|
|  | **Temperature** | Adjustable from 4.0°C to 99.0°C (in 0.1°C increments) |
|  | **Dwell time** | Adjustable from 000:00 to 999:59 (mmm:ss) in 1-second steps |
|  | **Number of cycles** | Adjustable from 1 to 99 |

2. Press the **enter** key to accept the changes.

**Extended options**

3. Press the *Options* softkey.

   The extended parameter settings for the marked program step are displayed.




| | |
|---|---|
| *Temp* | Temperature of the program step |
| *Temp Inc./Dec.* | Temperature change from one cycle to the next<br>Adjustable from –10.0°C to +10.0°C in 0.1°C increments.<br>You can switch between positive and negative values by pressing the +/- softkey. |
| *Gradient* | Temperature gradient in the thermoblock, displayed as columns<br>Detailed information on how to program a gradient step can be found in a separate section (see p. 54). |
| *Time* | Holding time for the program step |
| *Time Inc./Dec.* | Holding time change from one cycle to the next<br>Adjustable from –01:00 to +01:00 in 1 s increments.<br>You can switch between positive and negative values by pressing the +/- softkey. |
| *Ramp* | Temperature control speed of the thermoblock<br>Aluminum thermoblock: adjustable from 0.1 °C/s to 1.5 °C/s.<br>Alternatively, *max.* can be set. If you select *max.*, the maximum heating and cooling speeds specified in the Technical Data will be used. |

4. Press the *OK* softkey to accept the settings.

   The program view appears.

5. Press the >> softkey. Press the *Save* softkey.

   The changes are saved.

6. Press the *Exit* softkey to exit the editor.

### 6.3.3 Create gradient step

You can use a gradient step to optimize the specificity and yield in PCR reactions. A temperature gradient increasing from the left to the right side of the block is generated during the holding time. The ramp rates before and after the gradient step are constant across the entire thermoblock.

Details about the maximum gradient spread can be found in the product description (Tab.  on p. 22).

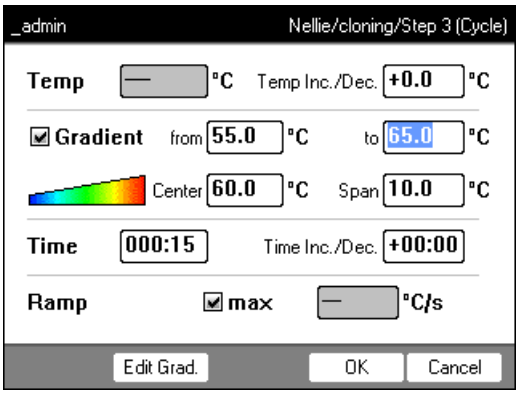
The gradient function is only available to the following devices:

- Mastercycler nexus gradient
- Mastercycler nexus gradient eco
- Mastercycler nexus GX2 (Gradient function only for thermoblock with 64 wells)
- Mastercycler nexus GX2e (Gradient function only for thermoblock with 64 wells)

Proceed as follows to define a gradient step in a PCR program:

1. Mark the temperature control step in which you would like to define the gradient.
2. Press the *Options* softkey.

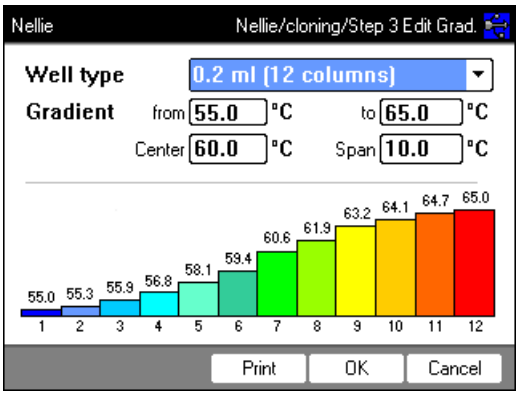
   The options for the selected temperature control step are displayed.




3. Select the *Gradient* checkbox.
4. Define the gradient temperatures.

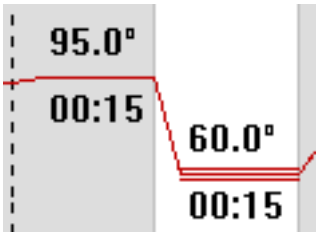
   The gradient temperatures can be defined in two ways:
   - By entering limit temperatures
     - *from*: lower limit temperature (left side of block)
     - *to*: lower limit temperature (left side of block)
   - By entering the center temperature and the temperature span
     - *Center*: center temperature (center of block)
     - *Span*: temperature span (gradient range)

5. Optional: Press the *Edit Grad.* softkey to display the resulting temperatures in block columns.




| | |
|---|---|
| *Well type* | Select the tube type:<br>• *0.2 ml (12 columns)*: standard PCR tubes and 96-well plates<br>• *0.5 ml (11 columns)*: 0.5 mL PCR tubes<br>• *0.2 ml GX2 (8 columns)*: 0.2 mL PCR tubes<br>• *0.5 ml GX2 (7 columns)*: 0.5 mL PCR tubes |
| *Gradient* | Gradient temperature |

6. Press the *OK* softkey to accept the settings and close the window.
   The gradient step is symbolized in the program editor by three horizontal lines.




### 6.3.4 Deleting program steps

1. Mark the desired program step with the arrow keys. To delete all program steps, press the *ClearAll* softkey.
2. Press the **del** key.
3. Press the *Save* softkey to save the change.

Press the *Exit* softkey to exit the editor.

### 6.3.5 Exporting a program as a PDF or text file

You can export a program to an external storage medium as a file for archiving.

1. Connect a storage medium (see p. 40).
2. Press the >> softkey.
3. Press the *Export* softkey.
4. Select the file format (text or PDF). Press the *OK* softkey.
   The program is saved to the external storage medium as a file.

### 6.3.6 Saving a program and exiting the editor

1. Press the >> softkey.
2. Press the *Save* softkey.
   The program is saved.
3. Press the *Exit* softkey.

The navigation tree is displayed. You can now start the program (see *Starting a program on p. 61)*.

## 6.4 Program templates

The following table provides an overview of the program templates. The program templates can be used to create new programs.

| Program template | Description |
|---|---|
| *none* | Empty template with standard header settings. |
| *2-step PCR* | Standard PCR program with two temperatures per cycle and 30 cycles, one hold step at the end. |
| *3-step PCR* | Standard PCR program with three temperatures per cycle and 30 cycles, one hold step at the end. |
| *Cycle sequencing* | Standard program for cycle sequencing with ramp rates of 1 °C/s. |
| *Fast PCR* | 3-step PCR with short hold times and temperature mode *fast* |
| *Gradient PCR* | PCR program with a temperature gradient in the annealing step of each cycle. |
| *Hot start PCR manual* | PCR program with thermoblock preheating at 95 °C. Start the following PCR run using the **start** key. |
| *Hot start PCR* | 10 min enzyme activation at 95 °C and 3-step PCR. |
| *Incubation* | IsoTherm incubation. |
| *Large volume PCR* | 3-step PCR in *safe* temperature mode. |
| *Long range PCR* | 3-step PCR with 10 min elongation and a time interval of +10 s per cycle. |
| *Low volume PCR* | 3-step PCR in *fast* temperature mode. |
| *Mastercycler 533x* | 3-step PCR with simulation of the temperature control behavior of the Mastercycler gradient 5331. |
| *Nested cycles* | Program in which 3 cycles, with 3 temperatures each, are summarized in a 9-StepCycle, e.g., for TAIL PCR. |
| *Reduced Ramping* | 3-step PCR with ramp rates of 1 °C/s. |
| *Reverse Transcription* | Incubation for reverse transcription and enzyme activation. |
| *RT-PCR* | Program for 1-step RT-PCR with series incubation for reverse transcription. |
| *Touchdown PCR* | PCR program with falling annealing temperature. During the first 16 cycles, the annealing temperature will be decreased by 1 °C per cycle. |

# 7 PCR run

## 7.1 Loading the thermoblock

### 7.1.1 Selecting the sample tubes

#### 7.1.1.1 Approved sample tubes for devices with a thermoblock with 96 wells

The thermoblock can be loaded with the following sample tubes:

- 0.1 mL PCR tubes
- 0.2 mL PCR tubes
- 0.5 mL PCR tubes (only for aluminum thermoblock)
- PCR tube strips (0.1 mL or 0.2 mL)
- 96-well PCR plates
- segments of separable 96-well PCR plates

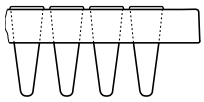
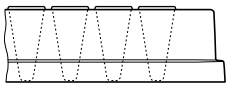
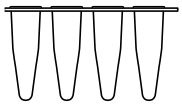
#### 7.1.1.2 Approved sample tubes for devices with 64+32-well thermoblocks

The thermoblock can be loaded with the following sample tubes:

- 0.1 mL PCR tubes
- 0.2 mL PCR tubes
- 0.5 mL PCR tubes
- PCR tube strips (0.1 mL or 0.2 mL)
- 64-well and 32-well PCR plates
- segments of separable 96-well PCR plates

#### 7.1.1.3 Compatible types of PCR plates

The following types of PCR plates are compatible.

| Semi-skirted PCR plate | Skirted PCR plate | Non-skirted/unskirted PCR plate |
|---|---|---|
|  |  |  |
| PCR plate with a semi skirt. | PCR plate with full skirt. | PCR plate without a skirt. |

#### 7.1.1.4 Requirements

The sample tubes must meet the following requirements:

- Temperature resistance of 120 °C min.
- Accurate fit in the thermoblock

### 7.1.1.5 Maximum volumes

The sample volumes may vary depending on which type of sample tube is used.

