

Eppendorf ThermoStat™ C – Features, Options, Applications

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Executive Summary

Primarily used in the field of life sciences, the Eppendorf ThermoStat™ C is a device for temperature control of liquids or samples. The device features an extremely wide temperature control range (-10 °C–110 °C). Because the Eppendorf ThermoStat C securely controls the temperature up to 30 °C below room temperature, the

device is ideal for incubations which require that cooling temperatures, for example 4 °C or 0 °C, be maintained. The exchangeable Eppendorf SmartBlocks™ ensure high flexibility in the use of various tube and plate formats. With *condens.protect*® technology, the ThermoTop® prevents condensation on tube lids or plate sealing foils.

Overview

> Exchangeable Eppendorf SmartBlocks (5 µL–50 mL)

Use the convenient Eppendorf QuickRelease™ to quickly and easily replace Eppendorf SmartBlocks for frequently used tubes and plates.

> The menu

Customize your Eppendorf ThermoStat C to your needs: create, edit and save programs; define ramp rates and select the required Time Mode in the menu. You can also change device settings such as key lock, signal tones, contrast and languages in the menu.

> Start/stop key and Pause

Start and stop the temperature control processes, or activate a pause.



> Eppendorf ThermoTop with *condens.protect* technology

A heated lid is optionally available for Eppendorf SmartBlocks with 5 µL–2.0 mL tube and plate volumes: the Eppendorf ThermoTop prevents condensation droplets from forming on the tube inner wall and tube lid.

> Temperature keys

Quickly access your most frequently used temperatures.

> The display

All at a glance: temperature, time, program name, program steps and active functions.

Eppendorf SmartBlocks™
Eppendorf SmartBlock™ 0.5 mL
Eppendorf SmartBlock™ 1.5 mL
Eppendorf SmartBlock™ 2.0 mL
Eppendorf SmartBlock™ 5.0 mL
Eppendorf SmartBlock™ 15 mL
Eppendorf SmartBlock™ 50 mL
Eppendorf SmartBlock™ 12 mm
Eppendorf SmartBlock™ cryo thaw
Eppendorf SmartBlock™ plates
Eppendorf SmartBlock™ PCR 96
Eppendorf SmartBlock™ PCR 384
Eppendorf SmartBlock™ DWP 500
Eppendorf SmartBlock™ DWP 1000
Lid for Eppendorf SmartBlocks™ 0.5 mL–2.0 mL, PCR 96 & 384, plates
> Lid (unheated)
> Eppendorf ThermoTop® (heated Lid)

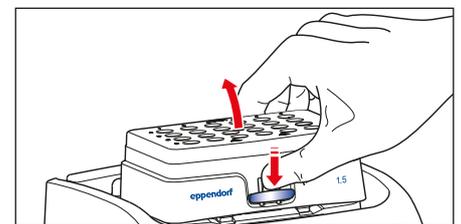
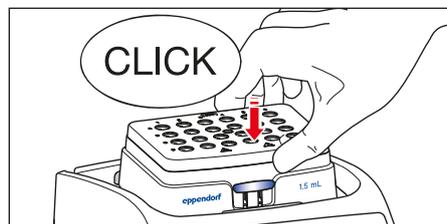
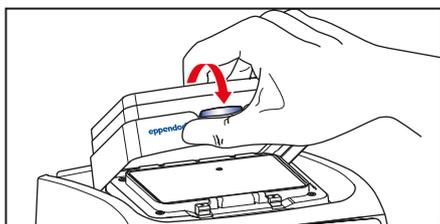
Technical data*
> Controlled temperature range: max. 30 °C below RT – max. 110 °C
> Lowest selectable temperature value: -10 °C
> Temperature accuracy: 20 – 45 °C: ± 0.5 °C; > 45 °C or < 20 °C: ±1 °C
> Heating rate: max 6.5 °C/min
> Cooling rate: above RT: max. 5 °C/min; below RT: max. 2.5 °C/min
> Block homogeneity: 20 – 45 °C: ±0.5 °C; < 20 °C or > 45 °C: ±1 °C
> Selectable Ramp rates
> Time Mode (Time/Temp Control)
> 5 Temperature keys; 15 free definable program places
*Complete technical data for each Eppendorf SmartBlock are available on www.eppendorf.com

The Eppendorf SmartBlocks

Various Eppendorf SmartBlocks are available in a volume range of 5 µL to 50 mL. The user-friendly Eppendorf QuickRelease technology makes replacing Eppendorf SmartBlocks easy and fast.

