Operating Manual

Biometra TAdvanced
High-performance thermal cycler
for DNA amplification by PCR

For a proper and safe use of this product follow the instructions. Keep the operating manual for future reference.

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1 Basic information

1.1 About this manual

Content

The operating manual describes the thermal cycler Biometra TAdvanced with all its 12 models.

In this text, these models are collectively referred to as **the device**. Any differences between the models are explained in the relevant section.

The device is intended to be operated by qualified specialist personnel who must observe all instructions given in the operating manual.

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

These instructions apply to devices from software version ME 1.70 - RE 1.46.

Furthermore, the words "protocol" and "program" are used to describe the same term in these instructions. In this context, a protocol or program is one or several consecutive temperature increments with the same or varying holding times which can be repeated in cycles.

Conventions

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

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

Elements of the control and analysis program are indicated as follows:
- Program terms are in bold (e.g., the **System** menu).
- Menu items are separated by vertical lines (e.g., **System** | **Device**).

Symbols and signal words used in this manual

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

WARNING

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

CAUTION

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

NOTICE

Provides information on potential material or environmental damage.

1.2   Intended use

The device Biometra TAdvanced is an end-point thermal cycler. The device is designed to amplify nucleic acids by iteration cycles of heating and cooling using DNA polymerases in a PCR reaction.

The thermal cycler is a device for general laboratory use.

The device combines modern design and user-friendly software. The user interface consists of a touch screen. The screen can display the time and status of the temperature program for each cycle in form of a diagram or a table. The operating personnel can use the touch screen keyboard to enter information and program parameters directly to the device.

Its high cooling and heating rates allow using the device for fast PCR applications. They also reduce the program execution time.

The device and its components may only be used for the analyses listed in the user manual. Only this specified use is regarded as the intended use, ensuring the safety of the user and the device.

2 Security

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

Observe all safety instructions listed in this user manual and all messages and information displayed on the monitor by the control and analysis software.

2.1 Safety labeling on the device

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

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

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

Warning symbol	Meaning	Comment
	Warning of a danger point	Proceed with care when handling biological and biochemical samples and when working on the device.
	Warning against hot surface	There is a risk of burning at the heated lid, the thermal block, the samples, and the rear of the device.

Mandatory signs/ information symbols	Meaning	Comment
	Symbol for waste disposal in accordance with the WEEE directive	Do not dispose of the device as household waste.
CE	CE marking	
	For People's Republic of China only	The device contains controlled substances. Analytik Jena GmbH+Co. KG guarantees that these substances will not escape in the next 25 years if the device is only used for the intended purpose.
	Ensure ventilation slots are unobstructed	Ensure that the ventilation slots on the underside and at the rear of the device are unobstructed. Make sure that there are no objects underneath the device, e.g., paper that may be drawn against the ventilation slot and thus interfere with ventilation.

2.2   Requirements for the operating personnel

The device must only be operated by qualified specialist personnel instructed in the use of the device. This instruction also include teaching the contents of this user manual and of the user manuals of the connected system components. We recommend training by qualified employees of Analytik Jena or its representatives.

In addition to the safety instructions in this user manual, the general applicable safety and accident prevention regulations of the respective country the device is operated in must be observed and adhered to. The operator must ensure the latest version of these regulations.

The user manual must be accessible to the operating and service personnel.

2.3   Safety instructions for transport and commissioning

- Please verify that the delivery is complete upon receiving the device and check for possible transport damage. Only start the device when it is free from defects. Please address any complaints and claims to the manufacturer.

To prevent health damage, the following must be observed when moving the device in the laboratory (lifting and carrying):
- The device has no carrying handles. To transport the device, grip the device firmly at the bottom with both hands and lift it.
- Empty the sample block before transporting the device. There must be no sample vessels in the block.
- Only send the device in its original packaging and with transport locks in place.
- Risk of damage to health due to improper decontamination! Perform a professional and documented decontamination of the device before returning it to Analytik Jena. The decontamination report is available from Service when registering the return. Without a completed decontamination report, the acceptance of the device will be refused. The sender may be liable for damage caused by inadequate decontamination of the device.

2.4   Safety instructions: during operation

2.4.1   Summary of safety instructions

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

Observe the following:
- The device may only be operated if all items of protective equipment (e.g. covers in front of electronic components) are in place, properly installed and fully operational.
- The sound condition of the protection and safety equipment must be checked regularly. Any defects must be corrected as soon as they occur.
- Protective and safety equipment must never be removed, modified or switched off during operation.
- Always ensure free access to the main switch and to the emergency shutdown switches and locks during operation.

- The ventilation equipment on the device must be in good working condition. Covered ventilation grilles or slots etc. may cause the device to break down or may cause damage to it.
- Modifications, conversions and extensions to the device are only permitted after consultation with Analytik Jena. Unauthorized modifications can jeopardize the device's operational safety and may lead to limitations regarding the warranty and access to customer service.
- Be careful to avoid crushing or pinching injuries when closing the device.
- Make sure not to squeeze your hands and fingers when changing the block.
- The use of oil between the samples and the sample block is not necessary to achieve an improved heat exchange. However, if you still want to use oil, you should use mineral oil. Do not use silicone oil.
- Ensure that no liquid enters the interior of the device, for example at cable connections. There is a danger of electric shock.

There is a risk of burns on the device. The following has to be observed:
- The thermal block, the samples, and the heated lid reach high temperatures. There is a risk of burns during contact.
- Keep all combustible materials away from the device.
- Verify that the lid is securely closed before starting the program. Do not touch the heated lid during operation.
- The rapid heating of the thermal block can cause liquids to boil explosively. Always wear safety goggles during operation.
- Do not touch hot sample vessels or plates and do not open them as boiling liquid may escape.
- Only use consumables such as plates and tubes that are suitable for high temperatures up to 100 ℃, that fit well into the thermal block without shaking, and whose lids or sealing foils seal tightly.

2.4.2   Safety instructions – protection against explosion and fire

The device may not be operated in an explosive environment.

2.4.3   Safety instructions – electrical equipment

Lethal voltages may occur in the device! Contact with live components may cause death, serious injury or painful electrical shock.
- Work on the electronics may only be carried out by the customer service of Analytik Jena and specially authorized technicians.
- The electrical components must be checked regularly by a qualified electrician. Any defects such as loose connections or faulty or damaged cables must be repaired without delay.
- Before opening the device's housing, the device must be switched off using the mains switch and the mains plug must be disconnected from the power outlet.
- The power plug must be connected to a properly installed and rated power outlet to ensure that the device meets protection class I (ground connector). Before connecting the device to the mains network set the correct operating voltage at the voltage switch on the underside of the device. Do not replace the removable power cable of the device with a power cable that does not meet the specifications (with no protective ground conductor). Extensions of the supply cable are not permitted.
- In the event of interferences with electric components, the device must be switched off immediately using the power switch (on the equipment backplate) and the power supply disconnected from the mains.

- Do not operate the device near sources of strong electromagnetic radiation such as an unshielded, deliberately operated high-frequency source. Strong electromagnetic fields can interfere with the proper operation of the device.

2.4.4 Handling hazardous substances

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

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

- Protective goggles and rubber gloves have to be worn when handing reagents.
- When treating only a small number of samples, two empty tubes of the same height must be placed in the corner positions of the block in addition to the treated samples. If the number of samples in the block is too low, there is a risk of the tubes being damaged and sample liquid leaking out.
- For your own safety, please consider the potential risk of infection of the examined biological material.

Observe the following:

- The operator is responsible for carrying out suitable decontamination should the device become contaminated externally or internally with dangerous substances.
- Splashes, drops or larger liquid spillages should be removed using an absorbent material such as absorbent cotton, laboratory wipes or cellulose.
- In case of biological contamination, wipe the affected area with a suitable disinfectant. Then wipe the cleaned areas so that they are dry.
- The only suitable cleaning method for the housing is wipe disinfection. If the disinfectant has a spray nozzle, apply disinfectant to a suitable cloth before using it on the device.
  Proceed with particular care and ensure utmost cleanliness when working with infectious material because the device cannot be decontaminated as a whole.
- Before using a cleaning or decontamination procedure other than the one prescribed by the manufacturer, the user is required to check with the manufacturer that the intended procedure will not damage the device. Safety labels attached to the device must not be moistened or wiped with methanol.

2.5 Safety instructions – maintenance and repair

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

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

- All maintenance and repair work on the device must only be carried out when the device is switched off (unless specified otherwise).
- Allow the device to cool down before any maintenance work or replacement of system components.
- Do not use organic solvents or abrasives to clean the device. Exercise caution when decontaminating the device with disinfectants containing alcohol. The alcohol can damage the safety labeling on the device.
- Only clean the exterior of the device with a slightly moistened, non-dripping cloth. Use only water and, if required, customary surfactants.

- Use only original spare parts, wear parts and consumables. These have been tested and ensure safe operation.

2.6   Behavior during emergencies

If there is no immediate risk of injury, switch off the device and the connected system components immediately in hazardous situations or in the event of an accident and/ or disconnect the power plugs from the power outlets.

3 Function and design

3.1 Principle of operation

Developed in 1983 by Kary Mullis, PCR (polymerase chain reaction) now is a common and indispensable technique used in medical and biological research laboratories.

The end-point thermal cycler amplifies nucleic acids by repeated cycles of heating and cooling using DNA polymerases reaction.

A typical PCR program comprises the following steps:

Step no.	Step	Temperature (example)	Explanation
1	Initial denaturation	95 °C	▪ Initial denaturation of the DNA strand: Division into two single strands ▪ Activation of the enzyme polymerase
2	Denaturation	95 °C	Denaturation: Division of the products of the PCR reaction into two single strands
3	Annealing	55 °C	Annealing of the primer pair consisting of forward and reverse primers which define the beginning and the end of the characteristic DNA section
4	Elongation (or extension)	70 °C	Strand extension: Construction of the complementary DNA strand by the enzyme polymerase and with the aid of free nucleotides starting at the primer
5	Final elongation	70 °C	Final strand extension
6	Final retention	10 °C	Retention of the amplified samples until execution of the measurement or further processing

The PCR program shown by way of example reiterates steps 2 to 4 cyclically in order to double a characteristic DNA section with each cycle. The number of products increases exponentially.

The device combines latest technology with ergonomic design and user-friendly software. The user interface consists of a touch screen. The screen displays the time, status and the temperature program for each cycle in form of a diagram or a table. You can use the touch screen keyboard to enter information and program parameters directly on the screen.

Twin-block models have two thermal blocks. These devices allow you to run two PCR runs at the same time during which you incubate different samples with different PCR programs.

3.2   Design
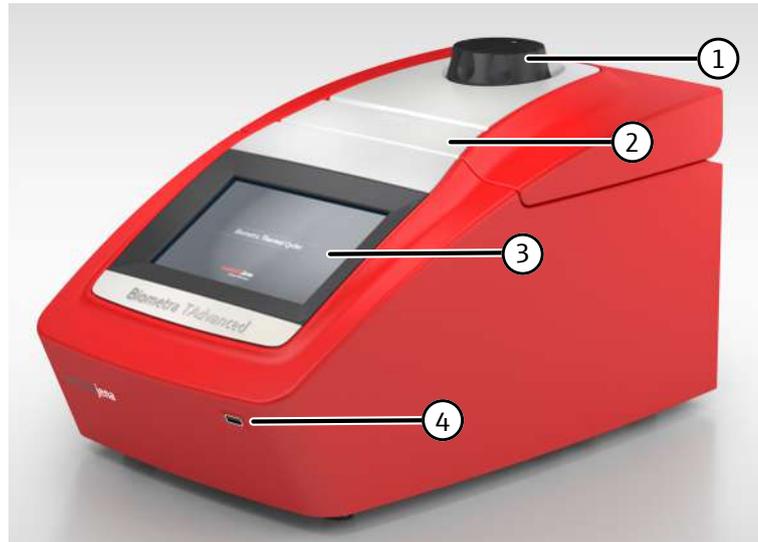
Fig. 1   Device configuration

1	Wheel for exerting the contact pressure	2	Lid sealing button
3	Display	4	USB port

The device is controlled via a 7" touch screen display and the easy-to-use user interface. The touch screen is installed at a flat angle. This guarantees that there are no reflections on the touch screen so that it can be operated ergonomically.

The touch screen display is resistive. You must apply slight pressure to trigger the function of a particular button. Just slightly touching the display as with the capacitive touch screen of a smartphone or tablet is not enough.

The lid is closed using the lid sealing button. In order to exert the ideal contact pressure on the samples, turn the lid wheel clockwise until you can hear a click. This lowers the lid until it touches the surface of the sample tubes. The integrated clutch mechanism ensures that the same contact pressure is effectively applied regardless of the sample vessels' height so that the conditions are reproducible.

You can use the USB port to export PCR protocols and run log files and save them onto a USB flash drive. This allows exchanging PCR protocols between instruments or saving run log files for documentation purposes to a PC with ease.

The device has an automatic restart function. In case of a power failure during a PCR run, the device will resume running as soon as the power supply is reestablished.

In the event of a prolonged power failure (≥30 min) the Freeze program will start automatically: The device will then cool down the sample block to 4 °C. You can then decide whether to repeat the run or to discard the samples.

3.2.1   Thermal block

The device can be delivered with one or two thermal blocks which, in turn, are offered in different block formats. You can control the two thermal blocks independently.

Fig. 2   Mono-block and twin-block models

1 Mono-block model   2 Twin-block model with two independent
                                                          sample blocks

Fig. 3   Opened mono-block model with thermal block

The thermal blocks are made of aluminum and coated with a special alloy. Aluminum blocks offer high heating and cooling rates for fast protocol run times.

Alternatively, the device is offered with thermal blocks made of silver. The excellent thermal conductivity ensures that the equilibration in a silver block is extremely fast. Therefore, silver blocks offer maximum processing speed and very even temperature distribution. To protect the valuable silver blocks against corrosion, the block surfaces are gold-plated.

The device is equipped with a quick block exchange system: You can exchange the thermal blocks yourself within a few seconds.

Fig. 4   Exchanging the thermal block

Once the lid is closed, the rubber seal of the heated lid ensures that the space around the sample block is encapsulated. This enclosed space improves the uniformity of the temperature inside the sample block and avoids the formation of condensed water during the final cooling step of the PCR process. Furthermore, all sample blocks are perfectly sealed to prevent condensed water from penetrating into the Peltier elements underneath the sample block and other parts of the electronics. The sealing protects the Peltier elements and prolongs the working life of the device.

3.2.2   Temperature gradient

The annealing temperature has a major impact on the PCR reaction:
- If the selected annealing temperature is too low, the primers may anneal to nucleotide sequences that are not fully complementary. The reaction will then be less specific and produce unwanted by-products.
- If the selected annealing temperature is too high, the thermal movement of the primers may be so extended that they do not anneal properly. As a result, the product is not formed at all or only inefficiently.

The ideal annealing temperature is about 5 ... 10 ˚C below the average melting temperature of the primers. This usually corresponds to a temperature of 55 ... 65 ˚C.

The optional gradient function allows you to optimize the temperature program for new primer pairs in a single run. To do this, use the Linear Gradient Tool to set a temperature difference between the columns (mono block) or the rows (twin block) of the sample block. The temperature difference between the columns or the rows is always the same.

3.2.3   Heated lid

The heated lid heats twice as fast as with older models and thus helps to shorten protocol run times. Moreover the heated lid fulfills two other important functions:
- It prevents condensation of sample liquid above the block surface.
- The constant contact pressure of the heated lid ensures reliable contact between reaction vessels and the thermal block.

Thanks to the integrated clutch mechanism, the pressure applied by the heated lid to the reaction tubes is always the same, regardless of the height of the plasticware that is used. The shape of the heated lid and the constant contact pressure ensure that the temperature is distributed evenly across all samples. Temperature uniformity is very high.

After pressing the lid sealing button, the heated lid swings up slowly. Thanks to this mechanism, the lid cannot fall down but will always swing back into the open position.

The fully opened heated lid will be outside your operating range while you insert the PCR tubes or plates. The risk of pinching your fingers or burning your skin on the hot surface of the heated lid is low.

3.2.4 Terminals and interfaces on the rear of the device

The rear panel of the device houses the Ethernet port, the power plug and the mains switch.

Fig. 5   Device rear

| 1 Ethernet port | 2 Power connection |
| 3 Fuse holder | 4 Mains switch |

3.3   Models

The following models are available for the thermal cycler Biometra TAdvanced:

Model	Block format	Thermal block	Gradient function
Biometra TAdvanced 96	96	Aluminum block	/
Biometra TAdvanced 96 G	96	Aluminum block	Gradient function
Biometra TAdvanced 96 S	96	Silver block	/
Biometra TAdvanced 96 SG	96	Silver block	Gradient function
Biometra TAdvanced 60	60	Aluminum block	/

Model	Block format	Thermal block	Gradient function
Biometra TAdvanced 60 G	60	Aluminum block	Gradient function
Biometra TAdvanced 384	384	Aluminum block	/
Biometra TAdvanced 384 G	384	Aluminum block	Gradient function
Biometra TAdvanced Twin 48	48	Aluminum twin block	/
Biometra TAdvanced Twin 48 G	48	Aluminum twin block	Gradient function
Biometra TAdvanced Twin 30	30	Aluminum twin block	/
Biometra TAdvanced Twin Combi	Combi (35 + 48)	Aluminum twin block	/

3.4 Control software

GLP compliance

The software can manage up to 90 user directories. At each system start, the device performs an initial self test. In addition to that, you have the option to initiate an extended self test via the software. The device summarizes the results of the extended self test in a log and saves them. In addition to the self-test functions, the device creates and stores log files for each single run. For long-term storage, you can export the log files and the logs of the extended self test in a proprietary file format and save them on a PC.

User management

Three user levels are available by default:
- Administrator
- User with general rights
- User with restricted rights

A convenient menu allows you to configure the settings for each user as an administrator. You have the option to enable and disable individual rights. The user management tool and the password protection feature for every user account allow restricting the access to the device to authorized persons. This prevents unwanted changes to the system settings and PCR protocols.