**For devices with an aluminum thermoblock**

- PCR plates and 0.1 mL or 0.2 mL PCR tubes: Max. 70 µL
- 0.5 mL PCR tubes: Max. 100 µL

## 7.1.2 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 information when loading the thermoblock with tubes

- Place the tubes in the center of the thermoblock and ensure that they are positioned symmetrically towards the center. This applies for individual tubes, tube strips and segments of divisible PCR plates.
- Load 96-well thermoblocks with at least 5 tubes. If you have fewer reaction batches, add some empty tubes to ensure that the thermoblock is loaded with a minimum of 5 tubes.
- Load 64+32-well thermoblocks with at least 2 tubes. If you have fewer reaction batches, add some empty tubes to ensure that the thermoblock is loaded with a minimum of 2 tubes.

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

- Increase the number of empty sample tubes in the thermoblock.
- Reduce the temperature of the heated lid (see p. 50).
- Use original Eppendorf PCR consumables. Eppendorf PCR consumables are a perfect match for the device.

## 7.2 Starting a program

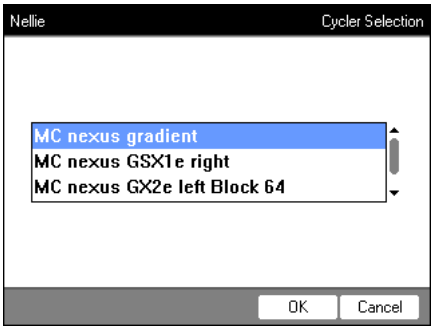
If the *PIN* function is activated, you can only start programs that are saved below your user node (see p. 67).

Prerequisites

- Thermoblock loaded (see p. 59)
- Heated lid closed (see p. 34)

1. Mark the program in the navigation tree with the arrow keys or open it in the editor.
2. Press the **start** key.

   If multiple cyclers are available, the *Cycler Selection* window appears.

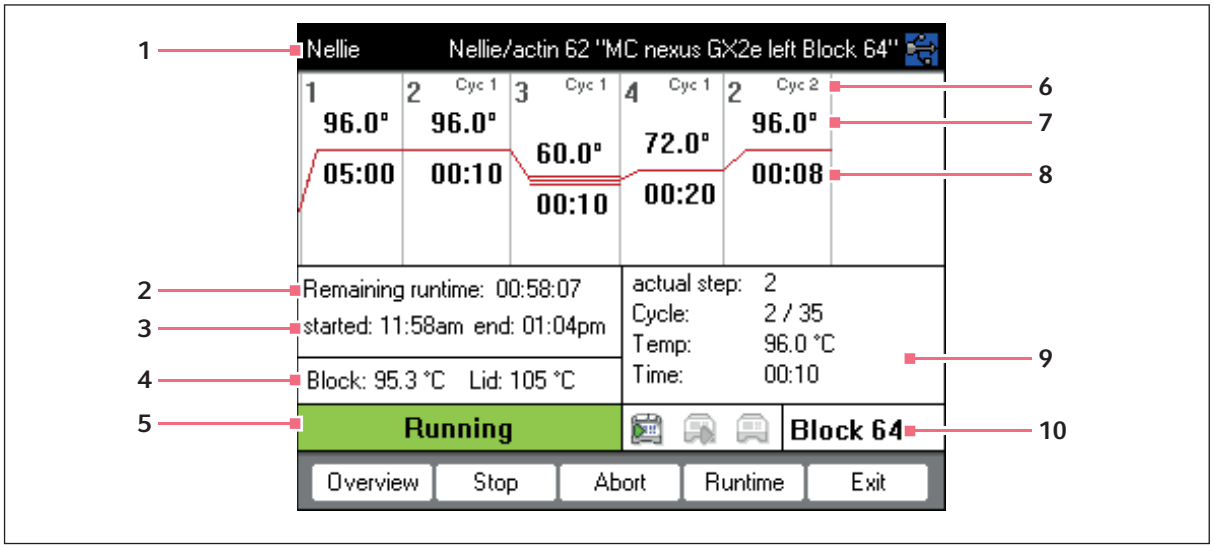



3. Mark the desired cycler.
4. Press the *OK* softkey.

The program is started and the status view appears.

### 7.2.1 Status view

The status view is automatically displayed immediately after a program is started. It shows the progress of and information on a running program. The currently active step is displayed as a flashing line.




1 **User, program name and cycler**

2 **Remaining run time**

3 **Start and end time of the program**

4 **Block and heated lid temperature**

5 **Device status**

6 **Cycle number**

7 **Block target temperature**

8 **Remaining holding time**

9 **Information on the current program step**

10 **Specification of the selected cycler**

If you have activated the *TSP* function in the program header (see p. 50), the heated lid is first brought to the correct temperature before the program run starts. This process is indicated in the status view by the message *TSP heated lid*.

You can exit the status view and return to the navigation tree at any time by pressing the *Exit* softkey, e.g. to edit another program or start a program on a different cycler. Use the left/right arrow key to access the status view of other connected cyclers. The program that was already started is not interrupted as a result.

#### 7.2.1.1 Displaying the status view

Proceed as follows:

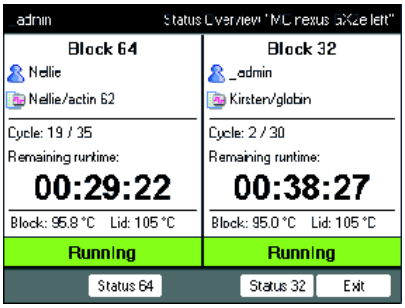
1. Mark the cycler in the navigation tree.
2. Press the *Status* softkey.

The status of the cycler is shown with an icon:

- Idle
- Running
- Paused
- Fault

### 7.2.2 Common status view for devices with a thermoblock with 64+32 wells

The common status view shows the progress and most important information on the running programs of both thermoblocks.




You can display the status views of the individual programs via the *Block 64* and *Block 32* softkeys.

The status views of the individual programs can be accessed via the up/down arrow keys.

Use the right/left arrow keys to call up the common status views of other connected cyclers.

To open the common status view, proceed as follows:

1. Mark the cycler in the navigation tree.
2. Press the *Overview* softkey.

The common status view can also be opened via the *Overview* softkey in the status view of the respective program.

## 7.3 Interrupting or stopping a program

### 7.3.1 Interrupting a program

1. Open status view (see *Starting a program on p. 61)*.
2. Press the **stop** key.
   *Paused* is displayed in the status view.

### 7.3.2 Resuming a program

1. If the heated lid is open: close the heated lid.
2. Press the *Resume* softkey.
   *running* appears in the status view, and the program run continues.

### 7.3.3 Stopping a program

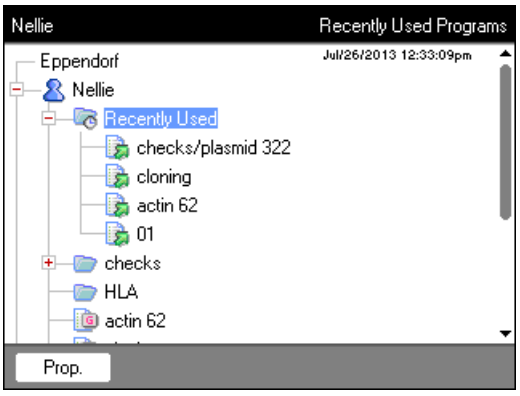
- Press the *Abort* softkey.
  The *Idle* status is displayed. The program has been aborted and cannot be continued.

A hold step at the end of a PCR program is completed via the **enter** key.
In the common status view, you can end the PCR program out of a hold step via the *End 64* or *End 32* softkeys.

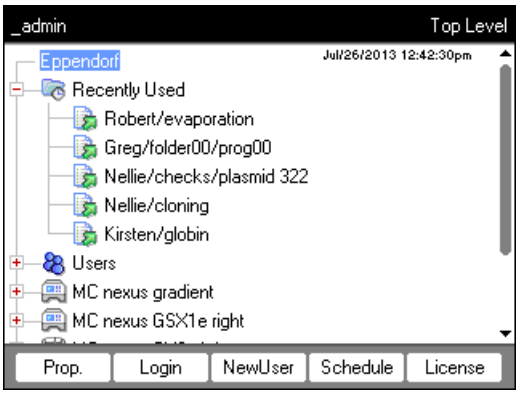
## 7.4 Displaying the most recently run programs

The device can display a list of the 5 most recently run programs.

If the *PIN* function is switched on and a user is logged in, the *Recently Used* node is positioned in the user node.



If the *PIN* function is switched off or the administrator is logged in, the *Recently Used* node is located below the *Eppendorf* node.




If no user is logged in, the *Recently Used* node is not available.

The following functions are available:

| | |
|---|---|
| Key: **start** | Start the last run program. |
| Softkey: *Prop.* | Display the properties of the last run program. |
| Softkey: *Edit* | Edit the last run program. |
| Softkey: *Copy* | Copy the last run program. |
| Softkey: *Export* | Export the last run program. |

# 8 System management

## 8.1 Administrator functions

The Mastercycler nexus software differentiates between default users and the administrator. All users and the administrator need a PIN to log into the device. Users can only make changes to their own accounts. The administrator has write access to all areas. If you deactivate the PIN function, all users automatically have administrator rights and can make changes to all user accounts (see p. 70).