Please note! The block will be initially placed at an angle against the rear edge of the universal mount and then engaged by applying pressure toward the rear.

Press the release head down to disengage the block so it can be removed.



Figures 1 + 2: Attaching a thermoblock

Figure 3: Removing a thermoblock

The Eppendorf ThermoStat C automatically detects the attached block; this ensures that the maximum mixing frequencies cannot be exceeded.

The best possible temperature accuracy can be guaranteed by individually adjusting a Eppendorf SmartBlock. Optimized temperature control for each block type keeps temperature overshoots and deviations caused by external interferences to a minimum.

To guarantee optimal performance over the entire period of use, Eppendorf offers a preventive maintenance program and certification services: your Eppendorf ThermoStat C and Eppendorf SmartBlocks are regularly cleaned, checked and adjusted. Additional information is available at: www.eppendorf.com/epservices.

Eppendorf SmartBlocks for	Shape of boreholes			Eppendorf ThermoStat C max temp
	LxW (mm)	Depth (mm)	bottom shape	
microtest tubes 1.5 mL	Ø 11.0	34.7	conical	100 °C
microtest tubes 2.0 mL	Ø 11.0	34.6	round	100 °C
microtest tubes 0.5 mL	Ø 8.2	26.4	conical	100 °C
vessels 5.0 mL	Ø 17.4	53.0	conical	100 °C
vessels with 11–11.9 mm diameter	Ø 12.1	34.5	conical 120°	110 °C
96-well PCR plates, 0.2 mL PCR tubes	Ø 6.4	14.0	conical	100 °C
384-well PCR plates	Ø 3.8	8.0	conical	100 °C
MTP's & DWP's (SBS format)	130 x 88		flat	100 °C
vessels for 15 mL/50 mL	Ø 17.4/29.8	106/102	conical	100 °C
cryo tubes	Ø 12.7	31.7	flat	110 °C

The display and its symbols

All important parameters are available at a glance using the clearly arranged digital display:

time, temperature		
program name		
program steps		
Rotating arrows:	Eppendorf ThermoStat C is active – temperature control	
Eppendorf ThermoTop	– the symbol only appears in the display if the Eppendorf ThermoTop is attached and has been detected by the device.	
Time Mode:	The symbols indicate which	
Time Control	Time Mode has been selected using the menu. A more detailed description can be found in the “Selecting the Time Mode’ section.	
Time Mode:		
Temp Control		
Signal tones on		
Signal tones off	The menu is used to set the volume of signal tones or switch them off.	
Key pad is open	When it is open, parameters can be changed during the run. The key lock function is selected using the menu.	
Key pad is locked	When the key pad is locked, parameters cannot be changed during the run. The key lock function is selected using the menu.	

condens.protect[®] technology with Eppendorf ThermoTop

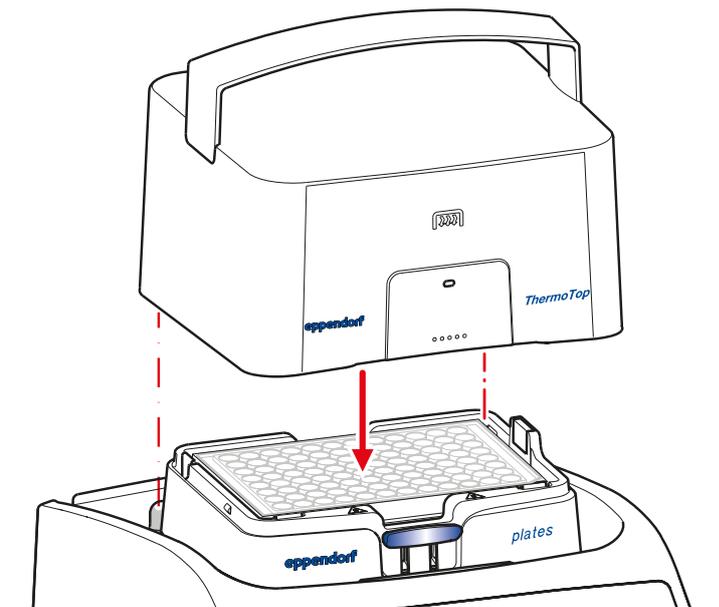
Optionally available for Eppendorf SmartBlocks 0.5/1.5 and 2.0 mL as well as Eppendorf SmartBlocks plates and PCR 96 & PCR 384 – labeled with the **condens.protect** symbol  – is this heated lid. It prevents the formation of condensation.