Easy programming

Creating new programs is a relatively time-consuming operation if you have to enter all the parameters for each individual step. This is why you will find pre-installed program templates for various applications in the software. You can easily make slight changes to the protocol structure to adapt it to the respective experiment.

For programming PCR protocols, the software incorporates Biometra's proven spreadsheet philosophy and alternatively offers graphical programming. One touch of a button will take you from the spreadsheet view to the graphical programming mode. This makes the creation of new programs or editing existing programs fast and easy.

Protocol wizard

The protocol wizard is a convenient way to create specific PCR programs by simply entering a few parameters. The protocol wizard is based on program templates for specific polymerases. You can store up to eight different polymerases program templates. To create a new PCR program, all you have to do then is to enter the annealing temperature, the number of cycles and the product length. You also have the option to create two-step or three-step PCR programs with the software.

Furthermore, the protocol wizard includes an input mask for calculating the primer annealing temperature. You can use the calculated T_a value to create your own programs.

User-specific quick start

The software generates a user-specific list with the programs the currently logged-in user has last used and offers these programs for quick start. Even if you do not use the device for a longer time, the information on the programs you have started last will not get lost.

For maximum ease of use the software additionally features a program preview. Before the start of a program the protocol steps are summarized in a clearly arranged table. The preview thus provides a comprehensive overview of the protocol structure.

3.5 Scope of delivery

The following components are delivered with the device:
- Thermal cycler
- Power cable
- USB flash drive with detailed operating manual, quick reference guide and installation instructions
- Printed quick reference guide and installation instructions
- Shipping box with transport locking devices made of foam
- Analytik Jena quality certificate (including calibration values from the final quality check)

3.6 Consumables and reagents

With regard to consumables and reagents, the device is an open system:
- Depending on the sample block, you can use single tubes, strips or plates.
- PCR plates can have a "high profile" or a "low profile". The plates can either have a full edge, half edge or no edge at all.
- Plasticware can have curved or flat lids and may be sealed with sealing foil or other technologies.

Regardless of the sealing method used, the pressure exerted by the device on the consumables is always evenly spread which ensures reproducible conditions.

Fig. 6   Fitting samples into the device

The device is not limited to reagents from a specific manufacturer and can be used with any kind of polymerase. The results of the device are highly reliable when working with isothermal, hot-start or non-hot-start polymerases.

4   Installation and commissioning

4.1   Installation conditions

4.1.1   Ambient conditions

Climatic conditions

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

Requirements with regard to the installation location

- This laboratory device is designed for inside use.
- Place the device on a stable surface.
- Do not locate the device near sources of electromagnetic interference.
- Do not use the device in explosion-hazard environments.
- The device must be positioned in such a way that allows easy access from all sides.
- Always ensure free access to the main switch and to the emergency shutdown switches and locks during operation.
- Keep a minimum distance of 10 cm to all walls, other objects, and any additional thermal cycler devices.
- Keep the ventilation slits free and do not obstruct them with other devices.
- You can adjust the contrast of the display to suit the local lighting conditions.

4.1.2   Power supply

WARNING

Danger due to electrical voltage

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

The device operates on single-phase alternating current.

The installation of the electrical equipment in the laboratory must comply with the DIN VDE 0100 standard. At the connection point, an electrical current in accordance with the standard IEC 60038 must be available.

Before plugging in the device, check that the voltage selection switch at the bottom of the device is set to the correct value.

4.2   Unpacking and setting up the device

WARNING

Risk of electric shock

- Before putting the device into service, make sure that the voltage selector switch on the device is set to the correct mains voltage.

NOTICE

Keep the original packaging

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

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

NOTICE

Damage to the electronics due to condensation

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

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

▶ Take the device out of its box and check it for damage. Only start the device when it is free from defects.

▶ Notify the manufacturer of any damage to the device immediately.

▶ Keep the original packaging.

▶ Check the operating voltage set on the voltage selector switch at the device's bottom. If required, adjust the operating voltage to the mains voltage.

▶ Use the mains cable supplied with the device to connect it to a grounded electric socket.

▶ Use the mains switch at the back of the device to switch the device on.

  ✓ After switching the device on, it will perform an automatic self test.

▶ If you want to connect the thermal cycler to a local network, use the Ethernet port and the management software Biometra TSuite.
The Biometra TSuite software is used to control the thermal cycler via your computer.

  ✓ The device is ready for operation.

4.3   Setting the operating voltage

WARNING

Risk of electric shock

- Before putting the device into service, make sure that the voltage selector switch on the device is set to the correct mains voltage.

You can operate the device at mains voltage ratings of 100 V; 115 V; 230 V ±10 %.
A voltage selector switch at the bottom of the device allows adjusting the device to the required mains voltage.

▶ Before starting up the device, check the voltage selector switch to verify that the device is correctly set for the mains voltage.

▶ If required, adjust the operating voltage to the mains voltage. To do so, switch off the device and disconnect the mains plug from the electric socket.

▶ Place the device on its side.

▶ Use a coin or other round object to turn the slot on the voltage selector switch and adjust it to the correct operating voltage.

    ✓ The device is ready for operation.
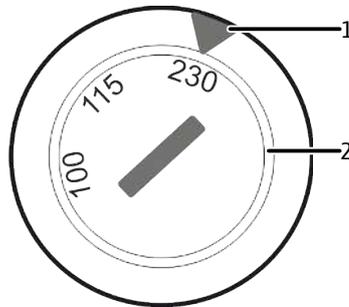
Fig. 7   Voltage selector switch at the bottom of the device

   1 Voltage indicator   2 Switch for voltage selection

4.4   Exchanging the thermal block

The quick block exchange option is available for all models.

▶ Switch off the device and disconnect it from the mains voltage.

▶ Lift the unlocking lever at the rear of the device (1). Slowly pull the thermal block backwards.

▶ Carefully insert the new block module from behind into the base unit until the connectors at the front of the module touch the socket inside the instrument.

▶ Carefully press the unlocking lever downward.

▶ Connect the device to the power line and switch it on again.

    ✓ The software will automatically identify the block module during its boot process and retrieve its block format and serial number.

Fig. 8   Block exchange

1   Unlocking lever on the rear of the device   2   Interfaces

4.5   Connecting the device to a network

You can use the Ethernet port and the management software Biometra TSuite to con-
nect the thermal cycler to a local network. Please observe the minimum requirements of
this software for the firmware version of the thermal cycler.

An Ethernet cable is available as an optional accessory. The minimum requirements for
the Ethernet cable are as follows: Performance category Cat 5e, cable type STP, length
≤30 m.

The PC's network interface controller should comply with the auto-crossover standard
IEEE 803.2ab_1999. Otherwise, the network cable must be crossed. More recent net-
work interface controllers usually meet this standard.

It is possible to connect the device to a computer via the internal network in the house.
When delivered, the device would usually be configured with a dynamic IP address and a
DHCP server.

Network connection via DHCP

▶   Use an Ethernet cable and a router to connect the device and a computer to the
    DHCP server.

Alternatively, you can connect the computer and thermal cycler to the internal network
of your organization, provided your company's IT policies permit this.

Network connection with fixed
IP address

As an alternative to the DHCP configuration, the thermal cycler can also be addressed di-
rectly.

▶   Change the settings of the thermal cycler to a network connection with fixed IP ad-
    dress (e.g. 192.168.0.30, subnet mask 255.255.255.0).

▶   Change the settings of the network interface controller in the network adapter set-
    tings in Windows to a fixed IP(V4) (e.g. 192.168.0.10, subnet mask
    255.255.255.0).

If only one thermal cycler is controlled via the software, the thermal cycler can also communicate directly with a PC via a network-cable-based peer-to-peer connection. Proceed as follows:

▸ Open the device menu on the thermal cycler and enter a suitable static IP address (e.g. 192.168.0.2) and a subnet mask (e.g. 255.255.255.0).

▸ Enter a suitable static IP address (e.g. 192.168.0.1) and a subnet mask (e.g. 255.255.255.0) matching the above device settings in the network settings on your computer.

▸ In the Biometra TSuite software: Enable the use of the network interface in the settings, see Biometra TSuite software.

See also

▤ Customizing software settings [▸ 58]

4.6   Opening and closing the device

CAUTION

Risk of burns

Immediately after a PCR run, the heated lid and the sample block may still be hot. There is a risk of burns on the inside of the lid and on the sample block.

▪ Keep a safe distance from hot components or wear heat-resistant gloves when opening the device.

▪ Alternatively, allow the device to cool down before opening it.

NOTICE

Damage to the locking mechanism

If the lid is under pressure when opened, this may damage the locking mechanism.

▪ Always reduce the contact pressure on the lid using the lid wheel before opening the lid.

Opening the lid

The heated lid exerts a constant contact pressure on the samples. You must reduce the contact pressure before opening the lid.

Each sample block has its own lid. This allows opening and closing the sample blocks independently.

▸ Reduce the contact pressure of the lid. To do this, turn the wheel counterclockwise until you feel no more resistance.

▸ Press the lid sealing button on the front of the device to open the lid.

✓ The lid swings open automatically.

Closing the lid

The intensity of the contact pressure is designed for a fully populated block. When using only a few samples in the block, place an additional two (empty) tubes of the same height in the four corner positions of the block. Otherwise, the sample tubes could be damaged.

Never attempt to close the heated lid by force. This could damage the device.

▸ Insert the samples to the block.

▸ Use the lid sealing button to close the lid until the button engages with a click.

▸ Turn the wheel clockwise until you clearly hear a clicking sound.

✓ The lid has reached the correct contact pressure.

4.7   Fitting samples into the device

The intensity of the contact pressure is designed for a fully populated block. When using only a few samples in the block, place an additional two (empty) tubes of the same height in the four corner positions of the block. Otherwise, excessive contact pressure could damage the sample tubes.
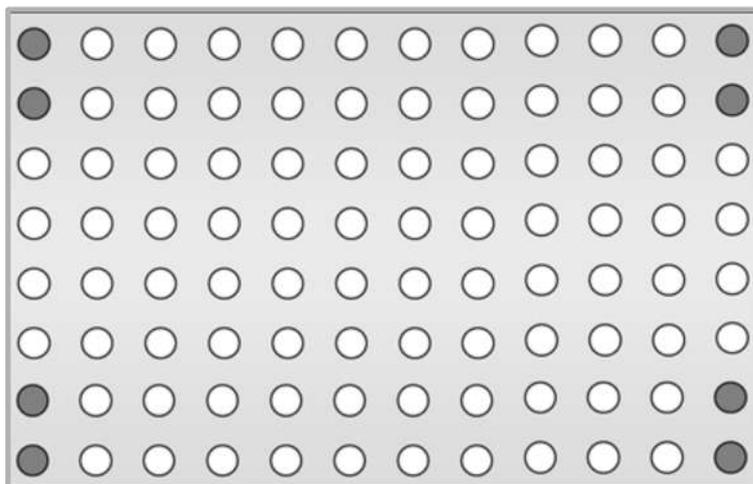
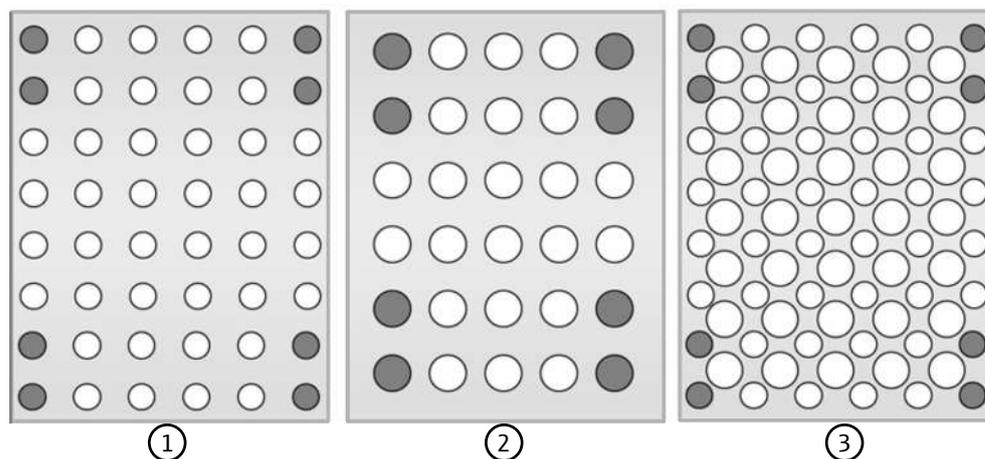**Fig. 9   Placing additional tubes into the block**

Fig. 10   Placing additional tubes into the block

1 48-well block   2 30-well block
3 Combi block

5   Operation

5.1   Using the software (general)

The touch screen display is resistive. You must apply slight pressure to trigger the function of a particular button. Just slightly touching the display as with the capacitive touch screen of a smartphone or tablet is not enough.

The software will display an alphanumeric or numeric keypad when selecting an input field:
- The alphanumeric keypad appears for entering texts.
- The numeric keypad is displayed for entering numerical values.

Function keys

The keypads contain the following function keys:

Key	Description
Shift	Shift key: Switch to uppercase
Caps	Caps lock key: Permanently switch character case
Space	Space key: Insert a blank space
← →	Move cursor
⟨X⟩	Delete characters to the left of the cursor
Del	Delete all characters
Tab	Tabulator key: Switch between input fields
∞	Enter infinite as a value (for time input)

For some functions the maximum number of characters is limited. User names, passwords and program names can have a maximum of 13 characters, user initials can have a maximum of 3 characters.

Arrow keys

The software uses lists, tables or graphical representations. Whenever the number of entries becomes higher than the number that can be displayed on a screen, the software will show arrow keys for navigation.

Key	Description
>>, **<<**, etc.	Arrow keys: navigate left, right, up or down in lists, tables or diagrams

Confirm or cancel

On many screens you will have to confirm your entry. This helps the software to prevent operating errors.

Key	Description
✓	Use the check mark on the green background to confirm entries or processes
X	Use the cross on the red background to discard entries or to abort processes

Optional user management

The software includes a user management feature that you can enable or disable. When the user management is enabled, not all users have the same rights and access options. For example, restricted users cannot create or delete PCR programs.

See also

- User management [▶ 64]

5.2   Starting the software

After switching the device on, the software is started automatically and performs an initial self test. The device stores the test result in the Power On Log File. During the test, the device shows the home screen.

After completing the initial self test, the software shows the login screen. The login screen offers the following functions:

Option	Icon	Description
Login		Start user login
Quick Start Block	24.5 °C / Free	The button shows the current block status.
		If one block is free: Tap to open the quick-start function for the last 5 program.
		On the login screen, the quick-start function is not user specific: A table provides an overview of the last programs that were used or changed.
DE/EN/CN	/	Change login screen language settings
		Note: You can use the user management for each individual user to set the language of the software interface.

Logging in a user

▶ Tap **Login** on the login screen.

▶ Tap on the required user on the user selection page.
In case there are more than six users: Use the arrow keys to scroll through the pages. The order of the listed users corresponds to the date they were last logged in.

▶ Optionally: Create a new user.

▶ If there is a password stored for the user: Use the keypad that appears to enter the password. The entry is case sensitive.
The default password for the administrator (Admin) is "Admin".

   ✓ After logging in, the software shows the **Home** screen.

See also

▤ Viewing the documentation [▶ 60]

▤ Editing a user [▶ 66]

▤ Creating new users [▶ 67]

5.3   Home screen

After logging in, the software shows the **Home** screen.
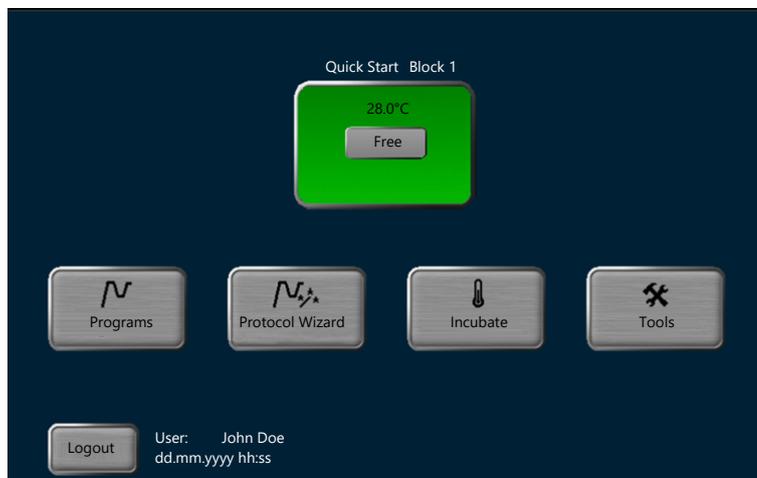
Fig. 11   Home screen (mono block)
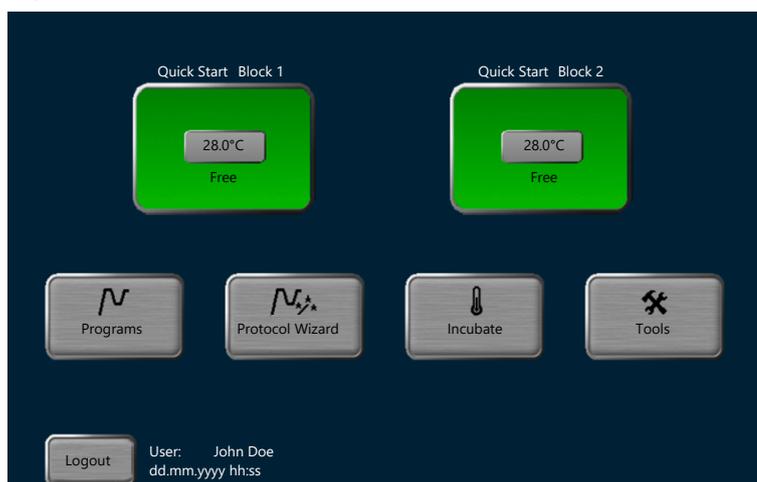
Fig. 12   Home screen (twin block)

The **Home** screen provides the following functions:

Option	Icon	Description
Quick Start Block		The button shows the current block status.
		If one block is free: Tap to open the quick-start function for programs.
		On the **Home** screen, the quick-start function is user specific: A table provides an overview of the last programs that the user used or changed.
Programs		■ Create or edit PCR programs ■ Select a program and start the PCR run
Protocol Wizard		■ Automatically create a PCR program ■ Calculate the annealing temperature and holding time for the elongation step
Incubate		Keep the block and samples at constant temperature

Option	Icon	Description
Tools		▪ Customize the software settings ▪ Set up the user management ▪ View documentation ▪ Perform an extended self test ▪ Create a Service info file file for a service case ▪ Perform a backup ▪ View device and system information ▪ Show contact information for the customer service
Logout	/	Log out user and return to login screen

Block status

The software shows the block status in the login screen and in the **Home** screen. If one block is free, you can use the button to open the quick-start function for programs.