The access rights differ as follows:

| Procedure | Default users | Administrator |
|---|---|---|
| Copying programs | From each user node to own user node | From each user node to each user node |
| Creating, deleting, editing and starting programs | Only programs below their own user node | All programs |
| Managing user accounts and generating PINs | Only change own user name and PIN | Create, change, delete user accounts. Change the PIN for each user. |
| Making system settings | None | All |
| Performing the self test, verification and adjustment | Self test and verification only | Self test, verification and adjustment |
| Performing backups, restores and software synchronizations | Only backups | All |

## 8.2 Managing user accounts

- A user name can only be assigned once.
- The administrator uses the set user name *_admin*.

### 8.2.1 Creating a user account

Prerequisites

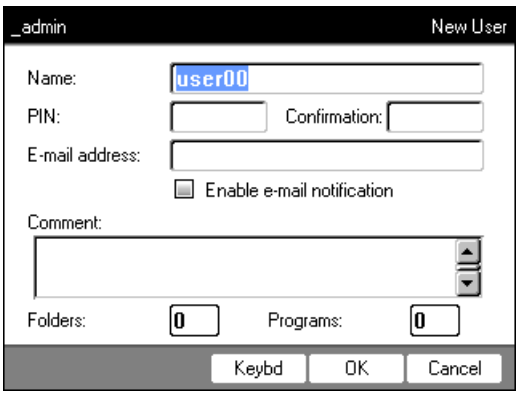
If the PIN function is activated: logged in as an administrator

You can set up a user account for each user:

1. In the navigation tree, mark the *Eppendorf* node (at the top).

2. Press the *NewUser* softkey.

   The *New User* window appears.




3. Enter the name and PIN of the new user. Re-enter the PIN in the *Confirmation:* field.
4. Optionally enter the user's e-mail address in the *E-mail address:* field. To activate e-mail notifications, check the *Enable e-mail notification* checkbox.
5. Press the *OK* softkey.

   The new user account is created. A new user node with this user name is created in the navigation tree. The user can now log in with his PIN.

### 8.2.2 Editing a user account

If you have the appropriate user or administrator rights, you can change the following data of existing user accounts:

- PIN
- E-mail address
- Comment

1. Mark the user node in the navigation tree. Press the *Prop.* softkey.

   The *User Properties* window appears.

2. Change the settings for the user account. Press the *OK* softkey.

### 8.2.3 Deleting a user account

You must be logged in as an administrator to be able to delete user accounts.

Deleting a user account will delete the respective user node including all folders and programs it contains. Deleting a user account is a permanent change and cannot be undone.

1. Mark the user node. Press the **del** key.

   A query appears whether you really want to delete the user account.

2. Press the *OK* softkey.

   The user account is deleted.

### 8.2.4 Changing the administrator PIN

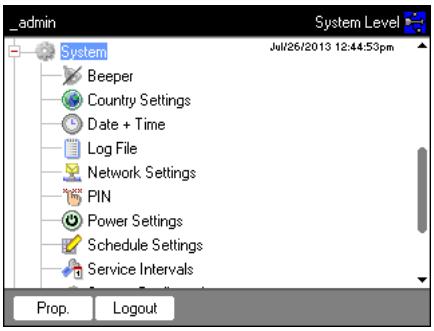
If you are logged on as an administrator, you can change the administrator PIN at any time.

**NOTICE! Data loss due to unauthorized use of the administrator password.**
The administrator password protects the device software from unwanted access.

- Make a note of the administrator password.
- Store the administrator password in a secure location.
- Only provide the administrator password to individuals who work with the system configuration.
- Please contact Eppendorf SE if you have any problems with the administrator password.

1. Switch on the Mastercycler nexus and log in as the administrator.
2. Mark the *System* node. Press the *Prop.* softkey.
   The *System Properties* window appears.
3. Enter the new administrator PIN using the numeric keys.
   If you have entered the PIN incorrectly, delete it with the **del** key and re-enter the PIN.
4. Re-enter the new PIN in the *Confirmation:* field to confirm.
5. Press the *OK* softkey.
   The new administrator PIN is immediately valid.

## 8.3 System settings




▸ To change the system settings, open the *System* node.

| | |
|---|---|
| *Beeper*: activate or deactivate signal tones | ▸ Activate or deactivate the *Beeper* node.<br>When the function is activated, the key-press and error message signal tones are switched on.<br>When the function is deactivated, only the error message signal tones are switched on. |
| *Country Settings*: change country settings | The country settings are identified by the international dialing code (e.g., "001" for the U.S.). In the country settings, you can define the language setting and the date and time display (12 or 24-hour format).<br>1. Mark the *Country Settings* node. Press the *Set* softkey.<br>2. Select the desired settings. Press the *OK* softkey.<br>The device restarts. |
| *Date + Time*: set date and time | 1. Mark the *Date + Time* node. Press the *Set* softkey.<br>2. Set the date and time . Press the *OK* softkey. |
| *Log File*: export log file | ▸ Mark the *Log File* node. Press the *Export* softkey. The log file is written to the storage medium.<br>▸ Optional: to display the log file, mark the *Log File* node. Press the *Show* softkey. |
| *Network Settings*: change network settings | Set up a network connection (see *Network connection on p. 83)*. |
| *PIN*: activate or deactivate the PIN | ▸ To activate the *PIN* function (user management), press the *Select* softkey, or press the *Unselect* softkey to deactivate it.<br>The device restarts. |

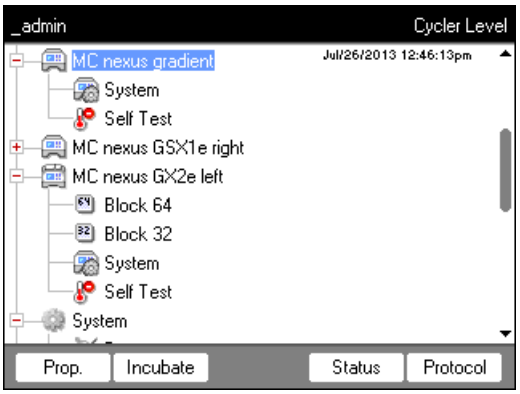
| | |
|---|---|
| *Power Settings*: configure the automatic power saving mode | The *Power Settings* node can be used to define when the device should automatically switch to power saving mode.<br>1. Mark the *Power Settings* node. Press the *Set* softkey.<br>2. To activate the automatic power saving mode, select the *Enable automatic standby* checkbox.<br>3. In the *Enter standby mode after (hh:mm)* field, set the time after which the device should automatically switch to power saving mode. Press the *OK* softkey. |
| *Schedule Settings*: make schedule settings | The *Schedule Settings* can be used to configure the schedule display and selection options.<br>▸ Mark the *Schedule Settings* node. Press the *Set* softkey.<br>• To use the schedule as a screensaver, select the *Enable Screensaver* checkbox. In the *Wait [s]* field, set the time after which the screensaver should be activated.<br>• To select the days of the week to be displayed in the schedule, activate the corresponding checkboxes for *In schedule day view the following weekdays are displayed*.<br>• To select the device types to be displayed in the schedule, activate the corresponding checkboxes for *In the schedule editor the following cyclers are enabled*.<br>▸ Press the *OK* softkey. |

| | |
|---|---|
| *Service Intervals*: configure the temperature verification and self-test intervals | The *Service Intervals* node can be used to define intervals for a regular temperature verification or a self test.<br><br>▸ Mark the *Service Intervals* node. Press the Verification or Self-test softkey. The intervals can be defined in the following display.<br>• Specification of months (1 – max. 24)<br>• Specification of programs run (1 – max. 2000)<br><br>The following information is displayed for each cycler:<br>• the programs run since the last verification or self test<br>• the date of the next check<br><br>This information can also be found in the *Block* cycler system functions (see p. 75).<br>You will receive an information message before the defined intervals expire. The information message contains details about the remaining days or program runs before the interval expires. If e-mail dispatch is activated (see p. 85), the administrator will receive a corresponding message.<br>When the intervals expire, a temperature verification and/or a self test must be carried out. Alternatively, you can deactivate the interval setting. |
| *System Configuration*: configure device-specific information on ramp and gradient | Changes under *System Configuration* are only required if you operate different variants of master and eco devices together.<br><br>▸ Mark the *System Configuration* node. Press the *Set* softkey.<br>▸ Set the ramp specifications.<br>• For devices with an aluminum thermoblock, select Mastercycler nexus. Adjustable value range: 0.1 to 1.5 °C/s or *max.*.<br><br>▸ Set the gradient range specifications.<br>• For devices with the 96-well thermoblock with a gradient function, select 20 °C. If "Off" is selected, no gradients can be programmed and the corresponding programs cannot be started.<br>• For devices with the 64+32-well thermoblock with a gradient function, select 12 °C. If "Off" is selected, no gradients can be programmed and the corresponding programs cannot be started.<br>• The *Show well types* checkboxes can be used to define which well types are displayed under *Edit Grad.* (see p. 54). |

| | |
|---|---|
| *User Log File*: display or export user data | The *User Log File* node can be used to display or export all actions performed as a log file. You can display or export the following data:<br>• login and logout procedures<br>• changes to and interventions in running programs<br>• software version update<br>• definition and deactivation of service intervals<br><br>▸ Mark the *User Log File* node. Press the *Show* softkey.<br>In the next window, you can print or export the log file.<br><br>▸ To export the log file, press the *Export* softkey.<br>▸ To print the log file, press the *Print* softkey. |