When working with small volumes, preventing condensation on the lid and edge of the tube is especially important because a reduced sample volume can have undesirable effects on sensitive, biochemical reactions. With the Eppendorf ThermoTop and its **condens.protect** technology, centrifugation steps for “spinning down” drops on the tube lid or plate cover are a thing of the past.

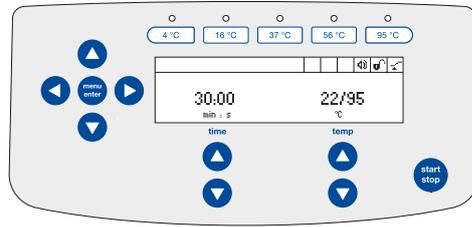
The Eppendorf ThermoTop is placed on the device housing using the SmartBlock. If the lid is correctly attached, it will be automatically detected by the device. The LED on the lid will light up blue and the Eppendorf ThermoTop symbol appears in the display . As soon as the temperature control process begins the blue LED on the lid will blink. If the temperature control has been completed, the lid symbol will light up blue again and the symbol disappears from the display after the Eppendorf ThermoTop has been removed.

- ! The Eppendorf ThermoTop should be placed upon the Eppendorf SmartBlock from the beginning of the temperature control. Thereby it is ensured that the Eppendorf ThermoTop has always an optimized temperature and thus, forming of condense water drops is prevented reliably from the beginning. Therefore using the Eppendorf ThermoTop causes a slight delay of the heat up speed of the Eppendorf SmartBlock.
- ! The temperature sensor of the Eppendorf SmartBlock reacts very sensitively to the sample temperature. Inserting cooler samples into a preheated Thermoblock can therefore lead to a momentarily descent of the displayed Eppendorf SmartBlock temperature. The same effect occurs if a cold Eppendorf ThermoTop is placed on a preheated Eppendorf SmartBlock.



Start a simple temperature control procedure

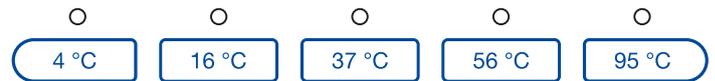
Use the arrow keys to select the temperature and time.
Press the **start/stop** key to start the run.



Temperature keys

You can use 5 temperature keys to quickly, directly access your most frequently used temperatures.

Select a temperature of your choice by pressing a **temperature key** and start by pressing the **start/stop** key.



Temperature keys

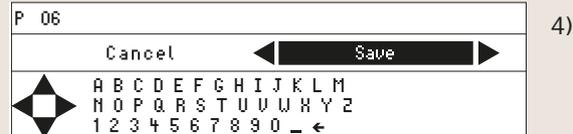
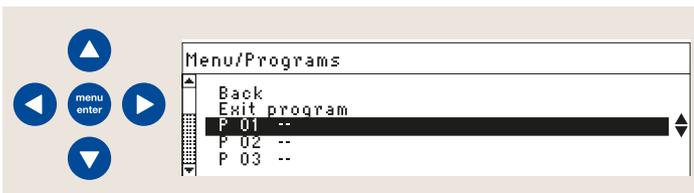
4 °C: Cooling; time ∞
16 °C: Ligation; time ∞
37 °C: Restriction digest; time ∞
56 °C: Proteinase K digest; time ∞
95 °C: Denaturation; time ∞

Calling, creating, changing, naming and saving programs

With the Eppendorf ThermoStat C, you can configure, name and save 15 programs with up to 4 steps per program.

To access these functions, go to the menu and select **Programs**. Here, you can decide if you would like to create a new program, load a program (**Load**) or edit a program (**Edit**) (1). Add or remove the program **Steps** under **Options** in the Edit mode and define ramp rates here (2;3). Then you can name and **save** the program (4).

! At the end of the operating manual you can find a table where you might list your programs.



Options: Steps & Ramp rates

1. Adding/removing steps

You can add up to 4 steps to each program, which enables the simple programming of more complex temperature control procedures. A practical cooling level can be defined as the final step in the program.