Option (color)	Display	Description
Free (green)	24.5 °C Free	The block is free. Tap to open the quick-start function for programs
Run (yellow)	95.0 °C ⚠ Hot Run Remain. Time 00:50:30	A PCR program is currently executed. Tap to switch to the program view The button shows the temperature and the remaining time. For ≥70 °C: Warning **Hot** (in red, with warning symbol).
Pause (blue)	95.0 °C ⚠ Hot Pause Pause Time 00:00:30	A PCR program was paused. Tap to switch to the program view The button shows the temperature and the pause time.

5.4   Quick-starting programs

On the login screen and the **Home** screen of the software the user will find a quick-start function. This quick-start function is only enabled when the block is free.

Login screen	You can start all recently used programs.
Home screen	You can start those programs that you have used most recently (user-specific quick start).

Using the quick-start function

▶ Tap the block status button: 24.5 °C Free .

   ✓ The software now displays a page containing a table with the most recently used programs.

No.	User	Program No.	Name	Block Type	Program Type
1	user1	03	Touchdown	Gradient 96	
2	user1	01	Fast-10s-60c	Gradient 96	
3	user1	02	Three-step	Gradient 96	
4	user1	04	Lin-grad-1c-a	Gradient 96	Gradient
5	user1	05	Lin-grad-1c-b	Gradient 96	Gradient

Fig. 13 Table containing the most recently used programs

▸ Select a PCR program.

▸ If required: Edit the program using the **Edit** command before starting the program.

▸ For twin-block models: Tap **Start Block 1** or **Block 2** on the preselected block to initiate the PCR run.

  – Switch between the two blocks by tapping on the buttons **1** and **2**.

  – Use the button **Choose block start program** to initiate a program on both blocks. Select both blocks in the prompt. Confirm your selection by tapping the green check mark.

Furthermore, the button **New from template** allows you to create a new program based on a particular program template.

See also

  ▤ Creating or editing PCR programs [▸ 33]

5.5   Incubating samples at constant temperature

Incubation mode allows you to incubate samples for any period of time at any temperature meaning that you could, e.g., also keep samples at a constant low temperature over night.

Many users carry out incubation at 4 ℃. However, temperatures a little higher than that, e.g. 10 ℃, are sufficient to avoid damage to stored amplified samples. Such higher temperatures prolong the life of the cooling Peltier elements.

▸ Tap **Incubate** on the **Home** screen.
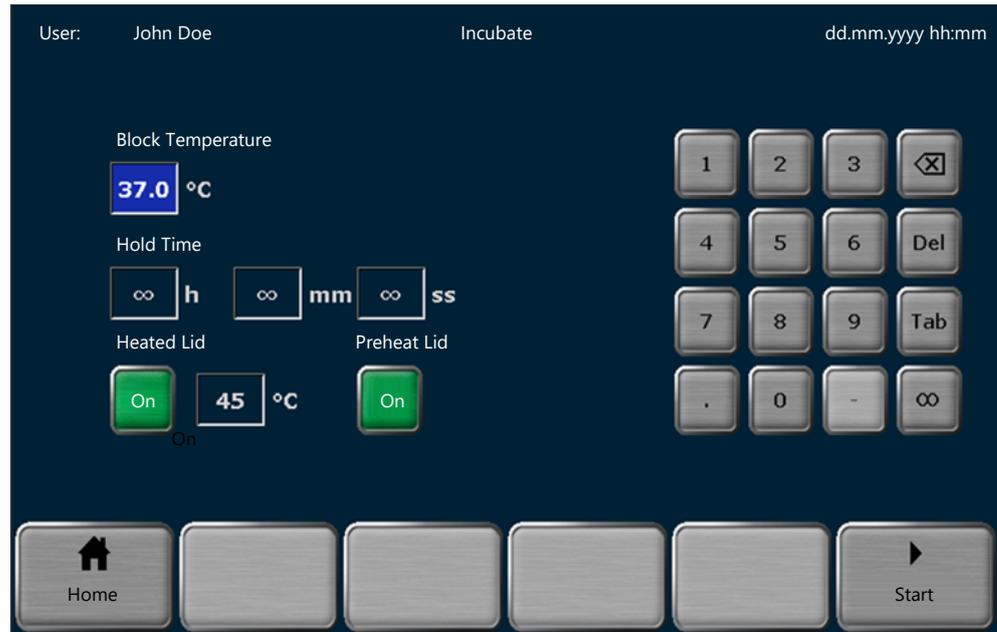
  ✓ The **Incubate** page opens.

Fig. 14   Incubate page

▸ Use the numeric keypad to enter **Block Temperature** and **Hold Time**.
If you enter ∞, the device will keep the set block temperature for an indefinite period
of time.

▸ Optionally: Use the button in the **Preheat Lid:** section to enable or disable the pre-
heating function of the heated lid.

▸ The button under **Lid** allows switching the heating function of the heated lid on and
off. You can also set the lid temperature here.

▸ Tap **Start** to initiate the incubation of the samples.

▸ For twin-block models: Tap **Start Block 1** or **Block 2** on the preselected block to initi-
ate the incubation.

– Switch between the two blocks by tapping on the buttons **1** and **2**.

– Use the button **Choose block start program** to initiate an incubation on both
blocks. Select both blocks in the prompt. Confirm your selection by tapping the
green check mark.

The device keeps the samples at the specified block temperature. There are different
buttons to stop, pause, continue or skip the incubation process.

Once you tap the button **Choose block stop program**, the device will show a prompt in
which you can select the block that you wish to stop.

Do not simply turn off the device during an incubation. The device will treat this discon-
nection as a power failure. The device will proceed with the incubation after restarting
the device.

5.6   Creating or editing PCR programs

Quick reference guide

▶ Tap **Programs** on the **Home** screen.

▶ Edit an existing program or create a new program based on a program template:

– Select an existing program on the page **Program overview**. Tap on the button **Edit** to edit the program.

– Or: Tap **New from template** on the **Program overview** page. Select a program template and open it by tapping **Open template**.

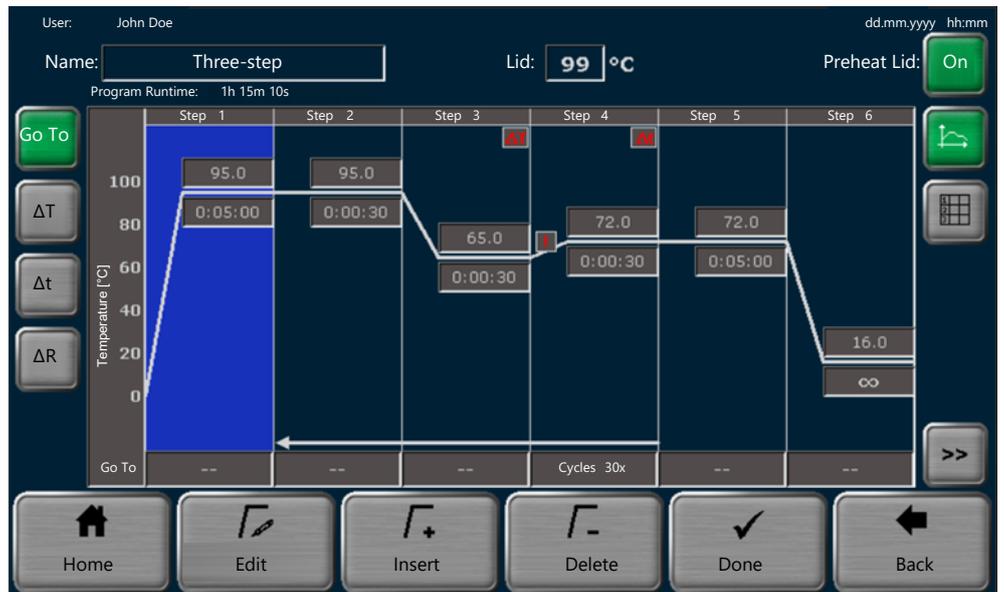▶ Use the buttons ⌒ and ▦ to choose between a graphical and a spreadsheet format for programming.

Fig. 15   Graphical programming

Fig. 16   Spreadsheet programming

▶ Use the input field **Name:** to specify the name for the program.

33

▸ Use the input field **Lid Temperature:** to set the temperature for the heated lid. You also have the option to enable the preheating function for the heated lid by tapping on the button **On**.

▸ You can use the buttons **Insert** and **Delete** to insert additional steps or to delete existing steps in the program. The maximum number of steps in a program is 30.

▸ Edit the individual program steps. To do this, tap on a program step to select it. The selected program step is highlighted in blue.

  – Edit the individual parameters for this step directly in the spreadsheet or diagram.

  – Or: After tapping **Edit** change all parameters on a particular page.

▸ Define at least one block temperature (3 to 99 ℃) and holding time (max. ≤9 h 59 min 59 s) for each program step. Enter ∞ to program a pause of infinite duration.

▸ Define the following optional parameters:

  – Program loops
    Program loops are repeated in cycles. The maximum number of iterations is 999. Define the step number to which the program shall return under **GoTo**. Define the number of repeated cycles under **Cycles**.

  – Temperature increment **ΔT**
    The block temperature increases or decreases by the temperature increment with each cycle. The temperature increment can be ±0.1 to 20 ℃.

  – Time increment **Δt**
    The holding time increases, e.g. in case of a long-range PCR, by this time increment with each cycle. The time increment can be 1 to 240 s.

  – Heating and cooling rate **ΔR**
    The block temperature is controlled by the specified heating or cooling rate. The value can be set by increments of 0.1 ℃/s. The maximum heating and cooling rate depends on the device model.

  – Temperature gradient **Degrees** (only for gradient-enabled models)
    The block temperature increases or decreases by a specified temperature gradient from column to column (mono block) or from row to row (twin block) in the sample block. The maximum temperature range depends on the device model.

▸ Once all program steps are completed, tap on **Done**.

▸ Select a user directory and a storage location for the program on the page **Copy/save programs**.

▸ Tap **Save** to save the program.

▸ Or: Tap **Save as** to save the program under a new name. The system will overwrite the initial name.

  ✓ You have created a program for a PCR run. The program execution time is shown under **Program information** in the preview.

You can now tap **Start** to start the program.

After this brief instruction, we will now proceed with a comprehensive description of the individual program parameters including important tips and information for the programming process.

5.6.1   Opening a program template for editing

▸ Tap **Programs** on the **Home** screen.

    ✓ The **Program overview** page opens. The directory of the current user is prese-
lected.

▸ Tap **New from template**.

    ✓ The system opens the **Program templates** page containing different program
templates. The program template **Blank** does not contain any predefined steps.
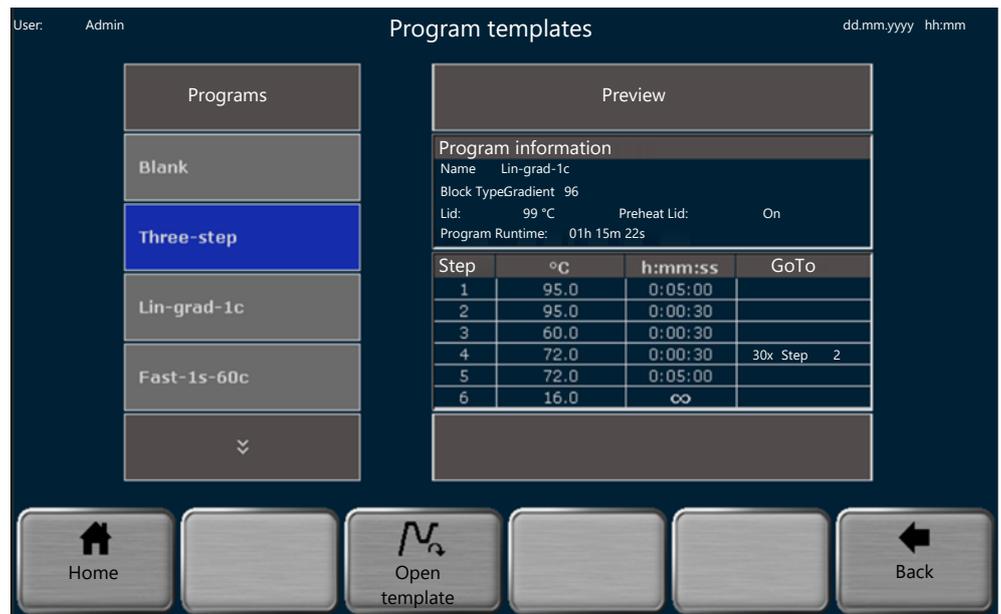
User:	Admin		Program templates		dd.mm.yyyy hh:mm

Programs / **Preview**

Blank

Three-step

Lin-grad-1c

Fast-1s-60c

Program information
Name   Lin-grad-1c
Block TypeGradient 96
Lid: 99 °C   Preheat Lid: On
Program Runtime: 01h 15m 22s

Step	°C	h:mm:ss	GoTo
1	95.0	0:05:00	
2	95.0	0:00:30	
3	60.0	0:00:30	
4	72.0	0:00:30	30x Step 2
5	72.0	0:05:00	
6	16.0	∞	

Home   Open template   Back

Fig. 17   Program templates

▸ Select a program template from the **Programs** list. Use the preview function to check
the program settings.

▸ If the number of programs is greater than what can be displayed in the list, use the
arrow keys to navigate through the list.

▸ Tap **Open template** to open the selected program template.

    ✓ The system will now open the graphical or spreadsheet programming screen
which allows you to adjust the program template to your personal needs.

When selecting the **Blank** program template you will first have to edit the initial step.
Only then will you be able to add additional steps.

5.6.2   Assigning program names

⇨ Prerequisite: You have opened an existing program or a program template for edit-
ing.

▸ Tap the input field **Name:** on the graphical or spreadsheet programming screen.

▸ Use the alphanumeric keypad to enter a program name of up to 13 characters and
figures.

    – Overwrite the initial name of the program template or the existing program by
entering a character or a figure.

    – Enter a blank to extend the initial program name.

▸ After the editing is completed, tap **Done** and then **Save** to save the program under
the name.

▸ Use **Save as** to amend the program name when saving the program. Confirm your entry by tapping the green check mark. Tap **Save** to save the program.

5.6.3 Defining the temperature and the preheating function of the heated lid

Temperature of the heated lid

⇨ Prerequisite: You have opened an existing program or a program template for editing.

▸ Tap the input field **Lid Temperature:** on the graphical or spreadsheet programming screen.

▸ Use the buttons **On** and **Off** on the numeric keypad to turn the heating of the heated lid on and off.

▸ If the heating is **On**: Use the numeric keypad to enter a temperature for the heated lid within the range of 30 to 110 ℃.

▸ Confirm your entry by tapping the green check mark.

▸ Save the program after completing the changes.

If the temperature of the heated lid in an PCR run exceeds the temperature of the sample block by more than 75 ℃, the heating of the heated lid will be switched off automatically. With block temperatures that low, it is no longer expected that sample condensation forms on the lid of the vessel. Furthermore, proceeding like this will prolong the working life of the Peltier elements as they do not have to cool down the sample block unnecessarily against the temperature setting of the heated lid.

Preheating the heated lid

▸ Use the button **On** on the graphical or spreadsheet programming screen to activate the preheating function of the heated lid.

▸ Or: Deactivate the preheating function of the heated lid by tapping on the button **Off**.

▸ Save the program after completing the changes.

For most applications it is recommended to preheat the heated lid before the PCR run to avoid sample condensation on the cold lid of the vessel.

If the preheating function is activated, the device will first preheat the heated lid to the predefined temperature for the heated lid before starting the PCR run. The device will only start heating the sample block after 40 s equilibration.

5.6.4 Graphical or spreadsheet programming

You can create and edit PCR programs on a graphical or spreadsheet programming screen.

Use the buttons to toggle between the programming modes:

Button	Description
	Graphical programming mode
	Spreadsheet programming mode

The two different programming modes offer the same programming steps, the only difference being the way the programming is displayed.