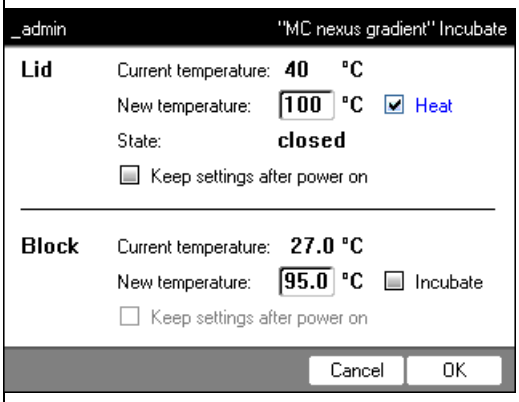
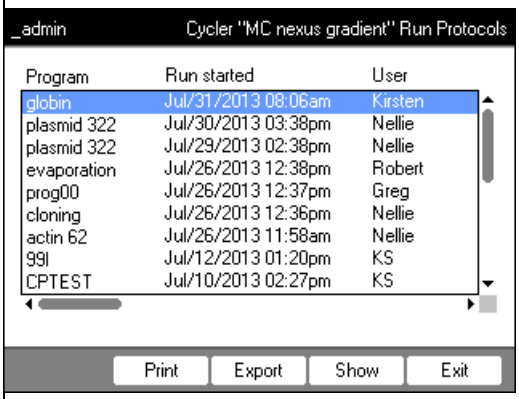
## 8.4 Cycler functions

The cycler nodes enable you to view and adjust the status of the thermoblock and the heated lid and access the protocols of the last 20 programs.




The softkeys have the following functions:

| | |
|---|---|
| *Prop.* | • Change the name of the cycler node.<br>The name must not contain any special characters.<br>• Display the installed firmware version<br>• Display the last logged-in user<br>• Display the last run program |

| | |
|---|---|
| *Incubate* | Display and change the current temperature of the heated lid and the thermoblock.<br>  <br><br>• *Current temperature:* Display the current temperature<br>• *New temperature:* Set the target temperature<br>• *Heat*/*Incubate*: Control the temperature of the heated lid/thermoblock<br>• *Keep settings after power on*: Automatically keep the current temperature control setting when the cycler is idle. This setting will remain unchanged even after a cycler restart. It can only be changed by an administrator. |
| *Status* | • Display the cycler operating status<br>• Display the temperatures of the thermoblock and the heated lid<br>• Display the remaining run time for the program<br>• Stop the program |
| *Protocol* | Protocols of the last 20 program runs:<br>  <br><br>▸ Select the protocol via the arrow keys.<br>• *Print* softkey: Print the protocol<br>• *Export* softkey: Copy the protocol to a storage medium<br>• *Show* softkey: Display the protocol |

The following applies to devices with a thermoblock with 64+32 wells:
The Cycle functions comprise the *Properties*, *Overview*, *Status 64* and *Status 32* softkeys.
The *Incubate* and *Protocols* softkeys are located under the subnodes *Block 64* or *Block 32*.

### 8.4.1 Cycler system functions

The *System* node contains the cycler system level with the following softkeys.

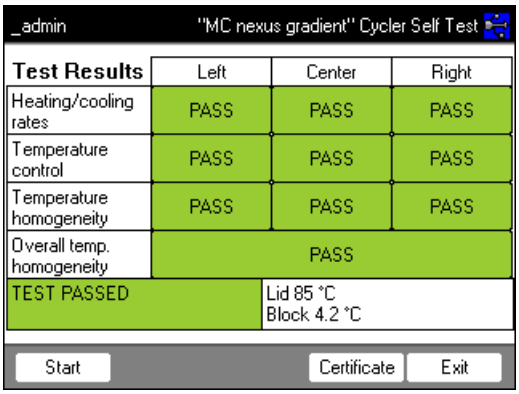
| | |
|---|---|
| *Info* | • Display the device name<br>• Display the date of the last verification<br>• Display the date of the last verification<br>• Display the programs run (since the last verification)<br>• Display the date of the last self test<br>• Display the date of the next self test<br>• Display the programs run (since the last self test)<br>• Display the date of the last adjustment<br><br>Details about the next verification or self test are only given if the settings have been made under *Service intervals* (see p. 70). |
| *Restart* | Entry for maximum duration of interruption of voltage supply (*mm:ss*) after which a running program should be automatically restarted. The program is not restarted after a longer interruption. |
| *Sensors* | Display current sensor temperatures for the control loops of the thermoblock and the heated lid. |
| *Verification* | Verify temperature accuracy and temperature homogeneity of the thermoblock with the Eppendorf Temperature Verification System. |
| *Adjustment* | Adjust temperature accuracy and temperature homogeneity of the thermoblock with the Eppendorf Temperature Verification System. Can only be done by the administrator. |

The Eppendorf Temperature Verification System is required for the *Verification* and *Adjustment* functions. For information on how to use this system, refer to the corresponding operating manual.

## 8.4.2 Self test

The self test function allows you to perform a quick check regarding the following attributes of the thermoblock without requiring an external measurement system:

- Heating and cooling rates
- Proper functioning of the temperature control loops
- Temperature homogeneity in each of the three block zones and across the entire block

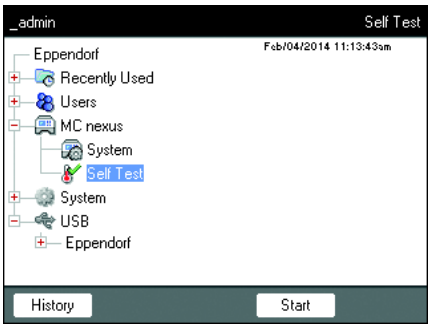



After a successful self test, a certificate can be generated in PDF format.

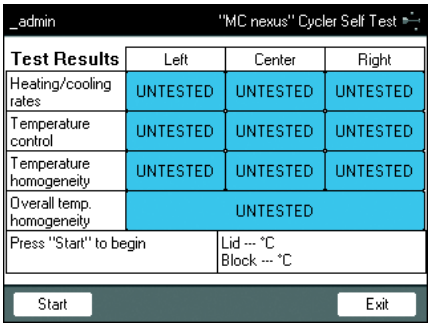
**Conducting a self test**

**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.

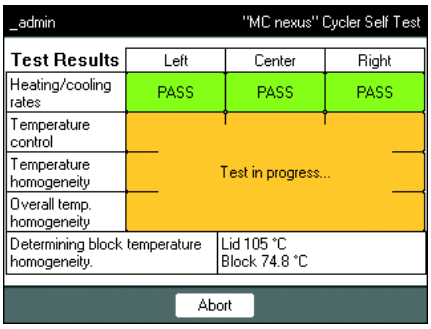



1. Load the thermoblock with an empty PCR plate.
2. Close the heated lid.
3. Select the device in the navigation tree.
4. Select the *Self Test* function.
5. Press the *Start* softkey.
   The *Test Results* window is displayed.




6. Press the *Start* softkey.
   The self test starts automatically. Information on the current test will be displayed.

### Test procedure




| | |
|---|---|
| *Left, Center, Right* | Left, center and right block zones according to the temperature control loops of the block. |
| *Heating/cooling rates* | Temperature control speed of the block during heating or cooling |
| *Temperature control* | Accuracy of the temperature control. |
| *Temperature homogeneity* | Temperature homogeneity in each individual control system |
| *Overall temp. homogeneity* | Temperature homogeneity throughout the entire block |

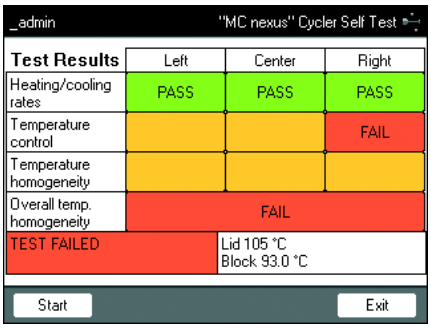
The temperature homogeneity and the accuracy of the temperature control are determined at the block temperatures 4 °C, 35 °C, 55 °C, 75 °C and 95 °C after a holding time of 30 s.

The test result is displayed after 5 to 10 minutes.

### Displaying the results

- *PASS*: Partial tests passed.
- *FAIL*: Partial tests failed.

The self test is considered passed if all partial tests have been successfully completed.




If the self test is not passed, this indicates that the block is aging, maladjusted or has a malfunction. Please contact the authorized service if this is the case.

Use the Eppendorf Temperature Verification System to verify and adjust the block's temperature accuracy.

### Creating a certificate

Prerequisites

The self test was passed in all partial tests, and the test result is displayed.

1. Connect a storage medium.
2. Press the *Certificate* softkey.

   The certificate is copied to the storage medium as PDF file. When the storing process is complete, the path to the copied file is displayed.

After the self test has been passed, a certificate in PDF format can be exported to an external storage medium.

The certificate can be displayed on a computer and printed. For this purpose, a PDF viewer such as Adobe Reader is required.