For example:

Step 1: Denaturation
Step 2: Enzyme reaction
Step 3: Enzyme heat inactivation
Step 4: Cooling

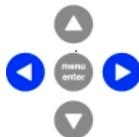
2. Ramp rates

Applications that require a controlled and reproducible heating or cooling speed can be executed using the Eppendorf ThermoStat C. To do so, select the program in the menu and select the ramp rates in the options.

Select with help of the menu arrow keys between following speeds:

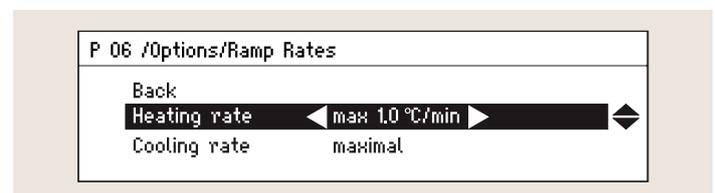
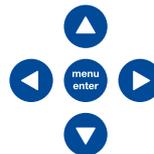
Heating/Cooling rates:

- > max. 3.0 °C / min
- > max. 2.0 °C / min
- > max. 1.0 °C / min
- > max. 0.1 °C / min
- > maximal



When the **maximum** option is selected, the device heats or cools at the maximum possible speed. This allows the device to reach values that vary slightly based on the type of Eppendorf SmartBlock, load (total volume), initial and final temperature and ambient temperature.

! A program starts always with step 1. It can't be started at another step. The active running step is signed with a star like this ***Step1**. It is possible to see all program steps while another step is running. The shown step is signed then by a black background whereas the running step is displayed with the star. The example display above shows therefore the parameters of Step 2 but Step 1 is just running.



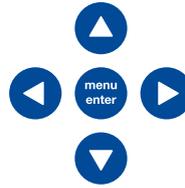
For instance:

Controlled slow cooling down from e.g. 60 °C to 30 °C in 5 h (0.1 °C/min)
> Time Mode: Temp Control
> Heating rate: maximal
> Cooling rate: 0.1 °C/min
> Program Step 1: 60 °C; time 30 min
> Program Step 2: 30 °C; time ∞

Selecting the Time Mode (Time Control; Temp Control)

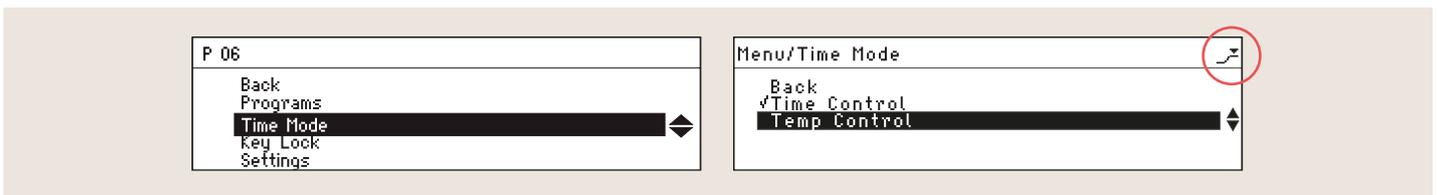
You can program the Eppendorf ThermoStat C so that the device immediately starts with time counting after you have pressed “start”. Therefore, the time counting process also starts if the set temperature has not yet been reached – the device is in **Time Control mode**.

However, with a relatively short temperature control period, the selected temperature may not be reached even though the programmed time has already elapsed. If this occurs, the **Temp Control mode** will provide a remedy: when the **Temp Control mode** is selected, the time counting process will only start after the selected temperature has been reached.



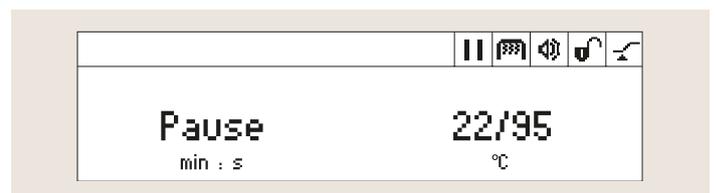
Time Mode	
Time Control	Temp Control
Time counting starts immediately, regardless of whether the selected temperature has already been reached.	Time counting starts only after the selected temperature has been reached.

! **The Temp Control mode** is always recommended when samples need to be incubated at a specific temperature for a specific period of time.



The Pause function

The Pause function can be activated by pressing the **start/stop key for at least 2 seconds**. The time counting process is now interrupted, but the temperature will continue to be controlled. **Pause** appears in the display. Time counting will be continued by pressing the **start/stop** key again.