Graphical programming

The currently selected step is highlighted in blue during the programming process. The graphical view divides each step into heating phase and holding time. Some parameters are only displayed by symbols (see table).
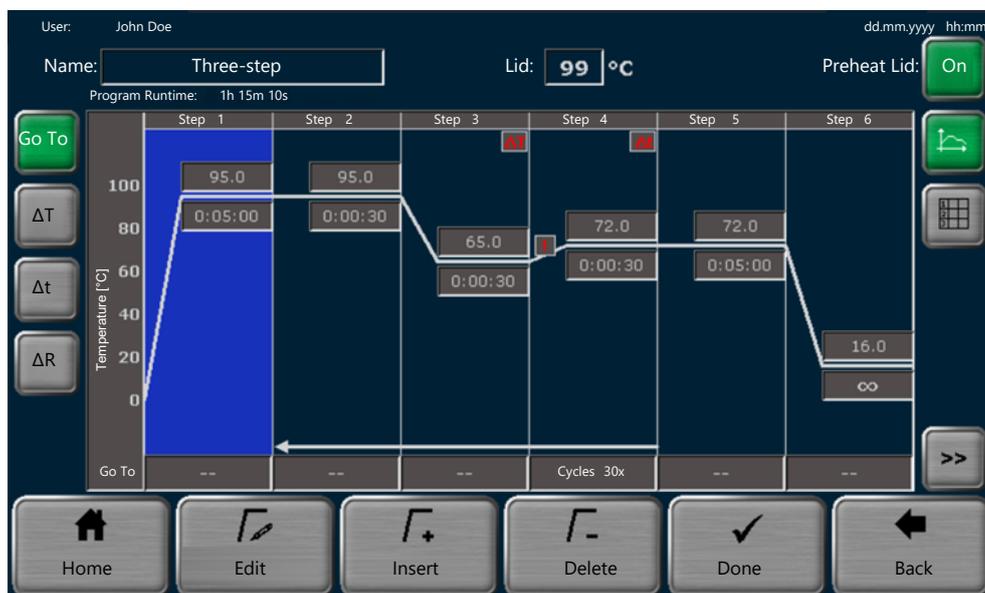

Fig. 18   Graphical programming

Program parameters	Display (example)	Description
Name:	**Three-step**	Define the program name
Lid:	**99 ℃**	Define the temperature of the heated lid (30 to 110 ℃)
Preheat Lid:	**On**	Enable or disable the preheating of the heated lid before the actual PCR run
Step	**Step 1**	Define at least one block temperature and holding time for each program step. All other parameters are optional.
		For more than 6 program steps, use the arrow keys to navigate through the displayed program
Temperature:	**95.0**	Define a block temperature (3 to 99 ℃ ±0.1 ℃) for each step
Hold Time (h:mm:ss)	**0:05:00**	Define a holding time during which the block temperature is maintained (≤9 h 59 min 59 s)
		Use ∞ to program a pause
GoTo **Cycles**	← Cycles 30x	Define program loops: ▪ Enter the step number to which the program shall return ▪ Define the number of iteration cycles (max. 999)
ΔT	**ΔT** (in red)	Increase or decrease the block temperature in each cycle by the temperature increment (**Temp. incr./decr.:**) of ±0.1 to 20 ℃
Δt	**Δt** (in red)	Extend the holding time in each cycle by the time increment of 1 to 240 s

Program parameters	Display (example)	Description
ΔR	! (in red)	Adjust the average heating and cooling rate for the selected step
		The maximum heating and cooling rate depends on the device model.
Degrees	55.0 ◢ +1.0	Increase or decrease the block temperature column by column (mono block) or row by row (twin block) by the temperature increment [°C] starting from the annealing temperature [°C]

Spreadsheet programming

The currently selected step is highlighted in blue during the programming process.

Fig. 19   Spreadsheet programming

Program parameters	Display (example)	Description
Name:	Three-step	Define the program name
Lid:	99 °C	Define the temperature of the heated lid (30 to 110 °C)
Preheat Lid:	On	Enable or disable the preheating of the heated lid before the actual PCR run
Step	1	Define at least the block temperature and the holding time for each step. All other parameters are optional.
		For more than 6 steps, use the arrow keys to navigate through the displayed program
Block Temp. (°C)	95.0	Define a block temperature (3 to 99 °C ±0.1 °C) for each step
Hold Time (h:mm:ss)	0:05:00	Define a holding time during which the block temperature is maintained (≤9 h 59 min 59 s)
		Use ∞ to program a pause

Program parameters	Display (example)	Description
GoTo	2	Define program loops:
Cycles	30	▪ Enter the step number to which the program shall return ▪ Define the number of iteration cycles (max. 999)
ΔT(℃)	10.0	Increase or decrease the block temperature in each cycle by the temperature increment (**Temp. incr./decr.:**) of ±0.1 to 20 ℃
Δt(s)	120	Extend the holding time in each cycle by the time increment of 1 to 240 s
ΔR(℃/s)	3.0	Adjust the average heating and cooling rate for the selected step The maximum heating and cooling rate depends on the device model.
Degrees	55.0 ▰ +1.0	Increase or decrease the block temperature column by column (mono block) or row by row (twin block) by the temperature increment [℃] starting from the annealing temperature [℃]

5.6.5 Editing, adding or deleting steps

Editing steps

There are two options to edit a program step in the software: Directly in the graphical or spreadsheet view or via an extra page.

⇨ Prerequisite: You have opened an existing program or a program template for editing.

▸ Tap on a program step. The selected step is highlighted in blue.

▸ Edit the individual parameters for the selected step directly in the spreadsheet or diagram.

▸ Define at least one block temperature and holding time for each program step.

▸ Tap **GoTo**, **ΔT**, **Δt** or **ΔR** in the graphical view to edit these parameters. Use the data entry line underneath the diagram.

▸ Or: Tap **Edit** and open an extra page for the programming process. Enter all parameters for the step on the page.

▸ Use the arrow keys on this page to navigate from step to step. This allows you to program several steps one after the other (multi-step programming).

▸ Confirm the entered parameters for all steps by tapping the green check mark. There is no need to confirm the entry for each individual step.

Fig. 20   Defining all parameters for a step

▸ For gradient-enabled models, define a gradient as required:

– Tap on the block temperature field in the graphical or spreadsheet view. Tap on the button **Degrees** on the numeric keypad.

– Or: Tap on the button **Degrees** on the extra page for programming all parameters.

▸ Save the new or edited program after changing all required parameters.

✓ You have edited one or several program steps.

Inserting steps

▸ Use the **Insert** button to insert additional steps in the program. The maximum number of steps in a program is 30.

✓ The new step will be inserted at the selected program step. This will not over-write the existing step. Instead, this step and any subsequent steps will by moved down one position.

Deleting steps

▸ Use the button **Delete** to delete individual steps.

✓ The selected step is deleted. All subsequent steps will move up one position.

5.6.6   Programming a loop

A typical PCR program consists of cyclically reiterated steps for:
■ Denaturation
■ Annealing
■ Extension

To reiterate steps, create program loops:

⇨ Prerequisite: You have opened an existing program or a program template for editing.

▸ Tap the button **GoTo** in the graphical view. Tap on the field for the step in the line underneath the diagram with which you want the loop to begin.

▸ Or: Tap on the field of the step with which you want the loop to begin in the column **GoTo** or **Cycles** in the spreadsheet.

▸ Or: Select the step. Tap **Edit** to open the extra page for programming all parameters.

▶ Use the filed **Go To:** to enter the step to which the program shall return in the loop.

▶ Use the field **Cycles:** to enter the number of cyclical reiterations.

▶ Confirm the entries by tapping the green check mark.

▶ Save the program after completing the changes.

✓ You have programmed a program with a program loop.

Loops	Step	Block Temp. (°C)	Hold Time (h:mm:ss)	Go To	Cycles	ΔT(°C)	Δt(s)	ΔR(°C/s)
	1	95.0	0:05:00					4.0
34x	2	95.0	0:00:30					4.0
	3	55.0	0:00:30					4.0
	4	72.0	0:00:30	2	34			4.0
	5	72.0	0:05:00					4.0
	6	16.0	∞					4.0

Fig. 21   Program with loop (spreadsheet view)

The example shows a loop in which the device first executes steps 1 to 4 and then reiterates denaturation, annealing and extension in step 2 to step 4 33 times. In step 5 the device executes the final extension at 72 °C. In the last step the device cools down the samples to 16 °C for an indefinite period of time.
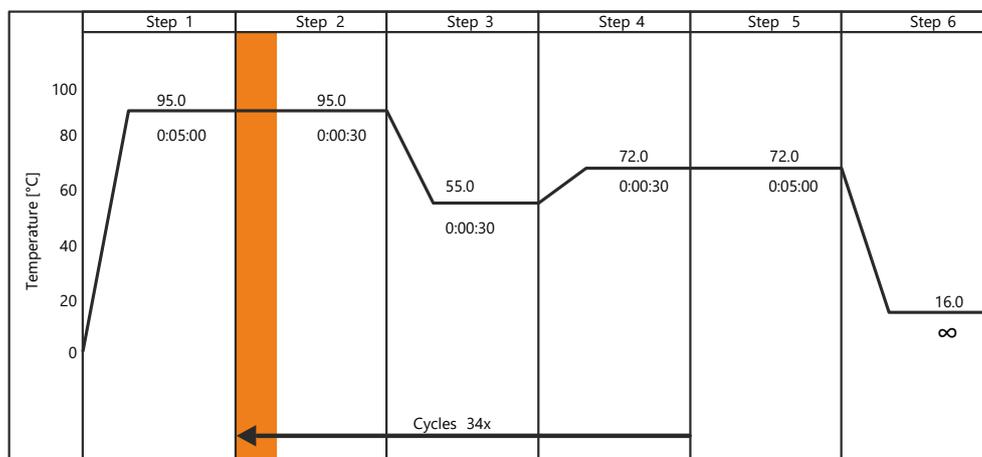

Fig. 22   Program with loop (graphical view)

In the graphical view, the program loop is illustrated by an arrow. The arrow begins at step 4, the end of the loop. The arrow points at the step to which the program reiterates within the loop (here: step 2). The number of cyclical reiterations is indicated above the arrow.

5.6.7   Programming a temperature increment

Certain applications such as a touch down PCR use temperature increments. The block temperature is increased or decreased by the set value in each cycle.

⇨ Prerequisite: You have opened an existing program or a program template for editing.

▸ Tap the button **ΔT** in the graphical view. Tap on the field for the step in the line underneath the diagram for which you want to set a temperature increment. The step must be within a loop.

▸ Or: Tap on the field for the step in the column **ΔT** of the spreadsheet view for which you want to set a temperature increment. The step must be within a loop.

▸ Enter a temperature increment within the range of ±0.1 to 20 ℃ in the field **Temp.-Incr./Decr.**.

▸ Confirm the entry by tapping the green check mark.

▸ Save the program after completing the changes.

   ✓ You have programmed a temperature increment for a selected program step. The graphical view only displays the symbol **ΔT** (in red) in this step.

5.6.8 Programming a time increment

Certain applications, for example long-range PCR, use time increments. The holding time is increased by the set value in each cycle.

   ⇨ Prerequisite: You have opened an existing program or a program template for editing.

▸ Tap the button **Δt** in the graphical view. Tap on the field for the step in the line underneath the diagram for which you want to set a time increment. The step must be within a loop.

▸ Or: Tap on the field for the step in the column **Δt** of the spreadsheet view for which you want to set a time increment. The step must be within a loop.

▸ Enter a time increment within the range of 1 to 240 s in the field **ss**.

▸ Confirm the entry by tapping the green check mark.

▸ Save the program after completing the changes.

   ✓ You have programmed a time increment for a selected program step. The graphical view only displays the symbol **Δt** (in red) in this step.

5.6.9 Adjusting the heating and cooling rate

You can adjust the average heating and cooling rate for each individual step. This can be useful for special PCR applications such as telomerase PCR. The average heating and cooling rate defines how quickly the block temperature is attained in a particular step.

The maximum heating and cooling rate depends on the device model.

   ⇨ Prerequisite: You have opened an existing program or a program template for editing.

▸ Tap the button **ΔR** in the graphical view. Tap on the field for the step in the line underneath the diagram for which you want to adjust the heating and cooling rate.

▸ Or: Tap on the field for the step in the column **ΔR(℃/s)** of the spreadsheet view for which you want to adjust the heating or cooling rate.

▸ Use the field **℃/s** to enter an exact heating or cooling rate in increments of 0.1 ℃/s.

▸ As an option, you can activate the field **Apply Ramp Rate to all steps**. This applies the heating and cooling rate to all program steps.

▸ Confirm the entries by tapping the green check mark.

▸ Save the program after completing the changes.

✓ You have adjusted the heating or cooling rate for one or for all program steps. For this step (or for all steps) the graphical view displays the symbol **!** (in red).

5.6.10 Programming a gradient

The gradient function is only available on gradient-enabled models.

Use the gradient function to find the ideal annealing temperature for a new primer pair. The thermal cycler establishes the temperature gradient across the sample block during the annealing step.

The device establishes the temperature gradient along the long edge of the sample block, so that it is possible to look at as many different temperatures as possible.

For mono blocks, the gradient is established from column to column, i.e. in horizontal direction from left to right. The highest temperature can be set in the first or in the last column. All samples in one column have one and the same temperature. However, the temperature varies from column to column.
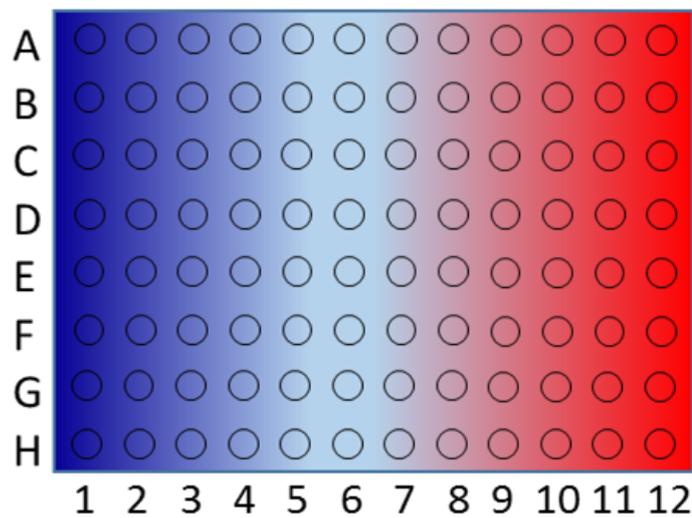

Fig. 23   Temperature gradient (block format 96)

For twin blocks, the gradient is established along the long edge of the block, in this case row by row in vertical direction.

Irrespective of the block that is used, the software will always use the term **Column**.
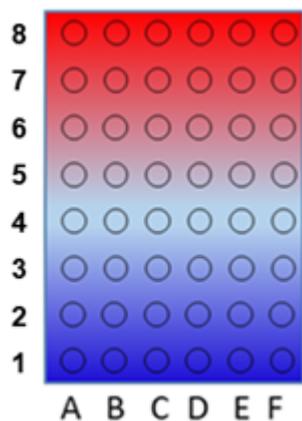

Fig. 24   Temperature gradient (block format 48)

In thermal cyclers with twin blocks, only the left block is gradient-enabled. Trying to start a gradient program on the right block will fail and result in an error message.

▸ Distribute sample replicates across the columns (mono block) or the rows (twin block) of the sample block to determine the block temperature that produces the best result.

▸ Open an existing program or a program template for editing.

▸ Select the annealing step in the graphical or spreadsheet view.

▸ Tap the field for the block temperature. Tap on the button **Degrees** on the numeric keypad.

▸ Or: Tap **Edit** in the graphical or the spreadsheet view. Tap **Degrees** on the extra page for programming all parameters.

▸ Use the buttons **Lin.** and **Std.** on the subsequent page to toggle between the Linear Gradient Tool or a standard gradient programming.
The two different programming modes offer the same programming steps, the only difference being the way the programming is displayed.
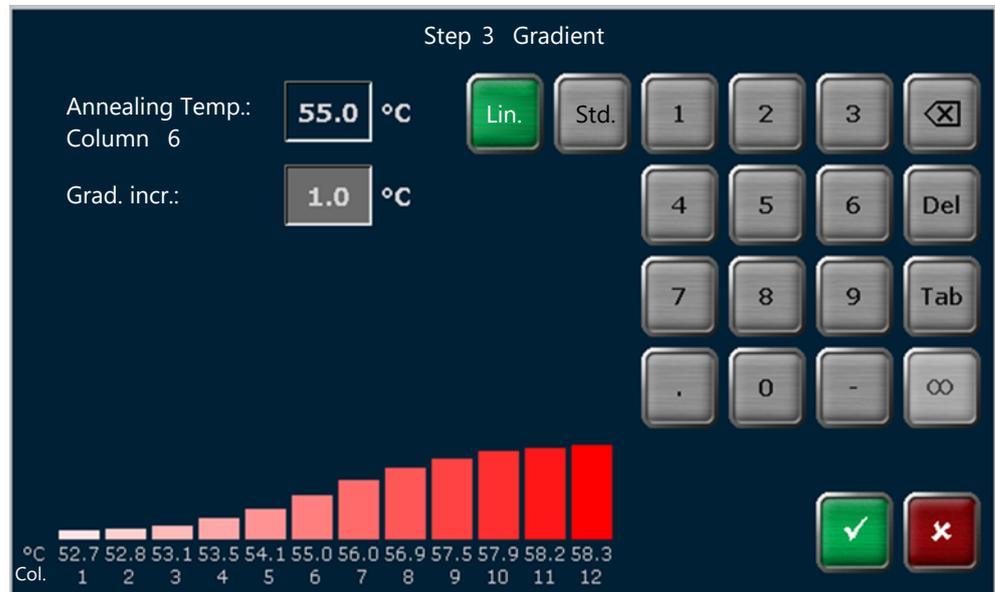

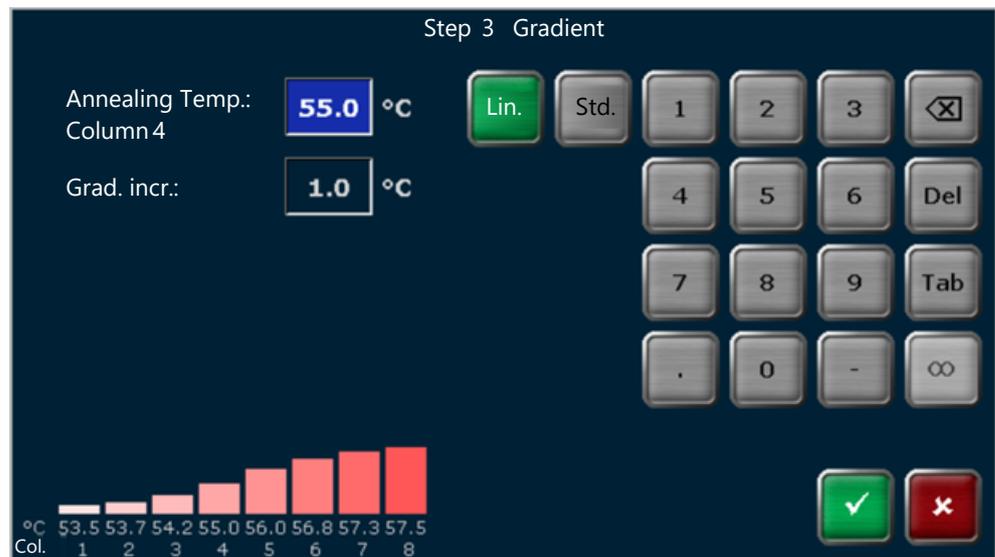**Fig. 25   Linear Gradient Tool (mono block)**

Fig. 26   Linear Gradient Tool (twin block) with position 1 at the bottom left

▶ Linear Gradient Tool: Enter the required annealing temperature in the field **Anneal-ing Temp.:**.