Eppendorf Certificate

eppendorf

Self Test Mastercycler®

Mastercycler nexus

Serial number: 6333PA900000

Software version: 3.7.0.0

Thermoblock and lid fulfills requirements according to selftest procedures and manufacturer's specifications:

| Block Zone | Temperature Control (95 °C, 75 °C, 55 °C, 35 °C, 4 °C) | Ramping Rates |
|---|---|---|
| left | PASSED | PASSED |
| center | PASSED | PASSED |
| right | PASSED | PASSED |

Your local distributor: www.eppendorf.com/contact
Eppendorf AG · 22331 Hamburg · Germany
E-mail: appendorf@eppendorf.com

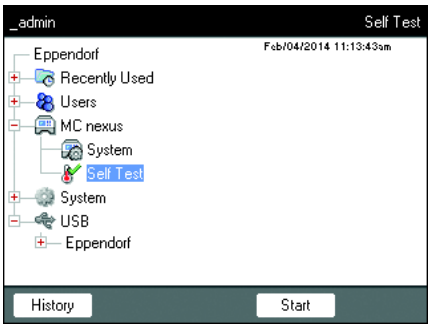
www.eppendorf.com

Fig. 8-1: Example of a certificate

### 8.4.3 Displaying, printing or exporting the history

Prerequisites

- A user is logged in (if the *PIN* function is active).
- The navigation tree is displayed.

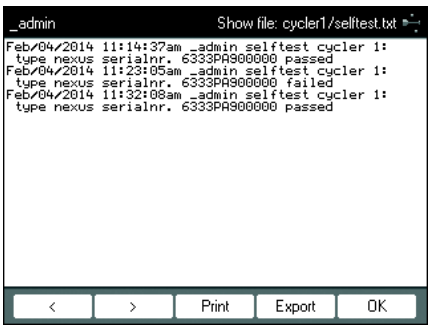



1. Select the device in the navigation tree.
2. Select the *Self Test* function.
3. Press the *History* softkey.
   The history is displayed.

### Printing the history

Prerequisites

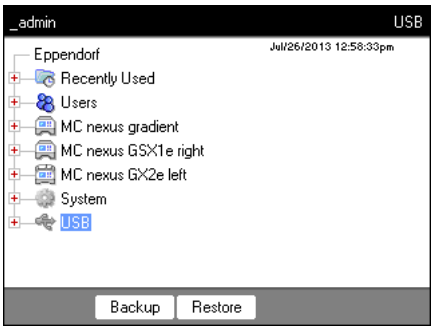
A supported printer is connected (see operating manual of the thermal cycler).




- Press the *Print* softkey.

## 8.5 Managing and backing up data

### 8.5.1 Backing up data




The softkeys in the window above show the possibilities the administrator has to transfer data. Default users can only perform backups here.

**NOTICE! Loss of data after creation and restoration of a data backup.**

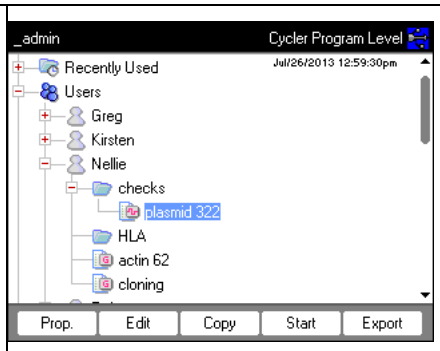
- Creating a data backup on a USB storage medium: Before the backup is created, the \eppendorf folder on the USB storage medium is completely erased.
- Restoring a data backup: Before the data backup is restored, already existing user nodes, folders and programs on the cycler are erased. Only the data transferred from the storage medium will be available after the restore.

1. Connect a storage medium.
   The node for the storage medium appears in the navigation tree.
2. Mark the node for the storage medium.

| | |
|---|---|
| *Backup* | Save user nodes, folders and programs to an external storage medium. |
| *Restore* | Administrator only: Restore the user nodes, folders and programs saved on the storage medium during a backup. |

## 8.5.2 Exporting and importing programs

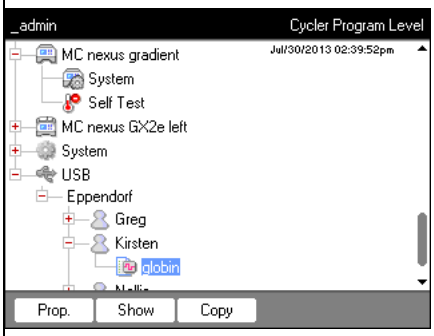
**Export**




1. In the navigation tree, mark the program.
2. Connect a storage medium.
3. Press the *Export* softkey.
   The program is copied to the storage medium.

You can transfer the exported programs to another device.

**Import**




1. Connect the storage medium with the exported programs.
2. Open the node for the storage medium and mark the folder or program you would like to import.
3. Press the *Copy* softkey.
4. Mark the user node or folder at the target location. Press the *Paste* softkey.

## 8.6 Transferring programs from an older Mastercycler model

PCR programs from older Mastercycler models can easily be transferred to the Mastercycler nexus without optimization of the temperatures and holding times.

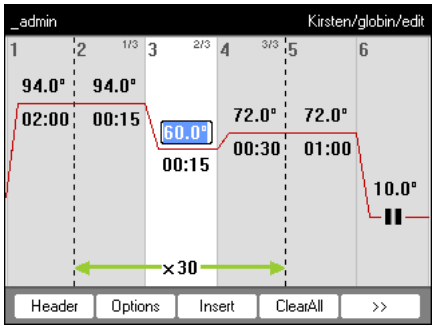
- Enter the program into the Mastercycler nexus editor:

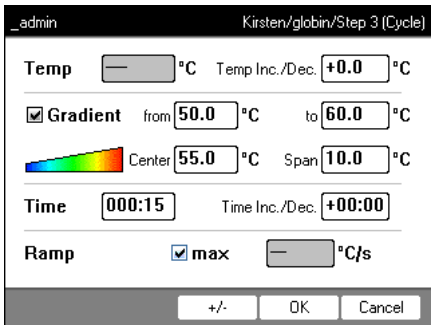
**Gradient protocol on the Mastercycler gradient and analog setting on the Mastercycler nexus gradient**

- Enter the program into the Mastercycler nexus editor:

**Example**

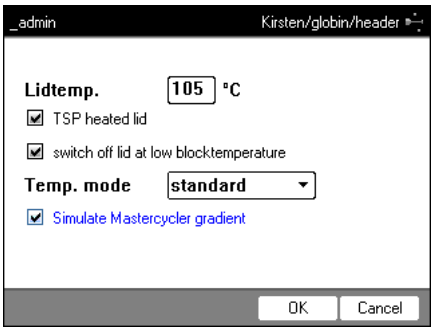
| | |
|---|---|
| 1 T = 94.0° | 0:02:00 |
| 2 T = 94.0° | 0:00:15 |
| 3 T = 60.0° | 0:00:15 |
| +0.0° | +0:00 |
| R = 3.0°/s | +0:0°/s |
| G =10.0° | |
| 4 T = 72.0° | 0:00:30 |
| 5 GOTO 2 | REP 29 |
| 6 T = 72.0° | 0:02:00 |
| 7 HOLD 4.0° | ENTER |




For the Mastercycler nexus you need to enter the gradient spreads.
A gradient setting of **G = 10.0°** for the Mastercycler gradient corresponds to a gradient spread of **20.0°C** for the Mastercycler nexus gradient. Enter this value in the *Span* field.

- Make the desired settings in the header (see *Editing header settings on p. 50)*.




| Setting from the Mastercycler 533x program | Corresponding setting in the program header |
|---|---|
| LID 105°C | *Lidtemp.* |
| WAIT ≙ | *TSP heated lid* |
| AUTO ≙ | *switch off lid at low blocktemperature* |
| CNTRL ≙ | *Block* = *Temp. mode fast*<br>*Tube* = *Temp. mode standard* or *safe*<br>Select the *Temp. mode* setting based on the reaction volume or the sample properties (see p. 50). The temperature control mode for 0.5 mL standard tubes (not thin-walled) is no longer supported on the Mastercycler nexus. |
| Block temperature control behavior | Check the *Simulate Mastercycler gradient* checkbox. |

- Press the *OK* softkey.
  The editor is displayed.
- Press the >> softkey. Press the *Save* softkey.

You can start the program without renewed optimization of the parameters.

## 8.7 Network connection

You can connect the Mastercycler nexus to an Ethernet network in order to send e-mails and protocols. To set up the network connection, you will need the following information from your network administrator:

- IP address, subnet mask and gateway address for the Mastercycler nexus (specified by the network administrator).
  Alternatively, you can assign the IP address automatically via DHCP.
- IP address of the primary DNS server
  You can optionally enter the IP address of a backup DNS server. Alternatively, you can assign the IP address automatically via DHCP.
- For sending e-mails:
  - E-mail address of the sender, user name and password to log into the SMTP-Server (if required)
  - Name or address and port number of the SMTP server
- For sending Syslog messages:
  - Name or address and port number of the syslog server

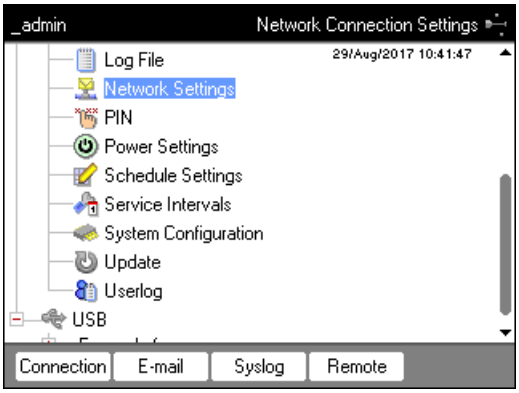
### 8.7.1 Setting up a network connection

Prerequisites

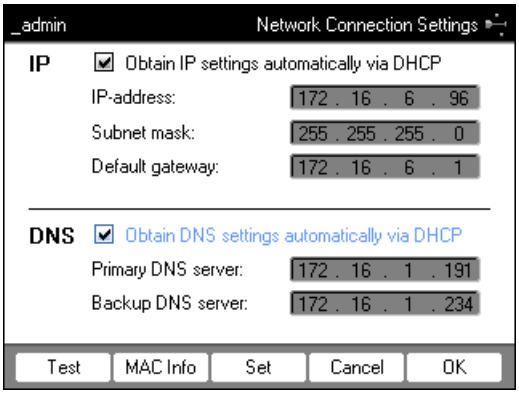
- Ethernet cable (RJ45, Cat.5), not included in the delivery package
- Logged in as an administrator (see p. 37)

Proceed as follows:

1. Select the *System* > *Network Settings* node.




2. Press the *Connection* softkey.
   The *Network Connection Settings* window appears.




3. To assign the IP address automatically via DHCP, check the *Obtain IP settings automatically via DHCP* checkbox. Alternatively, enter the IP address, subnet mask and standard gateway as specified by your network administrator.
4. To assign the IP address of the DNS server via DHCP, check the *Obtain DNS settings automatically via DHCP* checkbox. Alternatively, enter the IP addresses of the DNS servers as specified by your network administrator.