Example of use

! This function can be useful if time counting must be briefly interrupted to add enzymes, salts, catalysts, inhibitors or other materials to a sample during an assay. The time counting will be interrupted during the Pause. The temperature will continue to be precisely regulated.

Aborting a run:

if a program or a simple run is interrupted by briefly pressing the **start/stop** key, time counting will start over from the very beginning by pressing the key again.

! A pause between program steps must be programmed as a step.

Additional examples of use

The applications listed here serve as examples of how your device can be programmed. However, always observe the data in your protocol and modify the programming accordingly.

Labeling of probes for hybridization experiments – e.g. random priming

- > Eppendorf SmartBlock 1.5 mL or 0.5 mL
- > Time Mode: Temp Control
- > Program Step 1: 95 °C; 3 min (Denaturation); thereafter put the sample immediately on ice; addition of buffer, dNTP's, enzyme
- > Program Step 2: 37 °C; 2 h (Incubation)
- > Program Step 3: 70 °C; 10 min (enzyme inactivation)
- > Program Step 4: 4 °C; time: ∞ (cooling)

Transformation of DH5α

- > Eppendorf SmartBlock 1.5 mL
- > Time Mode: Temp Control
- > Program Step 1: 42 °C; 60 sec (Heatshock); put the sample immediately on ice
- > Program Step 2: 37 °C; 30 min–2 h (Transformation of DH5α)

Restriction digest of DNA

- > Eppendorf SmartBlock 1.5 mL or 0.5 mL
- > Time Mode: Temp Control
- > Program Step 1: 37 °C; 1 h
- > Program Step 2: 65 °C; 10 min (enzyme inactivation)
- > Program Step 3: 4 °C; time: ∞ (cooling)

DNase I digest of RNA preparations

- > Eppendorf SmartBlock 1.5 mL
- > Time Mode: Temp Control
- > 37 °C; 1 h (DNase I digest)
- > 65 °C; exactly 5 min (heat inactivation of the DNase)

Reverse transcription

- > Eppendorf SmartBlock 1.5 mL
- > Time Mode: Temp Control
- > Program Step 1: 70 °C; 10 min (denaturation of RNA and primers)
- > Program Step 2: 37–42 °C; 1 h (first strand cDNA-synthesis with oligo-(dT) primers)
- > Program Step 3: 70 °C; 30 min (inactivation of the reverse transcriptase by heat inactivation)
- > Program Step 4: 4 °C; time: ∞ (cooling)

Your local distributor: www.eppendorf.com/contact

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www.eppendorf.com

Phosphorylation of linker-DNA

- > Eppendorf SmartBlock 1.5 mL
- > Time Mode: Temp Control
- > Program Step 1: 37 °C; 30 min–1 h (incubation step)
- > Program Step 2: 65 °C; 20 min (stop of the reaction by heat inactivation)
- > Program Step 3: 4 °C; time: ∞ (cooling)

Dephosphorylation of linear DNA molecules

- > Eppendorf SmartBlock 1.5 mL
- > Time Mode: Temp Control
- > Program Step 1: 37 °C; 1 h (incubation step)
- > Program Step 2: 75 °C; 10 min (stop of the reaction by heat inactivation) – (or in order to stop the reaction add 5 mM EDTA pH 8.0)
- > Program Step 3: 4 °C; time: ∞ (cooling)

Immunoprecipitation with Antibody-Sepharose (covalently bound)

Immunoprecipitation at 4 °C:

- > 4 °C; time ∞ or 12–18 h
- or as a program:
- > Time Mode: Temp Control
- > Program Step 1: 4 °C; time 12–18 h or ∞

Dissociation of the immunoprecipitate:

- > Time Mode: Temp Control
- > Program Step 1: 56 °C; 1 h (enhances dissolution by reducing irreversible aggregation which occurs when rapidly heated to 100 °C)
- > Program Step 2: 100 °C; 5 min

Immunoprecipitation-Recapture:

- > Eppendorf SmartBlock 1.5 mL
- > Time Mode: Temp Control
- > Program Step 1: 21 °C; 5 min (incubation with elution buffer)
- > Program Step 2: 95 °C; 5 min (incubation with elution buffer)
- > Program Step 3: 21 °C; 10 min (incubation with lysis buffer)
- > Program Step 4: 4 °C; time: ∞ (cooling)