   – The annealing temperature that was entered is applied to a specific column of the sample block. This is indicated below **Annealing Temp.:**. For the sample block in the 96 block format, this is **Column 6**.

▶ Define a temperature increment under **Grad. incr.:**.

   ✓ The software will calculate the effective temperatures and display them in a bar chart.
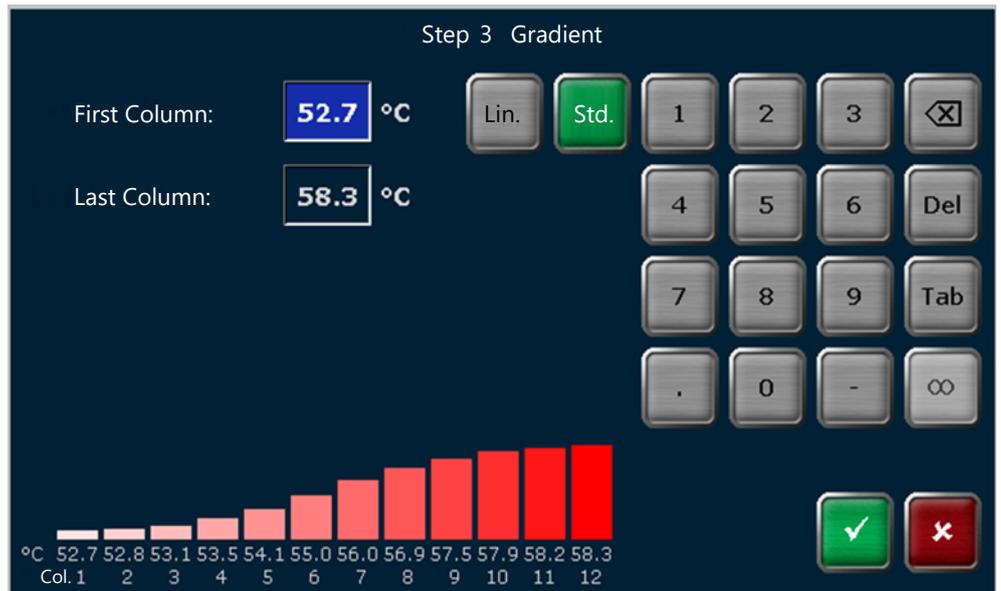

Fig. 27   Standard gradient programming

▶ Standard gradient programming: Enter the sample block temperature for the first and the last column in the respective fields.

   ✓ The software will calculate all effective temperatures and display them in a bar chart.

▶ Confirm your entry by tapping the green check mark.

▶ Save the program after entering the data for all program steps.

   ✓ You have created a temperature gradient for a program.

5.6.11 Saving the program

   ⇨ Prerequisite: You have opened an existing program or a program template for edit-ing. You want to save the program after making all the required changes.

▶ Tap **Done** on the graphical or spreadsheet programming screen.

▶ Select a user directory on the page **Copy/save programs**. The directory of the current user is preselected.

▶ Use the arrow keys to select a program storage space. The system preselects the first free slot in the directory of the current user. If the program is saved to a different storage location, all other programs are moved down one position.

▶ Alternatively, you can tap [⤢] to select user directories and program storage loca-tions. On the quick-selection pages, tap on the required user and storage location to select them.

▶ Tap **Save** to save the program.

▶ Or: Tap **Save as** to save the program under a new name. Confirm your entry by tapping the green check mark. Tap **Save** to save the program. The system will overwrite the original program name.

   ✓ You have saved a new or an edited program.

5.7   Copying or deleting PCR programs

You can copy or delete one or all programs.

Option	Icon	Description
Copy all		Copy all programs of the selected user
Copy		Copy a selected program
Delete all		Delete all programs of the selected user
Delete		Delete a selected program

Copying programs

▶ Tap **Programs** on the **Home** screen.

   ✓ The **Program overview** page opens. The directory of the current user is preselected.

▶ Tap **Copy all** to copy all programs.

▶ To copy a specific program, tap the required program to select it.

▶ In case the number of users or programs is longer than what can be displayed on the display, uses the arrow keys to navigate through the list. Or: Use [icon] to open the quick selection and display all users or programs on one page.

▶ Tap **Copy**.

▶ Select a user directory and a program storage location for the program copy/copies on the page **Copy/save programs**.

▶ Tap **Save** to save programs under their original name.

▶ Tap **Save as** to save programs under a new name.

   ✓ You have created a copy of one or of all programs.

You can edit the copied programs to create different versions for frequently used programs.

Deleting programs

▶ Tap **Programs** on the **Home** screen.

   ✓ The **Program overview** page opens. The directory of the current user is preselected.

▶ Tap **Delete all** to delete all programs.

▶ To delete a specific program, tap the required program to select it.

▶ In case the number of users or programs is longer than what can be displayed on the display, uses the arrow keys to navigate through the list. Or: Use [icon] to open the quick selection and display all users or programs on one page.

▶ Tap **Delete**.

▶ Confirm the prompt.

✓ The program or the programs are deleted.

Tip: You can recover deleted programs via a backup.

See also

▤ Performing a backup [▶ 64]

5.8   Protocol wizard

The protocol wizard is a useful tool for the automatic creation of PCR programs.
- You can use the wizard to calculate the ideal annealing temperature for a new primer pair.
- You can use the expected product length to determine the holding time for the elongation step.

The protocol wizard generates PCR programs based on polymerase-specific program templates. The software can save program templates for 8 polymerases. The software includes pre-installed program templates for polymerases produced by the company IST Innuscreen GmbH, a close cooperation partner of Analytik Jena.

The protocol wizard offers two-step and three-step PCR programs. A three-step program consists of separated steps for:
- Denaturation
- Annealing
- Extension or elongation

In a two-step program, the steps annealing and extension are combined. Use the primer annealing temperature T_a for a combined annealing and extension step in two-step programs.

Calculating the annealing temperature

In general, the ideal annealing temperature (T_a) is about 5 °C lower than the average primer pair melting temperature (T_m).
- If you know the average melting temperature of the primer, you can calculate T_a and set it as the temperature for the annealing step in the PCR program.
  The formula for that is: $T_a = T_m - 5\ °C$
- Alternatively, you can use the wizard to calculate the values for T_a and T_m based on the base sequence for the forward and reverse primers. When doing so, you can let the wizard include the concentration of primers and salts in its calculation. After saving, simply transfer the calculated annealing temperature to a PCR program of your choice.
- When using a gradient-enabled thermal cycler, you can validate the theoretical annealing temperature with a gradient program to further optimize this temperature setting.

Calculation basis

For short sequences of ≤14 nucleotides:

The following applies to the software's calculation of the primer annealing temperature (T_a) based on the primer T_m value:
- The software calculates the melting temperature for each primer using the equation according to Wallace et al.:

  $T_m = ((w*A + x*T)*2) + ((y*G + z*C)*4)$

  In this formula, the letters w, x, y and z represent the bases A, T, G and C in the primer sequence.
- The average T_m value is calculated based on the T_m values for both primers.

■ The annealing temperature T_a is calculated on the basis of the average T_m value according to the following rules:

If the difference between the T_m values is ≤4 ℃, then: $T_a = T_m - 5$ ℃

If the difference between the T_m values is >4 ℃, then: T_a is the lower T_m value plus 2 ℃.

For long primer sequences of >14 nucleotides:

The software calculates the primer annealing temperature (T_a) based on the so-called "nearest neighbor method" according to SantaLucia and von Ahsen et. al.

Calculation basis	References
Equation according to Wallace et al.	Wallace et al., Nucleic Acids Res. 6, 3543, 1979
Nearest neighbor method	SantaLucia, Proc Natl Acad Sci U S A. 1998 Feb 17; 95(4):1460-5
	von Ahsen et al., Clin Chem. 1999 Dec; 45(12):2094-101

Calculating the holding time for the elongation step

The software calculates the holding time for the elongation step based on the expected product length according to the following equation:

Elongation time s = product length base/1000 bases*60 s

The minimum elongation time in the software is set to 6 s for very short products.

5.8.1   Starting the wizard and opening a program template

Starting the wizard

▶ Tap **Protocol Wizard** on the **Home** screen.

  ✓ The software opens the page **Select/Edit Polymerase template** which shows a selection of polymerase-specific program templates including a preview.

The page **Select/Edit Polymerase template** provides the following options:

Option	Icon	Description
New Polymerase		Create a program template for a new polymerase
Copy all		Copy all program templates
Copy		Copy a specific program template
Delete all		Delete all program templates
Delete		Delete a specific program template
		You cannot delete the program templates for polymerases predefined by IST Innuscreen GmbH.
Edit Polymerase template		Edit a program template
Next		Open the wizard's parameter page to determine the annealing temperature and holding time for the elongation step
Home		Quit the wizard and go back to the **Home** screen

Some options will only be displayed after selecting a program template.

Selecting and opening a program template

▶ Tap a predefined program template on the page **Select/Edit Polymerase template** to select it.

▶ If the number of program templates is greater than what can be displayed on the screen, use the arrow keys to navigate through the list.

▶ Select **Next** to open the wizard's parameter page.

 ✓ You have started the protocol wizard and selected a predefined program template. You can now determine the annealing temperature and the holding time for the elongation step.

5.8.2   Editing an existing or creating a new program template for the wizard

▶ Tap **Protocol Wizard** on the **Home** screen.

 ✓ The software opens the page **Select/Edit Polymerase template** which shows a selection of polymerase-specific program templates including a preview.

▶ Select a program template and modify it under **Edit Polymerase template**.

▶ Or: Select **New Polymerase** to create a new polymerase-specific program template.

▶ Enter a new name for the new or edited program template under the item **Name** on the page **Edit Polymerase template**.

▶ Enter temperatures and holding times for the individual steps of the PCR reaction in the table. When doing so, follow the instructions provided with the polymerase.

	Temperature [°C]	Hold Time (h:mm:ss)
Initial Denaturation	96	--
Denaturation	--	--
Annealing	--	--
Elongation	--	--
Final Elongation	--	--
Final Storage	--	--

Fig. 28   Temperatures and holding times for the steps of the PCR reaction

The fields for the annealing temperature and the holding time for the elongation step are grayed out and cannot be enabled. You will determine these two parameters later using the wizard.

▶ Tap **Done** to complete the editing of the program template.

▶ The first free storage location in the polymerases list is preselected on the page **Select/Edit Polymerase template**. If required: Use the arrow keys to change the storage location.

▶ Tap **Save** to save the new or edited program template.

▶ Or: Tap **Save as** to save the new or edited program template under a new name.

▶ You can either save the program template to the thermal cycler or to a USB flash drive connected to the device. To do this, select either **Cycler** or **USB** in the list **Locations**.

 ✓ You have created a new program template for the wizard or edited an existing program template.

5.8.3   Creating PCR programs using the wizard

▶ Tap **Protocol Wizard** on the **Home** screen.

▶ Tap a predefined program template on the page **Select/Edit Polymerase template** to select it.

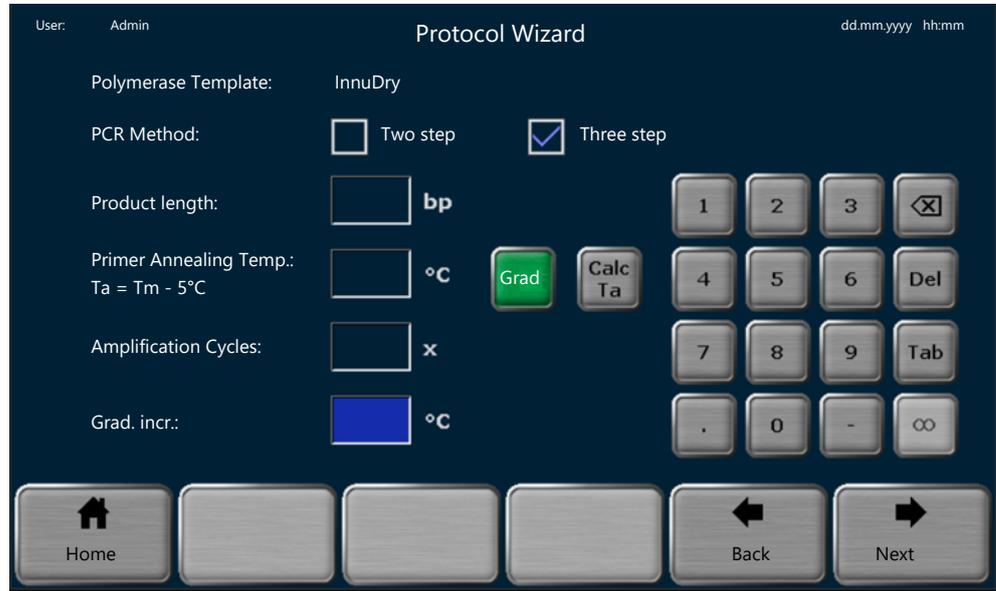▶ Select **Next** to open the parameter page of the protocol wizard.

Fig. 29   Parameter page of the protocol wizard

▶ Tap the check box to choose between a two-step and a three-step program. In a two-step program, annealing and elongation are combined in one step.

▶ Enter the PCR product length in *bp* (base pairs). The software uses the product length to calculate the holding time for the elongation step.

▶ If known: Enter the primer's annealing temperature in °C.
The general rule is: $T_a = T_m - 5$ °C

▶ If the annealing temperature is not known: Use **Calc Ta** to open the page **Edit Primer**. Here you can calculate the annealing temperature based on the nucleotide sequence of the forward and reverse primers.

▶ Enter the required number of cycles.

For gradient-enabled models   You can set a temperature gradient. This allows you to use the PCR program created with the wizard to test and further optimize the theoretical annealing temperature.

▶ Tap the button **Degrees**.

✓ An additional entry field **Grad. incr.:** is opened.

▶ Enter a temperature increment.

▶ After setting all program parameters, tap **Next** to open the page **View parameter**. This page displays the determined program parameters.

		Temperature [°C]	Hold Time (h:mm:ss)
	Initial Denaturation	95.0	0:02:00
30x	Denaturation	95.0	0:00:02
	Annealing	55.0	0:00:02
	Elongation	72.0	0:00:06
	Final Elongation	72.0	0:01:00
	Final Storage	16.0	∞

▶ Tap **Create program** to create a PCR program based on the determined parameters.

   ✓ The graphical or spreadsheet programming screen is opened.

▶ Check the program parameters and change them, if required.

▶ Enter a name for the new program under **Name:**.

▶ Complete the creation of the program by tapping **Done**.

▶ Tap **Save** to save the new program. Or: Tap **Save as** to save the program under a new name.

   ✓ You have used the protocol wizard to create a new PCR program. The wizard helped you to determine annealing temperature and holding time for the elongation step.

You can only start a program after saving it. Closing the protocol wizard before saving will discard the suggested program parameters.

Closing the protocol wizard

▶ Tap **Home**.

   ✓ The system will show a confirmation prompt: **Do you want to leave the protocol wizard?**

▶ Confirm this prompt by tapping the green check mark.

   ✓ You will return to the page **Home**.

See also

▤ Programming a gradient [▶ 43]

▤ Creating or editing PCR programs [▶ 33]

▤ Calculating the annealing temperature [▶ 51]

5.8.4 Calculating the annealing temperature

▶ Tap **Protocol Wizard** on the **Home** screen.

▶ Tap a predefined program template on the page **Select/Edit Polymerase template** to select it.

▶ Select **Next** to open the parameter page of the protocol wizard.

▶ Use **Calc Ta** to open the page **Edit Primer**. Here you can calculate the annealing temperature based on the nucleotide sequence of the forward and reverse primers.
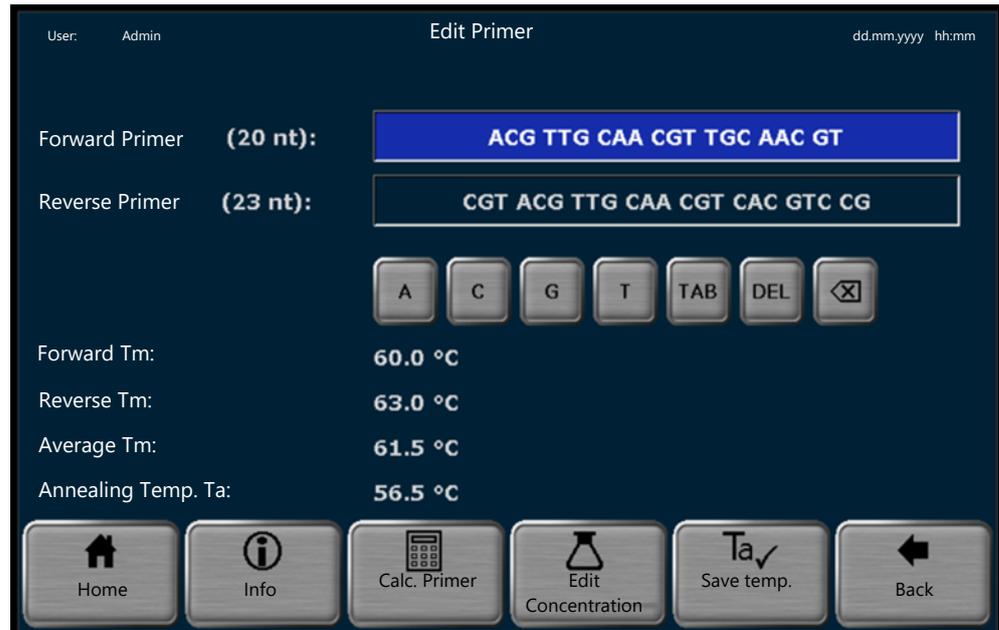
Fig. 30   Edit Primer page

▸ Use the buttons for the four bases A, C, G, T to enter the sequences for forward and reverse primers in *nt* (nucleotides).