5. Insert the Ethernet cable into the Ethernet port on the rear of the device and connect it to an Ethernet port of the Ethernet network.
6. Press the *Set* softkey to accept the settings.

Press the *Test* softkey to test the connection to the default gateway.

If your network administrator needs the MAC address of the Mastercycler nexus, press the *MAC Info* softkey.

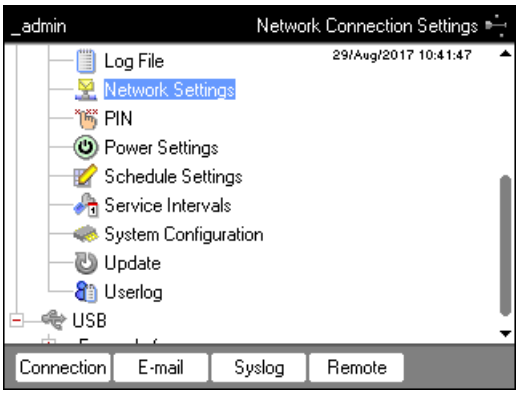
### 8.7.2 Setting up e-mail notifications

Prerequisites

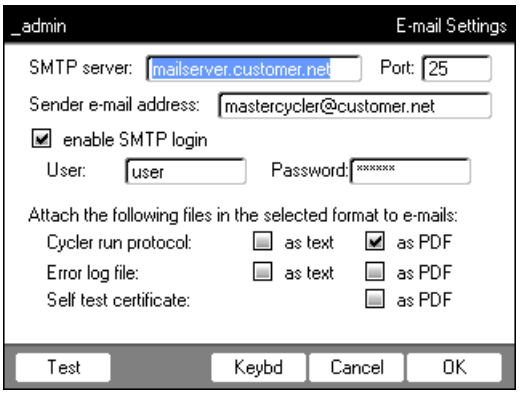
- Network connection has been set up (see p. 84)
- Logged in as an administrator (see p. 37)

Proceed as follows:

1. Select the *System* > *Network Settings* node.




2. Press the *E-mail* softkey.
   The *E-mail Settings* window appears.



3. Enter the settings as specified by the network administrator.

   If the SMTP server requires identification, check the *enable SMTP login* checkbox. Enter user name and password.

4. Select the data you would like to send and its file type.

   Selected data, such as protocols, is created by the system and automatically sent to the configured e-mail address.

   - *Cycler run protocol:* Protocol of the program run
   - *Error log file:* Log file with errors that occurred during the program run
   - *Self test certificate:* Self test certificate issued after a successful self test

   Press the *Test* softkey to send a test e-mail.

5. Press the *OK* softkey to accept the settings.

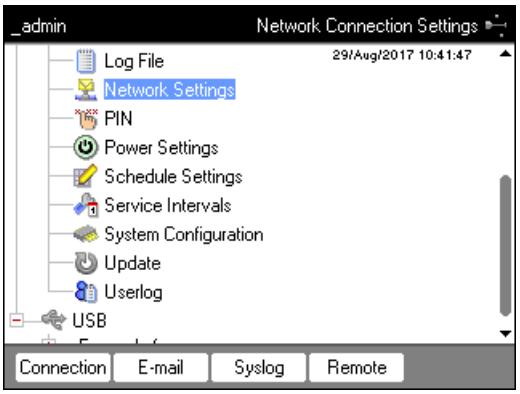
### 8.7.3 Setting up syslog messages

Prerequisites

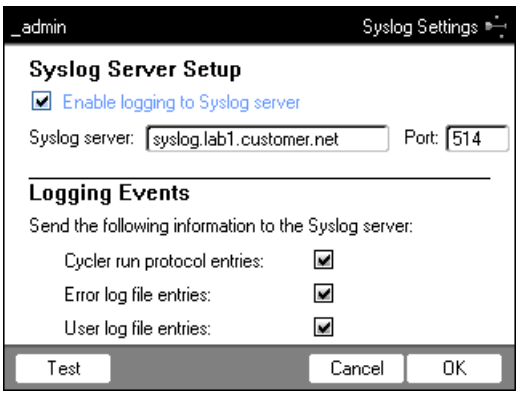
- Network connection has been set up (see p. 84)
- Logged in as an administrator (see p. 37)

Proceed as follows:

1. Select the *System* > *Network Settings* node.



2. Press the *Syslog* softkey.
   The *Syslog Settings* window appears.




3. To activate log files on the syslog server, check the *Enable logging to Syslog server* checkbox. Enter the server address and the port.
4. Select the information that you would like to create a protocol for.
   - *Cycler run protocol entries:* Protocol of the program run
   - *Error log file entries:* Errors that occurred during the program run
   - *User log file entries:* Protocol of the user actions (e.g., logging in, logging out, editing programs)

   Press the *Test* to send a syslog test message.
5. Press the *OK* softkey to accept the settings.

### 8.7.4 Activating remote access

Prerequisites

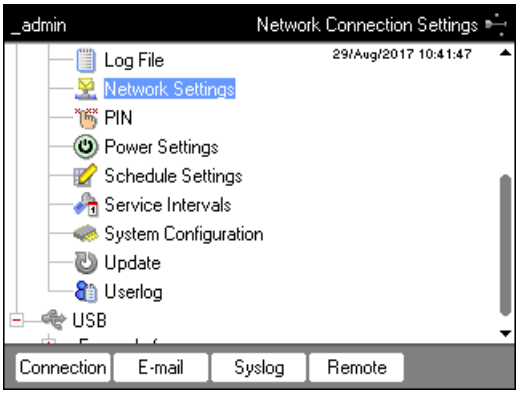
- Network connection has been set up (see p. 84)
- Logged in as an administrator (see p. 37)

The remote access enables you to connect the device to a network via the VisioNize box.

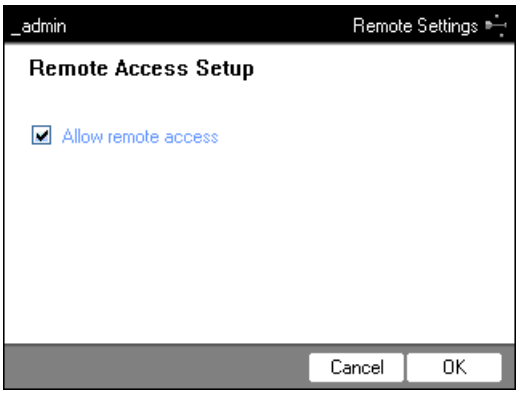
Proceed as follows:

While updating the device software, remote access must be deactivated.

1. Select the *System* > *Network Settings* node.



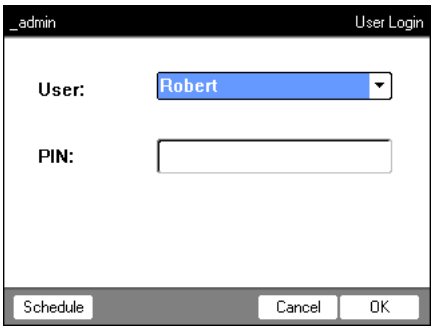

2. Press the *Remote* softkey.
   The *Remote Access Setup* window appears.



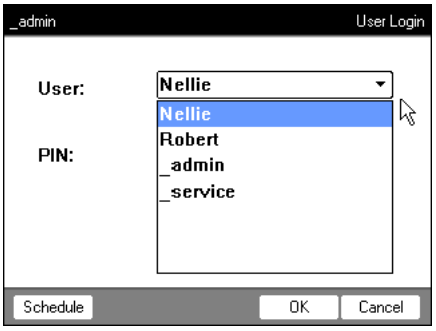

3. Select the *Allow remote access* checkbox.
4. Press the *OK* softkey.

# 9 Quick start

## 9.1 Login

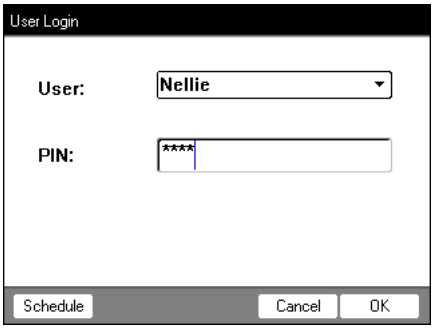


1. Open the list.



2. Select the user.

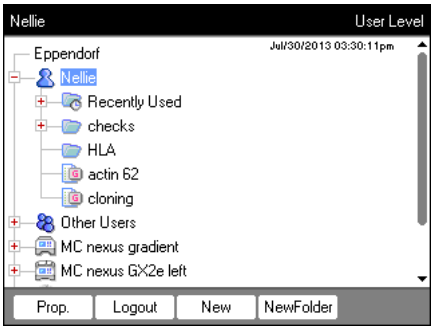
3. Confirm your selection.