  ✓ The software will count the sequence length and display it in brackets to the left of the input field.

▸ Alternatively, you can include the concentration of primer, salt and magnesium ions for calculating the annealing temperature. To do this, tap **Edit Concentration**.

  ✓ The **Edit Concentration** page opens.

Fig. 31   Edit Concentration page

▸ Enter the concentration of primer, salt and magnesium ions.

Concentration	Default	Value range
Primer	200 nmol/l (nM)	0 to 2000 nmol/l
Salt	50 mmol/l (mM)	0 to 200 mmol/l
Magnesium ions	0 mmol/l (mM)	0 to 200 mmol/l

▸ Tap **Calc. Primer**.

 ✓ The wizard will calculate the melting temperature of the forward and reverse primers, the average melting temperature and the annealing temperature.

▸ Tap **Save temp.** to transfer the calculated annealing temperature to the protocol wizard.

 ✓ You will be taken back to the parameters page of the protocol wizard. This page allows you to enter additional parameters for the PCR program and to create a program suggestion after tapping **Next**.

The pages **Edit Primer** and **Edit Concentration** provide the following options:

Option	Icon	Description
Info	ⓘ	View information for calculating the annealing temperature
Calc. Primer	🔢	Calculate the annealing temperature based on the entered nucleotide sequences
Edit Concentration	🧪	Enter the concentration of primer, salt and magnesium ions to include them in the annealing temperature calculation
Save temp.	Ta✓	Transfer the calculated annealing temperature to the protocol wizard
Edit Primer	ACGT✎	Return to the page **Edit Primer** from the page **Edit Concentration**
Back	⬅	Go back to the parameter page of the protocol wizard
Home	🏠	Quit the protocol wizard and return to the **Home** screen

5.9 Executing a PCR run

You have two options to start a program for a PCR run:
- Quick start of one of the last programs that were used

 Select the quick-start function using the block status button on the login screen or the **Home** screen.
- Program start via the menu **Programs**

Starting the program via the menu Programs

▸ Tap **Programs** on the **Home** screen.

 ✓ The **Program overview** page opens. The directory of the current user is preselected.

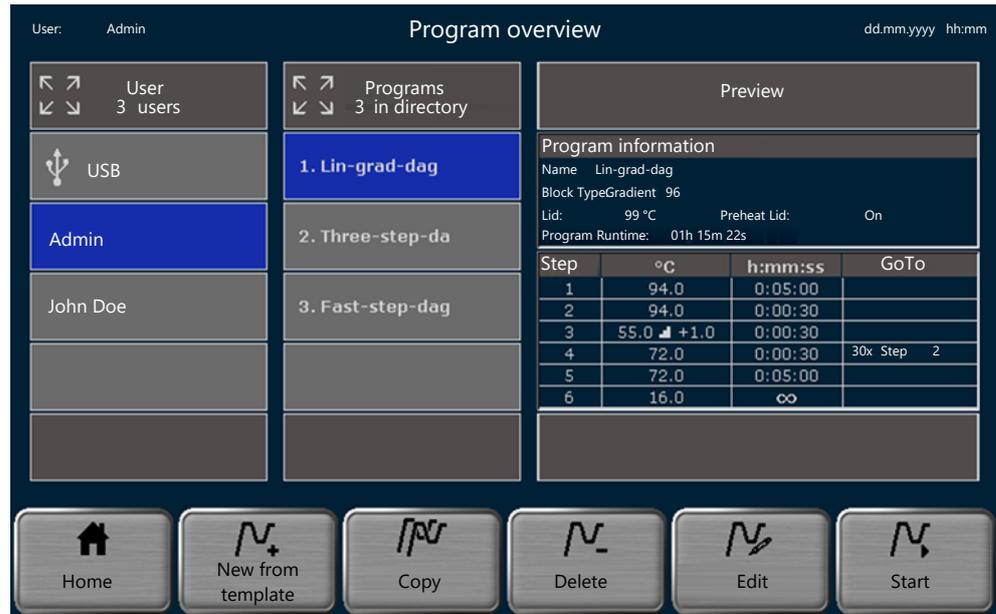▸ Choose a user directory and program.

Fig. 32   Program overview with preview

▸ If the number of users and programs is greater than what can be displayed on the screen, use the arrow keys to navigate through the list.

▸ Alternatively: Show all users or programs using the quick-selection button ⤢.

▸ Use the preview function to check the program settings. If required, use the button **Edit** to adjust the program settings.

▸ Insert the samples into the sample block.

▸ Close the heated lid. Establish the contact pressure. To do this, turn the wheel clockwise until you clearly hear a clicking sound.

▸ Tap **Start** to initiate the program.

▸ On twin-block models, the software will show a prompt: **Please select block to start:**. Select the respective check mark to start the program on **Block 1**, **Block 2** or on both blocks. Confirm your selection by tapping the green check mark.

Display during a program run

During a program run, the software displays the program that is running in form of a spreadsheet or a diagram. The current step is highlighted in yellow.

The gradient display shows the temperatures applied in each individual row of the sample block during a particular gradient step.

Use the buttons to switch between the display modes:

Button	Description
⤴	Display the program that is running in graphical view
	The diagram divides each step into a heating phase and a holding phase.
▦	Display the program that is running in a spreadsheet
◣	Only for programs with gradient:
	Display the course of the temperature gradient across the sample block for the gradient step

On twin-block models, the header will display the current block. Use the buttons **1** and **2** to switch between the blocks that are displayed.

The header of the three different views contains an overview table with the most important information about the program run:

Name	Estimated End	Remain. Time	Block Temp.	Lid	Step
Three-step	17:49:46	01h 26m 11s	58.4°C	99.7°C	2/6

Fig. 33   Overview of the program run

Display	Examples	Description
Name	Three-step	Program name ■ For programs with gradient: Display **(Degrees)** behind the program names
Estimated End	17:49:46	Expected completion time of the program
Remain. Time	01h 26m 11s	Expected remaining run time
Block Temp.	59.5°C	Current block temperature ■ For programs with gradient: Display of the lowest and highest block temperature, separated by the icon ◢
Lid	99.7°C	Current temperature of the heated lid
Step	2/6	Current step in the step sequence
	Preheating	Display during the preheating process of the lid and the subsequent equilibration (40 s)

5.9.1   Understanding the graphical, spreadsheet and gradient view

Understanding the graphical view

During a program run, the current step is highlighted in yellow. The graphical view divides each step into heating phase and holding time.
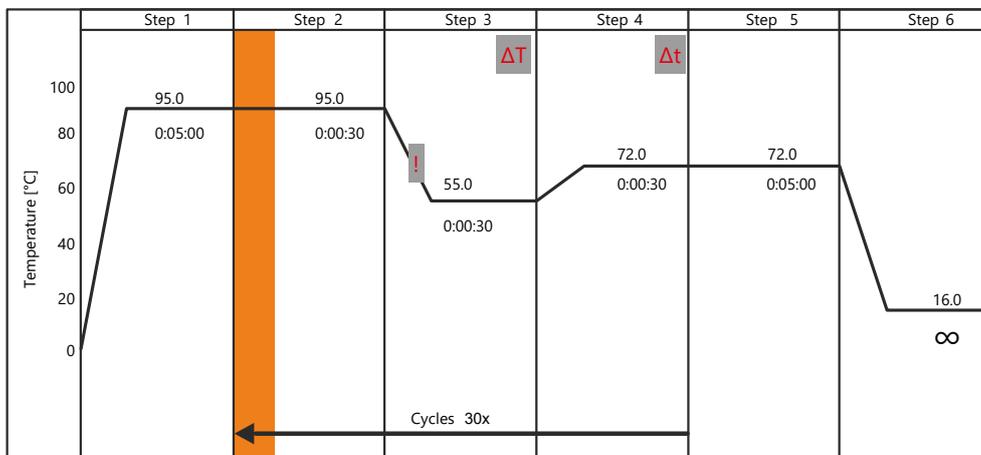

Fig. 34   Graphical display during a program run

The graphical view illustrates the following program parameters:

Program parameters	Display (example)	Description
Step	**Step 1**	There is at least one block temperature and holding time for each program step. All other parameters are optional. For more than 6 program steps, use the arrow keys to navigate through the displayed program.
Block Temp. (°C) **Hold Time (h:mm:ss)**	**95.0** **0:05:00**	After the heating phase, the sample block will keep the block temperature for the specified holding time.

Program parameters	Display (example)	Description
Loops	Cycles 30x	The selected steps are repeated cyclically x times.
Temperature increment	ΔT	The block temperature is increased or decreased by the temperature increment in each cycle.
Time increment	Δt	The holding time is increased by the time increment in each cycle.
Heat.-/Cool rate	!	The heating and cooling rate for the selected step was adjusted in the program.
Gradient	55.0 ◢ +1.0	The block temperature increases or decreases column by column (mono block) or row by row (twin block) by the temperature increment [℃] starting from the annealing temperature [℃].

Understanding the spreadsheet view

During a program run, the current step is highlighted in yellow.

In spreadsheet view all parameters are summarized in a table.

Loops	Step	Block Temp. (°C)	Hold Time (h:mm:ss)	Go To	Cycles	ΔT(°C)	Δt(s)	ΔR(°C/s)
	1	95.0	0:05:00					4.0
30x	2	95.0	0:00:30					4.0
	3	55.0	0:00:30			0.5		3.0
	4	72.0	0:00:30	2	30		2	4.0
	5	72.0	0:05:00					4.0
	6	16.0	∞					4.0

Fig. 35   Spreadsheet view during a program run

Program parameters	Display (example)	Description
Step	1	There is at least one block temperature and holding time for each program step. All other parameters are optional.
		For more than 6 program steps, use the arrow keys to navigate through the displayed program.
Block Temp. (℃)	95.0	Temperature of the sample block within the range of 3 to 99 ℃ for the respective program step
Hold Time (h:mm:ss)	0:05:00	After the heating phase, the sample block will keep the block temperature for the specified holding time.
Loops	30x	The selected steps are repeated cyclically x times.
Go To	2	
Cycles	30	In this example, the program will go back to step 2 after completing step 4 and reiterate this cycle 30 times.

Program parameters	Display (example)	Description
Temperature increment	**0.5**	The block temperature is increased or decreased by the displayed temperature increment [°C] in each cycle.
Time increment	**2**	The holding time is extended by the displayed time increment [s] in each cycle.
Heat.-/Cool rate	**4.0**	Between the steps, the device will heat or cool the sample block by the specified average heating or cooling rate [°C/s].
Gradient	**55.0** ◢ **+1.0** (at **Block Temp. (°C)**)	The block temperature increases or decreases column by column (mono block) or row by row (twin block) by the temperature increment [°C] starting from the annealing temperature [°C].

Understanding the gradient view

During each gradient step, the gradient view displays the temperatures that are applied in each of the columns of the sample block.

°C	55.0	56.0	57.0	58.0	59.0	60.0	61.0	62.0	63.0	64.0	65.0	66.0
Column	1	2	3	4	5	6	7	8	9	10	11	12
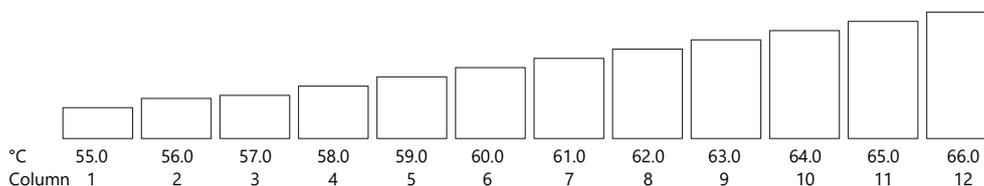
Fig. 36   Gradient view (during gradient step, block format 96-well)

5.9.2   Pausing or stopping executed programs, skipping steps

You have the option to pause, resume or stop the program during a PCR run. You can also skip individual steps.

Option	Icon	Description
Pause	❚❚	Abort the program at the current step
		The graphical and spreadsheet view highlights the current step in blue.
		The field **Step** in the table in the header reads **Pause**. The system counts the duration of the pause. The information displayed in the field **Estimated End** is adapted accordingly.
Continue	▶	Resume program after a pause
Skip	▶▶❙	Skip the current step. Continue the program with the subsequent step
Stop program	■	Stop program
		An additional prompt to confirm this selection helps avoiding operating errors.
Stop program Block 1/ Block 2	■	Stop program on the selected block
		An additional prompt to confirm this selection helps avoiding operating errors.
Choose block stop program	▦■	Select one or both blocks and stop the program
		The button is only displayed if a program is running on both blocks.

If you switch off the device during a pause step, this will be recognized as a power failure by the software. The software will generate a corresponding error message and record it in the run log file. Once the device is restarted, the software will resume the program.

5.10   Tools

The page **Tools** can be accessed via the **Home** screen.

On the page **Tools** you can use the following tools:

Option	Icon	Description
Settings		■ Adjust software settings such as date and time or the brightness of the screen ■ Connecting the device to a network
User-Managment		Manage user directories
Documentation		View documentation for functional tests and PCR runs
Self Test		Carry out an extended self test on heating and cooling function or thermal synchronicity
Service info file file		In case the device needs servicing, create a **Service info file** for the customer service
Backup		Save the contents of all folders, all programs, users and user settings within the software and on a USB flash drive
Cycler Info		View device and system information (serial number, block type, software version, etc.) Toggle between the pages using the buttons **System Info** / **Cycler Info**
Contact		Show contact information of the customer service
Home		Navigate back to the **Home** screen

5.10.1 Customizing software settings

You can use the menu option **ToolsSettings** to access the page **Settings**.

You can adjust the software on the **Settings** page.

Option	Icon	Description
Date and time		Set date and time Input via numeric keypad in the following format: ■ Date: DD MM YY ■ Time: hh mm ss
Automatic user logout		Use the buttons **On** / **Off** to activate or deactivate the automatic logout function Use the numeric keypad to enter the time after which the software automatically logs out an inactive user. Value range: 30 to 60 min
Beeper		Use the buttons **On** / **Off** to activate or deactivate the acoustic signal that is emitted when a PCR run is completed

Option	Icon	Description
Network		Connecting the device to a network
Display brightness		Use the slider **Dark – Bright** to adjust the brightness of the screen to the light conditions around the device
Touch screen calibration		Calibrate the touchscreen
		To do this, follow the instructions and touch three different spots on the screen
		If the calibration was successful, a small cross is displayed at the end.
Factory settings		Reset the software to factory settings
		Attention! After confirming the corresponding prompt, the software will delete all programs and user directories.
		Tip: Create a backup to be able to restore programs and user directories, if required.
Home		Navigate back to the **Home** screen
Back		Navigate back to the previous page

Network

You have the option to connect the device to a network and to run a query to get a list of network users on the page **Network**.

Option	Icon	Description
Network settings		Set up a network connection via a static or dynamic IP address
Network User		View the list of users accessing the device via a network

Network settings

The software can manage static and dynamic IP addresses:
- If you select the check box next to **Assign IP address automatically (DHCP)**, the DHCP server will automatically assign the network configuration settings to the device (default settings).
- If you select the check box next to **Static**, you have the option to enter the IP address, the subnet mask and the port using the numeric keypad.
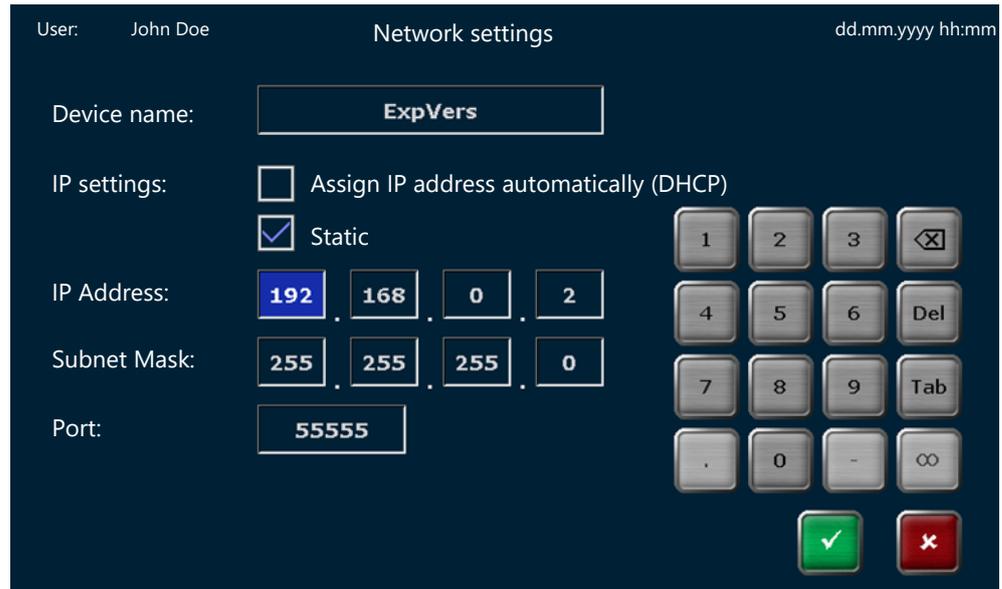
Fig. 37   Network settings

Network users   The software logs all users who access the device via the network. These users are listed in chronological order in a table. The table allows you to check if only authorized persons access the device via the network.

See also

    📄 Connecting the device to a network [▷ 24]

    📄 Performing a backup [▷ 64]

5.10.2 Viewing the documentation

To ensure functionality, the software carries out self tests and documents all PCR runs and error messages. The page **Documentation** allows you to view these records.

You can use the menu option **Tools|Settings|Documentation** to access the page **Documentation**.

Option	Icon	Description
Run Log File		View the records for the last 24 PCR runs
Power On Log File		View the results of the last initial self test
		The software automatically performs the initial self test when the device is started.
		The self test documents the date and time the device is switched on and lists any error messages in a table.
Self Test Log File		View the results of the last extended self tests
		You have the option to start an extended self test manually using the menu option **Tools|Self Test|Start Self Test**.
Error Log File		View the list of all error messages recorded by the device
		The software sorts all error messages by date and time in a table.
Home		Navigate back to the **Home** screen

Option	Icon	Description
Back	←	Navigate back to the previous page

Run Log File

The page **Overview Run Log Files** contains the documentation for the last 24 PCR runs.

The log files are sorted by date and time. The table contains the following information:
- Date and time of the PCR run
- User initials
- Number of the sample block used
- Program name
- User directory
- Program number

Use the arrow keys to navigate through the table if the table contains more than 6 run log files.

Viewing and exporting a Run Log File

The function keys allow you to view a log file and to export log files to a USB flash drive.

Option	Icon	Description
Selected Log File to USB		Save the highlighted log file on a USB flash drive
All files to USB		Save all log files on a USB flash drive
View Run Log File		View a log file with further information such as the login time or the time the program run was started and completed
Overview Run Log Files		Return to the spreadsheet view of the recorded log file
View program		View the program in the run log file
		Use the buttons to toggle between graphical and spreadsheet view.
		View the program in graphical view
		View the program in spreadsheet view
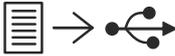
Self Test Log File

During an extended self test, the software checks the most important device functions and components such as the heating and cooling rate or the thermal synchronicity. The page **Self Test Log File** contains the results of the last tests.

▸ Navigate to the page **Self Test Log File**.

▸ Tap on the button for the respective test, e.g. **Cooler**.

  ✓ The spreadsheet overview contains the results of the last cooler tests.

The result of a test can either be **Passed** or **Error**. The last column in the table contains the result.
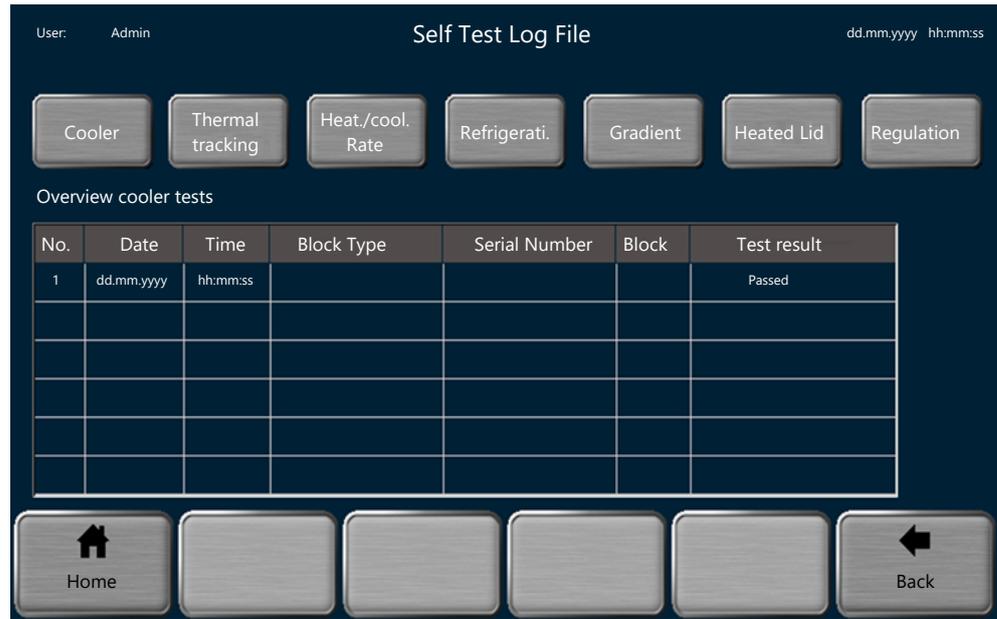
Fig. 38   Documentation of self tests

5.10.3 Performing an extended self test

During the extended self test, the device checks the most important device functions and components. The software will prompt you to carry out an extended self test at regular intervals.

▶ The following conditions must be met for the software to generate reproducible test results:

– Mains voltage: 100 V; 115 V; 230 V ±10 %

– Ambient temperature: 20 to 25 °C

– The sample block must be cooled to ambient temperature.

▶ Insert a microtiter plate or a series of individual sample tubes into the first and last columns of the sample block to ensure optimum contact pressure on the heated lid during the test.
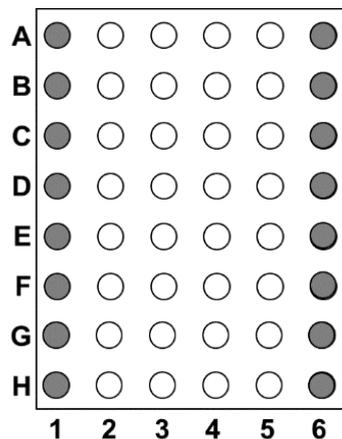
Fig. 39   Load the thermal block (block format 48) for the self test
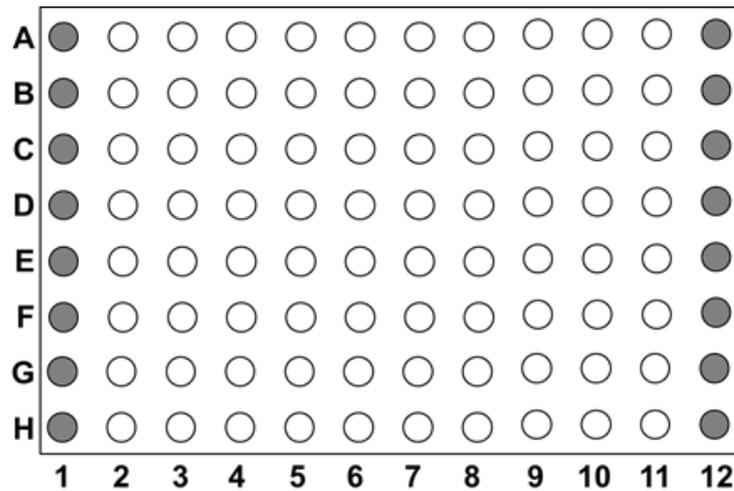
Fig. 40   Load the thermal block (block format 96) for the self test

▶ Close the heated lid.

▶ Use the menu option **Tools|Settings|Self Test** to navigate to the page **Self Test**.

▶ Initiate the self test with the button **Start Self Test**.

✓ During the following approximately 30 min the software will carry out the follow-
   ing tests:

Test	Description
Cooler	Incubates the sample block to 4 °C and checks if the temperature in the block is attained and can be held for a longer period of time.
Thermal tracking	Checks the synchronicity of the control loops and whether they interoperate in a coordinated way.
Heat.-/Cool rate	Checks whether the device attains the specified average heating and cooling rate.
Refrigerati.	Checks whether the heat sink and the fans interoperate properly.
Gradient	Only for gradient-enabled models Checks whether the sample block attains the predefined gradient temperatures.
Lid	Tests whether the heated lid attains the predefined temperature and can hold it for a longer period of time.
Regulation	Tests whether the control unit correctly controls the sample block.

The test result for each individual test can either be **Passed** or **Error**.

While carrying out a self test, you cannot start any other program on the device. Tap **Cancel Self Test** to abort a self test while it is running. In this case, the software will not generate a log file at all or only an incomplete log file.

See also

▤ Viewing the documentation [▶ 60]

5.10.4 Creating a service info file for troubleshooting

The service info file is a useful tool that helps the Analytik Jena customer service during troubleshooting.

▸ Insert a USB flash drive into the port on the front of the device.

▸ Use the menu option **Tools | Service info file** File | **Info File to USB** to save the service info file to a USB flash drive.

▸ Save the service info file on a computer. This may take a few minutes. Send an e-mail to the customer service and attach the file. You will find the contact information inside the front cover or under **Tools | Contact**.

5.10.5 Performing a backup

The backup function allows you to back up the contents of all folders, all programs and user directories on a USB flash drive.

- You can load a backup file at a later point in time to restore lost user directories and programs.
- You can also use the backup file to transfer the stored content to another thermal cycler (Biometra TOne, Biometra TAdvanced, Biometra TRIO).
  This allows synchronizing the content of the memory across different thermal cyclers. To be able to synchronize the data, all thermal cyclers must use the same software version.

You can use the menu option **ToolsBackup** to access the page **Backup**.

You can use the following functions:

Option	Icon	Description
Save backup file	▤ → •⇆	Save a backup file
Load backup file	•⇆ → ▤	Load a backup file to: - Restore any lost user directories and programs - Use user directories and programs of another thermal cycler on this device
Delete backup file	▤ –	Delete the highlighted backup file
Delete all backup files	▥ –	Delete all backup files from the spreadsheet view

5.11 User management

You can use the menu option **Tools | User-Managment** to access the user management. The user management allows you to manage up to 90 user directories.

On page **User Management** you will find a table containing all users including their names, initials and group assignments.

- In the table, all users are sorted by the date and time they last logged in.
- Use the arrow keys to navigate through the users if the list contains more than six users.

You can use the following functions for managing users:

Button	Icon	Description
Edit		Edit user settings
New User		Create a new user
Delete		Delete a user
User Management		Switch the user management on or off
Home		Navigate back to the **Home** screen
Back		Navigate back to the previous page

User roles and rights

By default, an administrator (Admin) is predefined with the password "Admin" in the software. Change the default password after switching on the device for the first time to protect the system from unauthorized access.

Administrator rights allow you to enable and disable the user management:

▸ Tap the button **User Management** on the page **User Management**.

▸ On the page **Configure User Management**, select the check mark for the option **On** to enable the user management. Tap **Off** to disable the user management.

When the program is started for the first time, the user management is disabled.

As long as the user management is disabled, the only user on the device is the administrator Admin. The administrator has the right to create additional users. The rights assigned to these users are the rights of general users.

If the user management is enabled, there are three different user groups with predefined rights:

■ **Administrator**
As an administrator you can create new users. You can assign users to one of the user groups and customize their individual user rights.

■ **General user**
As a user with general rights you have the right to create general and restricted users, but not to create administrators. You do not have the right to change the rights of other users. Furthermore, you cannot access the system configuration or create a backup.

■ **Limited user**
As a user with restricted rights you do not have any rights to manage users and to change the configuration of the system.

User roles with preset rights	Administrator	General user	Limited user
System configuration	X	-	-
Edit other users	X	-	-
Create new users	X	X	-
Delete other users	X	-	-
Write/delete programs of other users	X	-	-
Read programs of other users	X	X	X
Start/stop programs	X	X	X
Write/delete own programs	X	X	-

User roles with preset rights	Administrator	General user	Limited user
Show your own programs to other users	X	X	X

Please note that the software converts all newly created administrators into general users when you disable the user management at a later point in time. The only way to restore previous settings is to load a backup file.

All buttons which a user is not allowed to use are either hidden or grayed out for that particular user.

5.11.1 Editing a user

▶ Select the user from the table on the page **User Management**.

▶ Tap **Edit**.

▶ On the next page you have the option to change the user name and/or the language setting for the software interface.
You cannot change the initials of the user.

▶ Confirm your changes by tapping the green check mark.

   ✓ You have changed the user settings.

Changing the password

NOTICE

No system access without administrator password

If you forget the password of the only administrator, you will have to ask the customer service for assistance to access the system.

■ Enable the user management function and create at least one additional administrator who can restore the system using a backup file, if necessary.

■ Keep your passwords safe.

■ Contact the customer service if you can no longer access the system.

After logging in for the first time, you can change the password for the administrator Admin to protect the system from unauthorized access.

The default password that is set when the device is delivered is "Admin". User name and initials of the predefined default administrator cannot be changed.

▶ Open the user management. Select the administrator Admin from the table.

▶ Tap **Edit**.

▶ Recommendation: Before changing the administrator password, make a backup of the system to ensure that you will be able to restore the contents of all folders, programs and user directories in case this is necessary. To do this, use the menu option **Tools | Backup**.

▶ Enter the new password under **Password (optional):**.

▶ Re-enter the password.

▶ If you enter no password here, password protection for the administrator will be removed.

▶ Confirm your changes by tapping the green check mark.

   ✓ You have changed the administrator password.

As an administrator, you have the right to edit users. You can use the described method to also change other users' passwords.

See also

▤ Forgotten administrator password [▸ 69]

▤ Performing a backup [▸ 64]

5.11.2 Creating new users

▸ Tap **New User** on the login screen or on the page **User Management**.

▸ On the next page, enter a user name, initials and, if required, a password for the user:

 – **Username:** Enter up to 13 characters or figures using the alphanumeric keypad.

 – **Initials:** Choose two or three uppercase letters.

 – **Password (optional):** If you enter no password, the password protection is lifted

▸ Select the corresponding check box to set a particular language for the software interface: **English**, **German** or **Chinese**.

 ✓ A new user has been created.

The language setting is user-specific and can still be changed during operation.

5.11.3 Assigning user rights

As an administrator, you have the right to edit other users. You can use the user management to assign a role with a set of predefined user rights to a user. Furthermore, you can customize the user right settings for each individual user.

▸ Tap **New User** on the **User Management** page.

▸ Or: Select an existing user from the table. Tap **Edit**.

▸ On the next page, use the arrow button next to **User properties** to open the page **User data**.

▸ Use the corresponding button to assign a user group to the users: **Administrator**, **General user**, **Limited user**.

 ✓ The activated user group is highlighted in blue.

▸ If required: Extend or reduce the predefined default rights by tapping the corresponding rights.

 ✓ The activated rights are highlighted in blue.

▸ Confirm the settings by tapping the green check mark.

 ✓ You have assigned a user group to a user and customized the user right settings.

The user group is displayed on the page **User Management**. If the user right settings were adjusted, this page will display the notion "User-defined".

User rights	Meaning
System configuration	Grant access to system settings such as date and time, display brightness or network settings
Edit other users	Allow changing user names, user initials, language settings and user rights
Create new users	Allow creating new user accounts
Delete other users	Allow deleting existing user accounts

User rights	Meaning
Write/delete programs of other users	Allow editing, copying and deleting the programs of all users
Read programs of other users	Allow read-only access to other users' programs
	If disabled, a user will only see his or her own programs.
Start/stop programs	Allow starting and stopping programs
Write/delete own programs	Allow editing, copying and deleting one's own programs but not the programs of other users
Show your own programs to other users	Allow users to show or hide their own programs to/from other users

You cannot change the user right settings for the predefined default administrator Admin. This administrator always has all rights because at least one user must always have all rights.

5.11.4 Deleting a user

▸ Select the user from the table on the page **User Management**.

▸ Tap **Remove**.

▸ Confirm this prompt by tapping the green check mark.

    ✓ You have deleted the user with all of his or her programs.

6 Troubleshooting

6.1 Forgotten administrator password

NOTICE

No system access without administrator password

If you forget the password of the only administrator, you will have to ask the customer service for assistance to access the system.

- Enable the user management function and create at least one additional adminis-trator who can restore the system using a backup file, if necessary.
- Keep your passwords safe.
- Contact the customer service if you can no longer access the system.

If you have forgotten the administrator password:

▸ Use the function **Factory settings** to reset the system.
  NOTICE! All the user directories and programs that were created on this device will be deleted.

▸ Load a backup file to restore user directories and programs.

See also

  📄 Performing a backup [▸ 64]

6.2 Heating and cooling process take too long

The device is equipped with strong fans that remove the heat from the heat sink. The air inlet to these fans is located on the underside of the device. The air inlet may be ob-structed by soiling or objects such as a piece of paper that is drawn in by the fan's draft. If this is the case, the device will not achieve the desired heating and cooling rates.

▸ Check whether the air inlet is obstructed by soiling or objects.

▸ Frequently use a vacuum cleaner or a brush to remove soiling from the air inlet.

6.3 Automatic restart after power failure

The device has an automatic restart function. In case of a power failure during a PCR run, the device will resume running as soon as the power supply is reestablished.

In the event of a prolonged power failure (≥30 min) the Freeze program will start auto-matically: The device will then cool down the sample block to 4 ℃. You can then decide whether to repeat the run or to discard the samples.

After an automatic restart, you have to log in again as a user.

6.4   Automatic restart without an apparent cause

Strong voltage fluctuations may trigger a restart of the device. The reaction of the device in this case will be the same way as in case of a power failure.

The device will than indicate on the touch screen that a power failure has occurred during the run. The text on the screen will mention the time and the step with which the program was restarted.

To prevent sudden voltage fluctuations, do not connect the device to electrical circuits also connected to other devices requiring high levels of energy such as freezers or centrifuges.

After an automatic restart, you have to log in again as a user.

6.5   Transferring programs from other devices

Transferring programs

You want to transfer one or all programs of a particular user from one thermal cycler to another thermal cycler:

- ▶ Start the thermal cycler on which the programs are stored that you wish to transfer.
- ▶ Insert a USB flash drive into the USB port on the front panel of the thermal cycler.
- ▶ Use the menu option **Home**|**Programs** to open the page **Program overview**.
- ▶ Select a user from the column **User** in the program overview.
- ▶ Copy all the user's programs with **Copy all**.
  Or: Select a particular program and use **Copy** to copy it.
- ▶ Select the field **USB** in the column **User**.
- ▶ Use **Save** to save the programs on the USB flash drive.
- ▶ Start the second thermal cycler and insert the USB flash drive into the USB port of this device.
- ▶ Use the menu option **Home**|**Programs** to open the page **Program overview**.
- ▶ Select the field **USB** in the column **User**.
- ▶ Use **Copy all** to copy all programs saved on this USB flash drive.
  Or: Select a particular program and use **Copy** to copy it.
- ▶ Select a user in the program overview.
- ▶ Save the copied programs to the selected user directory by tapping **Save**.
    - ✓ You have transferred one or all programs from one thermal cycler to another thermal cycler.

Automatic program adjustment

After exchanging programs between different device models, you may need to adapt the programs to fit varying device specifications.

An adjustment may also be required after replacing the thermal block.

If the software detects deviations from the device specifications when reading a program, the software will automatically adjust this program. The adjustment is carried out during the editing or starting process of the program.