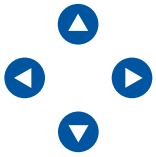


4. Switch to the *PIN:* field.

5. Enter and confirm the PIN.

## 9.2 Creating folders and programs

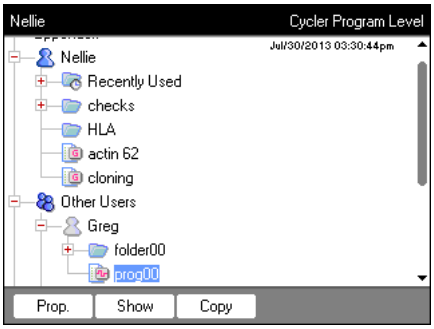


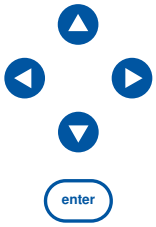



1. Select the user or folder.
2. Press the *New Folder* or *New* softkey.

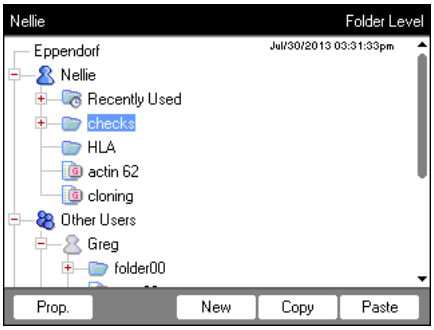
3. Enter the name and comment and confirm.

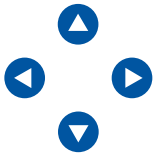
## 9.3 Copying folders and programs



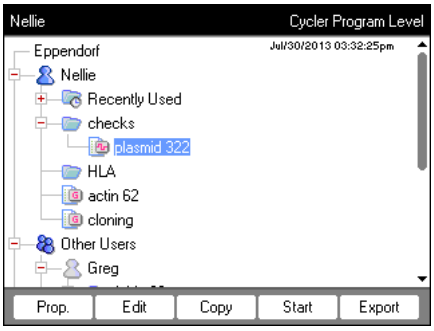

1. Select the folder or program.
2. Press the *Copy* softkey.
3. Confirm the prompt.

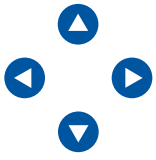


4. Mark the target folder or user.
5. Press the *Paste* softkey.

## 9.4 Deleting folders and programs



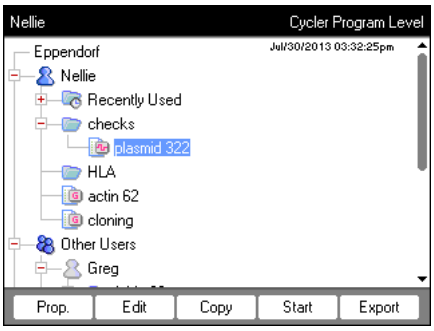



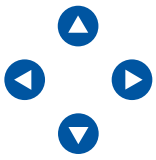
1. Mark the folder or program.

2. Press the **del** key.

3. Press the **enter** key.

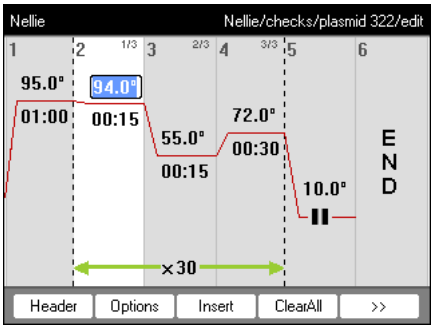
## 9.5 Editing programs



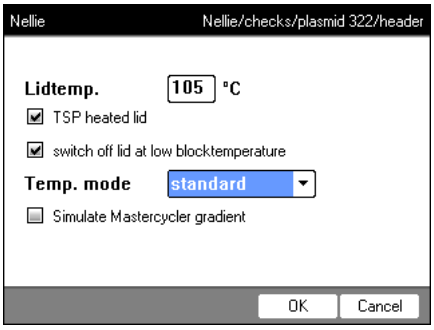



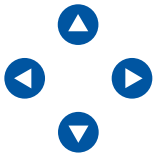
1. Select the program.

2. Open the program editor.



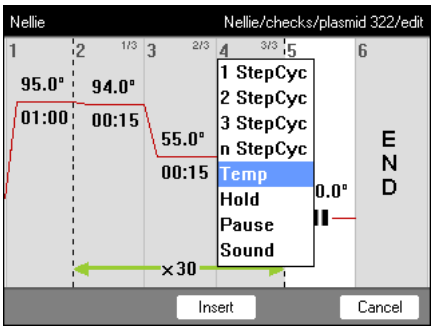

3. Press the *Header* softkey.



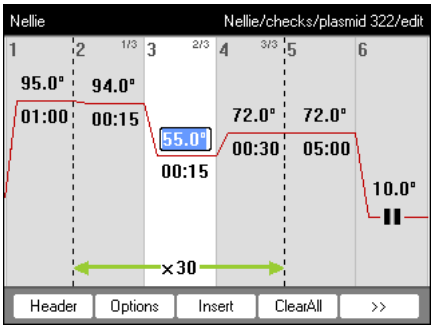



6. Set the temperature control.

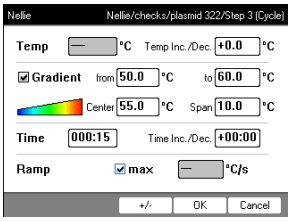
7. Confirm your entries.



8. Select the program step.
9. Press the *Insert* softkey.



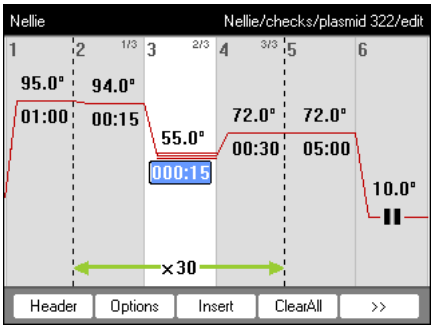
10. Enter the temperatures, holding times and number of cycles.
11. Select the program step.
12. Press the *Options* softkey.



13. Set the gradient, increment and ramp.

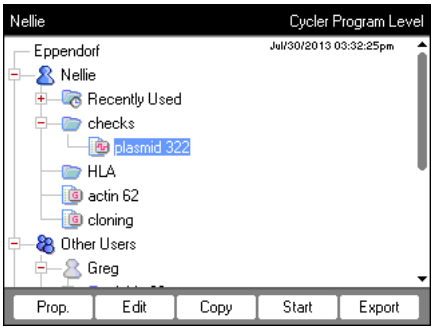


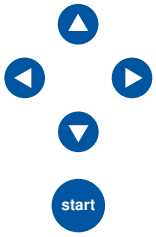
14. Confirm your entries.




15. Press the >> softkey.
16. Press the *Save* softkey.
17. Press the *Exit* softkey.

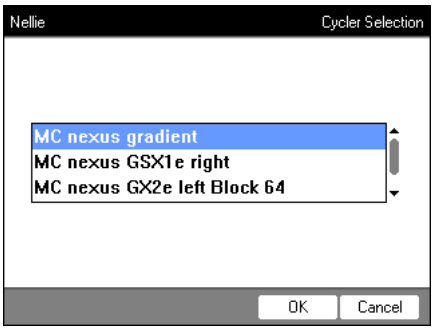
## 9.6 Stopping and starting programs



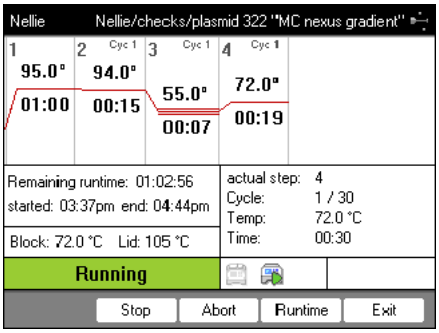

1. Mark the program.

2. Insert the sample tubes.
3. Close the heated lid.
4. Start the program.



5. If several cyclers are connected: highlight the cycler.

6. Confirm input.




7. The following options are available in the status view:
   - Stop the program: press the *Stop* softkey.
   - Abort the program: press the *Abort* softkey.
   - Resume the program: press the *Resume* softkey.

# 10 Maintenance

## 10.1 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 due to 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 it from the mains/power line before commencing any cleaning or disinfection procedures.
- Do not allow any liquids to enter the inside of the housing.
- Do not spray clean or spray disinfect the housing.
- Do not reconnect the device to the mains/power line unless both the inside and outside of the device are completely dry.

**DANGER! Electric shock.**

- Switch off the device and disconnect the mains/power plug before commencing any servicing or cleaning procedures.

### 10.1.1 Cleaning the housing

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

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

### 10.1.2 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.

## 10.2 Disinfection/decontamination

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

- Do not use UV, beta or gamma rays, or any other high-energy forms of radiation for disinfection.
- Avoid storage in areas with high UV radiation.