The software will display a prompt to inform you that certain adjustments to the program are required when you attempt to start or edit the program. You have the choice to either confirm or reject the automatic program adjustment. If you refuse a required adjustment, the device will not be able to start this program.

The following table provides an overview of possible adjustments:

Cause	Automatic adjustment
A program with temperature optimization step (TOS) is transferred to a device without TOS function.	The software will take the mean value of the temperatures programmed for the left and right sample block.
The heating and cooling rate is exceeded.	The software reduces the heating and cooling rate to the maximum rate that is possible.
The heating and cooling rate is not attained.	The software raises the heating and cooling rate to the maximum rate that is possible.
User-defined heating and cooling rate	The software maintains the user-defined heating and cooling rate.
A program with a temperature gradient is transferred to a non-gradient-enabled device.	The software deletes the gradient and applies the average temperature of the programmed gradient or the annealing temperature for this step.
The gradient is outside the permitted temperature range.	The software raises the lower temperature to the minimum permissible value, e.g. from 5 ℃ to 20 ℃.
The program exceeds the maximum permissible gradient range.	The software reduces the temperature range of the gradient and applies the mean temperature of the programmed gradient or the annealing temperature to do this.

6.6   Mirror programs on multiple devices

You can use the backup function to mirror devices. During this process, you will use the user management to copy the users and their programs from one device to another. You do not have to create every single user or program one by one. To be able to use this procedure, both devices must use the same software version.

6.7   Unlocking the lid wheel from a deadlock

When the heated lid is in the highest or lowest position it may happen that the lid wheel is uncoupled. In this situation, the clutch mechanism works in both directions. You will then hear the clicking sound when moving the lid in both senses of rotation.

To unlock the lid wheel, use a pen to press down the metal pin on the top of the lid wheel. This will bypass the clutch mechanism. Take care not to apply excessive pressure.

Lid deadlocked in upper position

▸ Use a pen to press down the metal pin on the top of the lid wheel (1). Apply only slight pressure.

▸ Carefully turn the lid wheel **clockwise** until it moves without resistance and you can hear no more clicking (2).
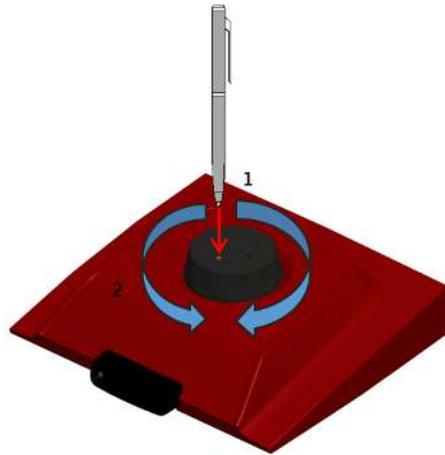
Fig. 41   Unlocking a deadlocked lid with a pen

▸ Release the pin and keep turning the lid further down in clockwise direction until the clutch mechanisms engages.

   ✓ The lid attains the ideal contact pressure. You can hear a clicking sound.

NOTICE

Risk of damage to the device due to excessive contact pressure

Excessive contact pressure can damage the device and the samples inside the device.

▪ After reaching the ideal contact pressure: Stop pressing the metal pin on the top of the lid wheel to avoid applying excessive contact pressure.

Lid deadlocked in lower position

▸ Use a pen to press down the metal pin on the top of the lid wheel. Apply only slight pressure.

▸ Carefully turn the lid wheel **counterclockwise** until it moves without resistance and you can hear no more clicking.

▸ Release the pin and keep turning the lid further up in counterclockwise direction until the pressure is completely relieved.

▸ Press the lid sealing button to open the lid.

6.8   Working successfully with 384-well sample blocks

When loaded with a 384-well plate, the heated lid is very close to the reaction volume. Therefore, the lid temperature has a significant impact on the effective incubation temperature.

Recommendations

▪ Reduce the temperature of the heated lid.

For common PCR conditions with denaturation at ≤95 °C and atmospheric humidity at ≤70 %:
▪ For reaction volumes of ≤10 µl, set the lid temperature to 95 °C.
▪ For reaction volumes of >10 µl, set the lid temperature to 85 °C.
  Even at such reduced lid temperatures, the risk of samples condensing on the heated lid is low.

For denaturation at >95 °C or atmospheric humidity of >70 %:
▪ Set the lid to the highest block temperature.

7   Maintenance and care

The device is mostly maintenance-free. The care and maintenance tasks which can be performed by the user are limited to the cleaning and disinfection of the housing and the sample block.

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

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

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

7.1   Calibration

The device is calibrated by the manufacturer before delivery. Provided that you observe the ambient conditions at the site of installation, the device does not require any temperature validation or temperature calibration after the installation.

7.2   Cleaning the housing

WARNING

Risk of electric shock

- Always switch off the device and disconnect the power plug before performing maintenance work.
  Power to the device is only disconnected by disconnecting the power plug. After the device is switched off, some parts are still live.

- Only leave the device and the software on as the maintenance instructions explicitly demand.

WARNING

Warning of biohazard

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

- Wear personal protective equipment when handling these substances.

- Observe all instructions and specifications in the safety data sheets. Observe national regulations when handling these substances.

- Decontaminate and clean the device after use.

▶ Only wipe the housing with a soft, clean cloth which may be slightly wetted with a commercially available neutral cleaning agent if necessary.
  i NOTICE! Alcohol, organic solvents or abrasive agents can damage the paint.

▶ Clean the ventilation slots on the underside and at the rear of the device with a vacuum cleaner.

7.3 Disinfecting the device

WARNING

Risk of electric shock

- Always switch off the device and disconnect the power plug before performing maintenance work.
  Power to the device is only disconnected by disconnecting the power plug. After the device is switched off, some parts are still live.

- Only leave the device and the software on as the maintenance instructions explicitly demand.

WARNING

Warning of biohazard

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

- Wear personal protective equipment when handling these substances.

- Observe all instructions and specifications in the safety data sheets. Observe national regulations when handling these substances.

- Decontaminate and clean the device after use.

Observe the following:
- The operator is responsible for carrying out suitable decontamination should the device become contaminated externally or internally with dangerous substances.
- Splashes, drops or larger liquid spillages should be removed using an absorbent material such as absorbent cotton, laboratory wipes or cellulose.
- In case of biological contamination, wipe the affected area with a suitable disinfectant. Then wipe the cleaned areas so that they are dry.
- The only suitable cleaning method for the housing is wipe disinfection. If the disinfectant has a spray nozzle, apply disinfectant to a suitable cloth before using it on the device.
  Proceed with particular care and ensure utmost cleanliness when working with infectious material because the device cannot be decontaminated as a whole.
- Before using a cleaning or decontamination procedure other than the one prescribed by the manufacturer, the user is required to check with the manufacturer that the intended procedure will not damage the device. Safety labels attached to the device must not be moistened or wiped with methanol.

As a possible disinfectant, Analytik Jena recommends:
- Meliseptol HBV disinfectant wipes from B. Braun
- The disinfectant Descosept Spezial produced by Dr. Schuhmacher GmbH is particularly suitable for disinfecting the sample block.

7.4   Firmware update

Please contact the customer service or your local distributor if you wish to update the firmware.

8 Transport and storage

8.1 Transport

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

Avoid the following during transport:
- Impact and vibration
  Risk of damage due to shock, impact or vibration!
- Large temperature fluctuations
  Risk of condensation!

8.1.1 Moving the device in the laboratory

CAUTION

Risk of injury during transport

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

- Proceed carefully when moving and transporting the device.

Observe the following when moving the device within the laboratory:
- Insufficiently secured components pose a risk of injury!
  Before moving the device, remove all loose parts and disconnect all connections from the device.
- As the device does not have carrying handles, grip the device firmly with both hands at the lower end.
- Observe the guide values and adhere to the legally mandated limits for lifting and carrying loads without auxiliary means.
- Observe the installation conditions at the new location.

8.1.2 Preparing the device for transport

NOTICE

Risk of device damage due to unsuitable packaging material

- Only transport the device and its components in the original packaging.

- Empty the device completely and attach all transport locks before transporting the device.

- Add a suitable desiccant to the packaging to prevent damage from moisture.

Place the device including the foam locking devices into the original shipping box.
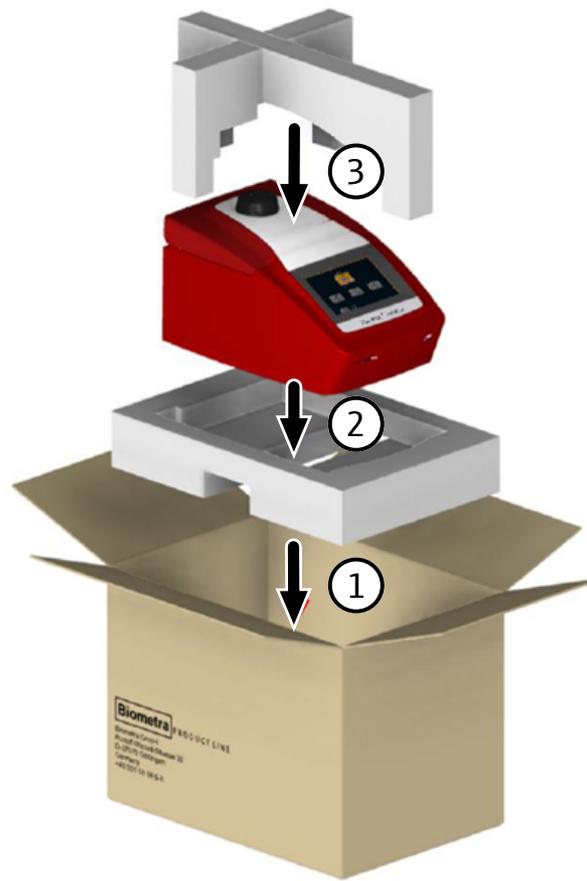
Fig. 42   Packaging instructions

8.1.3   Returning a device

> **WARNING**
>
> **Risk of damage to health due to improper decontamination**
>
> - Decontaminate the device professionally and document the cleaning measures before returning the device to Analytik Jena.
>
> - The customer service department will send you the decontamination report when you register the return.

▸ Clean all device components from biologically hazardous, chemical, and radioactive contamination.

▸ When registering the return, you will receive a decontamination report from the customer service. Complete the form and attach the signed decontamination declaration to the outside of the shipment.

▸ Only use the original packaging for the shipment and insert the transport lock. If the original packaging is no longer available, please contact Analytik Jena or your local distributor.

▸ Attach the warning label to the packaging:
"CAUTION! SENSITIVE ELECTRONIC DEVICE!".

▶ Enclose a sheet with the following data:

  – Name and address of the sender

  – Name and telephone number of a contact for inquiries

  – A detailed description of the fault, the precise conditions and situations under which the fault occurs

8.2 Storage

NOTICE

Risk of device damage due to environmental conditions

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

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

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

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

9   Disposal

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

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

10   Specifications

10.1   Model-specific data

Designation of the device	Biometra TAdvanced (12 models with different block formats and block materials, with and without gradient function)
Number of blocks	1 to 2 blocks (mono-block and twin-block models) Exchanging the block is possible in ≤10 s
Block material	▪ Aluminum (Al) coated with a special alloy ▪ Silver (Ag) with gold coating (Au)
Temperature range	3 to 99 ℃
Control accuracy	±0.1 ℃
Sample vessels	Can be used for low-profile and high-profile plastics (plates, tubes or 8-well strips), plates with and without edge and with half edge

The 12 models

Block format 96

Models	Biometra TAdvanced 96 Biometra TAdvanced 96 G	Biometra TAdvanced 96 S Biometra TAdvanced 96 SG
Block format	96	96
Block material	Aluminum (Al) coated with special alloy	Silver (Ag) with gold coating (Au)
Capacity (per block)	96 x 0.2 ml tubes, 96 -well micro plates, 12 x 8-well strips	96 x 0.2 ml tubes, 96-well micro plates, 12 x 8-well strips
Sample volumes (recommended)	5 ... 50 µl	5 ... 100 µl
Maximum heating rate*	6.0 ℃/s	8.0 ℃/s
Average heating rate*	5.5 ℃/s	7.0 ℃/s
Maximum cooling rate*	4.0 ℃/s	5.5 ℃/s
Average cooling rate* * measured in the block	3.5 ℃/s	4.5 ℃/s
Temperature uniformity		
95 ℃	±0.60 ℃ after 15 s	±0.50 ℃ after 15 s
70 ℃	±0.30 ℃ after 15 s	±0.25 ℃ after 15 s
55 ℃	±0.20 ℃ after 15 s	±0.15 ℃ after 15 s
Gradient	Biometra TAdvanced 96 G only	Biometra TAdvanced 96 SG only
Max./min. Gradient	30 ℃/0.1 ℃	40 ℃/0.1 ℃
Gradient temperature range	20 ... 99 ℃ across 12 columns	4 ... 99 ℃ across 12 columns

Block format 60, 384

Models	Biometra TAdvanced 60	Biometra TAdvanced 384
	Biometra TAdvanced 60 G	Biometra TAdvanced 384 G
Block format	60	384
Block material	Aluminum (Al) coated with special alloy	Aluminum (Al) coated with special alloy
Capacity (per block)	60 x 0.5 ml tubes	384-well micro plates
Sample volumes (recommended)	20 ... 150 µl	5 ... 25 µl
Maximum heating rate*	6.0 ℃/s	4.0 ℃/s
Average heating rate*	5.5 ℃/s	3.8 ℃/s
Maximum cooling rate*	4.0 ℃/s	2.0 ℃/s
Average cooling rate*	3.5 ℃/s	1.7 ℃/s
* measured in the block		
Temperature uniformity		
95 ℃	±0.60 ℃ after 15 s	±0.50 ℃ after 15 s
70 ℃	±0.30 ℃ after 15 s	±0.25 ℃ after 15 s
55 ℃	±0.20 ℃ after 15 s	±0.15 ℃ after 15 s
Gradient	Biometra TAdvanced 60 G only	Biometra TAdvanced 384 G only
Max./min. Gradient	30 ℃/0.1 ℃	24 ℃/0.1 ℃
Gradient temperature range	20 ... 99 ℃ across 10 columns	20 ... 99 ℃ across 24 columns

Twin blocks

Models	Biometra TAdvanced Twin 48	Biometra TAdvanced Twin 30	Biometra TAdvanced Twin Combi
	Biometra TAdvanced Twin 48 G		
Block format	48	30	Combi (35 + 48)
Block material	Aluminum (Al) coated with special alloy	Aluminum (Al) coated with special alloy	Aluminum (Al) coated with special alloy
Capacity (per block)	48 x 0.2 ml tubes, 48-well micro plates, 6 x 8-well strips, 0.2 ml	30 x 0.5 ml tubes	18 x 0.5-ml tubes, 35 x 0.5 ml narrow cap tubes
			48 x 0.2 ml tubes, 48-well micro plates, 6 x 8-well strips, 0.2 ml
Sample volumes (recommended)	5 ... 70 µl	20 ... 200 µl	20 ... 140 µl (0.5 ml)
			5 ... 70 µl (0.2 ml)
Maximum heating rate*	5.2 ℃/s	4.2 ℃/s	3.1 ℃/s
Average heating rate*	5.1 ℃/s	3.1 ℃/s	3.0 ℃/s
Maximum cooling rate*	4.1 ℃/s	3.3 ℃/s	2.3 ℃/s

Average cooling rate*	4.0 ℃/s	3.1 ℃/s	2.2 ℃/s
* measured in the block			

Temperature uniformity			
95 ℃	±0.60 ℃ after 15 s	±0.60 ℃ after 15 s	±0.60 ℃ after 15 s
70 ℃	±0.30 ℃ after 15 s	±0.30 ℃ after 15 s	±0.25 ℃ after 15 s
55 ℃	±0.20 ℃ after 15 s	±0.20 ℃ after 15 s	±0.20 ℃ after 15 s
Gradient (only 1 block equipped with gradient function)	Biometra TAdvanced Twin 48 G only	/	/
Max./min. Gradient	20 ℃/0.1 ℃	/	/
Gradient temperature range	20 ... 99 ℃ across 8 columns	/	/

Heated lid

Heated lid	High-Precision Smart Lid (HPSL)
Lid temperature	30 to 110 ℃
Contact pressure	Approximately 10 kg The clutch mechanism inside the heated lid guarantees a constant contact pressure on the inserted sample tubes.

10.2   General characteristics

General characteristics

Dimensions (W x D x H)	277 x 457 x 264 mm
Dimensions, with open lid (B x T x H)	277 x 457 x 414 mm
Mass	15 kg
Noise emissions	≤45 dB(A)

Process control

Operation	Stand-alone operation via color touch screen 7" Remote control application for control and monitoring via tablet PC
Minimum requirements of the application regarding the operating system	iOS 8.0; Android ≥4.4 (API 19)
Minimum requirements of the application regarding the thermal cycler	Software version V1.43 to V1.44
Interfaces	USB A; Ethernet

Functional scope of the software	▪ Generation of Service Info Files (SINF), extended self test ▪ User-specific quick start of the last programs ▪ Program preview ▪ Multi-step programming with adjustable heating and cooling rates ▪ Graphical or spreadsheet programming mode ▪ Simplified program creation using protocol templates ▪ Incubation mode ▪ Export function (via USB port)
Time increment	1 to 240 s per cycle
Temperature increment/decrement	±0.1 to 20 ℃ per cycle
Program storage capacity	350 programs in 90 user directories
Maximum number of steps per program	30
Maximum number of cycles per program	999
Maximum number of nested cycles	2
Language	German, English, Chinese
Auto restart	Automatic restart after power failure

Electrical specifications

Operating voltage	100 V; 115 V; 230 V ±10 %
Frequency	50 to 60 Hz
Fuses	2 x 10 A H (250 V)
Power consumption, max.	850 VA
Overvoltage category	II
Degree of contamination	2
IP rating of the housing	IP 20

Ambient conditions

Temperature during operation	15 to 35 ℃
Humidity during operation	≤70 %
Maximum altitude	2000 m above sea level

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