**Required equipment**
- Alcohol (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.

## 10.3 Decontamination before shipment

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

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

1. Observe the information contained in the decontamination certificate. It is available as a PDF document on our webpage (https://www.eppendorf.com/decontamination).
2. Decontaminate all parts to be shipped.
3. Include the fully completed decontamination certificate in the shipment.

# 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 due to lifting and carrying heavy loads**
The device is heavy. Lifting and carrying the device can lead to back injuries.

- Transport and lift the device with an adequate number of helpers.
- Use a transport aid for transporting the device.

**NOTICE! Damage due to incorrect packing.**
Eppendorf SE is not liable for any damage caused by improper packing.

- Only store and transport the device in its original packing.

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

- Decontaminate the device and accessories prior to storage or 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. 96)*.
2. Let the device sit 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 Disposal

Observe the relevant legal regulations when disposing of the product.

**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. They are marked with the following symbol to indicate this:

As the disposal regulations may differ from one country to another within the EU, please contact your supplier for more information.

# 13 Technical data

## 13.1 Power supply

| | |
|---|---|
| Voltage | 100 V – 240 V, ±10 % |
| Frequency | 50 Hz – 60 Hz |
| Power consumption | max. 700 W |
| Overvoltage category | II (IEC 61010-1) |
| Pollution degree | 2 |
| Protection class | 1 |

## 13.2 Weight/dimensions

| | |
|---|---|
| Dimensions | Width: 25.0 cm (9.8 inch)<br>Depth: 41.0 cm (16.1 inch)<br>Height: 32.0 cm (12.6 inch)<br>Height with heated lid open: 44.5 cm (17.5 inch) |
| Dimensions (devices with a thermoblock with 64+32 wells) | Width: 25.0 cm (9.8 inch)<br>Depth: 41.0 cm (16.1 inch)<br>Height: 33.0 cm (13.0 inch)<br>Height with heated lid open: 44.5 cm (17.5 inch) |
| Weight (Master variant) | 11.0 kg (24.3 lb) |
| Weight (eco variant) | 10.5 kg (23.2 lb) |

## 13.3 Ambient conditions

Tab. 13-1: Operation

| | |
|---|---|
| Environment | For indoor use only<br>No wet location |
| Ambient temperature | 15 °C – 35 °C |
| Relative humidity | up to 70 % |
| Atmospheric pressure | up to 2 000 m NN (approx. 80 kPa) |

Tab. 13-2: Storage

| | |
|---|---|
| Ambient temperature | –20 °C – 70 °C |
| Relative humidity | to 85 % |

## 13.4 Application parameters

| **Mastercycler nexus gradient, Mastercycler nexus gradient eco** | |
|---|---|
| Thermoblock | Universal block, aluminum |
| Sample capacity | • 96 × 0.1 mL PCR tubes<br>• 96 × 0.2 mL PCR tubes<br>• 71 × 0.5 mL PCR tubes<br>• one 96-well PCR plate (unskirted, semi-skirted, skirted; standard and low-profile) |
| Thermoblock temperature control range | 4 °C – 99 °C |
| Ramp rate<br>(measured on the thermoblock) | max. 3°C/s |
| Thermoblock temperature homogeneity<br>(with the gradient function switched off)<br>at 35 °C<br>at 90 °C | <br><br>≤ 0.3 °C<br>≤ 0.4 °C |
| Control accuracy<br>(with the gradient function switched off) | ±0.2 °C |
| Gradient spread | max. 20°C |
| Gradient temperature control range | 30 °C – 99 °C |
| Heated lid temperature control range | 37 °C – 110 °C |

| **Mastercycler nexus, Mastercycler nexus eco** | |
|---|---|
| Thermoblock | Universal block, aluminum |
| Sample capacity | • 96 × 0.1 mL PCR tubes<br>• 96 × 0.2 mL PCR tubes<br>• 71 × 0.5 mL PCR tubes<br>• one 96-well PCR plate (unskirted, semi-skirted, skirted; standard and low-profile) |
| Thermoblock temperature control range | 4 °C – 99 °C |
| Ramp rate<br>(measured on the thermoblock) | max. 3°C/s |
| Thermoblock temperature homogeneity<br>at 35 °C<br>at 90 °C<br>Control accuracy | <br>≤ 0.3 °C<br>≤ 0.4 °C<br>±0.2 °C |
| Gradient spread | – |
| Gradient temperature control range | – |
| Heated lid temperature control range | 37 °C – 110 °C |

| **Mastercycler nexus GX2, Mastercycler nexus GX2e** | |
|---|---|
| Thermoblock | Universal block, aluminum |
| Sample capacity | • 96 × 0.1 mL PCR tubes<br>• 96 × 0.2 mL PCR tubes<br>• 64 × 0.5 mL PCR tubes<br>• one 64-well PCR plate (unskirted, semi-skirted, skirted; standard and low-profile)<br>• one 32-well PCR plate (unskirted, semi-skirted, skirted; standard and low-profile) |
| Thermoblock temperature control range | 4 °C – 99 °C |
| Ramp rate<br>(measured on the thermoblock) | max. 3°C/s |
| Thermoblock temperature homogeneity<br>(with the gradient function switched off)<br>at 35 °C<br>at 90 °C | <br><br>≤ 0.3 °C<br>≤ 0.4 °C |
| Control accuracy<br>(with the gradient function switched off) | ±0.2 °C |
| **Thermoblock with 64 wells** | |
| Gradient spread | max. 12°C |
| Gradient temperature control range | 30 °C – 99 °C |
| Heated lid temperature control range | 37 °C – 110 °C |
| **Thermoblock with 32 wells** | No gradient function |
| Gradient spread | – |
| Gradient temperature control range | – |
| Heated lid temperature control range | 37 °C – 110 °C |

| **Mastercycler nexus X2, Mastercycler nexus X2e** | |
|---|---|
| Thermoblock | Universal block, aluminum |
| Sample capacity | • 96 × 0.1 mL PCR tubes<br>• 96 × 0.2 mL PCR tubes<br>• 64 × 0.5 mL PCR tubes<br>• one 64-well PCR plate (unskirted, semi-skirted, skirted; standard and low-profile)<br>• one 32-well PCR plate (unskirted, semi-skirted, skirted; standard and low-profile) |
| Thermoblock temperature control range | 4 °C – 99 °C |
| Ramp rate<br>(measured on the thermoblock) | max. 3°C/s |
| Thermoblock temperature homogeneity<br>at 35 °C<br>at 90 °C<br>Control accuracy | <br>≤ 0.3 °C<br>≤ 0.4 °C<br>±0.2 °C |
| Gradient spread | – |
| Gradient temperature control range | – |
| Heated lid temperature control range | 37 °C – 110 °C |

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# Declaration of Conformity

The product named below fulfills the requirements of directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

**Product name:**

Mastercycler® nexus, Mastercycler® nexus X2, Mastercycler® nexus X2e

Mastercycler® nexus flat, Mastercycler® nexus eco, Mastercycler® nexus flat eco,

Mastercycler® nexus gradient, Mastercycler® nexus gradient eco,

Mastercycler® nexus GSX1, Mastercycler® nexus GSX1e,

Mastercycler® nexus GX2, Mastercycler® nexus GX2e,

Mastercycler® nexus SX1, Mastercycler® nexus SX1e

**Product type:**

Thermocycler

**Relevant directives / standards:**

| | |
|---|---|
| 2014/35/EU: | EN 61010-1, EN 61010-2-010 |
| | UL 61010A-1, CSA C22.2 No. 61010-1 |
| 2014/30/EU: | EN 55011, EN 61326-1 |
| 2011/65/EU: | EN 50581 |

**Date:** March 10, 2016

Management Board

Portfolio Management

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ISO 9001 Certified

ISO 13485 Certified

ISO 14001 Certified

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6331 900.999-02

TÜV NORD
Umweltschutz

Measurement of sound power level according to
DIN EN ISO 3744: 2011-02 / EN ISO 3744:2010

**PCR-Cycler**

Eppendorf AG, 22331 Hamburg, Germany

**1. Machine:**

| | | |
|---|---|---|
| 1.1 | Type: | Eppendorf MCnexus |
| 1.2 | Serial Number: | FT-6331-28 |
| 1.3 | Year of construction: | 2011 |

**2. Specifications:**

See documents of the manufacturer

**3. Measurement system:**

| | | |
|---|---|---|
| 3.1 | Calibrated sound level meter: | Norsonic 118 |

**4. Measurement surface:**

| | | |
|---|---|---|
| 4.1 | Measurement surface: | hemisphere with 10 measuring points |
| 4.2 | Measurement distance: | 1 m |

**5. Measurement conditions:**

| | | |
|---|---|---|
| 5.1 | Environment: | Free field over a reflecting plane |
| 5.2 | Environmental correction $K_{2A}$: | 0.7 dB(A) |
| 5.3 | accuracy class | 2 |
| 5.4 | Operating conditions: | PCR cyclus |

| | | |
|---|---|---|
| 6. | **Measurement surface sound pressure level:** | 31.2 dB(A) |
| | **Sound power level:** | **39.2 dB(A)** |

**TÜV Nord Umweltschutz GmbH & Co. KG**

Große Bahnstraße 31, 22525 Hamburg

Nr. 111UBS165 Date of measurement: 22.10.2011

Dipl. - Ing. C. Michalke

# Evaluate Your Manual

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www.eppendorf.com/manualfeedback

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